

APPENDIX 7. INVESTIGATIONS – TRAFFIC



**GOOLWA NORTH
CODE AMENDMENT**

TRANSPORT INVESTIGATIONS



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APPENDIX A: FORECAST FUTURE TRAFFIC VOLUMES

1. EXECUTIVE SUMMARY

CIRQA has been engaged to undertake a review of the potential rezoning (Code Amendment) for approximately 241 ha of land located within Goolwa North (east of Alexandrina Road).

Previous detailed transport investigations were prepared (by CIRQA) as part of a previous broader rezoning proposal (which did not proceed). The previous proposal included a larger area of land east of Alexandrina Road as well as a significant area to the west of Alexandrina Road. The current proposal contemplates the rezoning of a smaller portion of land (all of which is located east of Alexandrina Road).

CIRQA has prepared a review of the current rezoning proposal, including the potential yields achievable within the Affected Area and potential interventions which may be associated with the future development of the Affected Area.

Generally, the transport investigations undertaken identify relatively similar outcomes to the transport investigations prepared for the previous (broader) rezoning proposal. Specifically, the following interventions have been identified to accommodate the ultimate volumes forecast:

- construction of a western link (bypass) between Alexandrina Road to Port Elliot Road (to minimise impacts on Cadell Street);
- new intersections on Alexandrina Road (one or two intersections depending on ultimate internal layout) to provide the primary access for the future development of the Affected Area. If a western link road is provided, the primary connection could be provided as a four-way intersection treated with a roundabout (or signal);
- new level crossings associated with the new road connections to Alexandrina Road. It is anticipated that the Department for Infrastructure and Transport (DIT) may require closure of one or two existing level crossings (effective relocation to the new connections), however, this can be further explored with the Department;
- upgrades of the intersections of Alexandrina Road with Airport Road and Goolwa (to Mount Compass) Road;
- upgrade of Byrnes Road and Vercoe Terrace to provide a minor collection route and assist with distribution of traffic to/from the Affected Area;
- upgrade of the intersections of Cadell Street with Glendale Grove/Vercoe Terrace and Gardiner Terrace (to single lane roundabouts);
- upgrade of the Hutchinson Street/Wildman Street/Oliver Street to a single lane roundabout; and

- the need for any future upgrade to Port Elliot Road west of Goolwa depending on other anticipated growth areas and development along the Fleurieu Peninsula which, along with the development of the Affected Area, may compound capacity issues in the longer term.

Notwithstanding the above ultimate interventions required, there is potential to commence development prior to all treatments being implemented. It is considered that approximately 500 dwellings could be accommodated towards the southern end of the Affected Area and accessed via the existing local road network without significant impact. A further 250 dwellings (with some flexibility for additional yields in an interim arrangement) could be developed once the Byrne Terrace collector upgrade is undertaken along with treatment of the Cadell Street/Glendale Grove/Vercoe Terrace upgrade. Additional yields (approximately 300 dwellings) may be achievable via an interim Alexandrina Road access. However, such an option will require further discussions with DIT to confirm acceptance of such an arrangement with the existing limited separation to the rail corridor.

2. BACKGROUND

2.1 AFFECTED AREA

The Affected Area is located at the northern side of the existing Goolwa township on the Fleurieu Peninsula and to the east of Alexandrina Road (refer Figure 1). The land comprises approximately 241 ha primarily utilised for primary production purposes.

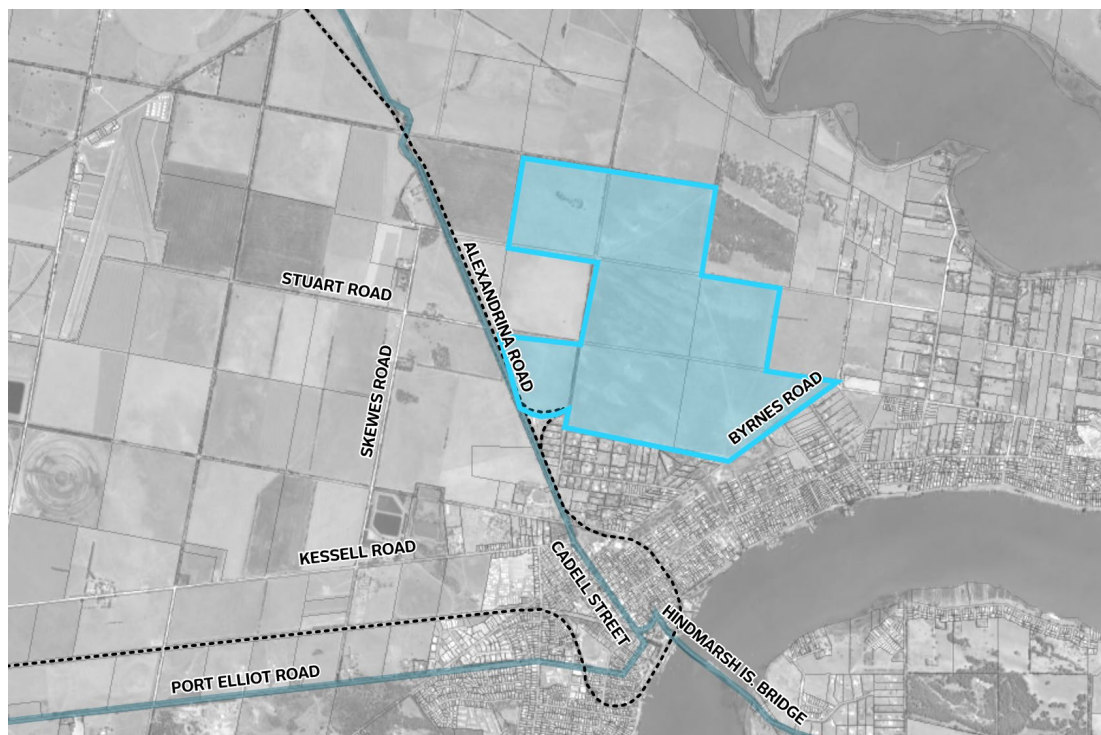


Figure 1 – Location of the Affected Area and the surrounding road network

The Planning and Design Code identifies that the land is currently within a Rural Zone. The following Overlays also apply either wholly or to portions of the Affected Area:

- Airport Building Heights (Aircraft Landing Area);
- Building Near Airfields;
- Environment and Food Production Area;
- Hazards (Acid Sulfate Soils)
- Hazards (Bushfire - Medium Risk);
- Hazards (Flooding - Evidence Required);
- Limited Land Division;
- Major Urban Transport Routes;
- Murray-Darling Basin;

- Native Vegetation;
- Prescribed Water Resources Area;
- River Murray Flood Plain Protection Area;
- Traffic Generating Development; and
- Water Resources.

2.2 ADJACENT ROAD NETWORK

The primary road frontage of the Affected Land is to Alexandrina Road (west of the site). Alexandrina Road is a Direct/Scenic Tourist Route under the care and control of DIT. The road comprises a single traffic lane and sealed shoulder in each direction separated by a marked centreline. Generally, an 80 km/h speed limit applies on Alexandrina Road within the vicinity of the site (which reduces to 50 km/h on approach to the Goolwa township). DIT data indicates the road has an Average Annual Daily Traffic (AADT) volume of approximately 7,100 vehicles per day (vpd) (albeit higher volumes are likely experienced during peak holiday periods).

