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University of Tasmania

Inveresk Car Park
Traffic Impact Assessment

May 2020

ENGINEERS AUSTRALIA

PROFESSIONAL ENGINEER OF THE YEAR
INDIVIDUAL AWARDS
TASMANIA
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1. Executive Summary

This traffic impact assessment was prepared to investigate the traffic and parking impacts associated with a proposed 852 space car park located at the northern end of the Inveresk Precinct.

The University of Tasmania (UTAS) proposes to relocate the majority of students and staff currently located at the Newnham Campus to the Inveresk Campus. The Australian Maritime College will remain at the Newnham campus (headcount of approximately 1,000 students to remain at Newnham). UTAS's Newnham Campus is currently the largest campus in the north of Tasmania whilst its Inveresk Campus, which includes the School of Architecture and Design and the Tasmanian College of the Arts, is relatively small.

This transformation will accommodate a potential of 10,000 (head count) students engaged with the Inveresk campus annually by 2032 (equating to 5,400 full time equivalent students) and 491 full-time equivalent staff. By 2032 it is anticipated students will enrol in a range of course including short courses, pathway courses and full degree programs. This results in a spread of students across the university year and thereby reduces the overall traffic and parking impacts.

The provision of car parking is a critical component to facilitate the UTAS transformation. The car park development subject of this report forms part of the multi-location parking response for the overall redevelopment of the precinct. The car park will provide for UTAS, as well as the general public and for events within the Inveresk Precinct.

The traffic generation associated with the car park when fully developed is likely to be 4,272 vehicle movements per day. The peak volumes are likely to be 602 and 475 vehicles per hour during the AM peak and PM peak periods respectively.

The car park will be accessed via two existing accesses that will be upgraded. These intersections with Forster Street will continue to operate at a high level of efficiency and safety based on the forecast traffic generation and the relatively low traffic volumes currently utilising Forster Street.

Both accesses to the site will require a short channelised right turn lane due to the relatively high volume of right turning entry traffic to the site. Some loss of on-street car parking will occur as a result of the installation of the right turn lanes. The on-street car parking in these areas is generally in low demand and is more than offset by the provision of a large quantity of off-street car parking associated with the development.

The intersection of Forster Street and Invermay Road was modelled to investigate the impacts of the additional traffic generated by the development. The overall performance of the intersection was found to continue to operate at an acceptable level of service under future background traffic growth as well as the additional traffic generated by the development.

The layout of the car park has been provided at a conceptual level. In general terms the layout of the car park meets the requirements of Australian Standards AS2890.1. The car parking layout complies with the requirements of Australian Standards, AS2890.1, and therefore meets the requirements of Performance Criteria P1 of Clause E6.6.2 of the Planning Scheme.

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2. Introduction

2.1 Background

Midson Traffic were engaged by the University of Tasmania to prepare a traffic impact assessment for a proposed 852 space car park located at the northern end of the Inveresk Precinct. The development is part of a broader response by the University to provide parking through the Inveresk and Willis Street precinct as part of its relocation of the Launceston Campus to the precinct.

The transformation will facilitate the relocation of components of the University's Newnham Campus to Inveresk, to accommodate a potential of 10,000 students engaged with the Inveresk campus annually by 2032 (equating to 5,400 full time equivalent students) and 491 full-time equivalent staff. The high-level impacts associated with this expansion have been investigated in the 'Inveresk Traffic and Parking Assessment', March 2020.

UTAS and City of Launceston have reached agreement that pedestrian movement should be prioritised over vehicular movement in the university/ museum precinct, and over time car parking will be reallocated in the northern end of the site. This report provides details of the car parking provision at the northern end of the Inveresk precinct.

This traffic impact assessment investigates the traffic and parking impacts in the surrounding road network associated with the normal operation car park as a component of overall Inveresk precinct development.

2.2 Traffic Impact Assessment (TIA)

A traffic impact assessment (TIA) is a process of compiling and analysing information on the impacts that a specific development proposal is likely to have on the operation of roads and transport networks. A TIA should not only include general impacts relating to traffic management, but should also consider specific impacts on all road users, including on-road public transport, pedestrians, cyclists and heavy vehicles.

This TIA has been prepared in accordance with the Department of State Growth (DSG) publication, *A Framework for Undertaking Traffic Impact Assessments*, September 2007. This TIA has also been prepared with reference to the Austroads publication, *Guide to Traffic Management,* Part 12: *Traffic Impacts of Developments*, 2009.

Land use developments generate traffic movements as people move to, from and within a development. Without a clear understanding of the type of traffic movements (including cars, pedestrians, trucks, etc), the scale of their movements, timing, duration and location, there is a risk that this traffic movement may contribute to safety issues, unforeseen congestion or other problems where the development connects to the road system or elsewhere on the road network. A TIA attempts to forecast these movements and their impact on the surrounding transport network.

A TIA is not a promotional exercise undertaken on behalf of a developer; a TIA must provide an impartial and objective description of the impacts and traffic effects of a proposed development. A full and detailed

assessment of how vehicle and person movements to and from a development site might affect existing road and pedestrian networks is required. An objective consideration of the traffic impact of a proposal is vital to enable planning decisions to be based upon the principles of sustainable development.

The Road and Railway Assets Code of the Launceston Interim Planning Scheme, 2015, identifies that a TIA is required due to the traffic generation of the proposed development. This TIA addresses relevant clauses in E4.0 Road and Railway Assets Code and E6.0 Parking and Access Code of the Planning Scheme

2.3 Statement of Qualification and Experience

This TIA has been prepared by an experienced and qualified traffic engineer in accordance with the requirements of Council's Planning Scheme and The Department of State Growth's, *A Framework for Undertaking Traffic Impact Assessments*, September 2007, as well as Council's requirements.

The TIA was prepared by Keith Midson. Keith's experience and qualifications are briefly outlined as follows:

- 24 years professional experience in traffic engineering and transport planning.
- Master of Transport, Monash University, 2006
- Master of Traffic, Monash University, 2004
- Bachelor of Civil Engineering, University of Tasmania, 1995
- Engineers Australia: Fellow (FIEAust); Chartered Professional Engineer (CPEng); Engineering Executive (EngExec); National Engineers Register (NER)

2.4 Project Scope

The project scope of this TIA is outlined as follows:

- Review of the existing road environment in the vicinity of the site and the traffic conditions on the road network.
- Provision of information on the proposed development with regards to traffic movements and activity.
- Identification of the traffic generation potential of the proposal with respect to the surrounding road network in terms of road network capacity.
- Review of the parking requirements of the proposed development. Assessment of this parking supply with Planning Scheme requirements.
- Traffic implications of the proposal with respect to the external road network in terms of traffic efficiency and road safety.

