# PRELIMINARY TRAFFIC IMPACT ASSESSMENT

Bundaberg East Levee M10021

**SMEC Reference: EPW00390 – Traffic Impact Assessment Report (30034151-RPT-9.0-001) – Revision 0**

## 2. Document control sheet

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### Version history

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| Final Report | |
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# Contents

# 1. Introduction

## 1.1 Background

SMEC Australia Pty Ltd (SMEC) has been commissioned by the Queensland Department of Housing, Local Government, Planning and Public Works (DHLGPPW) to undertake preliminary design of a flood levee wall, large flood gates and pump stations to protect East Bundaberg from flooding.

In 2019, detailed hydrologic and hydraulic modelling for river management and the concept design was undertaken for a flood wall, large flood gates and pump station to protect East Bundaberg from flooding. The design will include a flood gate and pump station at the outlets of both Saltwater Creek and the unnamed “Distillery Creek”. The flood gates are to be closed during regional flood events as to prevent backwater flooding from the Burnett River.

As part of the Preliminary Design Phase, SMEC has engaged HIG to carry out a traffic assessment for the construction and post-construction impacts of the Bundaberg East Levee (BEL) wall, flood gates and pump station.

The proposed Bundaberg East Levee site is located in an urban, residential, and mixed-use area adjacent to the southern bank of the Burnett River in Bundaberg, Queensland and is comprised of two levee wall sections. Due to the floodplain shape, relatively short sections of levee can be built to enclose and provide protection against a 1% Annual Exceedance Probability (AEP) flood event to approximately 600 residential properties and approximately 350 commercial properties. This will provide protection against a flood event equivalent to the 2013 event with circa 150mm freeboard.

The project site is bounded by Walla Street to the west, Bourbong Street and Cran Street to the south, Bundaberg Sugar Mill to the east, and the Burnett River to the north.

The levee is designed to protect the central business district and residential areas from Burnett River flooding. It intersects Saltwater Creek on the western section of the levee and Distillery Creek on the eastern section of the levee near the Bundaberg Millaquin Sugar Mill site, as illustrated in Figure 1.

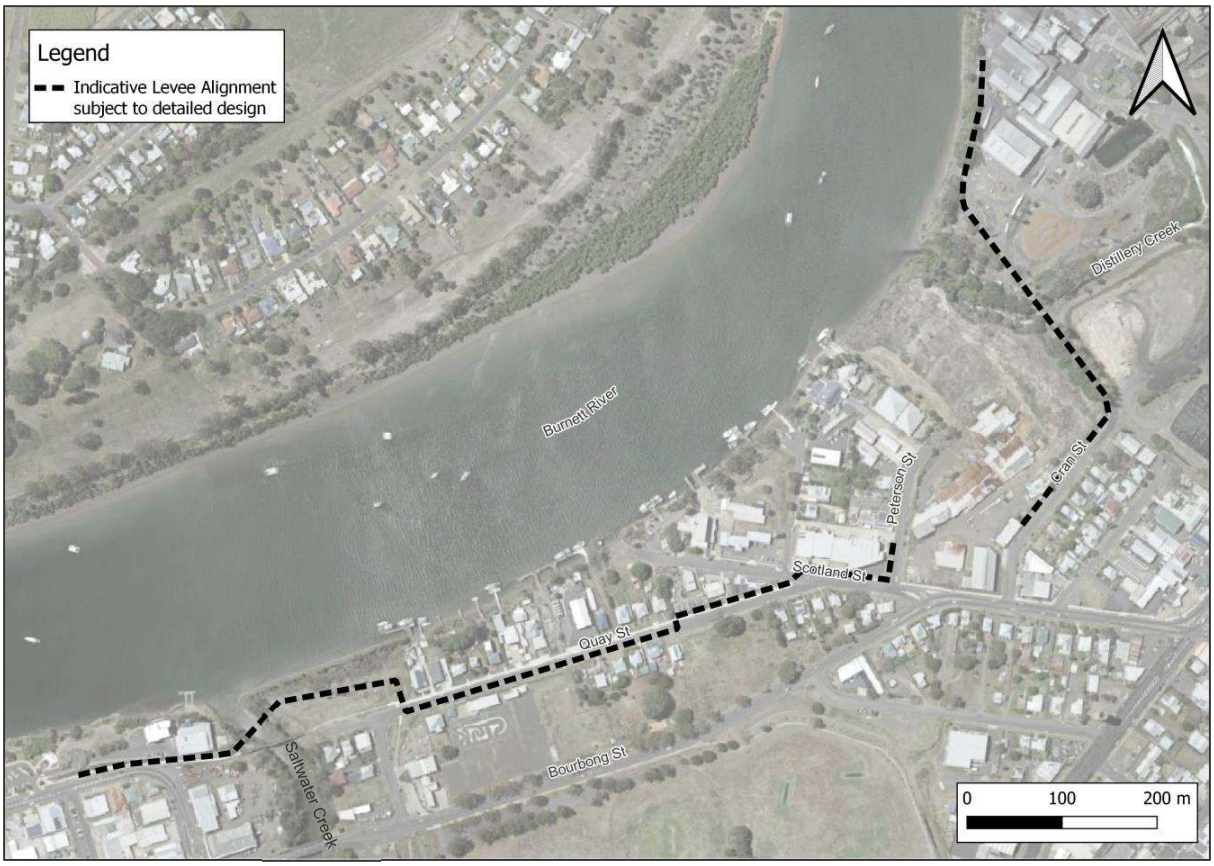


Figure 1: Indicative BEL Alignment (SMEC)

## 1.2 Wall Design and Alignment

It is noted that the levee alignment assessed in this report is conceptual and that the detailed design has not been conducted yet. Traffic impacts due to construction have been determined based on a number of broad assumptions that may change as detailed design is conducted.

The duration of construction is anticipated to commence in 2025 with a completion in 2027. The design level for the top of the levee is Australian Height Datum (AHD) 9.5m (300 mm above the 1% AEP level). The wall is expected to be constructed primarily of concrete, with breaks in the wall required for vehicle and pedestrian access.

The western section of wall will be approximately 1km in length. The wall will be at its maximum height relative to the existing ground level (excluding the section over Saltwater Creek) on Quay Street East, approximately 200m east of Kendall Street, where it will reach a height of approximately 3.9m above the road level.

The western section of the wall will consist of at a number of flood gates, including flood gates over Saltwater Creek, road gates (Quay Street East and Scotland Street), and flood gates for property access. The specific mechanism for the flood gates is subject to detailed design but may consist of retractable and demountable flood barriers. A pump station is also indicated to be constructed to the east of the Saltwater Creek flood gate, accessed via Quay Street East.

The eastern section of the wall will be approximately 700m in length and run along Cran Street, crossing Distillery Creek and end adjacent to the Millaquin Sugar Mill.

The eastern section of the wall is expected to have a limited number of gates (running largely parallel with Cran Street). A flood gate will be installed where the wall crosses Distillery Creek, with a pump station indicated to be constructed adjacent.

The proposed levee is expected to include both temporary and permanent sections of wall. The temporary sections will be erected for the duration of the flood event. At this stage the locations of the temporary sections are not confirmed.

The detailed design may include the construction of on-street parking areas on Quay Street East, replacing the expected loss of parking along the southern side of the road. Temporary parking is expected to be provided for the duration of construction, with the number of parks dependant on the number of construction workers.

The Department of Transport and Main Roads' (TMR) Guide to Traffic Impact Assessment (GTIA) specifies that road safety, access and frontage, road link capacity, and intersection delays should be assessed in the year of opening, and access and frontages also assessed 10 years after the year of opening. On this basis, the critical years of assessment have been determined to be:

- 2025-2027: Construction impacts
- 2027: Post-construction impacts
- 2037: Post-construction impacts (access and frontage only)

Traffic generation during construction has not been able to be quantified accurately within this report without the completion of detailed design. Refer to Section 3.1 for a discussion of the traffic generation and distribution during construction.

Post-construction traffic volumes are not anticipated to be significantly altered, with the levee unlikely to generate additional traffic volumes in itself. Specific turn movements at intersections and on roads may be impacted however due to potential restrictions imposed by the wall's placement and gate locations.

Pavement impacts during construction have not been assessed as part of this assessment.