Alexandrina Road continues as Cadell Street within the township. Cadell Street forms Goolwa's primary 'high street' with associated retail and commercial developments along it. Cadell Street also provides access to the Hindmarsh Island Bridge (via Goolwa Terrace and Brooking Street) and Port Elliot Road (via Hays Street and Hutchinson Street).

The remaining roads within and adjacent the Affected Area are generally local roads under the care and control of Alexandrina Council. These roads typically comprise two-way sealed roads with a single traffic lane in each direction. The roads primarily function to accommodate direct access to adjacent residential and primary production properties.

Figure 2 illustrates the available daily traffic volumes for the surrounding road network.

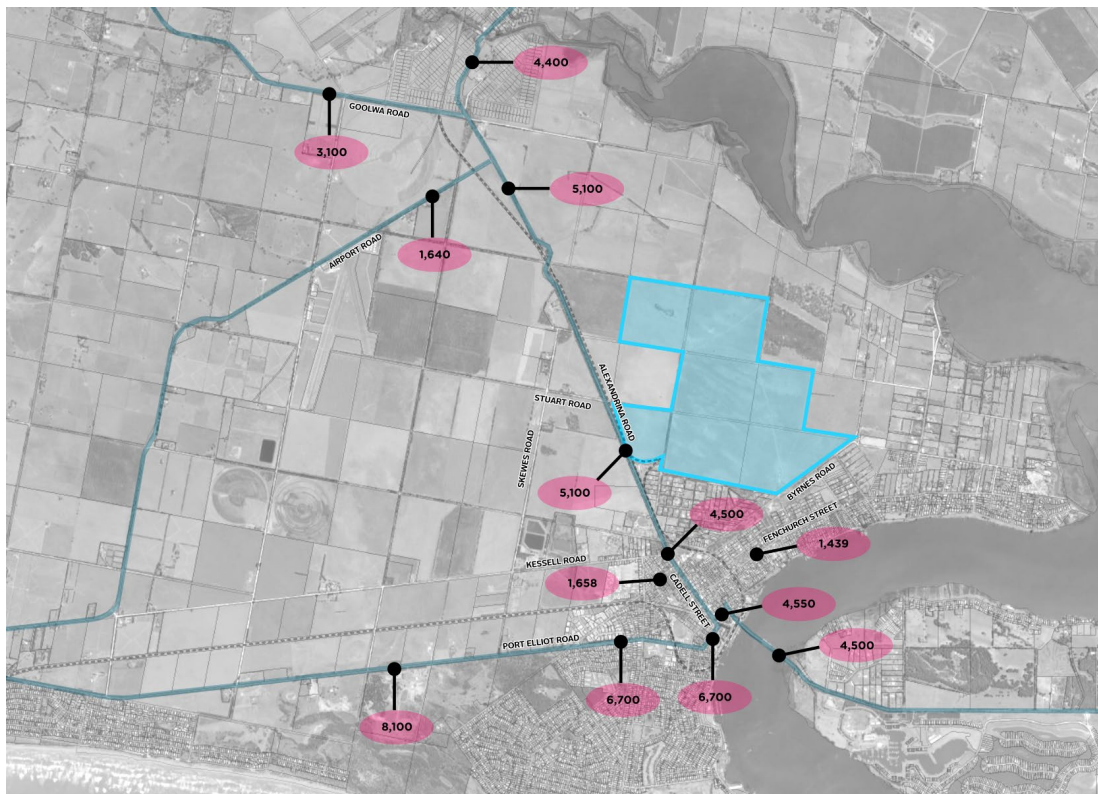


Figure 2 – Available daily traffic volumes on the surrounding road network

A rail corridor is located between the Affected Area and the alignment of Alexandrina Road (with a 'loop' around the eastern side of the central township area). The rail corridor services both the 'Southern Encounter' and 'Cockle Train' Steamranger services. The 'Southern Encounter' service operates between Mount Barker and Victor Harbor (via Goolwa) on the first, third and fifth Sundays of the month from June to the end of November (one trip in each direction on these days). The 'Cockle Train' service operates between Goolwa and Victor Harbor. The 'Cockle Train' service operates on a variable timetable with services typically undertaken on Saturdays, Sundays and Wednesdays outside of school holidays, with additional services on other days of the week also operating during school holidays. There are generally three services per day but additional services operate during peak periods (such as Christmas holidays).

Within and adjacent the Affected Area, the following level crossings are provided:

- active (signal controlled) crossing with advanced active signage on Alexandrina Road (between Airport Road and Skewes Road);
- passive crossing on Corio Terrace (just east of Alexandrina Road); and
- passive crossing on Vercoe Terrace (east of Alexandrina Road).

2.3 WALKING AND CYCLING

The majority of existing roads within the study area do not have footpaths (gravel verges are typically provided). Footpaths are provided on key streets such as Cadell Street and areas with more recent residential development.

The Encounter Bikeway is located approximately 600 m (at its closet point) to the south-west, south and south-east of the Affected Area. The Bikeway provides a 30 km shared cyclist and pedestrian link between Victor Harbor and Goolwa (via Port Elliot and Middleton).

2.4 PUBLIC TRANSPORT

Goolwa is serviced by LinkSA bus services which operate between Adelaide Central (Bus) Station and Goolwa (including stops at Marion, Noarlunga Centre and Victor Harbor). The service operates six times each weekday and three times a day on weekends in each direction. The closest stops to the Affected Area are located in Cadell Street (just north-west of Moore Street).

In addition, as noted above, the 'Southern Encounter' and 'Cockle Train' services also provide access between Victor Harbor, Goolwa and Adelaide (at select times). These services essentially function as 'tourist services' and would currently have limited use for other trip purposes (commuter, shopping etc.).

2.5 PREVIOUS REZONING PROPOSAL

A previous rezoning proposal (Development Plan Amendment) was prepared in 2019 which encompassed the Affected Area plus additional land immediately surrounding the Affected Area as well as additional land to the west of Alexandrina Road. Detailed transport investigations were prepared by CIRQA in support of the previous rezoning proposal. The previous investigations were based on anticipated yields of 1,600 dwellings within the previous Deferred Urban Zone and 2,920 dwellings within the previous Primary Production Zone (a total of 4,520 dwellings). Notably, these zones are no longer relevant as the area was redefined as Rural Zone as part of the implementation of the Planning and Design Code.

The investigations identified the potential impact of the rezoning (and the subsequent development anticipated) and provided recommendations in respect to improvements and upgrades required within the road network to accommodate the increased traffic movements associated with it. The previous rezoning proposal did not proceed.

3. PROPOSED REZONING

The current proposal is for the rezoning of the Affected Area (Rural Zone) to a Master Planned Township Zone or Master Planned Neighbourhood Zone with a possible Emerging Activity Centre Sub-Zone. Two yield scenarios have been identified for the Affected Area as follows:

- **Scenario A (Low)** – 2,437 allotments lots comprising
 - 971 lots in Stage 1;
 - 686 lots in Stage 2;
 - 780 lots in Stage 3;
- **Scenario B (High)** – 2,990 lots comprising:
 - 1,190 lots in Stage 1;
 - 842 lots in Stage 2;
 - 958 lots in Stage 3;

In addition to the residential yields, it is also anticipated that retail/commercial uses would be accommodated within the Affected Area. The Ethos Urban 'Goolwa North – Retail Capacity Assessment' report includes a preliminary recommendation that allowance be made for a retail centre within the Affected Area (east of Alexandrina Road) with up to 7,000 m² gross leasable floor area (including an approximate 3,000 m² floor area supermarket). The Ethos Urban report also notes the possible provision of an additional, smaller retail activity centre west of Alexandrina Road, however, that would primarily service additional growth (if/when proposed) associated with remaining potential growth areas.