2.5 Subject Site

The subject site is located at the northern end of the Inveresk precinct adjacent to Invermay Park, accessed via Forster Street. The site currently contains the old railway roundhouse that is currently utilised for parking. A range of community and agricultural related activities associated with the Show Society occur on a semi-regular basis in the north-eastern corner of the site.

The subject site and surrounding road network is shown in Figure 1.

Figure 1 Subject Site & Surrounding Road Network

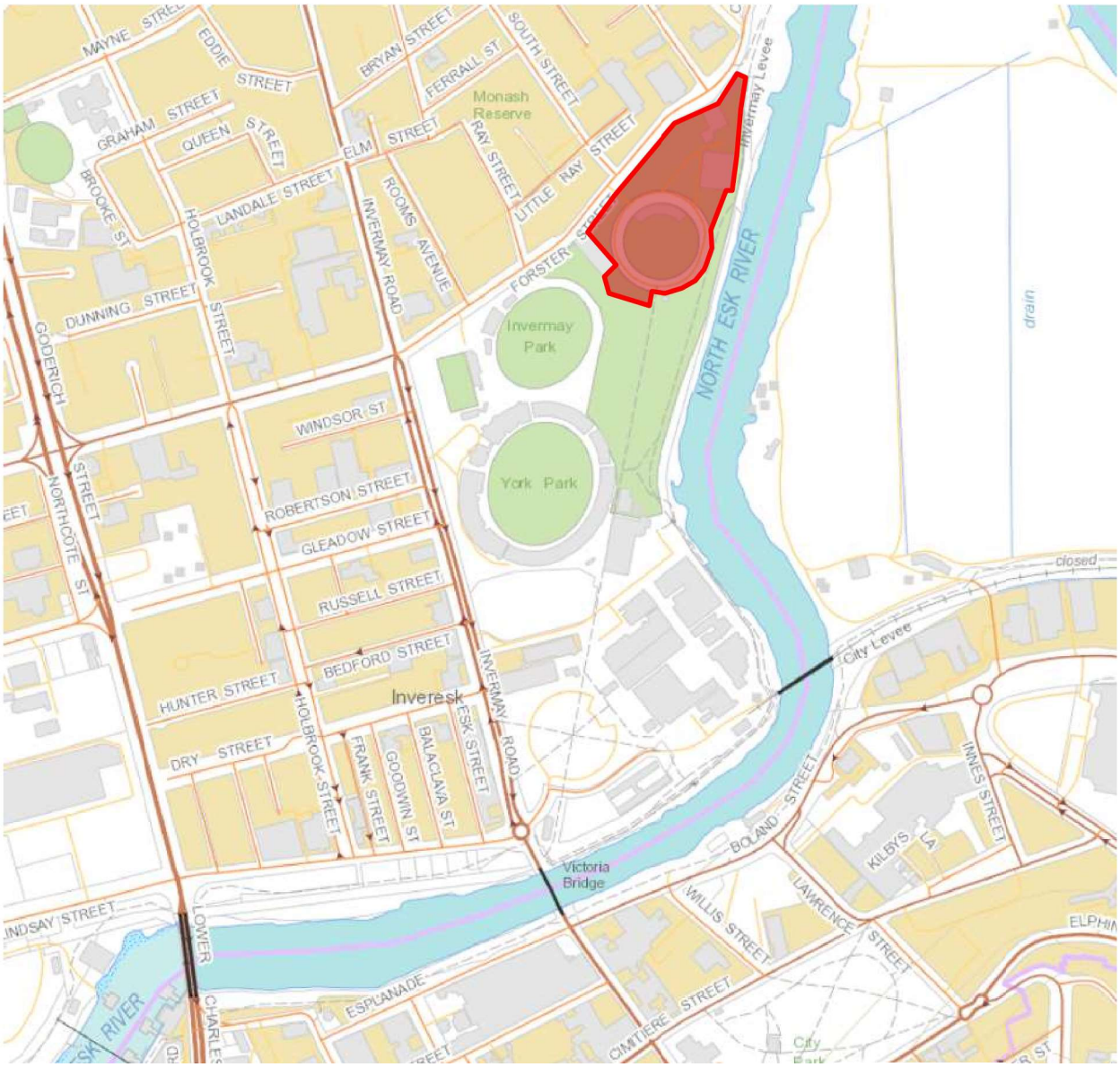


Image Source: LIST Map, DPIPWE

2.6 Reference Resources

The following references were used in the preparation of this TIA:

- Launceston Interim Planning Scheme, 2015 (Planning Scheme)
- Midson Traffic, UTAS Inveresk Traffic & Parking Assessment, March 2020
- Austroads, *Guide to Traffic Management,* Part 12: *Traffic Impacts of Developments*, 2009
- Austroads, Guide to Road Design, Part 4A: *Unsignalised and Signalised Intersections*, 2019
- Austroads, Guide to Traffic Management, Part 6: *Intersections, Interchanges and Crossings*, 2019
- Department of State Growth, *A Framework for Undertaking Traffic Impact Assessments*, 2007
- Roads and Maritime Services NSW, *Guide to Traffic Generating Developments*, 2002 (RMS Guide)
- Roads and Maritime Services NSW, *Updated Traffic Surveys,* 2013 (Updated RMS Guide)
- Australian Standards, AS2890.1, *Off-Street Parking*, 2004 (AS2890.1:2004)

3. Existing Conditions

3.1 Transport Network

For the purposes of this report, the transport network consists of Forster Street and Invermay Road.

3.1.1 Forster Street

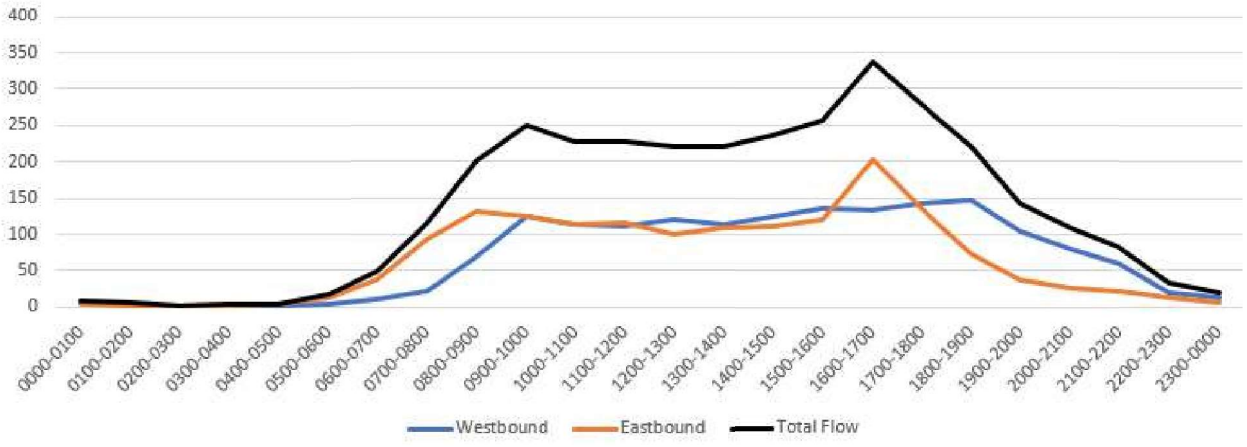
Forster Street connects between Invermay Road at its eastern end and terminates adjacent to the Tamar River, to the west of Goderich Street. It provides access to commercial and residential properties along its length and provides a major link between Goderich Street and Invermay Road.

