Enclosure 2 Traffic Impact Assessment Version 7, dated 24 March 2023 prepared by Geolink

Traffic Impact Assessment Lot 104 DP 751388, James Creek Road



PO Box 119 Lennox Head NSW 2478 T 02 6687 7666

PO Box 1446 Coffs Harbour NSW 2450 T 02 6651 7666

> PO Box 1267 Armidale NSW 2350 T 02 6772 0454

PO Box 229 Lismore NSW 2480 T 02 6621 6677

info@geolink.net.au

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1. Introduction

1.1 Background

GeoLINK has been engaged by MPD Investments to prepare a traffic impact assessment (TIA) for a proposed residential subdivision at Lot 104 DP 751388 James Creek Road, James Creek. This report aims to summarise the effect the proposed development is likely to have on the operation of adjacent roads, considering the impacts on all road users. It should be read in conjunction with the Statement of Environmental Effects and the associated design drawings.

1.2 Site Description

Lot 104 DP 751388 (the site) is rectangular in shape and has an area of approximately 33 ha. It is situated mid-way along James Creek Road in James Creek, bounded by James Creek Road to the east and Austons Lane to the south, with large rural lots to the north and west. The lot to the north is densely vegetated. Approximately 650 m further to the west flows James Creek and approximately 1.3 km to the east flows Palmers Channel. Both waterways flow north, discharging into the Clarence River approximately 1.7 km north of the site.

James Creek is a small, rural locality on the north coast of NSW. The nearest townships are Maclean, Gulmarrad and Yamba, all within 10-15 minutes' drive of the site. Grafton is the nearest larger centre, located 45 minutes' drive southwest.

The site has been historically cleared and modified for agriculture, sugar cane production and cattle grazing. It is currently essentially clear of vegetation other than grass. The crest of a small hill is located slightly to the north-west of the centre of the site. From this crest, the land falls away in all directions with slopes on the site typically in the range of 3% to 10%.

The site is predominantly zoned R1 General Residential, with a portion zoned R3 Medium Density Residential. There is also a small area approximately 2,100 m² zoned B1 Neighbourhood Centre. This area has the potential to include a neighbourhood shop or similar commercial development.

1.3 Proposed Development

The proposal is for subdivision of the site resulting in 329 residential lots and associated infrastructure (e.g. roads, services). At the time of writing, the subdivision is proposed to occur in five stages, however it is noted that the number of stages, the number of lots in each stage and the sequence of staging will be influenced by the market at the time and possibly by the provision of services.

Access for all proposed lots will be a single intersection on James Creek Road located approximately midway along the eastern boundary.

The internal road network comprises a permeable symmetric layout, including a main ring road and several smaller loop roads.

The proposal also includes a shared path extending from the development frontage along James Creek Road and Gardiners Road into Jubilee Street in Townsend.



2. Existing Conditions

2.1 Road Conditions

2.1.1 James Creek Road

All traffic to or from the site will use James Creek Road. James Creek Road is approximately 3.6 km in length, joining with Yamba Road to the north and Gardiners Road to the south. The northern-most 1.0 km portion of the existing road has been sealed by Clarence Valley Council (Council).

James Creek Road is a rural road with variable width, nominally 7.0 m from edge of seal to edge of seal. There is no kerbing and the shoulders are generally 1.0 m wide and unsealed. The road pavement appears to be in good condition.

Linemarking is provided only at the intersection with Gardiners Road and at the recently upgraded intersection with Yamba Road.

The alignment is generally flat with minimal horizontal curves. Crossfall varies from centre crown to one-way as required for superelevation and drainage.

There are a number of rural driveways along James Creek Road providing access to 25-30 rural dwellings. Austons Lane, which bounds the site to the south is a rural unsealed driveway providing access to a further two properties. Sapote Street is located approximately 450 m from the southern end of James Creek Road and provides access to a rural residential area of around 40 residences. There is also a concrete batching plant located near the Yamba Road intersection.

The speed zone is 80 km/h for the northern portion, dropping to 60 km/h along the property frontage towards the southern boundary of the site.



Figure 2.1 James Creek Road, view to the south near the site





Figure 2.2 James Creek Road, view to the south at Sapote Street intersection

2.1.2 James Creek Road / Yamba Road Intersection

This rural tee-intersection currently comprises a full length auxiliary left turn lane (AUL) for traffic travelling from Yamba and turning left onto James Creek Road, and a basic right turn treatment (BAR) for traffic travelling from Maclean or the Pacific Highway turning right onto James Creek Road.

There are no acceleration lanes provided for vehicles exiting James Creek Road onto Yamba Road in either direction.





Figure 2.3 James Creek Road / Yamba Road intersection [Source: Google Maps]



2.1.3 James Creek Road / Gardiners Road Intersection

This rural tee-intersection currently comprises basic left and right turning treatments for vehicles turning off Gardiners Road onto James Creek Road from either east or west.

There are no acceleration lanes provided for vehicles exiting James Creek Road onto Gardiners Road in either direction.

Radii at the intersection are sufficient for heavy vehicles to easily to navigate the intersection.



Figure 2.4 James Creek Road / Gardiners Road intersection [Source: Cardno Eppell Olsen]



Figure 2.5 James Creek Road / Gardiners Road intersection [Source: Google Maps]

2.1.4 Yamba Road

Yamba Road links Maclean in the west to Yamba in the east. It is a fully linemarked two-lane two-way rural road in very good condition. It provides connection to the Pacific Highway in both north and south directions via on and off ramps located south of the Yamba Road alignment.



The speed zone varies along the road's length, with 50 km/h through built-up areas, 80 km/h in the vicinity of the James Creek Road intersection, and 10 0km/h to the west of the Pacific Highway.