4. TRAFFIC GENERATION AND DISTRIBUTION

The previous transport investigations were based on a rate of eight daily trips per allotment (assuming a single dwelling is accommodated on each allotment). The previous report noted that this rate was likely to be conservative given a proportion of dwellings may be utilised as 'holiday homes' with typical traffic volume generation less than that identified by the above rate.

In addition to the residential traffic generation, allowance has been made for movements associated with the retail activity. A rate of 60 daily trips per 100 m² of retail/commercial floor area has been adopted for the retail (identified in comparative assessments for small regional shopping centres). The activity centre would also primarily service the development within the Affected Area. The associated generation has therefore been discounted 80% as most trips will remaining internal to the Affected Area, with the remaining 20% distributed to/from the external/broader road network.

Based on the above, the following daily traffic generation is forecast for the various scenarios:

- **Scenario A (Low)**
 - Stage 1 – 7,768 vehicles per day (vpd);
 - Stage 2 – 5,488 vpd;
 - Stage 3 – 6,240 vpd;
 - **Total – 19,496 vpd;**
- **Scenario B (High)**
 - Stage 1 – 9,520 (vpd);
 - Stage 2 – 6,736 vpd;
 - Stage 3 – 7,664 vpd;
 - **Total – 23,920 vpd;**
- **Retail Activity Centre**
 - **Total – 4,200 vpd (with 840 external daily trips)**

The above forecasts indicate that, depending on the scenario adopted, daily volumes (total – internal and external) could be between approximately 20,336 (Scenario A) to 24,760 vpd (Scenario B). This would equate to approximately 203 to 248 trips being generated during the am and pm peak hours (based on the typical assumption that 10% of the daily traffic volume occurs during the peak hours).

In comparison, the previous rezoning proposal was forecast to generate in the order of 36,000 vpd.

The distribution of movements on the broader network would be relatively similar to that identified for the previous rezoning proposal, albeit with less distribution to/from the road network west of Alexandrina Road (unless a western link is provided as discussed further below).

Given the previous assessment was undertaken over a broader area, a relatively high percentage was assumed to remain internal. However, the current proposed is over a reduced area with less non-residential land uses and, therefore, a higher proportion of movements would likely be distributed externally. For the purposes of this assessment it has been assumed that 40% of trips will remain internal within the Affected Area. The distribution of the remaining movements to the surrounding external network will ultimately be dependent on the future road network. However, Figure 3 illustrates a high-level assessment of the potential distribution of the remaining 60% of trips to the surrounding road network.

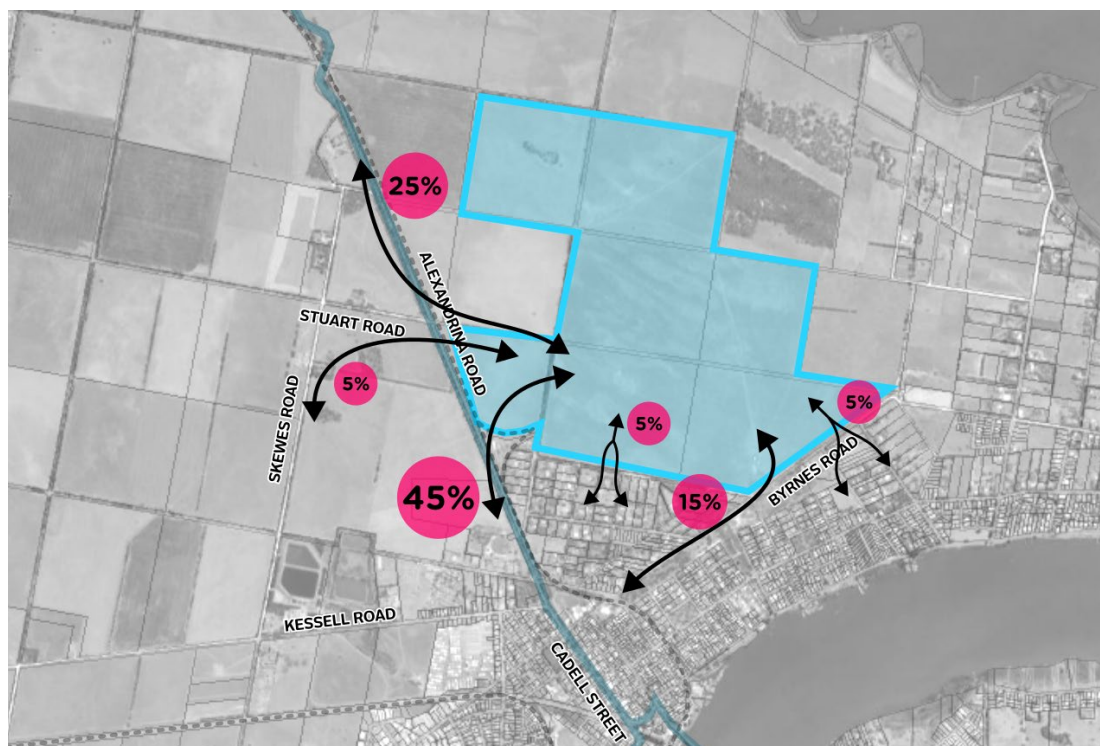


Figure 3 – High level distribution of the daily trips to the external road network

Forecasts have been prepared for key locations on the surrounding road network. This has included consideration of future design years assuming the development of the Affected Area occurs over 20 years following 2023. For the purposes of the assessment, it has also been assumed that development of the stages occurs relatively evenly across this time period with Stage 1 assumed to be completed by 2031, Stage 2 by 2031 and Stage 3 (ultimate development) by

2043. A 1% growth per annum in general traffic volumes has then been adopted to account for the development of other areas in the broader vicinity (such as areas already rezoned but not yet developed). While a growth rate of 2% per annum appears to be appropriate for the broader study area, the development of the Affected Area would account for a major proportion of such growth (hence a reduced 1% per annum rate is considered appropriate with the remaining proportion of growth already accounted for in the above forecasts).

Based on the above assumptions, Appendix A summarises the forecast 'base case' volumes (no development of the Affected Area) for the design years as well as the additional development volumes and, finally, the total future volumes for each location and stage/design year. These forecasts are based on the higher of the above Scenarios (which has been adopted for assessment of infrastructure requirements for the Code Amendment investigations). The first table in Appendix A details the forecast distribution of movements assuming no major changes to the existing road network. However, noting further commentary detailed below, the second table provides an adjusted assessment based on implementation of key infrastructure interventions to ensure volumes are accommodated appropriately (these are detailed further in Section 5).