Adjacent to the Inveresk campus, Forster Street provides access to the Roundhouse parking area (the old Inveresk Railway Turntable), as well as the various sporting venues (Cricket Club and Bowls Club). Forster Street provides access to residential properties as well as several local roads along its length to the east of the Invermay Road junction.

On-street car parking in Forster Street consists of 45-degree parking adjacent to the precinct, and parallel parking on both sides of the road. There is a mix of unrestricted and 1-hour parking with a total of 120 spaces.

Forster Street carries approximately 3,200 vehicles per day east of Invermay Road[1]. The hourly traffic flows of Forster Street immediately east of the Invermay Road junction are shown in Figure 2. The peak flows are 250 and 340 vehicles per hour during the morning and afternoon peaks respectively.

Figure 2 Forster Street Hourly Traffic Flow



[1] Source: Department of State Growth, SCATS traffic signal data, intersection of Forster St/ Invermay Road, December 2019

3.1.2 Invermay Road

Invermay Road is classified as a Sub-Arterial road that connects between Tamar Street, Launceston, and the Mowbray Connector near the George Town Road/ Vermont Road intersection through the suburb of Invermay. Invermay Road carries approximately 19,000 vehicles per day near the site. A posted speed limit of 50-km/h applies to Invermay Road.

Invermay Road has a divided carriageway adjacent to the Inveresk campus. Between Lindsay Street and Gleadow Street, Invermay Road consists of two southbound lands and one northbound lane. One-way service roads are provided on the western side of Invermay Road that provide access and parking for adjacent commercial properties. Between Gleadow Street and Forster Street two lanes are provided in both directions on Invermay Road.

Invermay Road crosses the North Esk River at the Victoria Bridge, becoming Tamar Street at its southern shore.

3.2 Road Safety Performance

Crash data can provide valuable information on the road safety performance of a road network. Existing road safety deficiencies can be highlighted through the examination of crash data, which can assist in determining whether traffic generation from the proposed development may exacerbate any identified issues.

Crash data was obtained from the Department of State Growth for a five-year period between 1st January 2015 to 31st December 2019 for Forster Street between Invermay Road and Churchill Park Drive.

The findings of the crash data is summarised as follows:

- A total of 9 crashes were reported during this time.
- Severity. 1 crash involved minor injury; 1 crash involved first aid at the scene; 7 crashes involved property damage only.
- Day of week. The majority of crashes were reported on weekdays (8 crashes). Wednesdays and Fridays had the highest crash frequency with 3 reported crashes each.
- Time of day. The majority of crashes were reported between 7:00AM and 7:00PM (8 crashes), with 3 crashes reported during the morning and 5 during the afternoon. 1 crash was reported at 12:12AM.
- Crash types. No clear crash trends were noted by crash type. 3 crashes were reported involving 'rear-end' collisions; 2 crashes involved 'cross-traffic' collisions.
- Crash locations. The majority of crashes were reported at the Invermay Road junction (7 crashes); 1 crash was reported at the South Street junction; and 1 crash was reported at a midblock location near the Invermay Road junction. The crash locations are shown in Figure 3.

The crash history does not provide an indication that there are any pre-existing road safety deficiencies in the transport network that may be exacerbated by traffic generated by the proposed development. The

crash rate at the Invermay Road/ Forster Street intersection is considered to be typical of a busy urban signalised intersection with high traffic flow on the Invermay Road corridor.