Figure 2.6 Yamba Road, view to the west, 400m east of James Creek Road

2.1.5 Gardiners Road

Gardiners Road links Townsend in the west to James Creek Road. Further east of the James Creek Road intersection, Gardiners Road provides access for a few large rural properties before merging into Amos Road then Palmers Channel South Bank Road. In Townsend, Gardiners Road becomes Jubilee Street, which currently crosses under the Pacific Highway and continues into Maclean.



Figure 2.7 Gardiners Road between James Creek Road and Townsend, view to the west



2.1.6 Pacific Highway

The Pacific Highway is the main connection between Sydney and Brisbane, or more locally, between Coffs Harbour, Grafton, Ballina and Tweed Heads. The highway has recently undergone major upgrade works to provide dual carriageway between Woolgoolga and Ballina. The works also include bypassing of Grafton and several other small townships.

The upgraded highway includes on and off ramps for north and southbound traffic at the Yamba Road interchange just south of the Harwood Bridge, and at the Maclean interchange approximately 5.5 km to the south. Refer to **Figure 2.8**.



Figure 2.8 Maclean (left) and Yamba (right) interchanges

2.2 Traffic Flows

2.2.1 James Creek Road

Existing traffic data from 2019 has been provided by Council for James Creek Road and additional counts have been collected in 2022. The data is summarised below.

Table 2.1	Traffic Data	for James	Creek	Road
	I ame Data		0.001	

Location	Dates	AADT	Heavy Vehicles
50 m south of Yamba Rd	24/06/2010 01/07/2010	362	14.1%
100 m north of Gardiners Rd	24/00/2019 - 01/07/2019	230	23.0%
At site frontage (2.5 km south of Yamba Rd / 1.1 km north of Gardiners Rd.)	22/03/2022 - 5/04/2022	311	13.2%



This data indicates that the average annual daily traffic (AADT) on James Creek Road is 362 veh/day close to Yamba Road, 230 veh/day close to Gardiners Road, and 311 veh/day at the site frontage. This suggests that the majority of traffic on James Creek Road travels north to their destination via Yamba Road, rather than south via Gardiners Road.

Peak hourly counts determined from the data collected in March 2022 were 32 veh/hour in the AM peak and 28 veh/hour in the PM peak. Directional split was measured to be approximately 50/50 overall throughout the day. However, during the AM hours, approximately 55% of traffic is heading north and 45% is southbound. In the PM hours, approximately 40% is northbound and 60% is southbound.

2.2.2 Yamba Road

Traffic volumes on Yamba Road were determined by Cardno Eppell Olsen (CEO) in late 2010 as part of Council's *Maclean Urban Catchment Local Growth Management Strategy 2011*. Existing AADT at the time was found to be 6,500 veh/day.

Additional data collected at the Yamba Road / James Creek Road intersection in March 2022 indicates an AADT on Yamba Road of 9,000 veh/day. This suggests an annual growth rate of 2.8% per year between 2010 and 2022.

Data presented in a TIA undertaken by PlanIt in 2018 calculated the 2018 AADT on Yamba Road to be 9,725 veh/day. These volumes were determined by taking seven days' traffic counts on Yamba Road, near to the intersection with Treelands Drive, on the western fringe of the Yamba township. Traffic volumes on Yamba Drive closer to the James Creek Road are expected to be less than these figures.

Assuming a 3.5% annual traffic growth, the volumes on Yamba Road can be expected to be up around 13,000 veh/day in ten years (2032).

Hourly traffic data collected in March 2022 indicates that the AM and PM peaks are 750 veh/hour for traffic travelling in both directions. Applying a 3.5% growth rate compounded annually, this becomes around 1,060 veh/hour in ten years (2032). The direction split is approximately 47% eastbound to 53% westbound in the AM peak and the reverse for the early PM peak (3:00-4:00 PM). The split is more pronounced at the later PM peak (4:30-5:30 PM), being around 57% eastbound and 43% westbound.

2.2.3 Gardiners Road

Data collected at the Gardiners Road / James Creek Road intersection in March 2022 indicates an AADT on Gardiners Road of no more than 2,000 veh/day. Assuming a 1.5% annual traffic growth rate, the volumes on Gardiners Road can be expected to be between 2,000 and 2,500 veh/day in ten years (2032), with peak hourly volumes around 200 veh/hour.

Hourly traffic data collected in March 2022 indicates that the AM and PM peaks are both close to 150 veh/hour for traffic travelling in both directions. Applying a 1.5% growth rate compounded annually, this becomes around 180 veh/hour in ten years (2032). The direction split is approximately 70% eastbound to 30% westbound in the AM peak and close to 50/50 during the PM peak.



2.3 Public Transport

The Grafton regional area is serviced by Busways North Coast Pty. Ltd. (Busways), including services between Grafton, Westlawn, Jackadgery, Ulmarra, Maclean, Yamba, Harwood and Iluka. Routes 380 and 386 operate between Grafton and Yamba (via Maclean), and Maclean and Iluka respectively. Both stop at a shelter on the southern side of Yamba Road directly west of the bridges.

Typical of regional and rural areas, the site currently has limited access to public transport services. The nearest bus stop to the site is on Yamba Road, located between the old Harwood Bridge and the road linking to the Pacific Highway northbound on and off ramps. This location is approximately 2.8km from the site, being a 4-minute drive or a 30-minute walk.

On weekdays, there are eight services a day to Grafton via Maclean, Tyndale, Cowper Public School, Ulmarra and South Grafton, and eight a day in the reverse direction. There are also eight services each weekday to Yamba via Palmers Island Public School, West Yamba, Angourie and Wooloweyah, and the same in the reverse direction. Weekends and public holidays offer half the number of services per day.