5. GENERAL ACCESS PROVISIONS

The forecast traffic volumes indicate that a relatively high growth would be experienced on Cadell Street without specific interventions (the 2043 with development scenario indicates 11,423 vpd would be 'accommodated' on Cadell Street if no notable change to the road network was undertaken). There is limited ability to upgrade a number of intersections along Cadell Street due to heritage buildings and limited road reserve provisions (unless land acquisition and demolition of heritage buildings was undertaken). Additionally, it is understood that there is potential for additional development to occur on Hindmarsh Island which will be highly reliant on the southern end of Cadell Street for access (with minimal alternative access routes for the associated traffic distributed via the bridge). It is, therefore, considered desirable to provide an alternative route to service the Affected Area around the town centre to minimise distribution of traffic (both existing and future) to Cadell Street.

Such a route would be best located on the western side of the township given the existing road hierarchy and town structure. Additionally, it would be easier to develop given a reduced extent of existing residential development and would also have reduced impacts in respect to level crossings (which have improved separation to existing roads on the western side). It is noted, however, that this relies on land outside of the Affected Area.

While the ultimate alignment would require further liaison with DIT and Council, Skewes Road provides a clear opportunity to provide such a connector route which could efficiently service the Affected Area as well as the broader area. This would require an intersection on Alexandrina Road to provide connectivity to/from the Affected Area (either combined with the Affected Area's primary intersection or an offset may be workable subject to appropriate design). At the south-western end of the bypass route, it would be desirable that the intersection of Skewes Road and Port Elliot Road be upgraded to a single lane roundabout (or traffic signal) given the forecast volumes. Such an intervention could also accommodate additional movements should land west of Alexandrina Road also be rezoned and developed in the future.

It is noted, however, that the provision of access for the Affected Area via Alexandrina Road would likely require an additional level crossing of the rail corridor on Alexandrina or, alternatively, an overpass or underpass arrangement (which may be cost prohibitive but a safer and more efficient outcome). If a level crossing was provided, it would be desirable to increase the separation between the rail corridor and Alexandrina Road to improve accommodation of the future traffic volumes to/from the eastern side of the Affected Area (i.e. to minimise queuing/stacking issues at the level crossing). This could be undertaken by realigning Alexandrina Road in the vicinity of the future intersection to increase the separation distance as illustrated in the high level sketch below (Figure 4).

The treatment adopted will also need to address the existing level difference between the rail line and Alexandrina Road (albeit increasing separation will allow greater opportunity to do so). The level crossing (if provided) should also be an active (signalised) crossing. Such an arrangement would, however, rely on land acquisition on the opposite side of Alexandrina Road (outside of the Affected Area). It should be noted that the location identified for the access in the figure below is indicative only and alternative locations could be investigated in the future (for example, alignment with the existing Stuart Road/Alexandrina Road intersection).



Figure 4 – Sketch of realignment to increase separation to rail corridor

While a single access point would be able to be designed with sufficient capacity to accommodate the future traffic volumes, consideration could be given to a second access point/intersection further north on Alexandrina Road. A secondary access/intersection would, however, also need to address the conflict with the rail corridor. This could be considered in the future, however, is not considered essential to support the development of the Affected Area. This could be provided in the vicinity of the unmade Rickaby Road alignment (northern end of Skewes Road) or there may even be possibility to link a connection further north of the level crossing on Alexandrina Road.

It is noted that DIT's standard position regarding development adjacent rail corridors is that additional level crossings are not supported. If DIT maintains such a position for the development of the Affected Area, consideration could be given to the closure of an existing level crossing (essentially relocating it to the new 'collector road' alignment). In the surrounding vicinity, the two primary 'candidates' for closure are considered to be:

- the **level crossing on Corio Terrace** (just east of Alexandrina Road) and the roads intersection with Alexandrina Road could be closed. Movements currently undertaken via this route could then be directed/diverted to the new 'collector road' intersection further north. Given the relatively low catchment currently serviced by this road and the presence of alternative access routes to/from the south, the impact of such a closure would be relatively low; or
- the **level crossing immediately south-west of the Byrnes Road/Vercoe Terrace intersection** could be closed. Movements currently undertaken via this route could be diverted to Vercoe Terrace (via Alexandrina Road) or Fenchurch Street (via roads such as Clark Street and Mark Lane West).

On the basis of the above comments, a general concept for access provision for the Affected Area has been determined as illustrated in Figure 5.

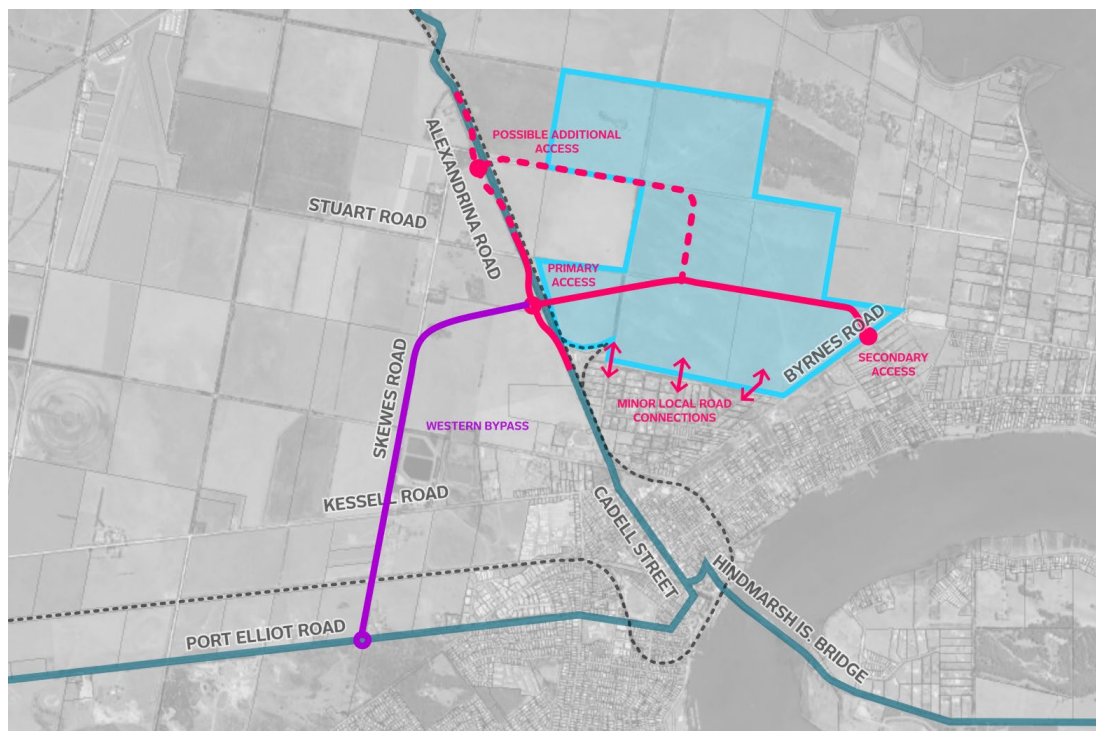


Figure 5 – High level access arrangements for the Affected Area

The recommended connector route via Skewes Road will cross the existing rail corridor (between Kessel Road and Port Elliot Road). There is an existing passive level crossing in this location. With the increased volumes distributed to Skewes Road, the crossing should be upgraded to an active (signalised) level crossing.