Figure 3 Crash Locations

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4. Proposed Development

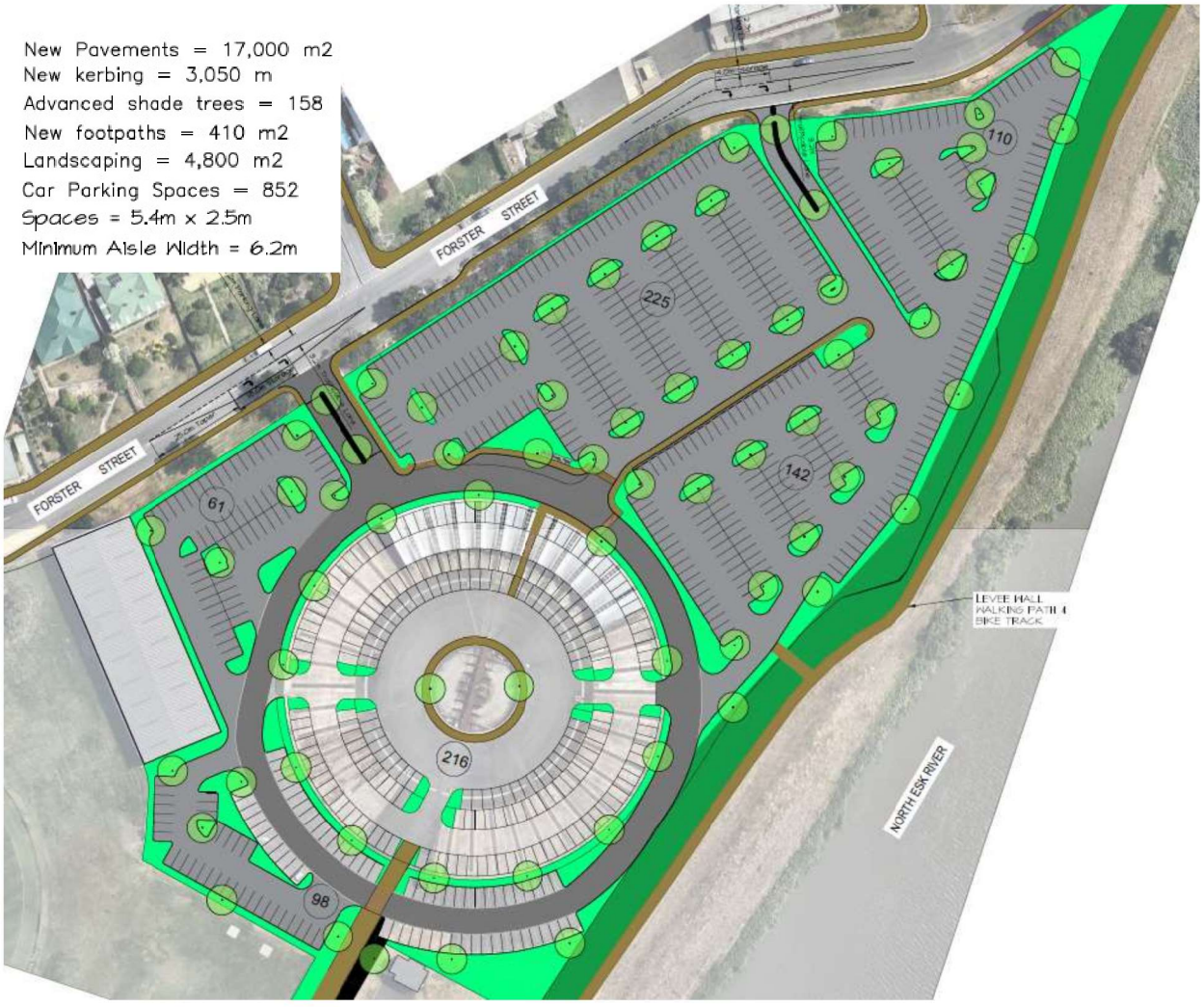
4.1 Development Proposal

The proposed development involves the construction of 852 parking spaces, increasing the capacity of the existing Roundhouse car park by 660 spaces.

Access is via the existing access that connects the Roundhouse structure to Forster Street, as well the existing access to the north.

The proposed development is shown in Figure 4.

Figure 4 Proposed Development Plans



5. Traffic Impacts

5.1 Traffic Generation

The car park will predominantly cater for the needs of students of the University. The traffic generation associated with the proposed car park therefore relates to the traffic generation of the University. The impacts associated with the car park in isolation will be experienced on the network immediately surrounding the car park however.

The Inveresk Traffic and Parking Assessment estimated the fully developed Inveresk campus to have a traffic generation of 6,884 vehicles per day, with a peak of 970 vehicles per hour during the morning peak and 765 vehicles per hour during the afternoon peak. This traffic generation will be experienced across the whole precinct.

The traffic generation associated with the car park subject of this report is likely to be proportional to the total car parking provision of the fully redeveloped precinct. The forecast parking demand of the fully redeveloped precinct 1,373 spaces.

The traffic generation associated with the car park is therefore likely to be:

- 4,272 vehicles per day
- 602 vehicles per hour during the AM peak
- 475 vehicles per hour during the PM peak

5.2 Trip Distribution

The car park relies upon two existing accesses: the main access connecting directly to the roundhouse; and the second access located approximately 140 metres to the north.

The traffic generation associated with the car park will utilise both access predominantly as right-in/ left-out movements. The southern access is likely to have a higher proportion of traffic due to its proximity to the Invermay Road junction and the higher number of parking spaces that it has direct access to.

The proportion of traffic generation at the accesses is likely to be as shown in Table 1.

Table 1 Trip Distribution

Access	Daily Traffic	AM Peak Traffic	PM Peak Traffic
Southern access	2,777 vpd	391 vph	309 vph
Northern access	1,495 vpd	211 vph	166 vph
TOTAL	4,272 vpd	602 vph	475 vph

The directional split during the AM and PM peaks is likely to be as shown in Table 2.

Table 2 Access Directional Splits

Access	AM Inward	AM Outward	PM Inward	PM Outward
Southern access	274 vph	117 vph	124 vph	185 vph
Northern access	148 vph	63 vph	66 vph	100 vph
TOTAL	422 vph	180 vph	190 vph	285 vph

5.3 Road Access Impacts

The Acceptable Solution A3 of Clause E4.5.1 of the Planning Scheme states "*The annual average daily traffic (AADT) of vehicle movements, to and from a site, using an existing access or junction, in an area subject to a speed limit of 60km/h or less, must not increase by more than 20% or 40 vehicle movements per day, whichever is the greater*".

In this case, the proposal generates more than 20% and more than 40 vehicles per day. The development therefore does not comply with Acceptable Solution A3 of Clause E4.5.1 of the Planning Scheme.

The Performance Criteria P3 of Clause E4.5.1 states:

> *"Any increase in vehicle traffic at an existing access or junction in an area subject to a speed limit of 60km/h or less, must be safe and not unreasonably impact on the efficiency of the road, having regard to:*
>
> *(a) the increase in traffic caused by the use;*
>
> *(b) the nature of the traffic generated by the use;*
>
> *(c) the nature and efficiency of the access or the junction;*
>
> *(d) the nature and category of the road;*
>
> *(e) the speed limit and traffic flow of the road;*

(f) any alternative access to a road;

(g) the need for the use;

(h) any traffic impact assessment; and

(i) any written advice received from the road authority".

The following is relevant with respect to the proposed development:

a. Increase in traffic. The existing traffic generation of the site on the site is not quantified but assumed to be relatively low based on minimal activity witnessed during site investigations. The traffic generation associated with the development is likely to be in the order of 4,272 vehicles per day across both accesses. The peak hourly volume is likely to be 602 and 475 vehicles per hour for the AM and PM peaks respectively. This level of traffic can be absorbed by Forster Street and the surrounding transport network.

b. Nature of traffic. Traffic utilising the car park will be predominantly students, staff and commuters. The nature of traffic will be generally consistent with the commercial traffic that is currently utilising the existing accesses in Forster Street.

c. Nature and efficiency of junction. The site's accesses can cater for the forecast peak generation at a relatively high level of efficiency. The peak traffic generation at each access (refer to Table 2) can be accommodated with the existing low volume on Forster Street.

d. Nature and category of road. Forster Street is a minor collector road that services residential and commercial property along its length. This type of road is compatible with and suitable for the type of traffic utilising the road for the proposed development.

e. Speed limit. The General Urban Speed Limit of 50-km/h applies to Forster Street.

f. Alternative access. No alternative access is considered possible or necessary.

g. Need for use. The proposed car park is considered an integral component of the University's Master Plan.

h. Traffic Impact Assessment. This report document documents the findings of a traffic impact assessment. Note that a detailed traffic and parking impact study was also undertaken for the Inveresk Precinct.

i. Written advice from road authority. Council (as road authority) require a traffic impact assessment to be prepared to determine the likely impacts associated with the car park on the road network.