Approximate bus trip times to/from Bus Stop No. 52 are as follows:

- 5 minutes to Maclean (River Street)
- 10 minutes to Maclean TAFE
- 10 minutes to West Yamba shops
- 20 minutes to Yamba
- 30 minutes to Ulmarra
- 40 minutes to Iluka (switching to Route 386 in Maclean. Note this route only operates twice a day)
- 1 hour to Grafton

In addition to the local regional bus services, there is also one service each day in each direction between Grafton and Byron Bay, via Maclean. This service takes approximately 3 hours each way between Maclean and Byron, and timing is such to allow connection with the train services in Grafton to Coffs Harbour, Newcastle and Sydney. Similarly, from Byron, there are several coach services onwards to Brisbane.





Figure 2.9 Yamba Rd at Pacific Hwy Bridge Bus Stop



2.4 Pedestrians and Cyclists

There are no pedestrian or cycleway facilities currently provided on James Creek Road. However, given that it is a low volume and generally flat road, it is reasonable to assume that James Creek Road may be used by cyclists either recreationally or commuting to Townsend (5km), Gulmarrad (7km), Maclean (8km) or Yamba (15km).

There are several footpaths, cycle paths and shared paths within Maclean and Yamba. The Pacific Highway upgrade works include a shared path connection from Townsend to Maclean. However, any cycling between the site and nearby destinations will require some, if not most of the journey riding on the roadway.

Council's *Bike Plan* (2015) indicates a future cycleway route extending from Yamba to Tyndale to Wooli, as part of the NSW 'Coastline Cycleway' project. This project aims to create a continuous cycling route along the NSW coast from the Queensland boarder to the Victoria border. In the vicinity of the site, the route turns off Yamba Road on Palmers Channel South Bank Road (1.6km east of the Yamba Road / James Creek Road intersection). South Bank Road merges into Amos Road then Gardiners Road, which passes by the southern end of James Creek Road. As such, if the future cycleway eventuates, the site would be well connected to other coastal townships.

The Bike Plan also gives the cycle route between Maclean and Yamba a 'high' priority rating

Given the rural nature of the location and the proximity to the Pacific Highway, it is considered that pedestrian activity to, from, or near the site is unlikely.



Figure 2.10 Extract from Council's Bike Plan (2015)



3. Assessment

3.1 Traffic Generation

The RMS *Guide to Traffic Generating Developments* (2002) provides generic rates for trip generation for various land uses. For residential dwellings, the RMS Guide suggests each dwelling generates 9 vehicle trips per day, and 0.85 trips per dwelling for the weekday peak hour. The RMS Technical Direction TDT 2013/04a, *Guide to Traffic Generating Developments: Updated Traffic Surveys* (RMS, 2013) provides a revised rate of 7.4 daily vehicle trips and 0.78 peak hour trips per dwelling in regional areas, such as James Creek.

For the purposes of this assessment, the more conservative rates of 9 daily trips and 0.85 peak hour trips will be employed.

Based on these rates, it can be anticipated that the proposed residential development will generate $329 \times 9 = 2,961$ vehicle trips per day, or 280 trips during the weekday peak hour.

It should be noted that the rates used are considered 'worst case', as a proportion of the trips generated will be internal to the development. Furthermore, facilities promoting alternative modes of transport such as walking, cycling and public transport are likely to be improved in the future, which would further reduce the passenger vehicle trips generated by the development.

In addition to the residential development, the site has the potential to include a small neighbourhood shop (e.g. a corner store, a bakery, hairdresser etc.) Based on the available space and the need for on-site car parking provisions, it is expected that such a development would comprise no more than 750 m² gross floor area (gfa). The RMS Guide suggests rates of 10 daily trips or 2 peak hour trips per 100 m² gfa for office and commercial spaces, equating to 75 veh/day and 15 veh/peak hour for the 750 m³ gfa neighbourhood centre. However, it is expected that most (70-75%) of the traffic generated by the commercial area will be from within the development.

Thus, the total traffic expected to be generated by the development based on the RMS Guide and assumptions described herein, is taken to be 3,000 vehicle trips per day, or 300 peak hour trips. After construction is complete, it is expected that the traffic generated will consist almost entirely of light vehicles.

3.2 Roadway Capacity

The level of service (LOS) is a qualitative stratification of the performance measure or measures representing quality of service (AGTM03, 2020). The performance measures encompass speed, travel time, delays, density, freedom to manoeuvre, traffic interruptions, comfort, convenience and safety. LOS ranges from A to F, with LOS A representing the best operating conditions and service quality from the users' perspective (i.e. free flow) and LOS F the worst.

Roadway conditions that affect capacity and LOS include the type of road, lane widths, design speed, composition of traffic, and the horizontal and vertical alignment.

According to the Austroads *Guide to Traffic Management Part 3: Traffic Studies and Analysis* (2020), the capacity of a single traffic lane, C, measured in vehicles per hour, is a function of the lane width and lateral clearances, and the percentage of heavy vehicles, as follows:



C = 1800 fw F_{HV}

Thus

Where: $f_W = 0.9$ (Table 4.1 of AGTM03)

F_{HV} = 1 / [1 + P_{HV} (E_{HV} – 1)]

 P_{HV} = Proportion of heavy vehicles in traffic stream = 0.23 (worst case from **Table 2.1**) E_{HV} = Ave. passenger car equivalents for heavy vehicles = 2.0 (Table 4.2 of AGTM03) C = 1800 x 0.9 x 0.8 = 1,317 veh/h

3.3 Intersections

The existing intersections most likely to be impacted by the development are the James Creek Road / Yamba Road intersection, and, to a lesser extent due to likely trip destinations, the James Creek Road / Gardiners Road intersection. Both have been assessed using Austroads guidelines in terms of the suitability of the type of intersection (i.e. turning treatments provided) for the predicted future traffic volumes.