It should be noted that there may be alternative road alignments and treatments for the connector and collector roads which could be adopted (particularly in

response to detailed identification of level crossing provisions by DIT). Alternative options are not precluded, however, the following assessment has been based on the assumption that the above (or similar) access arrangements are achieved.

On the basis, of the above access arrangements, the forecast distribution of movements has been adjusted (i.e. to reflect an increased distribution of movements via the Skewes Road connector route). This is also includes allowance for a proportion of other movements (i.e. not associated with the Affected Area) to redistribute from the central roads (Cadell Street etc.) to the western bypass connection. The resultant alternate distribution forecasts are summarised in the second table in Appendix A.

5.1 INTERNAL TRANSPORT NETWORK

The future internal road network for the Affected Area should generally provide a grid layout with a high level of permeability for all road users. Intersections should generally be T-intersections or, if four-way intersections are provided, treated with appropriate traffic controls depending on the expected traffic flows (such as roundabouts, raised plateaus etc.).

A clear road hierarchy should be developed reflecting the anticipated traffic volumes and the primary connections discussed in Section 5.1. Desirably, residential allotments fronting roads with future traffic volumes greater than 6,000 vpd (major collector roads) should be rear-loaded (i.e. accessed via rear lanes). The future cross sections adopted within the Affected Area should be reflective of the anticipated volumes on the future internal roads. Identification of the road hierarchy (and associated design provisions) can be undertaken as part of future stages and in conjunction with Alexandrina Council. The potential for public transport bus services to operate along the collector roads should also be considered as part of the road design to ensure such services could operate if proposed in the future.

Future pedestrian and cycling networks within the Affected Area would desirably achieve a high-level of connection to the proposed destinations within the Affected Area (such as the activity centre), the existing Goolwa town centre and nearby waterfront destinations. Depending on the broader site considerations, there may also be opportunities for linear reserves with additional pedestrian and cyclist connections. Allowance for connection between the Affected Area and the Encounter Bikeway should also be made (with some improvements within the existing adjacent transport networks required to complete these connections).

5.2 BROADER TRAFFIC IMPACTS

Based on the traffic volumes and access provisions identified in Sections 3 and 4, high-level assessment of the impacts on the broader road network has been undertaken. The assessment for key roads and intersections in the broader

vicinity has included identification of transport infrastructure interventions that may be required to accommodate the increased volumes and ameliorate their impacts. The assessment has generally been based on anticipated 'non-holiday' period traffic volumes, however, consideration has also been given to the likely higher 'holiday' period volumes (i.e. upgrade recommendations include general allowance for higher volumes during these periods).

Detailed turn count data is not available for the intersections within the subject road network. The analysis is therefore of a high-level nature based on typical capacities associated with the forecast traffic volumes and road network infrastructure (number of lanes, intersection treatments etc.). Nevertheless, future land division and development applications should include more detailed analysis of the associated traffic impacts and turn count data could be collected to inform these future studies. Additionally, detailed analysis is more appropriate at such time that more detailed yields and development timing/staging is identified.

5.2.1 ALEXANDRINA ROAD

The section of Alexandrina Road abutting the Affected Area and the section to the north (between the Affected Area and Airport Road) are forecast to accommodate a daily traffic volumes in the order of 8,300 vpd following full development of the Affected Area.

Such future volumes would be within the capacity of a two-way road with single traffic lanes in each direction (particularly given the limited extent of access that would likely be accommodated along these sections of Alexandrina Road). No general upgrade requirement is considered necessary for these sections of Alexandrina Road. However, existing and future intersections will require appropriate treatments to accommodate the forecast traffic volumes.

As noted above, the Alexandrina Road access point (new intersection) associated with the development of the Affected Area will require treatment with either a (single lane) roundabout or traffic signals. While a single lane roundabout would be sufficient to accommodate the forecast volumes, the geometric design would need to ensure sufficient dimensional provisions to achieve an adequate level of capacity (as well as appropriate separation from the rail corridor).

The only notable existing intersections with the above sections of Alexandrina Road are its intersections with Airport Road and Goolwa Road (north of the Affected Area). Both of these roads (as well as Alexandrina Road) provide important, strategic connections for the Fleurieu Peninsula.

The Airport Road/Alexandrina Road intersection forms a priority-controlled T-intersection (with Alexandrina Road as the priority approaches). All approaches

comprise a single lane in each direction with the exception of the northern Alexandrina Road approach which includes a separated right-turn lane (approximately 112 m long excluding the taper). While the additional movements to/from Airport Road will be relatively low, the additional through volumes on Alexandrina Road would warrant the upgrade of the intersection to a single lane roundabout to safely and efficiently accommodate the ultimate volumes.

The Goolwa Road (to Mount Compass)/Alexandrina Road intersection forms a priority-controlled T-intersection (with Alexandrina Road as the priority approaches). The northern approach of Alexandrina Road to the intersection includes a separated right-turn lane (approximately 70 m long excluding taper) and the southern Alexandrina Road approach includes a separated left-turn lane (approximately 140 m long excluding taper). Single approach and departure lanes are provided on Goolwa Road. Similar to the intersection with Airport Road, upgrade of the intersection to a roundabout would be desirable to accommodate the future increases in traffic volumes. In addition, it is noted that the available Safe Intersection Sight Distance between Goolwa Road and the northern Alexandrina Road approach is restricted (below the desired level identified in the relevant Austroads' design guidelines) due to the bend in the road alignment. Consideration should be given to the appropriateness of the existing speed zone on this section of Alexandrina Road and also the potential 'bringing forward' of the intersection upgrade to ensure safety at the intersection is not compromised. Desirably, this would be reviewed and addressed by DIT regardless of the subject rezoning.

South of the Affected Area, Alexandrina Road is forecast to accommodate in the order of 10,000 vpd (assuming a western connector route is implemented). As above, the current arrangement of single lanes in both directions would generally have adequate capacity to accommodate such volumes.

The future conditions at the intersection of Corio Terrace and Alexandrina Road will be highly dependent on the internal road network developed within the Affected Area and whether the connection remains open (i.e. if the level crossing was required to be closed by DIT). Desirably, the design of the future road network would seek to minimise additional movements being undertaken via Corio Terrace (if its intersection with Alexandrina Road is kept open). A priority-controlled T-intersection is considered sufficient to accommodate the likely future volumes, however, provision of a sheltered right-turn lane would be desirable. Consideration could also be given to the restriction of the intersection to left-in/left-out as right-turn movements could be accommodated via the future primary connector for the Affected Area.

The intersection of Alexandrina Road with Vercoe Terrace and Glendale Grove forms a priority-controlled four-way intersection with single lane approaches and

departures on all legs. The intersection will ultimately service additional volumes from the Affected Area distributed via Byrnes Road and Vercoe Terrace. Based on the forecast traffic volumes, it is considered that a single lane roundabout will be required to safely and efficiently accommodate movements at this intersection.

The intersection of Alexandrina Road with Kessell Road is a priority-controlled T-intersection. The level of additional movements at the intersection associated with the Affected Area will primarily be through-bound movements on Alexandrina Road with minimal impact on movements on Kessell Road. It is therefore considered that this intersection can be retained as a priority-controlled intersection, albeit provision of a separated right-turn lane would be desirable to minimise the impact of right-turning vehicles on south-bound movements.