Based on the above assessment, the proposed development meets the requirements of Performance Criteria P3 of Clause E4.5.1 of the Planning Scheme.

5.4 Sight Distance Assessment

The Acceptable Solution, A1, of E4.6.4 of the Planning Scheme states that "*Sight distances at an access or junction must comply with the Safe Intersection Sight Distance shown in Table E4.6.4*". The requirements of Table E4.6.4 are reproduced in Table 3.

Table 3 Planning Scheme SISD Requirements

Vehicle Speed	Safe Intersection Sight Distance in metres, for speed limit of:	
km/h	60 km/h or less	Greater than 60 km/h
50	80	90
60	105	115
70	130	140
80	165	175
90		210
100		250
110		290

In this case, the required SISD is 80 metres, noting that the actual vehicle speed (measured as the 85th percentile speed) was assumed to be equal to the general urban speed limit of 50-km/h.

The available sight distance exceeds the minimum SISD requirements in Table E4.6.4 of the Planning Scheme. The Acceptable Solution A1 of Clause E4.6.4 of the Planning Scheme is therefore met.

5.5 Pedestrian Impacts

The development will result in an increase of pedestrian movements between the car park and the University Inveresk campus. This will be via a network of carefully planned paths between key areas within the precinct. Minimal pedestrian activity would be likely between the car park and the immediately surrounding network (Forster Street).

The pedestrian infrastructure in the surrounding network is considered to be of a high standard and can accommodate the likely increase in pedestrian activity.

5.6 Road Safety Impacts

No significant adverse road safety impacts are foreseen for the proposed development. This is based on the following:

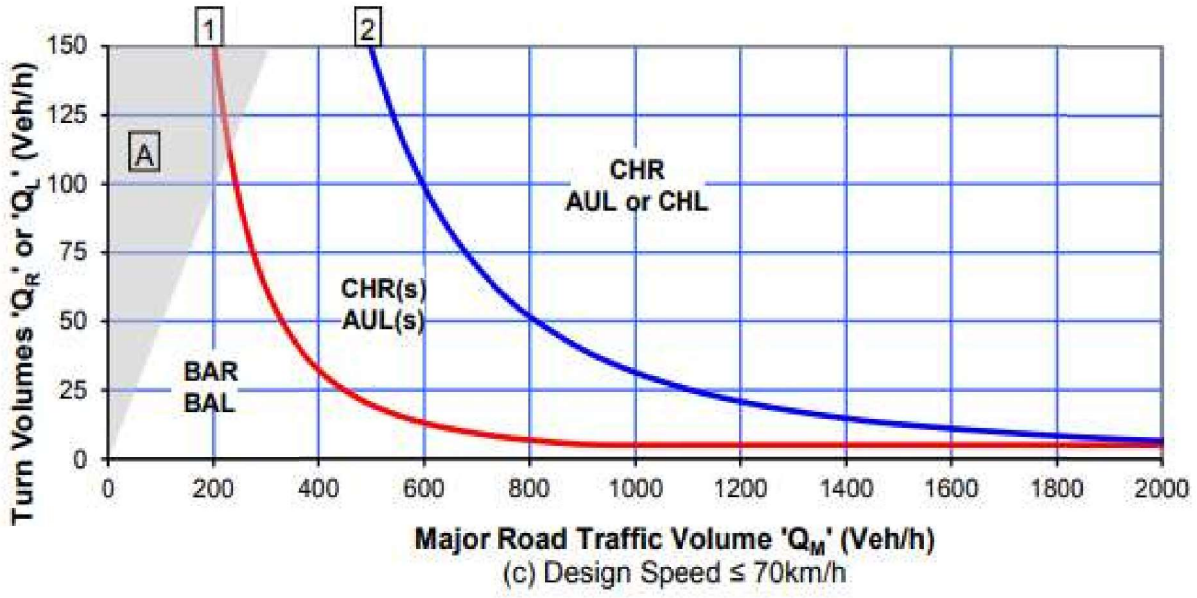
- There is sufficient spare capacity in Forster Street and the surrounding road network to absorb the peak hour traffic generated from the proposed development. The estimated peak generation is estimated to be 602 and 475 vehicles per hour (AM and PM peaks respectively).
- The existing road safety performance of Forster Street near the subject site does not indicate that there are any specific road safety deficiencies that might be exaggerated by traffic generated by the proposed development. Noting that no crashes have been reported at the existing accesses to the subject site in the past five years.
- The accesses are existing and have been in operation for many years. As such, vehicle movements into and out of the site will not be seen as 'unusual' for motorists on Forster Street.
- There is adequate sight distance from the access for the prevailing vehicle speeds on Forster Street in accordance with Planning Scheme requirements.

5.7 Junction Requirements

The Austroads publication, Guide to Traffic Management, Part 6: Intersections, Interchanges and Crossings, 2019, provides the guiding technical requirements for junction treatments.

In an urban context (design speed less than 70-km/h), the requirements for junction treatments are reproduced in Figure 5.

Figure 5 Austroads Turning Lane Warrants



Based on the right turn entry movements (up to approximately 250 vehicles per hour at the southern access and 140 vehicles per hour at the northern access during the AM peak period), the site accesses will require a channelised right turn lane, CHR, in Forster Street on the approach to the accesses to the car park.

The right turn lanes should be designed in accordance with relevant standards and guidelines. Sufficient road width is available in Forster Street to accommodate the construction of right turn lanes at the access locations.

5.8 Traffic Efficiency

The overall traffic network impacts associated with the UTAS transformation project were detailed in the Inveresk Traffic and Parking Assessment. The car park subject of this report is a major component of the transformation (noting that the car park supports the actual development that will occur within the UTAS site).

The traffic generated as a result of the car park will have the greatest impact increase traffic flow on Forster Street. When fully developed, the traffic flow in Forster Street will increase from approximately 3,200 vehicles per day to 6,000 vehicles per day. It is noted some of the existing traffic associated with Forster Street is currently generated by land use activity that will be relocated away from the site (including the existing use of the Roundhouse car park and the showgrounds – estimated to equate to approximately 1,500 vehicles per weekday).

The total peak hour flows on Forster Street when the car park is fully operational are estimated as follows:

- Morning peak 752 vehicles per hour (existing 250 vph + 602 vph – 100 vph)
- Evening peak 715 vehicles per hour (existing 340 vph + 475 vph – 100 vph)

This is on the assumption that approximately 100 vehicles per hour are currently generated by land use activity on the site during both peak periods.

The midblock capacity of Forster Street would be in the order of 1,200 vehicles per hour (equating to a daily flow of approximately 12,000 vehicles per day). The forecast total peak hour traffic volume can be absorbed in Forster Street.