# 2. Existing Conditions

## 2.1 Existing Road Network

The components of the road network that have been investigated for impacts of the construction traffic (increase of greater than 5% over background traffic volumes) include the following roads and intersections:

- Quay Street (Toonburra Street)
- Bourbong Street (Scotland Street)
- Quay Street East (Kendall Street)
- Scotland Street (Local Government Road)
- Petersen Street
- Cran Street
- Quay Street / Toonburra Street Intersection
- Bourbong Street / Kendall Street Intersection
- Scotland Street / Quay Street East / School Lane Intersection
- Bourbong Street / Scotland Street / Petersen Street Intersection
- Scotland Street / Cran Street Intersection

### 2.2.1 Quay Street (Toonburra Street)

Quay Street is a sealed state government-controlled road with the following properties:

- The road is known by TMR as Bundaberg-Bargara Road (174).
- As the road turns to the south, it is known as Toonburra Street.
- Permanent count site data at TMR site 120101 (through distance 1.421, 600m west of Toonburra Street) recorded a 2022 AADT of 19,480 vpd. The ten-year growth between 2012 and 2022 indicated a linear growth rate of 1.3% per annum, however recent growth between 2019 and 2022 has increased to 1.65% per annum. A conservative 3% per annum linear growth has been assumed for future traffic volumes.
- Largely a 2-lane (3.5m wide lanes) undivided road with posted speed of 60km/h. Channelised turn lanes are provided at most intersections.
- There are no bus stops on Quay Street in the vicinity of the project, with the closest being 700m west of the intersection with Toonburra Street.
- The road has edge lines and centre linemarking.
- The street is lit on both sides of the road.
- The road has kerb and channel generally on both sides.
- The road generally has an 18m seal but narrows to approximately 10m towards the east as it turns into Toonburra Street.
- Generally, has a 40m road reserve along Quay Street, reducing to 30m on Toonburra Street.
- Generally, has on-street parking on the northern and southern sides of the road.
- The Quay Street Service Road is located to the north of the road, partially within the road reserve. The service road provides significant parking along its length. The service road is generally at a lower level than the main road.
- The road is gazetted for use by up to 26m long B-doubles.
- Several mid-block unsignalised pedestrian crossings are provided (protected with centre refuge islands and kerb build outs).
- The road is on the Principle Cycle Network. A shared pedestrian/cycle path is provided on the northern side, which connects to Quay Street East via a shared pedestrian/cycle bridge.
- Pedestrian paths of varying width are provided along the south and north of the road.

The northern pedestrian path crosses over the Saltwater Creek via a footbridge.

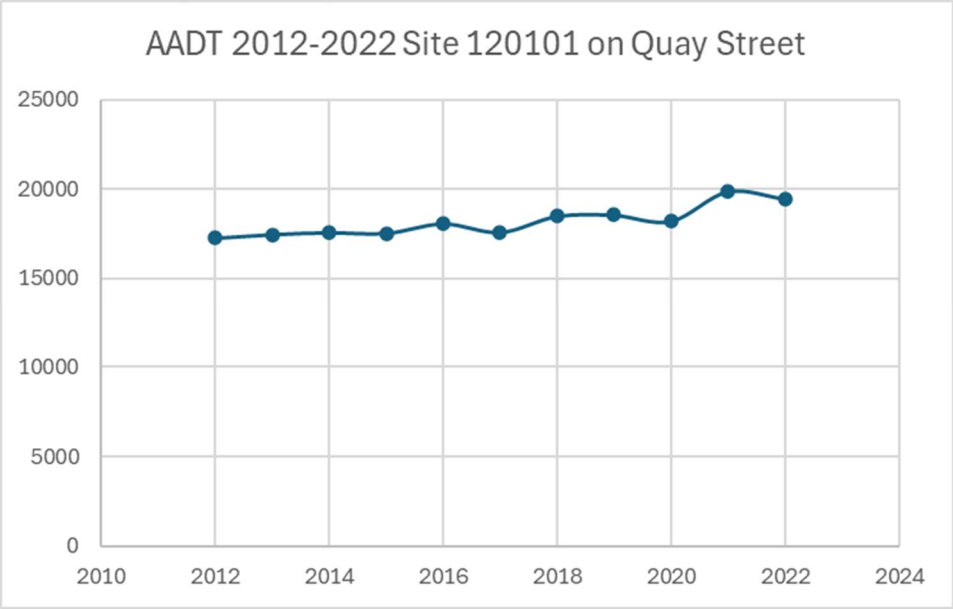


Figure 2: Traffic Growth on Quay Street


Figure 3: Quay Street Looking East Towards Toonburra Street (Google Street View 2020)

### 2.2.2 Bourbong Street (Scotland Street)

Bourbong Street is a sealed state government-controlled road with the following properties:

- The road is known by TMR as Bundaberg-Bargara Road (174).
- To the west of Toonburra Street, the road is a Bundaberg Regional Council (BRC) road.
- To the east of the intersection with the local government road Scotland Street, the road becomes known as Scotland Street also.
- Permanent count site data at TMR site 120898 (through distance 2.647, approximately 300m east of Kendall Street) recorded a 2022 AADT of 17,666 vpd. The ten-year growth between 2012 and 2022 indicated a linear growth rate of 1.1% per annum, however recent growth between 2020 and 2022 has increased to 2.05% per annum. A conservative 3% per annum linear growth has been assumed for future traffic volumes.
- 2-lane (3.5m wide lanes) undivided road with posted speed of 60km/h. Channelised turn lanes are not provided at most intersections.
- The road has edge lines and centre linemarking.
- The road is on the Principle Cycle Network between Kendall Street and 130m west of Sussex Street (315m). There are no formal cycle lanes, however in this section 2.5m wide sealed shoulders are provided either side and a shared pedestrian/cycle footpath is provided on the northern side east of Kendall Street, which crosses to the southern side at the signalised pedestrian crossing 120m east of Kendall Street. The wide shoulders commence just east of the Kennedy Bridge (between the bridge and Kendall Street), and continue to the east beyond the the end of the Principle Cycle Network.
- There is a hail and ride bus stop adjacent the Kendall's Flats parking area servicing the 608 and 609 bus routes. Both the 608 and 609 routes use Bourbong Street between Toonburra Street and Princess Street. Refer to Figure 6 and Figure 7.
- The street is lit on both sides of the road.
- The road has kerb and channel generally on both sides.
- The road generally has a very wide 32m seal to the west of Saltwater Creek but narrows to approximately 12.5m seal on the eastern side of the creek. The road narrows to 7m width over the Kennedy Bridge.
- Generally, has a 20m road reserve, but has an increased 40m width on the west side of the creek.
- Does not have line marked on-street parking, though road shoulders are generally 2.5m in width on the northern and southern sides of the road.
- The road is gazetted for use by up to 26m long B-doubles, though weight and height restrictions apply to Scotland Street east of Princess Street (discussed in Section 3.2).
- A signalised pedestrian crossing is provided 100m east of Kendall Street, connecting to the Daphne Geddes Park to the north and Cricket Fields to the south.
- A 3m wide pedestrian footpath is provided along the southern side of the road, reducing to 1.2m to the east. A footpath is provided over Saltwater Creek on the south side of the Kennedy Bridge.

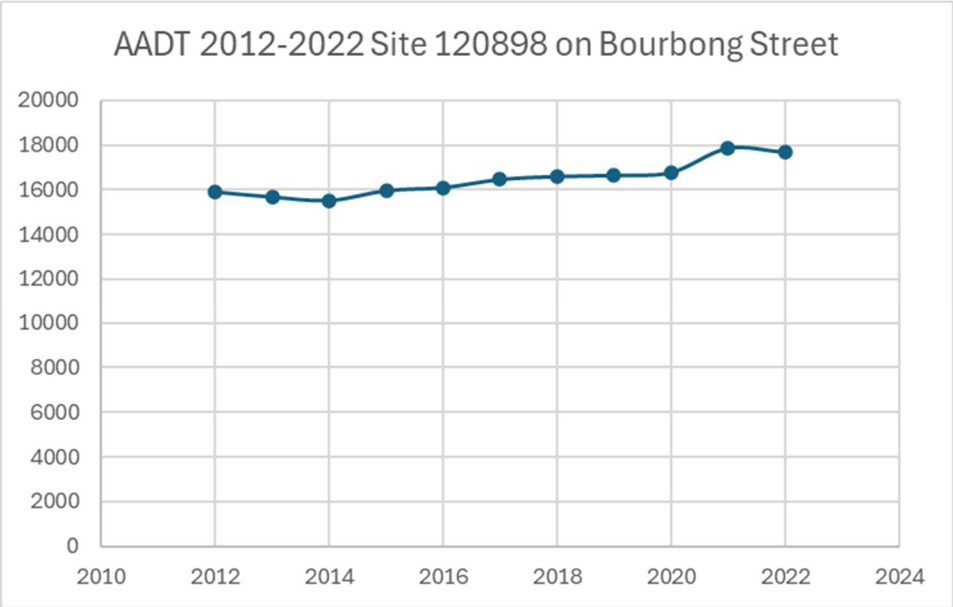


Figure 4: Traffic Growth on Bourbong Street


Figure 5: Bourbong Street Looking East (Google Street View 2020)