Most intersections in regional urban and rural environments are unsignalised. Different turning treatments are recommended for left and right turning movements at unsignalised intersections depending on the speed environment and relative traffic volumes performing each movement during the peak hour. If volumes for a specific movement or overall volumes are high, then the intersection may need to be upgraded to a roundabout or traffic signals to maintain efficiency and safety.

For unsignalised intersections, the warrants for different turning treatments for the major road of an unsignalised intersections are provided in the Austroads *Guide to Traffic Management Part 6: Intersections, Interchanges and Crossings* (2020). Figure 3.25(b) from AGTM06 is reproduced below, for a design speed between 70 and 100 km/h.



Figure 3.1 Warrants for major road turn treatments at unsignalised intersections (70-100km/h)





Figure 3.2 Warrants for major road turn treatments at unsignalised intersections (<70km/h)

The figures above were used to produce the table below, indicating which turn treatment is appropriate at each intersection. Note that the proposed intersection on James Creek Road providing access to the site will be located within a 60 km/h zone.

Note also that it is expected the worst-case peak hour would occur in the evening, with an assumption of 70% of the calculated peak hour traffic entering the site, and 30% exiting. Further, it was assumed that 70% of traffic associated with the site would enter (or exit) the site from (or to) the north. Turning volumes were all considered as worst cases.

Intersection	Q _M (veh/hr)	Q _R (veh/hr)	Q _L (veh/hr)	Min. turn treatment
James Creek Road	For left turn: 12	147	147 63	Left turn: BAL
/ The Site	For right turn: 93	147		Right turn: BAR
Yamba Road /	For left turn: 530	105	105	Left turn: AUL(s)
James Creek Road	For right turn: 1,065	105		Right turn: CHR
Gardiners Road /	For left turn: 88	20	80	Left turn: BAL
James Creek Road	For right turn: 195	20		Right turn: BAR

Table 3.1 Intersection turn treatments

BAL = Basic left turn, CHL/CHR = Channelised left/right turn, CHR(s) = Short CHR, AUL = Auxiliary left turn

Although a BAR is potentially a satisfactory solution for the right turn off James Creek Road into the development, it is recommended that a CHR(s) be provided for added safety and efficiency. Similarly, it is recommended that an AUL be provided for traffic entering the development from the south.

Under current conditions, the minimum recommended turn treatment for the Yamba Road intersection is a CHR(s) and AUL(s). Currently the intersection comprises a BAR and a full length AUL. Analysis indicates that a full length CHR should be provided at the Yamba / James Creek Road intersection at approximately the 6-year mark, although this depends quite heavily on how quickly the land is developed and lots released. However, given that the intersection is already in need of an upgrade, it is recommended that a full length CHR be constructed by the local Council as soon as practicable.

For the Gardiners Road intersection, current conditions indicate that the existing BAR and BAL are suitable for the current traffic volumes and will continue to be suitable once the James Creek Road subdivision is fully developed.



Figure 3.3 Typical intersection turning treatments

3.4 Intersection Sight Distance

The proposed development includes one new intersection on James Creek Road. The location for the proposed intersection is on a straight, flat section of James Creek Road, with approximately 330 m of sight distance available to the north and in excess of 500 m to the south. Note that 'sight distance' is the distance over which a road user needs to have unobstructed sight to respond to visual cues or safely avoid a conflict. Safe intersection sight distance (SISD) is the minimum standard which should be provided on the major road at any intersection. Values for SISD are defined by the Austroads *Guide to Road Design Part 4A: Unsignalised and Signalised Intersections* (2017). In accordance with this guide, for a design speed of 80 km/h and a reaction time of 2.0 seconds, the minimum SISD required is 181 m.



Note that even for a slower reaction time of 2.5 seconds and a design speed of 110 km/h, the recommended minimum SISD is 300 m.

In accordance with AGRD04A, SISD for trucks is calculated using the following formula:

SISD_{TRUCK} = $[(D_T \times V) / 3.6] + [V^2 / (254 \times (d + 0.01a))]$

Where: D_T = Decision time = 3s observation time + 2s reaction time = 5 seconds (AGRD03) V = operating speed = 80 km/h d = coefficient of deceleration (Table 5.3 of AGRD03) = 0.29 for trucks a = longitudinal grade in % = -3% (assumed worst case)

Thus SISD_{TRUCK} = $[(5 \times 80) / 3.6] + [80² / (254 \times (0.29 - 0.03))] = 208 m$

Therefore, the available sight distance at the proposed intersection in both directions is ample for design speeds greater than those anticipated.

3.5 Subdivision Design

The proposed lot layout includes a main ring road and several smaller loop roads. The short entry road and the main ring road have proposed road reserves widths between 20 m and 24 m. Two roads crossing the site from north to south have proposed road reserve widths of 18 m, and the other roads, servicing no more than 20 lots each have proposed road reserves 16 m wide.

There are no one-way, cul de sac, or other unusual road types proposed, and the layout is reasonably permeable (i.e. each lot can be accessed by at least two different paths, and the most direct travel path required to access is lot is unconvoluted). All lots have adequate road frontage, with minimal battle-axe lots proposed.

Corner lots have truncated corner boundaries to facilitate kerb returns and services around 90-degree bends.

Most intersections within the proposed layout are tee-intersections, with only two cross-intersections and one roundabout proposed. All intersections are at 90-degree angles.

The Northern Rivers Local Government *Development Design Specification D1: Geometric Road Design* (NRLG D1) provides design standards for subdivisional roads within the Clarence Valley Council Local Government Area.