In addition to the above comments, it is noted that the existing speed zone is 100 km/h for the majority of the Affected Area's frontage to Alexandrina Road (which reduces to 80 km/h, then 50 km/h near the southern end of the Affected Area). Given the increased level of traffic and access associated with the future development of the Affected Area, it would be desirable that a reduction in the speed limit be implemented in the future (i.e. in line with development timing).

The extension of pedestrian and cyclist facilities between the Affected Area (possibly via Corio Street for the eastern side and Glendale Grove for the western side) would be desirable to maximise connectivity and safety for users of these modes.

5.2.2 BYRNES ROAD AND VERCOE TERRACE

Byrnes Road will accommodate additional traffic movements associated with the Affected Area (the forecasts indicate an ultimate future volumes in the order of 2,800 vpd on Byrnes Road). Accordingly, it would be desirable that it be upgraded with a 'minor collector road' cross section between (at least) the eastern-most future access point of the Affected Area and Vercoe Terrace. Such an upgrade should include provision of pedestrian paths and cycling facilities (either a shared path or on-road facilities). The road connection from the Affected Area to Byrnes Road will also need to be designated appropriately and likely require a roundabout treatment (particularly if provided as a four-way intersection with an opposite existing side street intersection).

A similar upgrade for Vercoe Terrace would be desirable, particularly if the level crossing immediately east of the Byrnes Road/Vercoe Terrace intersection is closed. If the level crossing is retained, it should be converted to an active (signalised) level crossing.

5.2.3 CADELL STREET

Cadell Street is forecast to accommodate in the order of 7,700 vpd following development of the Affected Area. While such volumes are within the general capacity of a two-way road with single lanes in each direction, there are a relatively high number of intersections and, at times, a high level of activity associated with its 'high street' nature (parking manoeuvres, pedestrian crossing movements etc.).

Near the northern end of Cadell Street, its intersection with Gardiner Street forms a four-way priority-controlled intersection. Given the broader connections provided by Gardiner Street (and its continuation as Brooking Street), it is recommended that a single lane roundabout (or traffic signal) should be implemented at the intersection to accommodate future traffic volumes. This would assist in directing a greater proportion of Hindmarsh Island related traffic to utilise Brooking Street (particularly right-out/northbound movements) rather than Cadell Street. In particular, this would ease pressure on the intersection of Cadell Street/Goolwa Terrace (discussed further below). Detailed design of the roundabout and associated treatments on Gardiner Street should ensure that any impacts on set-down/pick-up movements and parking associated with the adjacent School are adequately accommodated (or relocated appropriately).

Near the southern end of Cadell Street, its priority-controlled T-intersection with Goolwa Terrace provides a linkage for vehicular access to/from the Hindmarsh Island Bridge. Drivers undertaking right-turn movements out of Goolwa Terrace currently experience relatively high delays, particularly during holiday periods. The additional movements distributed to Cadell Street will reduce capacity for turning movements into and out of Goolwa Terrace and an upgrade may be required. While a single lane roundabout or traffic signal could be implemented from a traffic engineering perspective, it is understood the intersection and its surrounds are within a State Heritage Area. The ability to upgrade the intersection is therefore limited without impacts on heritage aspects of the area. The upgrade of the Gardiner Street/Cadell Street intersection (discussed above) is therefore important to reduce the level of Hindmarsh Island related traffic distributed to/from the Goolwa Terrace intersection. Given right-out movements from Gardiner Street would be easier following the upgrade of its intersection with Cadell Street, there would be less demand for right-out movements from Goolwa Terrace to Cadell Street. As through-bound volumes increase on Cadell Street in the future, there may be a need to restrict right-out movements from Goolwa Terrace (to further encourage redistribution of movements via Brooking Street/Gardiner Street).

There are three additional intersections located on Cadell Street between the two intersections discussed above (Brooking Street/Gardiner Street and Goolwa Terrace), namely the intersections of Cadell Street with Moore Street, Crocker

Street and Dawson Street. These three side streets are all lower order roads (compared to Brooking Street, Gardiner Street and Goolwa Terrace). Drivers undertaking non-priority turns at these intersections will experience additional delays as movements increase on Cadell Street. However, the provision of upgrades at the intersections of Cadell Street with Brooking Street/Gardiner Street and Goolwa Terrace would provide alternative 'controlled' options for drivers to turn into and out of Cadell Street (particularly for right-out movements). Generally, it is considered that treatment of these intersections with roundabouts or traffic signals is not considered warranted (and would likely be difficult given limited road reserve width and adjacent heritage buildings). However, consideration could be given to the restriction of some turning movements at the intersections to improve both safety and capacity as volumes increase. Given the timeframe associated with the development of the Affected Area, it is considered these intersections could relatively easily be treated as and when needed.

5.2.4 PORT ELLIOT ROAD-HUTCHINSON STREET-HAY STREET

The route comprising Port Elliot Road, Hutchinson Street and Hay Street, east of Skewes Road, will accommodate in the order of 8,600 vpd following development of the Affected Area. It is noted that the Port Elliot Road/ Hutchinson Street/Beach Road/Foster Place intersection is currently treated with a single lane roundabout. Additionally, Hutchinson Street already includes a painted median treatment along most of its length. While a similar treatment would also be desirable for Hay Street, there is limited road reserve width within the section to accommodate such an upgrade (this further supports the need for the western bypass connection, otherwise higher volumes would need to be accommodate on Hay Street).

It is also considered desirable that a roundabout be installed at the intersection of Hutchinson Street with Wildman Street and Oliver Street to accommodate both existing and future traffic volumes. Oliver Street provides a key connection to Barrage Road and the Goolwa South area. Wildman Street is the key access road for the adjacent sports facilities. A roundabout in this location would also provide an alternative access route for drivers who would otherwise undertake right-turn movements at the four-way intersections on Hay Street (where there is reduced road reserve provisions and limited ability to undertake significant upgrades). DIT has advised that it supports provision of a roundabout at the Hutchinson Street/Wildman Street/Oliver Street intersection and noted previous consideration has been given to such a treatment. DIT has noted the potential for queuing back to the level crossing (to the west). However, given the infrequent use of the level crossing and the 160 m separation it is considered that this can be adequately managed. Nevertheless, queuing conditions and possible amelioration treatments (if required) would need to be further analysed as part of future infrastructure works.

5.2.5 OTHER ROADS AND INTERSECTIONS

West of the southern end of Skewes Road, it is forecast that the development of the Affected Area would distribute approximately 2,970 additional daily trips to Port Elliot Road. This equates to approximately 300 additional peak hour trips associated with the Affected Area that would be distributed to Port Elliot Road and the surrounding road network west of Skewes Road.

The future volumes on Port Elliot Road, west of Skewes Road, would be well within the capacity limits for a two-way road with single lanes in each direction. Given there is relatively limited access along this section of road, it is considered that it will adequately accommodate the additional movements associated with the Affected Area. Holiday period volumes would, however, put increased pressure on this section of Port Elliot Road with increased delays and queues for drivers exiting side streets.