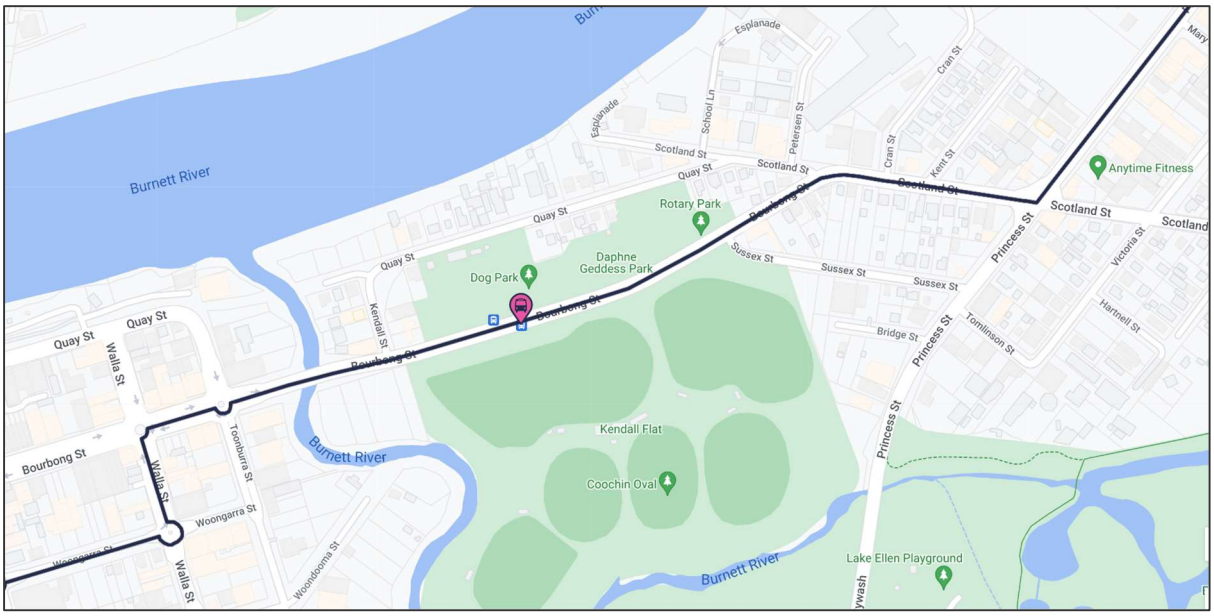


Figure 6: Translink Route 608


Figure 7: Translink Route 609

### 2.2.3 Quay Street East (Kendall Street)

Quay Street East is a sealed local government road with the following properties:

- North of Bourbong Street, the road is known as Kendall Street, and continues to the east as Quay Street East. A small stub road is located at the intersection of Kendall Street and Quay Street East.
- February to March 2024 count data, collected approximately 140m from Kendall Street, indicates that the average daily volume on the road was 465vpd, with average weekday volumes of 509vpd. It is not expected that volumes on Quay Street will increase significantly over the construction period but have been assumed to grow at a conservative 3% per annum.
- 2-lane undivided road with no posted speed (assumed 50km/h default speed).
- Channelised turn lanes have not been provided at intersections.
- The road has no edge lines or centre linemarking.
- The street is lit from the southern and eastern sides of the road.

- The road has kerb and channel generally on both sides.
- There are no bus stops on Quay Street East or Kendall Street.
- The road generally is 9m in width but widens for on-street angled parking on the southern side. Kendall Street is approximately 12m in width.
- Generally, has a 20m road reserve, though widens significantly around the Quay Street East / Kendall Street intersection.
- Has 3 sections of on-street angled 45-degree parking and several marked parallel parking areas along the southern side of the road. Parallel parking is also observed to occur along the northern side of the road though is not marked.
- The road is not gazetted for as a right of way B-double route. The National Heavy Vehicle Regulator has confirmed that there are no current active permits for B-doubles along Quay Street or Kendall Street.
- Quay Street East and Kendall Street are on the Principle Cycle Network. There are no on-street cycle lanes provided. A 3m wide shared cycle/pedestrian footpath is provided along the northern side of the road, and on the eastern side of Kendall Street. The northern shared footpath connects to Quay Street to the west over Saltwater Creek via a shared pedestrian/cyclist footbridge that is also included in the Principle Cycle Network.


Figure 8: Kendall Street and Quay Street East (Google Maps)


Figure 9: Quay Street East Looking East (Google Street View 2015) [Northern Footpath Not Constructed at the Time]


Figure 10: Kendall Street Looking North (Google Street View 2015) [Kerb and Channel Not Constructed at the Time]

### 2.2.4 Scotland Street

Scotland Street is a sealed local government road with the following properties:

- 2018 count data, collected approximately 2m west from School Lane, indicates that the average daily volume on the road was 525vpd, with average weekday volumes of 543vpd. 2018 data collected 20m west of Peterson Street indicated an average daily volume of 1,303vpd and weekday volume of 1,366vpd. It is not expected that volumes on Scotland Street will increase significantly over the construction period but have been assumed to grow at a conservative 3% per annum.
- 2-lane undivided road with no posted speed (assumed 50km/h default speed).

- Channelised turn lanes have not been provided at intersections.
- The road has no edge lines or centre linemarking.
- The street is lit from both sides of the road.
- The road is on the Principle Cycle Network south east of the intersection with Quay Street East. There are no on-street cycle lanes provided within the section adjacent to the levee, with the on-street cycle lanes ending 800m east of Cran Street. In the vicinity of the project site, a shared cycle/pedestrian path is provided on the northern side of the road.
- There are no bus stops on Scotland Street.
- The road generally has kerb and channel either side.
- The road generally is 12.5m in width but narrows east of Quay Street East to 10m.
- Generally, has a 20m road reserve.
- Does not have line marked on-street parking, though parking is observed on both the northern and southern sides of the road.
- The road is not gazetted for as a right of way B-double route. The National Heavy Vehicle Regulator has confirmed that there are no current active permits for B-doubles along the Local Government Road (LGR) Scotland Street.
- A 2.5m wide pedestrian footpath is provided along the northern side of the road to the east of Quay Street East. To the west, the footpath narrows to 1.2m and terminates approximately 65m west of the intersection.


Figure 11: Scotland Street Looking East (Google Street View 2016) [Northern Footpath Not Constructed at the Time]

### 2.2.5 Petersen Street

Petersen Street is a sealed local government road with the following properties:

- No traffic volumes available. Assumed to be less than 100vpd based on the small industrial and commercial developments serviced by the road.
- 2-lane undivided road with no posted speed (assumed 50km/h default speed).
- The street has no edge lines or centre linemarking.
- The street is lit from the eastern side of the road.
- The street has kerb and channel on both sides of the road.

- There are no bus stops on Peterson Street.
- The street is not on the Principle Cycle Network.
- The street generally is 12.5m in width between kerbs, though the eastern shoulder is not sealed along the full length despite the kerb and channel on both sides, narrowing to 9m pavement in the southern section (refer to Figure 12).
- Generally, has a 20m road reserve.
- Does not have line marked on-street parking, though parking is observed on both the eastern and western sides of the road.
- The street is not gazetted for B-doubles.
- There are no footpaths along the street.


Figure 12: Petersen Street Looking South (Google Street View 2015)

### 2.2.6 Cran Street

Cran Street is a sealed local government road with the following properties:

- No traffic volumes available. The road provides access to the Millaquin Sugar Mill (one of several accesses), as well as residential properties and other industrial properties. It is likely that road would currently cater for 100-500vpd.
- 2-lane undivided road with no posted speed (assumed 50km/h default speed). Channelised turn lanes have not been provided at intersections.
- The road has no edge lines or centre linemarking.
- The street is lit from the eastern side of the road.
- The road has kerb and channel on both sides of the road.
- The road generally is 12.5m in width between kerbs, with kerb and channel either side within the residential section. The eastern and western shoulders are not sealed along the full length.
- There are no bus stops on Cran Street.
- The street is not on the Principle Cycle Network.
- Generally has a 20m road reserve.
- Does not have line marked on-street parking, though parking is observed on both the

eastern and western sides of the road.

- The road is gazetted for B-double access, assumed to be primarily for the sugar mill.
- The road continues as a narrower 4m private road into the Millaquin Sugar Mill.
- There are no footpaths along the road.