The design of the proposed layout and road network, including proposed typical cross-sections, longitudinal sections and kerbing has been assessed and determined that a detailed design compliant with the relevant standards is possible. In accordance with Austroads Guidelines and NRLG D1, the final design would include:

- 'Local streets', servicing no more than 2,000 veh/day (approximately 222 lots), to have a minimum carriageway width of 7-9 m, constructed within a minimum 15-17 m road reserve. Note the majority of the roads within the proposed subdivision fall into the 'local street' category.
- Streets servicing between 2,000 and 3,000 veh/day (222 to 333 lots), to have a minimum carriageway width of 11 m, constructed within a minimum 18 m road reserve.
- Streets servicing over 3,000 veh/d (more than 333 lots) to have a minimum carriageway width of 13 m, constructed within a minimum 20 m road reserve.
- Mountable kerb and guttering.
- Footpath or shared path on one side of the road (where deemed appropriate).



- Minimum 3.5 m verges on each side of the carriageway.
- Provision for parking within the carriageway.
- Design speed of 50 km/h or less.
- Cross fall generally no greater than 3%.
- Longitudinal grades no less than 0.5% and no greater than 12% (note existing topography on site longitudinally along the proposed road alignments is generally no greater than 5%, with a maximum gradient of 6.3%).
- Horizontal curves no less than 20 m and vertical curves no less than 25 m (20 m at intersections).
- Crest vertical curves located such that they do not adversely impact on sight distance at intersections.
- The outer loop road is designed to accommodate buses, given the subdivision size and the recommended maximum walking distance to a bus stop for all residence being 400 m.
- Clear definition of the priority or 'major' road at each of the cross intersections, including signage and linemarking in accordance with AS 1742.
- Traffic calming along straight stretches of road greater than 150 m (e.g. narrowed roadway with planted kerb blisters etc.).

3.6 Speed Zones

3.6.1 James Creek Road

As previously noted, the existing 80 km/h speed zone applicable to the northern portion of James Creek Road changes to a 60 km/h speed zone for the southern portion of James Creek Road between the two proposed intersections providing access into the development.



Figure 3.4 Proposed relocated change in speed zone



This is not considered to be an appropriate location for a change in speed zone, given that drivers may be preoccupied with negotiating the intersections and disregard the speed zone signage.

TfNSW has the responsibility for reviewing and setting speed limits in NSW. All requests for an assessment or a review of a speed limit must be directed to TfNSW regional office for the area with that road section, usually via the relevant local Council.

In accordance with the TfNSW document, *NSW Speed Zoning Guidelines V4.0* (SZG, 2011), a review of the speed limit seeks to enhance road safety by applying speed management policies and practices to evaluate the appropriateness of current speed limits and determine the need for a change in the current speed limit – in this case to ensure that speed limits reflect changes in road use and the level of roadside activity.

Following discussions with TfNSW Northern Region representatives, Matt Adams, (Manager Land Use Assessment) Greg Aitken (Manager Network & Safety Services) and Cheryl Sisson (Development Assessment Officer), the TfNSW team responsible for speed zone referrals has recommended that the proposed subdivision design specifies a proposed relocation of the speed zone signage to be approximately 195 m north of the existing speed change point, as shown in **Figure 3.4**.

The minor change will result in < 5 seconds increase in travel time and will provided a greater benefit in terms of safety for all road users along the property frontage.

TfNSW has recommended that Council's Local Traffic Committee bringing this request forward to TfNSW once the intersection construction work is underway to ensure the speed zone and associated signage is adjusted prior to the intersection opening to traffic.

3.6.2 Internal Road Network

Internal roads within the proposed development are proposed to become part of a new default urban speed polygon. The SZG specifies the following with respect to setting speed limits:

- The speed limit for a particular length of road must reflect the road safety risk to the road users while maintaining mobility and amenity.
- The default 50 km/h general urban speed limit and practice in speed zoning of other speed limits in the urban environment should be the initial consideration for speed limits in urban areas.
- A default urban speed limit of 50 km/h applies in all built-up areas, in the absence of other speed limit signs. In the context of speed limits, a built-up area, in relation to a length of road, means an area in which either of the following is present for a distance of at least 500 metres or, if the length of road is shorter than 500 m, for the whole road: buildings not over 100 m apart, on land next to the road; and street lights not over 100 m apart.

As such, it is expected that the proposed development will meet the criteria for a 50 km/h speed zone, as the lot frontages are well under 100 m and street lighting will likely be at less that 100 m centres.

TfNSW's Matt Adams (Manager Land Use Assessment, Northern Region) has provided the following comment:

"Following consultation with our Network and Safety Services team, I have been advised that based on the internal subdivision layout and number of lots proposed, the internal roads within the subdivision should be signposted 50 km/h and internal roads should be designed accordingly."



4. Traffic Impacts of Proposal

The biggest impacts of the development on the traffic network will be experienced close to the site. Further from the site, impacts will be experienced less and less, as directional splits associated with different trip destinations taken by the generated traffic reduce the volume of traffic.

For the purpose of this TIA, the impacts of the proposed development have been assessed for:

- James Creek Road (whole length, particularly northwards from the site);
- James Creek Road / Yamba Road intersection;
- James Creek Road / Gardiners Road intersection;
- Yamba Road, in the vicinity of the James Creek Road intersection

Gardiners Road beyond the intersection with James Creek Road has not been assessed as it is considered that most of the traffic associated with the development will travel north from the site. This would almost certainly be the case for trips to and/or from Palmers Island, Yamba, Maclean, and destinations north of the Clarence River (e.g. Harwood, Iluka, Woody Head, Ballina, Lismore etc.) It is also likely for traffic leaving the site and travelling to destinations south along the Pacific Highway to use the Yamba Road interchange, as this is the route suggested by Google Maps.

Accessing the site from the south, traffic may take either the Maclean or Yamba interchanges, as there is negligible difference in distance or travel time. If drivers choose to take the latter, Gardiners Road will again be bypassed. The 50km/h zone through Townsend would also be bypassed. Some drivers may prefer this option, although some may have reason to stop in Townsend on the way home.