5.9 Invermay Road/ Forster Street Impacts

The key road junction in the surrounding network that will be impacted by the proposed development is the Invermay Road/ Forster Street signalised intersection. This intersection was therefore modelled to determine the likely impacts associated with the additional traffic generation associated with the development.

5.9.1 SIDRA Traffic Modelling Overview

Intersection Analysis software, SIDRA Intersection (Akcelik and Associates), was used to determine the likely performance impacts at the signalised intersection as a result of the development.

SIDRA uses complex analytical traffic models coupled with iterative approximation technique to provide estimates of capacity and performance of intersections. SIDRA is endorsed as a modelling tool by Austroads.

The key outputs of the SIDRA modelling are defined as follows:

- Average delay for all vehicles (s)

  The average delay in seconds for all vehicles taking into account how many vehicles are performing each manoeuvre and the average delay for that movement.

- Worst movement average delay (s)

  The average delay in seconds for all vehicles undertaking the movement with the highest average delay.

- 95th percentile queue length (m)

  The queue length in metres not exceeded 95% of the time for the lane with the highest queue length.

- Average level of service

  The average level of service for all vehicles taking into account how many vehicles are performing each manoeuvre and the level of service for that movement.

  Level of service is a representation of average delay and describes the quality of traffic service in terms of 6 levels with level of service A (LOS A) representing the best operating condition (i.e. at or close to free flow) and level of service F (LOS F) representing the worst (i.e. forced flow).

  In general, the target level of service in an urban environment such as the subject site is level of service D (LOS D).

- Worst movement level of service

  The level of service for all vehicles undertaking the movement with the worst level of service.

The LOS measurement criteria used in SIDRA modelling is summarised in Table 4.

Table 4 Level of Service Criteria

LOS	Average Delay per vehicle (s/veh)	Traffic Signals/ Roundabout	Give Way and Stop Signs
LOS A	< 14	Good operation, ideal flow conditions	Good operation, ideal flow conditions
LOS B	15 – 28	Good operation with acceptable delays and spare capacity	Good operation with acceptable delays and spare capacity
LOS C	29 – 42	Satisfactory operating conditions.	Satisfactory operating conditions.
LOS D	43 – 56	Operating near capacity. Generally accepted limit for urban peak periods.	Operating near capacity. Generally accepted limit for urban peak periods.
LOS E	57 – 70	At capacity.	At capacity, requires alternative traffic management control method.
LOS F	> 70	Forced flow conditions.	Forced flow conditions.

SIDRA models were developed for the future turning movements as a result of traffic generated by the proposed car park development.

5.9.2 Junction Turning Movements

The peak traffic generation of the development was estimated to be +502 and +375 vehicles per hour during the morning and afternoon peak periods respectively (net traffic generation that includes the traffic generated by the development proposal minus the traffic generated by existing land uses of the site removed). Traffic generation is summarised in Section 5.1.

Turning movements were applied in the ratios set out in Table 5.

Table 5 Invermay Rd/ Forster St Existing Turning Movements

Approach	Movement	AM Peak			PM Peak		
		Cars	Heavy Vehicles	TOTAL	Cars	Heavy Vehicles	TOTAL
Invermay Rd south	Left turn	98	10	108	133	3	136
	Through	517	28	545	510	13	523
	Right turn	44	3	47	61	1	62
Forster Street east	Left turn	58	2	60	64	2	66
	Through	24	5	29	48	1	49
	Right turn	17	2	19	21	0	21
Invermay Rd north	Left turn	15	2	17	11	1	12
	Through	524	32	556	644	11	655
	Right turn	62	12	74	86	3	89
Forster St west	Left turn	137	11	148	124	5	129
	Through	48	4	52	51	2	53
	Right turn	211	12	223	183	2	185

Future turning movements at the intersection were factored as follows:

- A compound growth rate of 1% was applied for all movements over a ten-year period.
- The net traffic volume increase on Forster Street was applied to movements at the intersection with the following distribution:
  - → AM peak – 70% eastbound/ 30% westbound
  - → PM peak – 30% eastbound/ 70% westbound
  - → Turning movements of the Forster Street entry and exit movements were distributed across the intersection in a similar proportion to existing flows at the intersection.

The resulting future traffic flows at the intersection are provided in Table 6.

Table 6 Invermay Rd/ Forster St Future Turning Movements

Approach	Movement	AM Peak			PM Peak		
		Cars	Heavy Vehicles	TOTAL	Cars	Heavy Vehicles	TOTAL
Invermay Rd south	Left turn	108	11	119	147	3	150
	Through	571	31	602	563	14	577
	Right turn	86	3	89	116	1	117
Forster Street east	Left turn	142	2	144	191	2	193
	Through	64	5	69	143	1	144
	Right turn	43	2	45	62	0	62
Invermay Rd north	Left turn	66	2	68	22	1	23
	Through	579	35	614	711	12	723
	Right turn	68	13	81	95	3	98
Forster St west	Left turn	151	12	163	137	6	143
	Through	306	4	310	98	2	100
	Right turn	233	13	246	202	2	204

5.9.3 SIDRA Base Models

SIDRA base models were developed for the AM and PM peaks using turning movements in Table 5. The SIDRA outputs are summarised in Table 7 and Table 8 for the AM and PM peaks respectively.

Table 7 Invermay Rd/ Forster St SIDRA AM Base Model

Movement Performance - Vehicles								
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m
South: Invermay Rd south								
1	L	114	9.3	0.089	8.7	LOS A	0.5	4.1
2	T	574	5.1	0.553	27.2	LOS C	9.8	71.3
3	R	49	6.4	0.101	31.9	LOS C	1.5	10.7
Approach		737	5.9	0.553	24.7	LOS C	9.8	71.3
East: Forster St east								
4	L	63	3.3	0.135	32.0	LOS C	2.0	14.4
5	T	31	17.2	0.135	25.4	LOS C	2.0	14.4
6	R	20	10.5	0.135	34.2	LOS C	1.4	11.4
Approach		114	8.3	0.135	30.6	LOS C	2.0	14.4
North: Invermay Rd north								
7	L	18	11.8	0.715	41.6	LOS D	11.5	84.8
8	T	585	5.8	0.715	33.0	LOS C	11.6	85.0
9	R	78	16.2	0.208	36.3	LOS D	2.5	20.2
Approach		681	7.1	0.715	33.6	LOS C	11.6	85.0
West: Forster St west								
10	L	156	7.4	0.321	33.7	LOS C	4.9	36.7
11	T	55	7.7	0.107	23.5	LOS C	1.6	12.0
12	R	235	5.4	0.668	39.1	LOS D	8.8	64.2
Approach		445	6.4	0.668	35.3	LOS D	8.8	64.2
All Vehicles		1977	6.5	0.715	30.5	LOS C	11.6	85.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement

Table 8 Invermay Rd/ Forster St SIDRA PM Base Model

Movement Performance - Vehicles								
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m
South: Invermay Rd south								
1	L	143	2.2	0.109	8.6	LOS A	0.8	5.5
2	T	551	2.5	0.522	26.9	LOS C	9.3	66.2
3	R	49	6.4	0.101	31.9	LOS C	1.5	10.7
Approach		743	2.7	0.522	23.7	LOS C	9.3	66.2
East: Forster St east								
4	L	69	3.0	0.157	32.2	LOS C	2.4	16.9
5	T	52	2.0	0.157	24.7	LOS C	2.4	16.9
6	R	22	0.0	0.157	33.0	LOS C	2.0	13.9
Approach		143	2.2	0.157	29.6	LOS C	2.4	16.9
North: Invermay Rd north								
7	L	13	8.3	0.810	45.3	LOS D	14.5	103.3
8	T	689	1.7	0.810	36.8	LOS D	14.6	103.4
9	R	94	3.4	0.230	35.9	LOS D	3.1	22.0
Approach		796	2.0	0.810	36.8	LOS D	14.6	103.4
West: Forster St west								
10	L	136	3.9	0.273	33.2	LOS C	4.2	30.5
11	T	56	3.8	0.107	23.4	LOS C	1.6	11.8
12	R	195	1.1	0.552	37.1	LOS D	6.9	48.5
Approach		386	2.5	0.552	33.7	LOS C	6.9	48.5
All Vehicles		2068	2.3	0.810	31.0	LOS C	14.6	103.4

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement

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5.9.4 SIDRA Future Models

SIDRA future models were developed for the AM and PM peaks using turning movements in Table 6. The SIDRA outputs are summarised in Table 9 and Table 10 for the AM and PM peaks respectively. These models assume 10-year compound background traffic growth of 1% per annum on the network and all traffic generation from the fully developed car park.

It can be seen that all vehicle movements operate between LOS A to D at the intersection when the additional traffic is included. The overall performance of the intersection is considered to be a good outcome (with LOS 'D' being an acceptable level of service in an urban environment). The additional traffic generated at the intersection of Invermay Road and Forster Street by the development is therefore considered to be acceptable.

Table 9 Invermay Rd/ Forster St SIDRA AM Future Model

Movement Performance - Vehicles								
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance m
South: Invermay Rd south								
1	L	125	9.2	0.101	8.9	LOS A	0.7	5.5
2	T	634	5.1	0.687	34.4	LOS C	13.0	95.3
3	R	94	3.4	0.211	37.8	LOS D	3.3	23.9
Approach		853	5.6	0.687	31.0	LOS C	13.0	95.3
East: Forster St east								
4	L	152	1.4	0.308	33.1	LOS C	6.1	43.4
5	T	73	7.2	0.308	29.7	LOS C	6.1	43.4
6	R	45	0.0	0.308	41.5	LOS D	3.3	24.0
Approach		269	2.7	0.308	33.6	LOS C	6.1	43.4
North: Invermay Rd north								
7	L	72	2.9	0.821	49.3	LOS D	16.7	121.7
8	T	646	5.7	0.821	41.0	LOS D	16.8	123.0
9	R	85	16.0	0.219	39.0	LOS D	3.1	24.5
Approach		803	6.6	0.821	41.6	LOS D	16.8	123.0
West: Forster St west								
10	L	172	7.4	0.302	33.3	LOS C	5.7	42.4
11	T	326	1.3	0.524	27.0	LOS C	11.8	83.3
12	R	259	5.3	0.844	53.4	LOS D	13.0	94.8
Approach		757	4.0	0.844	37.4	LOS D	13.0	94.8
All Vehicles		2682	5.1	0.844	36.2	LOS D	16.8	123.0

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement.

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Table 10 Invermay Rd/ Forster St SIDRA PM Future Model

Movement Performance - Vehicles								
Mov ID	Turn	Demand Flow veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m
South: Invermay Rd south								
1	L	158	2.0	0.128	9.4	LOS A	1.3	9.2
2	T	607	2.4	0.647	33.5	LOS C	12.2	87.2
3	R	125	2.5	0.281	38.4	LOS D	4.5	32.4
Approach		891	2.4	0.647	29.9	LOS C	12.2	87.2
East: Forster St east								
4	L	203	1.0	0.410	34.8	LOS C	8.3	58.5
5	T	152	0.7	0.410	27.9	LOS C	8.3	58.5
6	R	65	0.0	0.410	36.5	LOS D	6.6	46.4
Approach		420	0.8	0.410	32.6	LOS C	8.3	58.5
North: Invermay Rd north								
7	L	24	4.3	0.834	49.5	LOS D	18.4	130.9
8	T	761	1.7	0.834	41.2	LOS D	18.5	131.2
9	R	103	3.1	0.232	37.8	LOS D	3.7	26.4
Approach		888	1.9	0.834	41.0	LOS D	18.5	131.2
West: Forster St west								
10	L	151	4.2	0.268	33.6	LOS C	5.0	36.3
11	T	105	2.0	0.176	24.3	LOS C	3.4	24.0
12	R	215	1.0	0.821	53.1	LOS D	10.5	74.3
Approach		471	2.2	0.821	40.4	LOS D	10.5	74.3
All Vehicles		2669	1.9	0.834	35.9	LOS D	18.5	131.2

Level of Service (LOS) Method: Delay (HCM 2000).
Vehicle movement LOS values are based on average delay per movement

6. Parking Assessment

6.1 Parking Provision

The existing car park is known as the 'Roundhouse' car park. It currently has capacity for 192 spaces. The proposed development will provide a total of 852 parking spaces, an increase of 660 spaces.

The parking is required to support the Inveresk precinct in the longer term, particularly due to the expansion of the UTAS Inveresk campus. The parking requirements associated with this redevelopment are documented in the UTAS Inveresk Traffic & Parking Assessment, March 2020.

6.2 Planning Scheme Requirements

The Acceptable Solution A1 of Clause E6.5.1 of the Planning Scheme states:

> *"The number of car parking spaces must:*
>
> *(a) not be less than 90% of the requirements of Table E6.1 (except for dwellings in the General Residential Zone); or*
>
> *(b) not be less than 100% of the requirements of Table E6.1 for dwellings in the General Residential Zone; or*
>
> *(c) not exceed the requirements of Table E6.1 by more than 2 spaces or 5% whichever is the greater, except for dwellings in the General Residential Zone; or*
>
> *(d) be in accordance with an acceptable solution contained within a parking precinct plan".*

In this case, Table E6.1 specifies '*No requirement set*' for 'Vehicle Parking' use. The parking subject of this report will form an integrated component of the overall UTas Inveresk transformation project. The Acceptable Solution A1 of Clause E6.5.1 of the Planning Scheme is therefore met.