Figure 13: Cran Street Looking North (Google Street View 2015)

### 2.2.7 Quay Street / Toonburra Street Intersection

Quay Street / Toonburra Street is not a formal intersection; however, an egress is provided from the service road to the north onto the road. The intersection has the following properties:

- Travel volumes were not available at the time of the assessment.
- Quay Street and Toonburra Street are continuous, the service road connects onto the Quay Street Service Road beside the Rowers on the River rowing club. There is no give-way signage or linemarking at the intersection. No Entry signage is provided to prevent entry from Quay Street and Toonburra Street.
- The shared footpath on Quay Street continues east over the service road towards the Saltwater Creek footbridge. The shared footpath has give-way linemarking either side of the egress.
- The intersection is lit on the north eastern corner.
- Quay Street to Toonburra Street is signed with a 40km/h speed advisory for eastbound traffic.
- Sight distance from the service road onto Quay Street and Toonburra Street is unimpeded once vehicles are positioned beyond the retaining wall separating Quay Street and the service road (no give-way line is provided).
- Two crashes requiring medical treatment occurred at the intersection in 2015 and 2016 but appear to be from vehicles traveling around the Quay Street to Toonburra Street bend and colliding. A single vehicle fatality crash occurred in 2010, with a vehicle along Quay Street leaving the carriageway and colliding with an object.

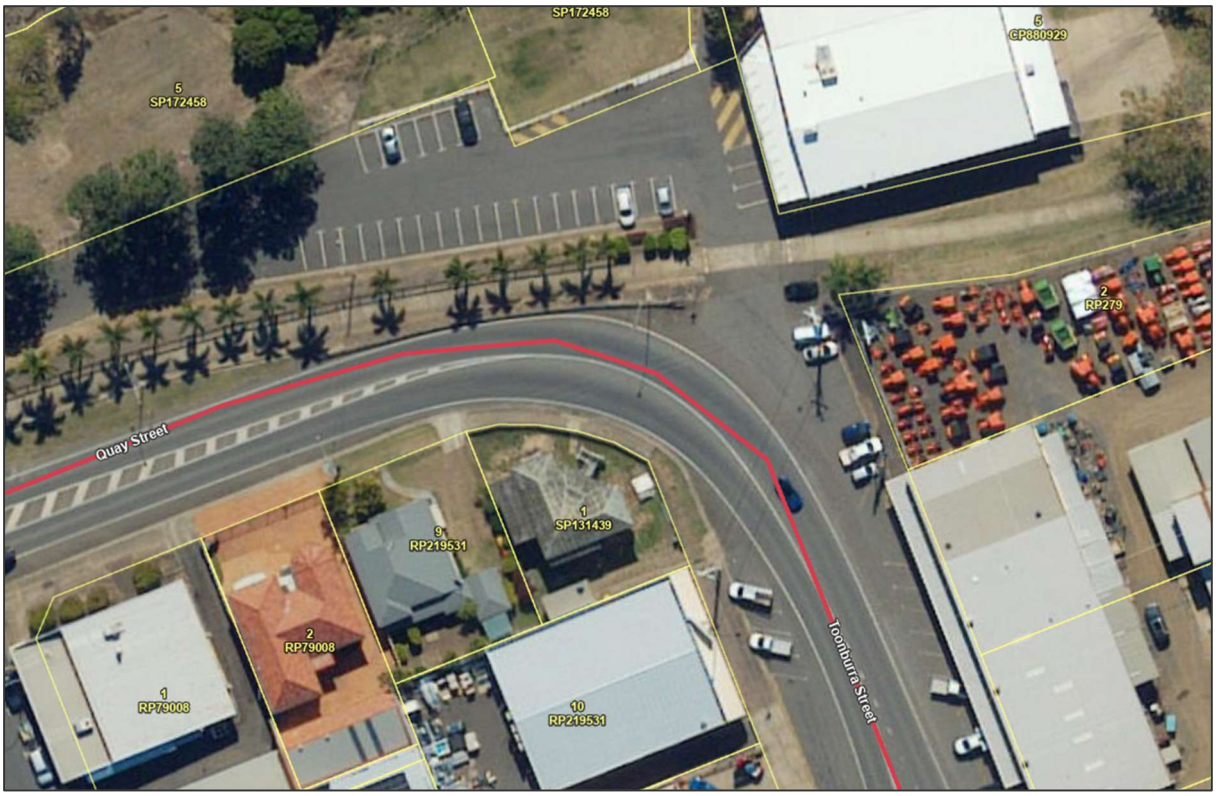


Figure 14: Quay Street / Toonburra Street (Queensland Globe 2023)


Figure 15: View to the South from Quay Street Service Road (Adjacent Rowers on the River) (Google Street View 2018)

### 2.2.8 Bourbong Street / Kendall Street Intersection

The Bourbong Street / Kendall Street intersection is an unsignalised stop sign-controlled T-intersection with the following properties:

- Travel volumes were not available at the time of the assessment.
- The intersection is lit to the south.
- Accesses for Freedom Fuels station are located in close proximity of the intersection on the north east corner. Gated accesses are located opposite Kendal Street also.
- Sight distance from Kendall Street onto Bourbong Street appear to be unimpeded.
- There is no left turn treatment at the intersection. A basic right turn treatment (BAR) is provided, which could be impeded by on-street parking.

- The intersection has sufficient visibility for SISD at design speed 70km/h. On this basis the stop sign appears unwarranted.
- No crashes have occurred at the intersection in the past ten years.


Figure 16: Bourbong Street / Kendall Street (Queensland Globe 2023)

### 2.2.9 Scotland Street / Quay Street East / School Lane Intersection

The Scotland Street / Quay Street East / School Lane intersection is an unsignalised give-way sign-controlled staggered T-intersection with the following properties:

- Travel volumes were not available at the time of the assessment.
- School Lane intersection with Scotland Street is located offset from the Scotland Street / Quay Street East intersection by approximately 10m.
- Give way signage and linemarking on the Quay Street East approach to the intersection. The School Lane approach has no give way signage or linemarking.
- Quay Street East intersects with Scotland Street at an approximate 25-degree angle.
- The intersection is lit on the north-western corner of School Lane and south-eastern corner of Quay Street.
- There are three large, concreted driveways to commercial premises on the northern side of the intersection and two residential driveways on the south-eastern corner.
- Sight distances from Quay Street East and School Lane appear to be unimpeded.
- There are no current channelised turn treatments at the intersection.
- No crashes have occurred at the intersection in the past ten years.

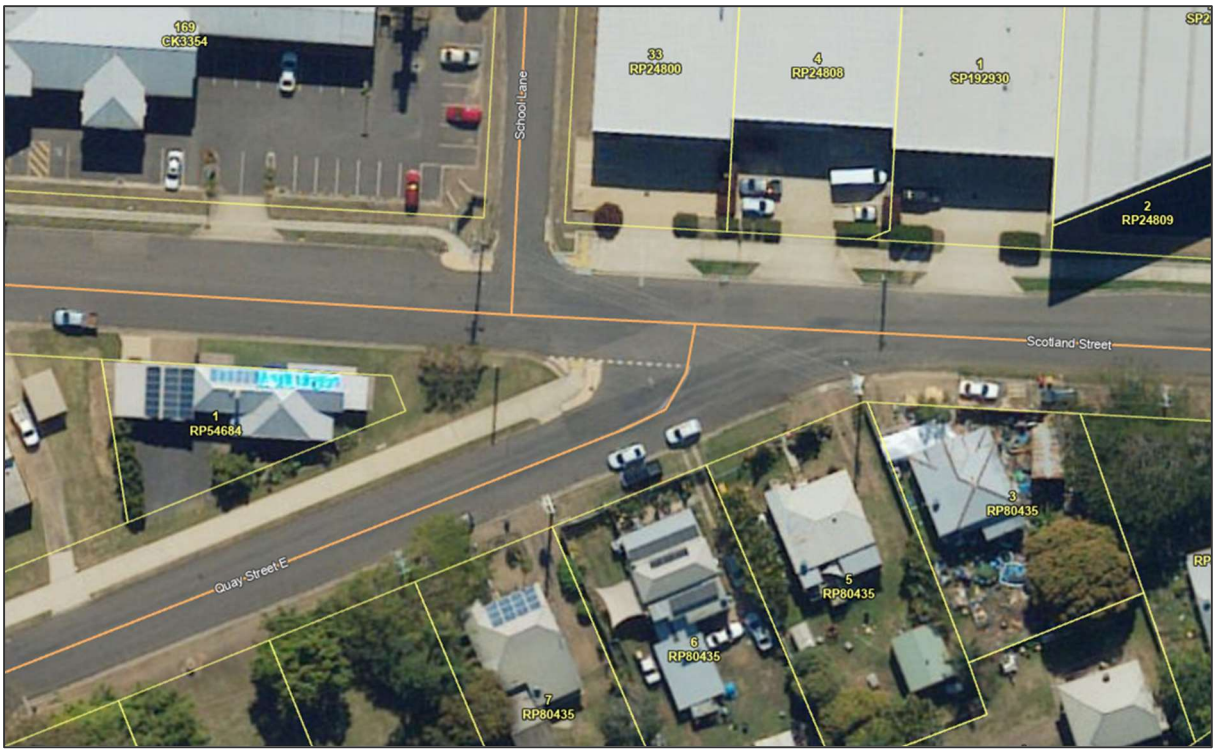


Figure 17: Scotland Street / Quay Street East / School Lane (Queensland Globe 2023)