Traffic travelling to or from the site via Townsend, Gulmarrad or Brooms Head would more than likely travel along Gardiners Road. However, given there are fewer services and less possible destinations in these small towns, it is estimated that only a small percentage of the overall traffic will travel along Gardiners Road.

4.1 During Construction

Construction of the subdivision is expected to be carried out in stages. Assuming each stage follows the previous stage in relatively quick succession, then construction of the whole subdivision would take approximately two years. Beyond the subdivisional works, each new lot will also have a dwelling construction. However, it is anticipated that the dwellings of each completed stage will be constructed during the subdivisional works of the next stage, thus only marginally extending the overall length of construction works at the site.

If construction stages do not follow on relatively consecutively, then construction at the site could continue intermittently for several years, although it is not expected that construction will continue for more than five years.

Construction traffic will introduce heavy vehicles to the area for the duration of the construction – mainly associated with earthworks, but also to bring in road construction materials, drainage and utility pipes, and water tankers for dust suppression.

It is recommended that a Construction Management Plan (CMP) including a Traffic Management Plan (TMP) be prepared and implemented prior to, and for the duration of the construction on site. This will assist to reduce risks and impacts associated with construction traffic accessing the site.



Other mitigating methods could be employed, such as to undertake all bulk earthworks during the first stage, thereby reducing the length of time that multiple heavy vehicles are accessing the site.

Given that James Creek Road is currently a very low volume road, the intersections at either end of James Creek Road are geometrically suitable for heavy vehicle turning movements, and construction activities will be relatively short term (five years maximum), then the impact of construction on the traffic network is considered to be minor and acceptable.

4.2 Traffic Efficiency

4.2.1 James Creek Road

Traffic data from 2022 indicates that the existing peak hour traffic on James Creek Road is 32 veh/h. The predicted peak hour traffic generated by the development is around 300 veh/h.

As calculated previously, the capacity of each lane of James Creek Road is 1,317 veh/h. Thus, James Creek Road has ample capacity to accept the expected increase in traffic.

The RMS Guide provides indicative expected LOS for two-lane rural roads with level terrain as follows.

Terrain	Level of Service	Peak hour flow				
		10% heavy vehicles		15% heavy vehicles		
		(veh/h) 100 km/h	(veh/h) 80 km/h*	(veh/h) 100 km/h	(veh/h) 80 km/h*	
Level	В	560	504	530	477	
	С	920	828	870	666	
	D	1,480	1,332	1,410	1,269	
	E	2,390	2,151	2,290	2,061	

 Table 4.1
 Two-way peak hour flows on two lane rural roads

* Note that capacities for 80km/h design speed are assumed to be 90% of the equivalent for 100km/h

The RMS Guide suggests that acceptable peak hour LOS on major and minor rural roads is C. As per the table above, it is expected that James Creek Road will function with a LOS B or better, after the site is fully developed.

It is noted that the *James Creek Urban Growth Area Road Infrastructure Developer Contributions Plan* (the Contribution Plan) prepared by GHD and adopted by Council in February 2020 includes widening of the southernmost 900 m of James Creek Road to better cope with the expected traffic generated by the proposed development.

4.2.2 Yamba Road

Yamba Road already carries a relatively high volume of traffic, and traffic flows are expected to increase over time due to new development in the area. Future traffic on Yamba Road has been estimated based on a 3.5% annual growth rate. It should be noted that this 3.5% would include some, if not all of the traffic generated by the proposed development on James Creek Road. However, for the purpose of this report, it is conservatively assumed that the traffic generated by the subdivision development at the site is in addition to the predicted further traffic on Yamba Road. Based on the 2022 traffic count data, Yamba Road carries no more than 10% heavy vehicles.



Based on an assumed future AADT of 13,000 veh/day on Yamba Road, as per **Section 2.2**, and assuming a directional split of 60/40 and taking the peak hour traffic as 10% of the AADT, this given a peak hour single lane traffic flow of 780 veh/h.

It is assumed that the majority of traffic generated by the development will head north on James Creek Road, thus using Yamba Road (e.g. 70%). Assuming a 60/40 directional split at the Yamba Road / James Creek Road intersection, this adds up to 125 veh/h to the worst-case lane already on Yamba Road. Thus, the peak hour single lane traffic flow in Yamba Road becomes approximately 905 veh/h.

According to **Table 4.1** reproduced from the RMS Guide, Yamba Road is expected to operate with a level of service C.

Although the traffic volumes put the LOS close to the threshold for D, it is reiterated that the predicted future traffic on Yamba Road as stated above, 780 veh/h, was calculated using a growth rate that would already include the James Creek Road development. As such, the peak hour single lane traffic flow for a ten-year design horizon would actually sit more comfortably in LOS C.

As previously mentioned, the RMS Guide suggests that acceptable peak hour LOS on major and minor rural roads is C. It should be noted that outside of peak hour, Yamba Road, and indeed James Creek Road would likely operate at LOS A.

4.2.3 James Creek Road / Yamba Road Intersection

Analysis of the existing intersections and the recommended minimum turning treatments required for the projected increase in traffic found that the existing intersection of James Creek Road and Yamba Road will likely require upgrading to maintain traffic efficiency and minimise delays.

The intersection of Yamba Road and James Creek Road currently includes a basic right treatment and a full length auxiliary left turn lane. However, the existing traffic volumes indicate that a short channelised right lane is already warranted.

Modelling of the intersection using SIDRA Intersection for the existing (2022) and future (2032) conditions indicates that all movements will operate at a LOS A, with the exception of the right turns into and out of James Creek Road. Currently, the model shows the right turn into James Creek Road is at LOS A, but is expected slip to LOS B after 5 years for the PM case and after 8 years for the AM case. The right turn out of James Creek Road onto Yamba Road is currently at LOS C, but expected to slip to LOS D after 6 years (AM and PM models), and to LOS E after 9 years for the AM peak and 10 years for the PM peak.