If higher volumes are realised in the future (i.e. should additional growth areas be developed), there may be a need for duplication of Port Elliot Road or provision of an alternative access route. It is understood that consideration has been given to a bypass around the north of Middleton (potentially connecting Airport Road with Waterport Road). In the longer term, while not specifically required to accommodate development of the Affected Area, consideration could be given to a connection between the Skewes Road connector road and a future Middleton bypass to alleviate traffic volumes on Port Elliot Road. Given the timeframe for this to occur is distant, it is not included as a specific recommendation. However, the transport interventions undertaken should not preclude such a connection being achieved in the future.

In relation to the general impact of the volumes generated by the Affected Area on roads and intersections further west, these movements would be distributed to/from a variety of origins, destinations and associated routes, including (but not limited to):

- origins/destinations within and surrounding Middleton;
- Waterport Road including its intersections with Port Elliot Road and Victor Harbor Road/Welch Road;
- origins/destinations within and surrounding Port Elliot;
- origins/destinations within and surrounding Hayborough; and
- origins/destinations within and surrounding Victor Harbor and Encounter Bay.

The further west the above locations, roads and intersections are from the Affected Area, the lower the level of traffic distributed to them will be.

Furthermore, the additional movements distributed to the above intersections would be associated with various turning movements. The impact of these additional volumes associated with the Affected Area on any of the above locations would be relatively low. Future upgrade requirements in these locations would be more likely to be required as a result of ongoing and future development closer to the townships listed above than the development on the Affected Area.

5.3 OVERALL TRANSPORT INTERVENTIONS

Based on the above discussions, Figure 6 illustrates the various transport interventions identified to accommodate the development of the Affected Area

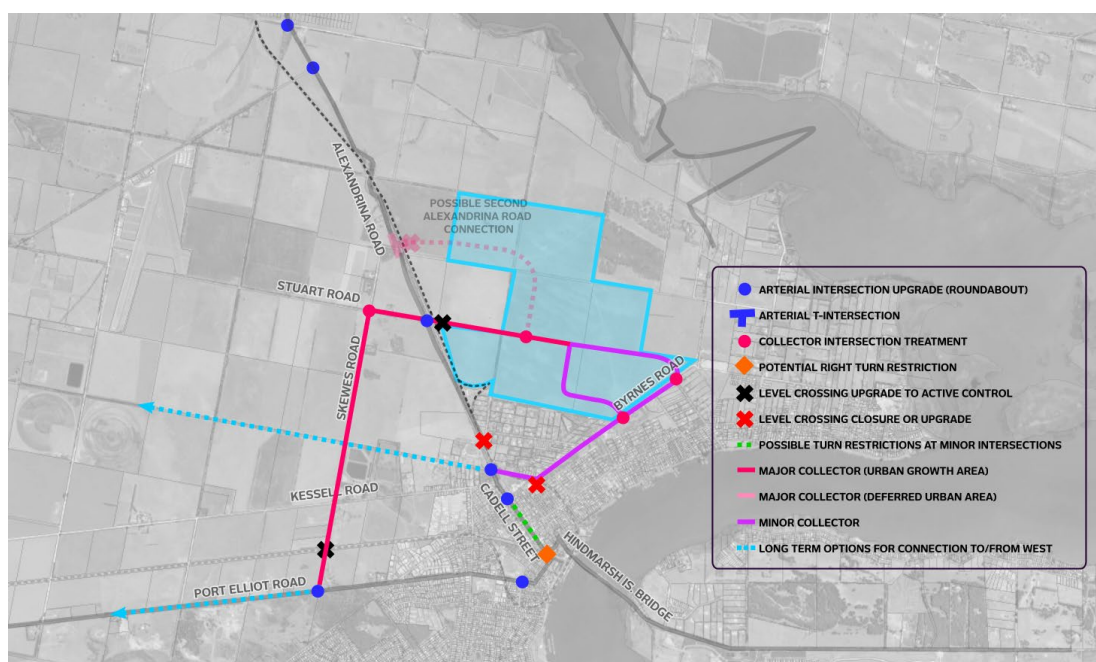


Figure 6 – Recommended transport provisions and interventions

It should be noted that the recommended upgrades are not solely associated with the future development of the Affected Area but also relate to the accommodation of general growth in traffic volumes within Goolwa as well as the potential for additional growth areas to be rezoned/developed. Contributions to the transport interventions would therefore be desirably split between relevant stakeholders including private developments, the State Government and Alexandrina Council. Further discussions between DIT, Alexandrina Council and the proponents will need to occur to identify the future funding mechanisms and distributions for the recommended road and intersection upgrades. As noted by DIT, this would require cost estimates for the works to be prepared as well indicative timing of the requirements for the upgrades (which would also need more detailed identification of likely staging of future development to be determined).

5.4 INFRASTRUCTURE TIMING AND INTERIM DEVELOPMENT

The specific timing for the above transport interventions will require further detailed analysis of development staging and impacts at each location. Such additional analyses can be prepared as part of the preparation of infrastructure deeds for the proposal.

However, it should be noted that a proportion of development would be achievable prior to the above interventions being implemented (i.e. 'utilising' latent capacity within the existing road network).

For example, it would be possible to commence development staging towards the southern end of the Affected Area with connections to existing local roads, such as Byrnes Road, Sumner Street, Corio Terrace and Mark Lane West) prior to the major interventions being required. There is little existing traffic data for these roads, however, it is anticipated that existing traffic volumes would be below 500 vpd on these local streets (and generally less than 300 vpd). From a high level, it is anticipated that in the order of 4,000 vpd could be distributed to the existing local road network to the south and south-east of the Affected Area without altering the nature or function of the existing road network. This would equate to the ability to develop approximately 500 dwellings (assuming by this point no internal activity centre is developed and that all trips are therefore distributed externally).

Additional yields within the southern section of the Affected Area could then be 'unlocked' through the upgrade of Byrnes Road to a collector road and upgrade of the Vercoe Terrace/Cadell Street/Glendale Grove intersection to a roundabout. Based on the assessment of the ultimate volumes detailed above, an additional 250 dwellings could be serviced via this route following its upgrade. In reality, there would likely be some additional capacity to accommodate a slightly higher yield until such time that a major intersection/connection is implemented on Alexandrina Road (with the additional volumes then redistributed).