### 2.2.10 Bourbong Street / Scotland Street / Petersen Street Intersection

The Bourbong Street / Scotland Street intersection and Scotland Street / Petersen Street intersection are two closely spaced (30m) intersections under give-way sign control with the following properties:

- Travel volumes were not available at the time of the assessment.
- Petersen Street intersection with Scotland Street is located offset from the Bourbong Street / Scotland Street intersection by approximately 30m.
- Scotland Street intersects with Bourbong Street at an approximate 40-degree angle.
- The intersection is lit on the northern, western, and southern sides.
- Sight distances from Scotland Street and Petersen Street appear to be unimpeded.
- There is a short 25m long Channelised Right (CHR(s)) turn treatment on the SCR Scotland Street. The Scotland Street (LGR) has separate left and right turn lanes on the approach, approximately 15m long.
- The intersection has several crashes within the past 10 years:
    - 2016 crash from a through vehicle continuing westbound from Scotland Street to Bourbong Street leaving the carriageway and hitting an object resulting in minor injury.
    - 2018 head on collision requiring medical treatment between vehicles on Bourbong Street and Scotland Street.
    - 2015 rear end collision to a vehicle turning right from Scotland Street (SCR) requiring medical treatment.
    - 2015 crash between a through and right turning vehicle from Scotland Street (LGR) requiring medical treatment.,
    - 2020 crash from a eastbound through vehicle turning right through Bourbong Street to Scotland Street curve leaving the carriageway and hitting an object resulting in a hospitalisation.
    - 2021 crash from a westbound through vehicle turning left through Scotland Street to Bourbong Street curve leaving the carriageway and hitting an object resulting in a hospitalisation.


Figure 18: Bourbong Street / Scotland Street / Petersen Street (Queensland Globe 2023)

### 2.2.11 Scotland Street / Cran Street

The Scotland Street / Cran Street intersection is an unsignalised give-way sign-controlled T-intersection with the following properties:

- Travel volumes were not available at the time of the assessment.
- Scotland Street has a continuous median turning lane that runs from Bourbong Street to Princess Street and is used to provide channelised right turns into Kent Street and Cran Street and accesses along Scotland Street. The lane is not linemarked as a Two Way Right Turn Lane (TWRTL) in the vicinity of the intersection, however it is assumed that drivers accessing the residential properties to the south would store in the right turn lane. At the eastern end of the lane a right turn arrow indicates its use for a business on the southern side of Scotland Street.
- B-double access at the intersection is restricted, with access for vehicles travelling from Sugar Mill between Cran Street and Steptoe Street, via Scotland Street and Steindl Street in a one-way direction of travel southbound. It is understood that B-doubles for the sugar mill access their site unladen via Cran Street due to the load limit on the existing culvert, and do not exit via Cran Street.
- The intersection is not directly lit but has lighting to the east and west of the intersection.
- Sight distances from Cran Street appear to be unimpeded.
- A 2015 rear end collision occurred at the intersection resulting in hospitalisation.

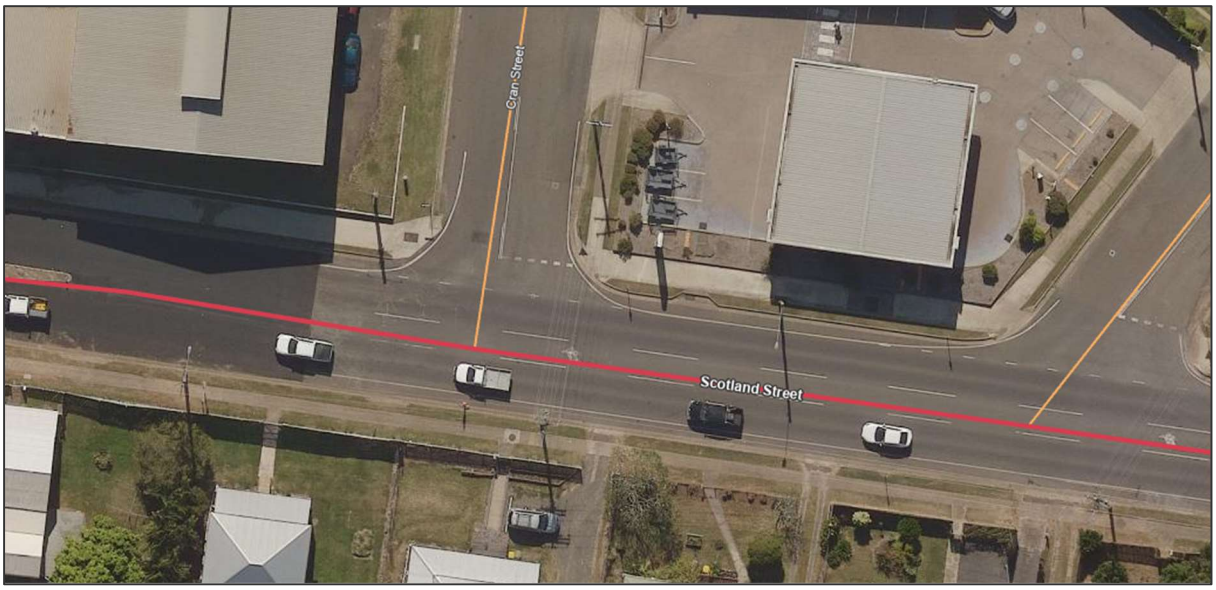


Figure 19: Scotland Street / Cran Street (Queensland Globe 2023)

# 3. Traffic Generation and Distribution

## 3.1 Traffic Generation

Traffic generation during construction has not been able to be quantified accurately without the completion of detailed design.

The Queensland Government has indicated that the BEL project will support an average of 100 Full Time Equivalent (FTE) jobs over 4 years. It is expected that a portion of the jobs would be construction support (consultants etc. not working on-site and not directly generating traffic during construction).

It is not currently anticipated that any workers camp or similar accommodation would be established for the construction of the levee. It is expected that local construction companies would be engaged for construction, with workers primarily coming from Bundaberg or nearby towns. Specialist consultants are expected to be sourced locally where possible, or if required to be sourced from elsewhere within Queensland or interstate, transported to Bundaberg via road or air, and housed in local hotels or long-term accommodation where required.

In addition to worker transportation during construction, it is expected that significant heavy vehicle traffic will be generated. The construction design vehicle is not currently known at this point in time; however, Quay Street and Bourbong Street East are part of the 25/26m B-double network. It is expected that the vast majority of the transportation of construction materials and plant will be via heavy vehicles, transported on up to a 26m B-double.

It is expected that concrete batching will occur off-site and will be transported to site as required. Transportation of other construction materials to site (steel reinforcement, flood gate and door components, pump station components) is also expected via road from within Queensland or interstate.

Post-construction traffic volumes are not anticipated to be significantly altered, with the levee unlikely to generate additional traffic volumes in itself, aside from occasional maintenance vehicles. Specific turn movements at intersections and on roads may be impacted however due to potential restrictions imposed by the wall's placement and gate locations.

## 3.2 Traffic Distribution

Traffic generation from local construction workers is expected to be varied and spread across the network. The impact from construction workers is likely to be concentrated where accessing the site compound. If a site compound were to be constructed on Quay Street East, it would be expected that significant additional turning traffic would be generated at the Bourbong Street / Kendall Street, and Bourbong Street / Scotland Street intersections. In addition, the intersections of Quay Street / Toonburra Street, Quay Street East / Kendall Street and Quay Street East / Scotland Street would be expected to be impacted during construction of the wall.

The 25/26m B-double network around Bundaberg is illustrated in Figure 20.The network includes Bundaberg Ring Road to the east, Childers Road to the south, and Gin Gin Road to the west, eventually connecting to the Bruce Highway. Construction materials may be sourced from local quarries within the region, with other specialist components transported to site via road, possibly from ports at Gladstone, Brisbane, or Bundaberg, connected to the site via the 25/26m B-double network. The Port of Bundaberg is not anticipated to be used for construction materials as it is largely limited the export and import of sugars, sand, and wood pellets.