The overall parking requirements associated with the Inveresk transformation were detailed in the Inveresk Traffic and Parking Assessment.

6.3 Car Parking Layout

6.3.1 Australian Standards Requirements

Australian Standards, AS2890.1, defines the parking as User Class 2 – '*Long-term city and town centre parking, sports facilities, entertainment centres, hotels, motels, airport visitors (generally medium-term parking*'. The basic physical dimensions required for User Class 2 are outlined as follows:

- Space length 5.4m, or 4.8m where parking is to a low kerb
- Space width 2.5m
- Aisle width 5.8m

The typical parking space dimensions within the car park are summarised as follows:

- Space length 5.4m
- Space width 2.5m
- Aisle width 5.8m

It can be seen that the parking space dimensions of the spaces meet AS2890.1 requirements.

6.3.2 Planning Scheme Requirements

The Acceptable Solution A1.1 of Clause E6.6.2 of the Planning Scheme states:

"Car parking, access ways, manoeuvring and circulation spaces must:

(a) provide for vehicles to enter and exit the site in a forward direction where providing for more than 4 parking spaces;

(b) have a width of vehicular access no less than the requirements in Table E6.2, and no more than 10% greater than the requirements in Table E6.2;

(c) have parking space dimensions in accordance with the requirements in Table E6.3;

(d) have a combined access and manoeuvring width adjacent to parking spaces not less than the requirements in Table E6.3 where there are 3 or more car parking spaces; and

(e) have a vertical clearance of not less than 2.1 metres above the parking surface level".

The following is relevant with respect to the proposal:

a. On-site turning is provided to enable vehicles to enter and leave the site in a forward direction. The design of the car parking modules enables turning on-site.

b. Table E6.2 requires a minimum width of 5.5 metres (greater than 21 parking spaces). The proposed accesses have a total width of approximately 12 metres (6m separated entry and exit carriageways at both accesses), thereby exceeding the minimum width requirement of Table E6.2 by more than 10%.

c. The parking spaces do not comply with the dimensions in Table E6.3. Notably, the space width is below the minimum requirement for 90-degree parking. The spaces do comply with requirements for User Class 2 of AS2890.1, as noted in Section 6.3.1.

d. The combined access and manoeuvring width adjacent to the parking spaces is typically 5.8 metres. The aisle width complies with the requirements for User Class 2 of AS2890.1.

e. Vertical clearance is not applicable.

Based on the above assessment, the proposal does not comply with Acceptable Solution A1 of Clause E6.6.2 of the Planning Scheme. Specifically, the development does not comply with the physical dimensions of Table E6.3 of the Planning Scheme.

The Performance Criteria P1 of Clause E6.6.2 of the Planning Scheme states:

> *"Car parking, access ways, manoeuvring and circulation spaces must be convenient, safe and efficient to use, having regard to:*
>
> *(a) the characteristics of the site;*
>
> *(b) the proposed slope, dimensions and layout;*
>
> *(c) vehicle and pedestrian traffic safety;*
>
> *(d) the nature and use of the development;*
>
> *(e) the expected number and type of vehicles;*
>
> *(f) the nature of traffic in the surrounding area; and*
>
> *(g) the provisions of Australian Standards AS 2890.1 - Parking Facilities, Part 1: Off Road Car Parking and AS2890.2 Parking Facilities, Part 2: Parking facilities - Off-street commercial vehicle facilities".*

The car parking proposed for the development complies with the requirements of AS2890.1, for User Class 2 which is applicable for long-term city and town centre parking.

Based on the above assessment (ie. the general compliance with Australian Standards requirements), the car parking area meets the requirements of Performance Criteria P1 of Clause E6.6.2 of the Planning Scheme.

6.4 On-Street Car Parking

Some loss of on-street car parking in Forster Street will occur as a result of the installation of right turn lanes at both accesses to the development.

Observations indicate that the on-street car parking in these areas is generally in low demand and is more than offset by the provision of a large quantity of off-street car parking associated with the development.

In general terms, to prevent students and staff from utilising on-street car parking within the Invermay area, it will be important to monitor the impacts on nearby on-street car parking in the surrounding area. The use of parking restrictions (such as time restrictions and residential parking zones) may be effective strategies to restrict parking demands beyond the precinct area.

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7. Conclusions

This traffic impact assessment (TIA) investigated the traffic and parking impacts of a proposed 852 space car park development at the northern end of the Inveresk precinct, accessed via Forster Street. The car park forms part of a broader response by the University to provide parking through the precinct as part of its relocation of the Launceston campus to the precinct. The overall impacts associated with the Inveresk precinct redevelopment was documented in the UTAS Inveresk Traffic and Parking Assessment in March 2020.

The key findings of the TIA are summarised as follows:

- The total number traffic movements for the car park is likely to be 4,272 vehicle movements per day. The AM peak traffic generation is likely to be 602 vehicles per hour. The PM peak traffic generation is likely to be 475 vehicles per hour.
- The impacts of the additional traffic generated by the development were investigated at the signalised intersection of Forster Street and Invermay Road. With the additional traffic generated by the development, the overall performance of the intersection is considered acceptable.
- The car park will be accessed via two existing accesses that will be upgraded. These intersections with Forster Street will continue to operate at a high level of efficiency and safety based on the relatively low traffic volumes currently utilising Forster Street (east of the Invermay Road junction).
- The two accesses to the site will both require a short channelised right turn lane due to the relatively high volume of right turning entry traffic to the site. The right turn lanes should be designed in accordance with relevant standards and guidelines. It is noted that there is sufficient road width in Forster Street to accommodate the construction of right turn lanes at the access locations. Some loss of on-street car parking will occur as a result of the installation of the right turn lanes. The on-street car parking in these areas is generally in low demand and is more than offset by the provision of a large quantity of off-street car parking associated with the development.
- The layout of the car park has been provided at a conceptual level. In general terms the layout of the car park meets the requirements of Australian Standards AS2890.1. The car parking layout complies with the requirements of Performance Criteria P1 of Clause E6.6.2 of the Planning Scheme.
- It will be important to monitor the impacts on nearby on-street car parking in the surrounding area over time. The use of parking restrictions may be effective strategies to restrict parking demands beyond the precinct area.

Based on the findings of this report and subject to the recommendations above, the proposed development is supported on traffic and parking grounds.

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