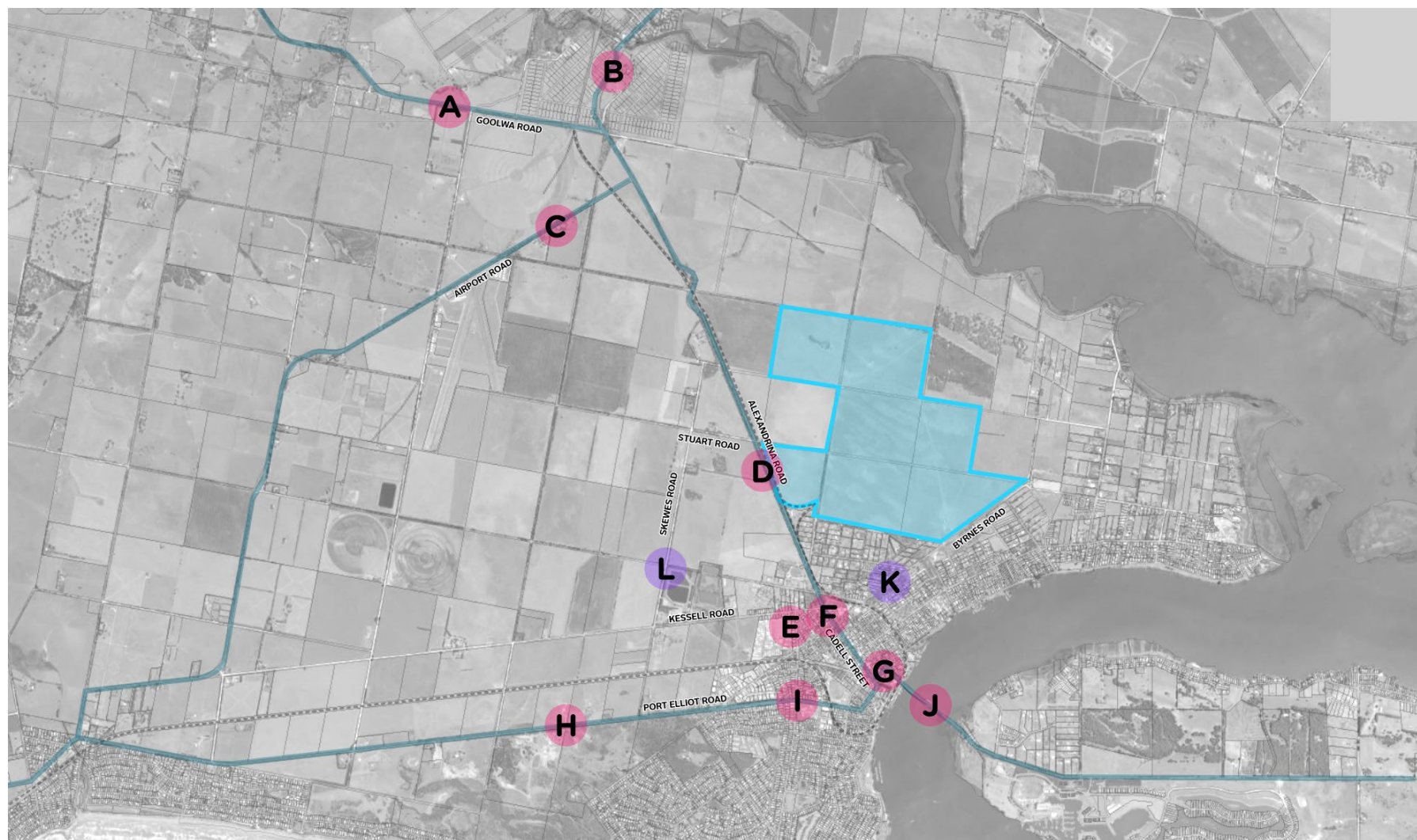
In respect to the ability to accommodate access via Alexandrina Road prior to a implementation of a major access treatment, there would be very limited capacity to do so given the constraints associated with the rail line. It is noted that there is an existing rail crossing at the alignment of the unmade road (eastern 'continuation' of Stuart Road). This could be treated in a similar manner to the existing Corio Terrace/Alexandrina Road intersection and level crossing which provide a short extent of separation and 'Stop' linemarking to define queuing areas between the intersection and rail corridor. A review of crash data indicates that no crashes have been reported at the intersection between 2018 to 2022 (the current recent data available). This suggests that such an arrangement can

operate with a reasonable degree of safety (also noting the relatively low number of services utilising this section of rail).

Discussions are occurring with DIT in relation to an interim arrangement allowing access via this location and commencement of development within the site. A change to the speed limit on Alexandrina Road is also being discussed with DIT. Should such an interim access arrangement be negotiated with DIT, from a high-level capacity review, it is considered that approximately 300 dwellings could be developed and serviced solely by this connection with associated queues not overlapping the rail corridor (i.e. assuming no other connection to the local road network to the south).

APPENDIX A

FORECAST TRAFFIC VOLUMES



Location Identifiers for Future Forecasts

FORECAST TRAFFIC VOLUMES (WITHOUT WESTERN BYPASS)

ID	Section of Road	Forecast Base Volumes				Forecast Development Volumes			Total Future Forecast Volumes		
		2023	2031	2037	2043	Stage 1	Stage 2	Stage 3	2031 + St 1	2037 + St 2	2043 + St 3
A	Goolwa Road	3,226	3,493	3,708	3,936	148	252	371	3,374	3,746	4,079
B	Alexandrina Road (north)	4,624	5,008	5,316	5,643	1,183	2,019	2,971	5,807	7,027	8,287
C	Airport Road	1,794	1,942	2,062	2,189	148	252	371	1,941	2,195	2,433
D	Alexandrina Road (central)	7,388	8,000	8,493	9,015	2,661	4,543	6,685	10,049	12,544	15,178
E	Crawford Street	1,813	1,964	2,084	2,213	296	505	743	2,109	2,468	2,827
F	Cadell Street	5,414	5,862	6,223	6,606	2,069	3,534	5,200	7,483	9,396	11,423
G	Goolwa Terrace	5,076	5,497	5,835	6,126	296	505	743	5,372	6,002	6,578
H	Port Elliot Road	8,429	9,127	9,689	10,285	1,478	2,524	3,714	9,907	11,651	13,403
I	Hutchinson Street	6,972	7,550	8,014	8,507	1,478	2,524	3,714	8,450	10,074	11,728
J	Hindmarsh Island Bridge	4,683	5,071	5,383	5,714	237	404	594	4,919	5,475	5,977
K	Byrnes Road*	500	541	575	610	887	1,514	2,228	1,387	2,055	2,803
L	Skewes Road*	300	325	345	366	296	505	743	596	830	1,088

* 2023 volumes based on estimates

FORECAST TRAFFIC VOLUMES (WITH WESTERN BYPASS)

ID	Section of Road	Forecast Base Volumes				Forecast Development Volumes			Total Future Forecast Volumes		
		2023	2031	2037	2043	Stage 1	Stage 2	Stage 3	2031 + St 1	2037 + St 2	2043 + St 3
A	Goolwa Road	3,226	3,493	3,708	3,936	148	252	371	3,374	3,746	4,079
B	Alexandrina Road (north)	4,624	5,008	5,316	5,643	1,183	2,019	2,971	5,807	7,027	8,287
C	Airport Road	1,794	1,942	2,062	2,189	148	252	371	1,941	2,195	2,433
D	Alexandrina Road (central)	7,388	8,000	8,493	9,015	1,183	2,019	2,971	8,571	10,020	11,464
E	Crawford Street	1,813	1,964	2,084	2,213	296	505	743	2,109	2,468	2,827
F	Cadell Street	5,414	5,862	6,223	6,606	591	1,010	1,486	6,005	6,872	7,709
G	Goolwa Terrace	5,076	5,497	5,835	6,126	296	505	743	5,372	6,002	6,578
H	Port Elliot Road	8,429	9,127	9,689	10,285	1,183	2,019	2,971	9,611	11,147	12,660
I	Hutchinson Street	6,972	7,550	8,014	8,507	237	404	594	7,209	7,954	8,608
J	Hindmarsh Island Bridge	4,683	5,071	5,383	5,714	177	303	446	4,860	5,374	5,828
K	Byrnes Road*	500	541	575	610	887	1,514	2,228	1,387	2,055	2,803
L	Skewes Road*	300	325	345	366	1,774	3,029	4,457	2,074	3,354	4,802

* 2023 volumes based on estimates