Figure 20: 25/26m B-Double Network (Yellow) (Aerial: Queensland Globe 2023) [Wall in Red]

Heavy vehicle restrictions for accessing the site include:

- Kennedy Bridge, which has a 4.9m height limit, 42.5t Gross Vehicle Mass (GVM) limit, and an approximate clear width of 7m. The GVM limit corresponds with the GVM limit of a 19m semi-trailer vehicle. 9 axle B-doubles are subject to a 62.5t General Mass Limit (GML), and hence any b-doubles travelling across the bridge will be unable to be fully laden. Additionally, vehicles over 22.5t are also required to give way to bridge traffic at either side of the bridge, possibly delaying traffic.
- The section of Scotland Street between Princess Street and Sheridan Street has B-double travel restrictions between 8am to 9am and 2pm and 4pm school days due to the Bundaberg East State School.


Figure 21: Kennedy Bridge Heavy Vehicle Restrictions (Google Street View 2020)

It is anticipated that due to the weight and height restrictions at the Kennedy Bridge, in addition to the requirement to travel through the Bundaberg CBD, that a significant portion of construction heavy vehicles are likely to travel to the site via the east, using Bundaberg Ring Road, Princess Street, and Scotland Street to access the site. Smaller and lighter heavy vehicles may utilise the Kennedy Bridge to access the site as it is likely to provide a more direct route from the Bruce Highway.

# 4. Traffic Impacts

## 4.1 Quay Street and Quay Street / Toonburra Street Intersection

The preliminary alignment of the wall to the south side of the northern footpath on Quay Street requires a flood gate be installed across the existing access to maintain egress adjacent the rowing club as well as a gate for the shared pedestrian/cyclist path leading to the bridge over Saltwater Creek .

Vehicles exiting the rowing club onto Toonburra or Quay Street will wait south of the levee for an opportunity to enter the street, with visibility unimpeded by the levee. The intersection will not require any upgrades due to the location of the levee.

There is potential that a section of the levee along Quay Street will be temporary, removed following the flood event. The extents of the temporary section are not known at this time.

In its current proposed alignment the levee commences outside the clear zone (estimated to be 6m based on over 1,500vpd and 50km/h design speed in proximity to the horizontal curve). The levee becomes closer to the traffic lane closer to the horizontal curve. At the horizontal curve the levee is behind a guard railFurther investigation is required to determine whether protection is required to the levee which may involve providing a temporary section of levee from the start of the wall to the east to behind the guard rail, or extending the guard rail in this section to the west.

## 4.2 Quay Street East

The preliminary alignment of the wall along Quay Street East will have a large impact to on-street parking.

- It is likely that the wall would result in the loss of a minimum 34 angled parking spaces along the road and may possibly result in further parallel parking losses.
- Parking may be able to be provided on the stub end of Quay Street East (the western leg of the Quay Street East/Kendall Street intersection), which would likely require realignment of the intersection to provide Kendall Street with priority and formally align Quay Street East and Kendall Street as a continuous road.
- On-street parking opportunities may be available on the south-east corner of the Quay Street East / Kendall Street intersection but would require the redesign of the existing footpath and crossing points.

Parking requirements for construction workers has not been reviewed as part of this assessment, but accommodation of a large number of worker vehicles may be limited due to the requirement to maintain public access along Quay Street East during any construction works. Limited parking may be able to be accommodated on-street, or as part of a site compound (refer Figure 22). Temporary parking may also be able to be provided in a potential temporary car park in Daphne Geddes Park, accessed from Quay Street East.


Figure 22: Possible Site Compound and Parking Locations.

High patronage of Red Shed Seafood during seasonal events such as Easter and Christmas is known to cause traffic issues along Quay Street East. Where possible, parking areas should be maintained during construction to minimise impact on adjacent businesses. Where possible, work activities should be planned to avoid construction during these holiday periods, and construction works should be staged to maximise the road and verge areas in the lead up to holidays to minimise traffic impacts.

The Saltwater Creek Railway Bridge will be required to be closed temporarily during construction stages. There is an alternative route for pedestrian and cyclist traffic over Kennedy Bridge on Bourbong Street.

The preliminary alignment of the wall indicates that the wall will be located along the northern and southern kerb lines in parts and will impact at least 7 residential properties. Flood gates will be required to maintain access to these properties. The potential 4m height of the wall in this area will impede sight lines for exiting vehicles from the residential properties. The width of flood gates currently proposed are sufficient to enable sight lines to the east and west along Quay Street East to a minimum AS2890.1 standard to vehicles, pedestrians and cyclists based on a 50km/h design speed (the BRC count on Quay Street East recorded an 85$^{th}$ percentile speed with 4s headway of 51km/h), 40m.

Additional flood gates may be required for maintaining pedestrian footpaths and enabling pedestrian crossings along Quay Street East. A mid-block crossing or means of passing through the wall from north to south should be explored during the detailed design, with consideration to all other criteria required for levee performance.

The current proposed gate widths allow for garbage bins to fit beside a 3m access driveway or 6m commercial access. Australia post vehicles are assumed to continue to travel along the verge between the property boundary and levee, using the gates to cross to the other verge.

The proximity of the wall to the existing kerb line will require that appropriate clearances to the traffic lanes be considered. The current proposal has the levee located beyond the shy line, which is 2m at 60km/h. It is recommended that a centre line and edge lines be provided along Quay

Street East to minimise potential for drivers deviating to the other side of the road away from the levee. Provision of edge lines will also control parking on the northern side of Quay Street East.

Specific consideration will be required where gaps have been left for flood gates as these may pose a safety risk to an errant vehicle where no end treatment to the breaks in the wall is provided. The clear zone along this section is in the order of 2m (<60km/h, <750vpd), and therefore for the current proposed alignment the openings in the wall are outside the clear zone.

Lighting of the wall will need to be considered for traffic safety, as well as for pedestrians.

## 4.3 Bourbong Street (Scotland Street)

The construction and post construction traffic is not expected to have any significant impact on the bus route and hail and ride bus stops on Bourbong Street. Relocation of bus stops and rerouting of routes is not expected to be required.

As noted in Section 4.2, the Saltwater Creek Railway Bridge will be required to be closed temporarily during construction stages. There is an alternative route for pedestrian and cyclist traffic over Kennedy Bridge on Bourbong Street.

The preliminary alignment of the wall indicates that the wall on Scotland Street will be located close to the northern kerb line and will impact 3 industrial properties. Flood gates will be required to maintain access to these properties. At this stage, it is unknown whether this section of levee is temporary or permanent. If permanent, it is recommended that the levee be relocated to between the shared path and the property boundary to avoid visibility issues between pedestrians (particularly children), cyclists and vehicles entering the properties. If temporary, and installed for just the duration of the flood event, it is assumed there will be no breaks in the walls, and vehicles will not be turning in or out of accesses, interacting with pedestrians or cyclists.

It is recommended that a centre line and edge lines be provided along Scotland Street in this section between School Lane and Bourbong Street.

The width of flood gates will need to be sufficient to enable sight lines to the east and west along Scotland Street to a minimum AS2890.1 standard, being 45m for a non-domestic property (desirable 69m). Assuming an edge line is provided, the required sight distances are achieved. Sight lines between vehicles, cyclists and pedestrians will need confirmation of attaining the minimum AS2890.1 requirements for the final adopted levee alignment.

Pedestrian/cyclist crossing locations should be incorporated into the detailed intersection design of Scotland Street / Quay Street East and Scotland Street / Petersen Street, noting that Scotland Street in this section is part of the Principle Cycle Network, connecting to Quay Street East to the south.

The current proposed wall location is outside the shy line for the Scotland Street traffic lanes, and assuming edge lines are provided the current location of the breaks in the wall are outside the clear zone and do not require protection. The clear zone is estimated to be less than 3m based on 60km/h and <1,500vpd noting that the BRC traffic count 20m west of Peterson Street recorded an 85$^{th}$ percentile speed of 45.9km/h.

## 4.4 Petersen Street

The preliminary alignment of the wall along Petersen Street indicates that the wall will be located close to the western kerb line. The wall will end adjacent to one industrial access but is expected to be in the range of 300mm height and have minimal impact to sight lines.

As noted in Section 4.8, it is recommended that the pedestrian/cyclist crossing location across Petersen Street be incorporated into the detailed intersection design of Scotland Street / Petersen Street. If the alignment along Scotland Street is relocated to between the shared path and the property boundary as per the recommendations in Section 4.3, it is recommended that a gate be provided to access the verge in this section. If the alignment is not altered, a pedestrian crossing location across Petersen Street should be incorporated into the detailed design of the Scotland Street / Petersen Street intersection to maintain the Principle Cycle Network and pedestrian connectivity along this route.