LOS C and D are considered to be acceptable with estimated delays under 25 section and 40 seconds respectively. However, the LOS E for the right turn out of James Creek Road predicted to occur in approximately ten years (depending on the timing of development construction and lot release) is not considered to be acceptable.

Given the much higher volumes of traffic travelling on the main road compared to traffic turning into and out of James Creek Road, a roundabout would not be a beneficial solution for a future upgrade. A safer solution could be to prohibit right turns at this intersection, either entirely or only during the AM and PM peaks. As this is not expected to be a major concern until 9 years post construction of the subdivision, it is recommended that the local roads authority monitors the traffic movements at this intersection over time. Regardless of the upgrades to improve efficiency for traffic turning right out of James Creek Road, it is recommended that the BAR be upgraded to a full length CHR as soon as practicable, but certainly within the first six years, in order to efficiently accommodate traffic turning



right onto James Creek Road as well as the through traffic. It appears that there is sufficient space available to construct the necessary upgrade.

The Contributions Plan also indicates that this intersection, including approximately 200 m of Yamba Road to the west and 100 m to the east, will require upgrading within the next ten years. This report agrees with our recommendation that a right-hand turn lane from Yamba Road will be required to accommodate traffic loads.

4.2.4 James Creek Road / Gardiners Road Intersection

The existing intersection at the southern end of James Creek Road with Gardiners Road currently provides only BAL and BAR turning treatments. The modelling suggests that both treatments will be adequate to provide efficiency for traffic considering a ten-year design horizon. However, a short channelised right turn lane may be deemed appropriate to improve safety at the intersection.

It is noted that the Contributions Plan specifies this intersection will require sheltered turn lanes into and out of James Creek Road in addition to widening and likely raising of the intersection to provide 1 in 20-year flood immunity.

4.2.5 New Intersections on James Creek Road

The intersection proposed to provide entry to the new subdivision will require widening of James Creek Road to facilitate an auxiliary left turn lane and a channelised right turn lane. This configuration, together with the proposed single-lane roundabout at the intersection of Roads 1 and 2 has been modelling using SIDRA Intersection traffic modelling software, with conservative estimates of existing and future traffic volumes. The results showed that, for a ten-year design horizon, all movements at the new intersection are expected to offer the highest level of service (LOS A). Refer to **Appendix A**.

A previous iteration of the design included two accesses into the development. However, the modelling clearly demonstrates that only one is required for traffic efficiency, and fewer intersections on the main road (James Creek Road) results in a safer road network overall. The entry to the development has been designed with separated ingress and egress lanes, which will offer a higher level of safety in case of an emergency such as a bushfire, allowing emergency service vehicles to enter the site in the event one of the lanes becomes blocked.

The presence of this intersection is not expected to affect the efficiency of through traffic, which will maintain priority. However, it is proposed that Council considers a submission to TfNSW to relocate the existing change in speed zone by < 200 m to the north, such that the new intersection will fall within the 60 km/h speed zone. The lower speed over 200 m will result in a very minor delay, being 3 seconds. This proposal has been discussed and agreed with TfNSW.

4.3 Amenity

The amenity on James Creek Road will be affected by the significant increase in traffic. However, as discussed, the existing roadway is suitable for such volumes of traffic. Furthermore, the existing dwellings are generally set back 50 m or more from the carriageway, and most have vegetation providing a visual and pseudo-sound buffer to the traffic.

Most of the existing residents on James Creek Road live south of the site and given most of the traffic associated with the proposed development is expected to travel north on James Creek Road to reach their destination, the amenity on James Creek Road south of the site will only be nominally affected.



The additional traffic volumes will not cause any unreasonable delays for existing residents wishing to exit their property onto James Creek Road.

4.4 Safety

As discussed, James Creek Road is suitable to safely convey the anticipated traffic volumes. Traffic flow on James Creek Road will not be such that residents exiting their properties along the road will need to regularly judge gaps to safely enter the roadway.

It is assumed that the new subdivision will be designed in accordance with the relevant standards and guidelines to ensure no road safety issues are introduced as part of the proposed works. It is recommended that this includes provision of traffic calming on the long, straight sections of road and visual thresholds at cross intersections and some tee-intersections to clearly indicate the priority road.

The proposed single intersection on James Creek Road is located such that ample sight distance is provided. It is recommended that is comprises an AUL and a CHR (short, as appropriate).

It is proposed that Council considers a submission to TfNSW to relocate the existing change in speed zone by < 200 m to the north, such that both new intersections will fall within the 60 km/h speed zone. This proposal has been discussed and agreed with TfNSW.

Additional turning movements at the Yamba Road and Gardiners Road intersections will introduce greater opportunity for conflict between vehicles. As previously discussed, the Yamba Road intersection will require upgrades to provide a channelised right turn lane to accommodate the additional traffic utilising James Creek Road. Although not explicitly warranted in accordance with the Austroads Guidelines, it may be considered prudent to provide a short channelised right turn treatment for the Gardiners Road intersection to reduce the risk of rear-end collisions.

Consideration should also be given to the provision of lighting at the Yamba Road, Gardiners Road and the site entrance to improve safety.

The additional traffic is not expected to impact on the safety of the existing roads, and construction of the recommended upgrades will offer a significant increase in safety for turning and through vehicles at the James Creek Road intersections.

4.5 Road Pavement

The theoretical impact on the road pavement is measured by the equivalent standard axle (ESA) load applied by the additional traffic to the life cycle ESA of the existing road pavement. The development is expected to add up to 2,966 veh/day, comprising no more than 2% heavy vehicles.