Sight distances from Petersen Street to the west along Scotland Street meet Austroads Guide to Road Design Safe Intersection Sight Distance (SISD) requirements, being a minimum 90m. If a pedestrian/cyclist crossing location is incorporated into the intersection design, appropriate sight distances must be maintained between vehicles, pedestrians and cyclists.

## 4.5 Cran Street

The current proposal commences the levee 80m north of Scotland Street, continuing adjacent to the road when the road enters private property 225m north of Scotland Street.

The preliminary alignment of the wall along Cran Street indicates that the wall will be located close to the western kerb line. The wall will cross 5 accesses to Lot 1 on RP54418 on the north-western side of Cran Street, with the first access at the southern end of the wall, and the fifth approximately 70m to the north. Flood gates will be required to maintain property access. In this section, the wall is expected to be between approximately 0.1m and 0.8m in height and is not expected to impede sight lines between pedestrians, cyclists and vehicles.

The proximity of the wall to the existing kerb line will require that appropriate clearances to the traffic lanes be considered. At the southern end of Cran Street it is recommended that a centreline and edge lines be provided to ensure that the start of the permanent section of wall is outside the clear zone of the traffic lane (2m). In the narrower section of Cran Street within private property, the current alignment of the wall is outside the clear zone and shy line, with no changes recommended to the road or wall alignment in this section.

Pedestrian movements along Cran Street are expected to be minimal but must be considered during detailed design.

It is recommended that access to the area between the levee and the western property boundary be restricted.

The gate widths for the accesses on Cran Street are not available at this time, however it is understood they will be a minimum of 5.5m. This minimum width will allow for garbage bins to fit beside a 3m access driveway. Australia post vehicles are assumed to access mail boxes where necessary via the gate, noting that the site appears to be industrial and the primary access to Lot 1 on RP54418 appears to be via Lot 6 on RP904416 to the south.

## 4.6 Bourbong Street / Kendall Street Intersection

Turning movement volumes at the Bourbong Street / Kendall Street intersection were not available at the time of this assessment. According to 2022 traffic data from TMR, the average weekday AM peak hour on Bourbong Street occurs between 8am-9am, and PM peak hour between 3pm-4pm.

The average weekday AM volumes in 2027 are expected to be:

- 1,093vph westbound and

- 706vph eastbound

The average weekday PM volumes in 2027 are expected to be:

- 907vph westbound and
- 991vph eastbound

The preliminary wall alignment does not directly impact the intersection, though it is expected that turning traffic at the intersection will be increased throughout the construction period.

Turning volumes into Kendall Street have not been quantified but based on 2024 Quay Street East weekday volumes during the Bourbong Street peak hours of less than 50vph, it is expected that turning traffic at the intersection would be less than 20vph in any one movement (i.e. no more than 20 right turn vehicles from Bourbong Street onto Kendall Street during the peak hour).

Whilst traffic generation due to construction has not been quantified, it is expected to add to the existing turn volumes at the intersection.

If left turn volumes into Kendall Street, including construction traffic, are expected to exceed 5vph during peak hour, it is highly probable that a Short Auxiliary Left (AUL(s)) turn lane would be warranted at the Bourbong Street / Kendall Street intersection. This would be exacerbated during the possible 3-year construction period. If total left turn volumes are expected to exceed 30vph during the construction period, it is possible that a full length AUL would be warranted. Whilst construction traffic volumes were not available, based on the data for Kendall and Bourbong streets it is considered likely that the traffic volumes would warrant an AUL(s).

If right turn volumes into Kendall Street, including construction traffic, are expected to exceed 6vph during peak hour, it is highly probable that a full Channelised Right (CHR) lane would be warranted at the Bourbong Street / Kendall Street intersection, which will be exacerbated during the possible 3-year construction period.

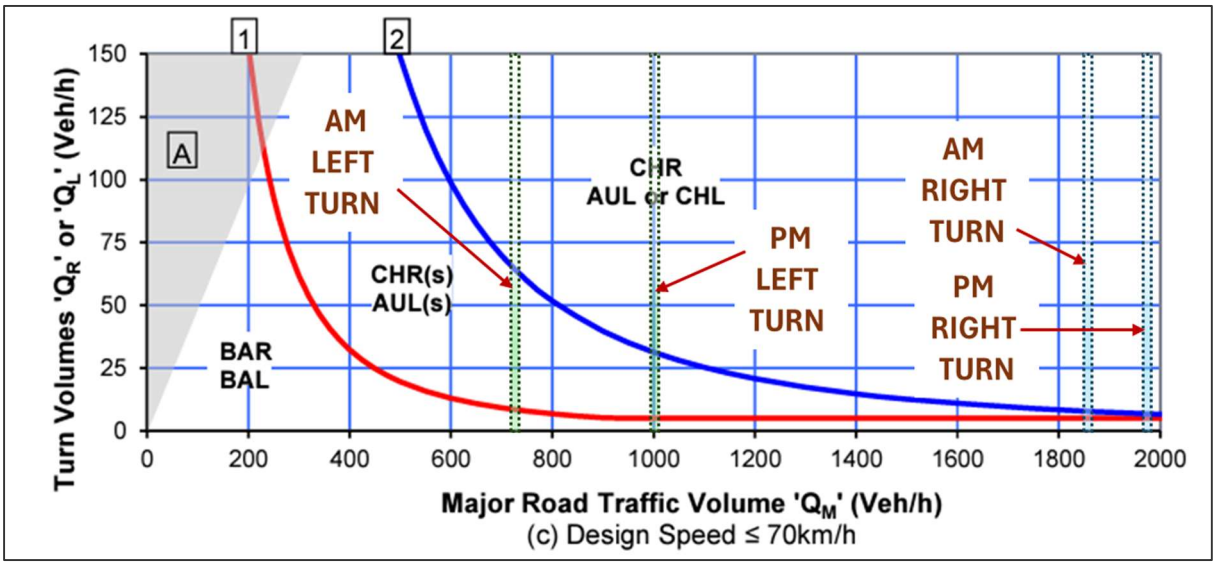


Figure 23: Warrants for Bourbong Street / Kendall Street Intersection

It is probable that the Bourbong Street / Kendall Street intersection should be upgraded to include at a minimum an AUL(s) and a CHR to cater to both the expected construction traffic volumes, as well as the likely existing traffic volumes. A formal traffic survey at the intersection should be conducted to confirm.

As noted in Section 2.2.8, the existing stop sign appears to be unwarranted, which should be confirmed as part of any upgrades to the intersection. It is expected that an investigation would determine a give way sign is appropriate.

The intersection design should be confirmed to accommodate the expected construction design vehicle, which may include a b-double vehicle (Kendall Street is not a b-double route).

SIDRA intersection modelling has not been undertaken at this time due to the absence of intersection count data and unknown traffic generation during construction.

## 4.7 Scotland Street / Quay Street East / School Lane Intersection

Turning movement volumes at the Scotland Street / Quay Street East / School Lane intersection were not available for this assessment.

The preliminary wall alignment requires that a flood gate be installed diagonally across Scotland Street (Figure 24). Austroads Guide to Road Design requires a SISD of 90m minimum. Based on the current proposed alignment, the flood gate will need to be widened by 7m to the south to accommodate this sight line.