The following calculations have been carried out to determine the resultant number of ESA from the development (DESA):

DESA = ESA/HVAG x NDT

Where: ESA/HVAG = average number of ESA per heavy vehicle axle group N_{DT} = cumulative number of HVAG over design period.

For a design period of 20 years, total AADT of 3,000 consisting of 2% heavy vehicles, based on the Austroads *Guide to Pavement Technology Part 2: Pavement Structural Design* (2017), DESA is estimated to be 5.0 x 10⁵.



Assuming James Creek Road has been constructed in general accordance with NRLG and Austroads guidelines, it can be conservatively expected that the existing road pavement consists of a minimum subgrade CBR of 10, and minimum base and sub-base material thicknesses of 150 mm each. Thus, using Figure 8.4 of the same guide, AGPT02, the design traffic for James Creek Road is expected to be at least 4 x 10^6 .

Therefore, the projected traffic volumes generated by the development combined with existing traffic are not expected to shorten the design life of the existing road pavement.

4.6 Public Transport

The additional residential dwellings proposed at the site would likely increase the patronage for the existing public transport system servicing the area, particularly for school children and older persons. However, the nearest bus stop is 2.8 km from the site. This distance would pose a significant inconvenience for those who want or need to make use of the public transport system and it is unreasonable to expect all residents to be able to walk this distance comfortably, particularly as there is currently no pathway between the site and the bus stop.

Council's *Residential Zones DCP* (2011) specifies that public transport services shall be within 400 m of all dwellings. The increase in residents under the proposal warrants an adjustment to the existing regional bus service route to include James Creek Road in the vicinity of the site. A possible option would be for the existing service between Maclean and Yamba to detour from Yamba Road south along James Creek Road, looping through the proposed subdivision, continue south on James Creek Road, turn east on Gardiners Road, then re-join Yamba Road via Amos Road and Palmers Channel South Bank Road (or vice versa). This would add approximately 10 minutes to the total trip time between Maclean and Yamba, hence this deviation might only be offered on some of the daily services, rather than all. Another option would be to turn off Yamba Road onto James Creek Road, make the loop through the subdivision, then turn left on James Creek Road to return directly to Yamba Road. This option would add less time to the existing bus route.



Figure 4.1 Possible future re-routing of Busways Route 380 [Source: Google Maps]



4.7 Pedestrians and Cyclists

The proposal allows for a 2.0 m wide shared path along Road 2 (the perimeter road) and 1.5 m footpaths on all other streets within the development, providing good connectivity between the residential dwellings and the proposed paths and open spaces.

Beyond the subdivision, the proposal will also provide a 2.0 m shared path extending from the development south along James Creek Road, west onto Gardiners Road and into Jubilee Street within Townsend.

Although the desirable minimum width of a shared path is 2.5 m, 2.0 m is ample width to allow for two cyclists or two wheelchairs to pass one another safely and comfortably. Austroads Guide to Road Design Part 6A *Paths for Walking and Cycling* Table 5.3 allows for a minimum width of 2.0 m to be used for shared paths where cyclist volumes and operational speeds remain low. Given the location o of the proposed path, it is expected that this will certainly be the case, with < 50 cyclists per peak hour expected to be utilising the path between James Creek and Townsend.

Impact on existing pedestrians and cyclists is expected to be low, given that there are no dedicated facilities for these road users in the area and numbers of such, particularly pedestrians, are assumed to be low.



5. Summary and Recommendations

Having become familiar with the site, undertaken desktop review of relevant plans and documentation, calculated predicted traffic generation, assessed the internal road layout and the expected impacts of the proposed development, the following conclusions have been made:

Construction of a subdivision of this size will likely take a number of years to complete, particularly
if the development is staged. Construction traffic will have a negative impact on the amenity of the
locality and may impact on traffic safety and efficiency on James Creek Road and at the
intersections.

Recommendation: A Construction Management Plan (CMP) including a Traffic Management Plan (TMP) should be prepared and implemented prior to, and for the duration of the construction on site to reduce risks and impacts associated with construction traffic accessing the site. **Recommendation:** Consider undertaking all bulk earthworks during the first stage, thereby reducing the length of time that multiple heavy vehicles are accessing the site.

- The development will significantly increase the volume of traffic on James Creek Road. However, the road is in suitable condition and geometry to accept the additional traffic and has the capacity to do so. The additional traffic volumes are not expected to shorten the design life of the road pavement.
- The increase in traffic volumes utilising the intersection at the northern end of James Creek Road warrants upgrades to ensure safety and efficiency is maintained for through and turning traffic. *Recommendation:* The Yamba Road intersection requires the existing basic right turn treatment (BAR) be upgraded to a channelised right turn lane (CHR) as soon as practicable, as this is already required based on existing traffic conditions. The existing AUL is sufficient for the predicted traffic growth over the next 10 years.

Recommendation: Traffic at this intersection is to be monitored in the first few years once lots begin to be released, paying close attention to the level of service offered for traffic turning right out of James Creek Road onto Yamba Road.

Recommendation: Lighting at both the Yamba and Gardiners Road intersections should be considered.

The proposed layout for the development is in accordance with the relevant design standards and a compliant road design within the subdivision is achievable. The location of the proposed intersections on James Creek Road provides ample sight distance.

Recommendation: Priority at the proposed cross-intersections should be clearly defined by signage and linemarking, with consideration given to the use of painted or raised pavement thresholds.

Recommendation: Use traffic calming techniques on straight stretches of road in excess of 150 m long (e.g. planted kerb blisters to narrow the roadway, chicanes, raised humps etc.) **Recommendation:** The intersection at the entrance of the subdivision will require an AUL and a CHR (short) to ensure safety and efficiency for through and turning traffic.