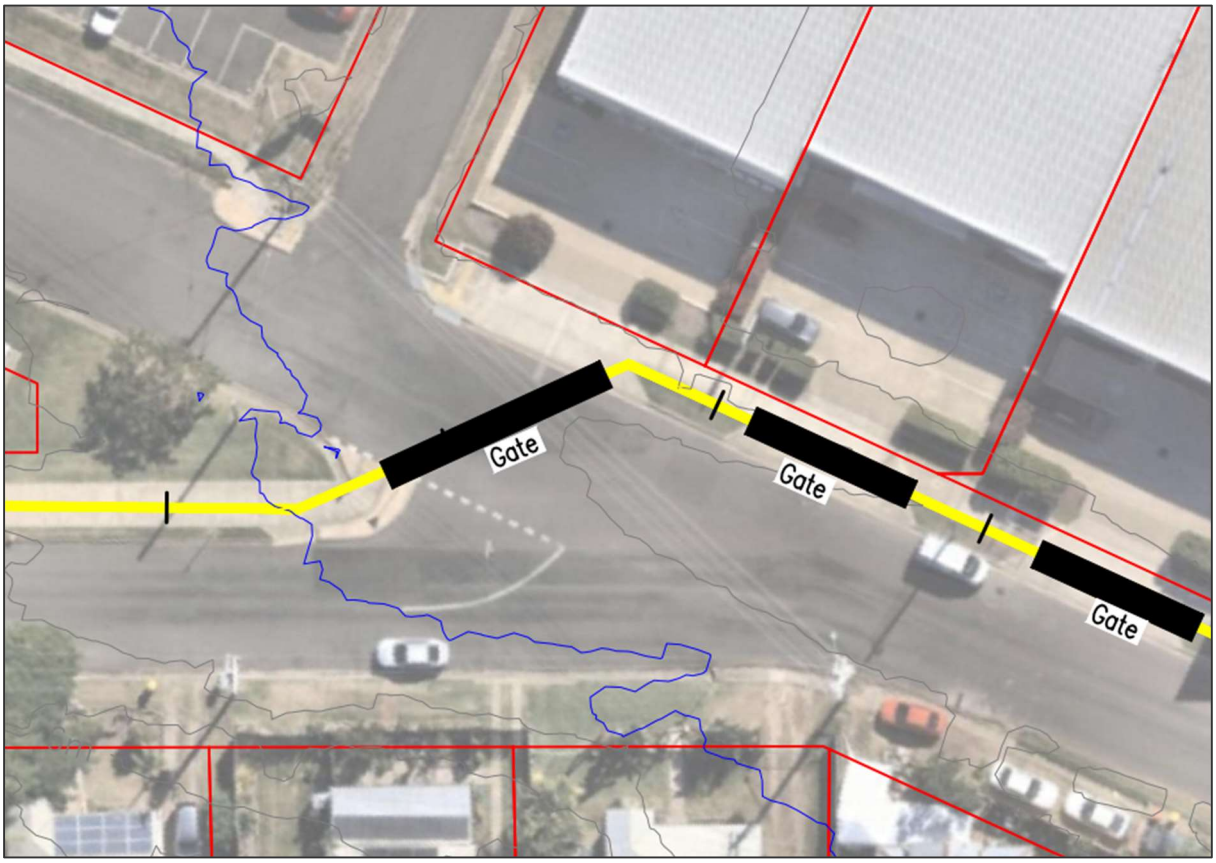


Figure 24: Scotland Street / Quay Street East / School Lane Preliminary Wall Layout

The proposed wall will need to account for clear distances for turning vehicles and allow for visibility to pedestrian and cyclist movements across Scotland Street. Widening of the gate 7m to the south should enable sufficient visibility to be provided however further review should be undertaken based on updated geometry. The pedestrian crossing location may need to be shifted to the west towards School Lane to ensure sight distances at the intersection to pedestrians are available.

Give-way signage and linemarking should be considered on School Lane.

Channelised turn treatments are unlikely to be warranted at the intersection, however the road width should not be reduced by the wall. The intersection design should be confirmed to accommodate the expected construction design vehicle, which may include a b-double vehicle (neither Quay Street East nor Scotland Street are b-double routes).

## 4.8 Bourbong Street / Scotland Street / Petersen Street Intersection

Turning movement volumes at the Bourbong Street / Scotland Street / Petersen Street intersection were not available for this assessment. According to 2022 traffic data from TMR, the

average weekday AM peak hour on Scotland Street (SCR) occurs between 8am-9am, and PM peak hour between 3pm-4pm.

The average weekday AM volumes in 2028 are expected to be:

- 979vph westbound and
- 986vph eastbound

The average weekday PM volumes in 2028 are expected to be:

- 1,098vph westbound and
- 977vph eastbound

Turning volumes into Scotland Street have not been quantified but based on 2018 Scotland Street (LGR west of Petersen Street) weekday volumes during the Scotland Street (SCR) peak hours of less than 120vph, it is expected that turning traffic at the intersection would be less than 50vph in any one movement (i.e. no more than 50 right turn vehicles from Scotland Street (LGR) into Scotland Street (SCR) during the peak hour) and less than 10vph total turning movements to/from Peterson Street.

Whilst traffic generation due to construction has not been quantified, it is expected to add to the existing turn volumes at the intersection.

If left turn volumes into Scotland Street (LGR), including construction traffic, are expected to exceed 5vph during peak hour, it is highly probable that an AUL(s) turn lane would be warranted at the Bourbong Street / Scotland Street intersection, which will be exacerbated during the possible 3-year construction period. If total left turn volumes during the construction period are expected to exceed 30vph, which is considered likely, it is probable that a full length AUL would be warranted.

If total right turn volumes into Scotland Street (LGR), including construction traffic, are expected to exceed 5vph during peak hour, it is highly probable that a full CHR lane would be warranted at the Bourbong Street / Scotland Street intersection, which will be exacerbated during the possible 3-year construction period. A short CHR(s) is currently provided. A BAR for Petersen Street may also be required.

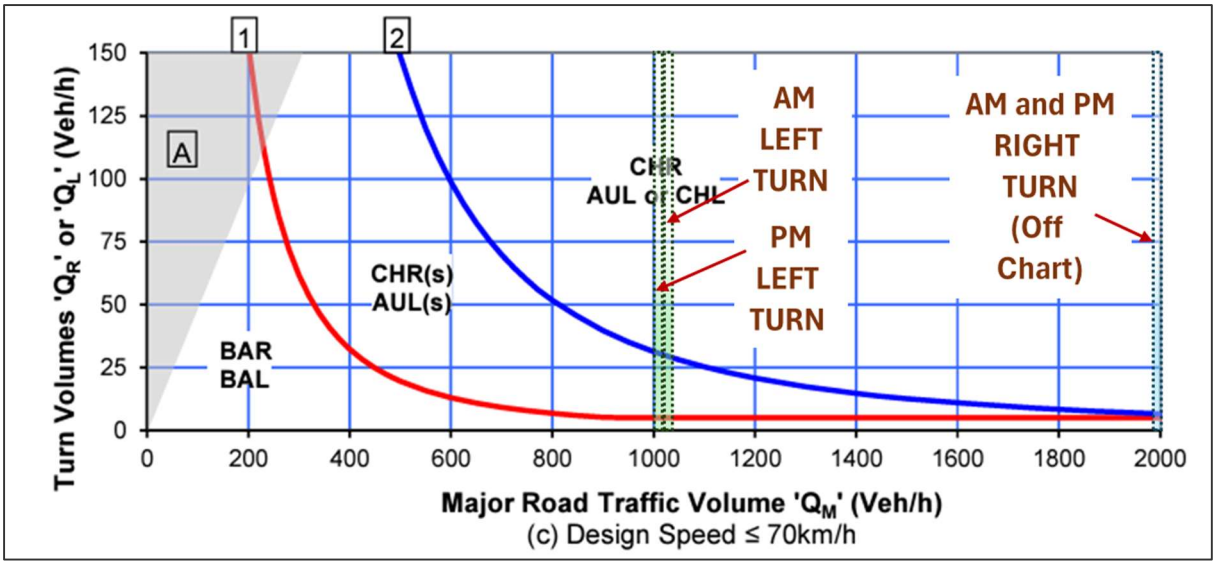


Figure 25: Range for Warrants for Bourbong Street / Kendall Street Intersection

It is probable that the Bourbong Street / Scotland Street Intersection should be upgraded to include at a minimum an AUL(s) and a CHR to cater to both the expected construction traffic

volumes, as well as the likely existing traffic volumes. An AUL is considered likely to be warranted during the construction period. A formal traffic survey at the intersection should be conducted to confirm.

The intersection design should be confirmed to accommodate the expected construction design vehicle, which may include a b-double vehicle (the LGR Scotland Street is not a b-double route).

Figure 26: Bourbong Street / Scotland Street / Petersen Street (Queensland Globe 2023) [Road Resurfacing in Progress]

The pedestrian/cyclist crossing location across Petersen Street should be incorporated into the detailed intersection of Scotland Street / Petersen Street, noting the existing shared footpath is part of the Principle Cycle Network.

Sight distances from Petersen Street to the west along Scotland Street meet Austroads Guide to Road Design SISD requirements, being a minimum 90m. If a pedestrian/cyclist crossing location is incorporated into the intersection design, appropriate sight distances must be maintained between vehicles, pedestrians and cyclists.

SIDRA intersection modelling has not been undertaken at this time due to the absence of intersection count data and unknown traffic generation during construction.

## 4.9 Scotland Street / Cran Street Intersection

Turning movement volumes at the Scotland Street / Cran Street intersection were not available for this assessment.

The preliminary wall alignment does not directly impact the intersection, though it is expected that turning traffic at the intersection will be increased throughout the construction period.

Current turn volumes into Cran Street are unknown, though it is expected that turning traffic at the intersection would be less than 20vph on any one movement.

If left turn volumes into Cran Street, including construction traffic, are expected to exceed 5vph during peak hour, it is highly probable that an AUL(s) turn lane would be warranted at the Scotland Street / Cran Street intersection, which will be exacerbated during the possible 3-year construction period. If total left turn volumes during the construction period are expected to exceed 30vph, which may be possible under construction, it is probable that a full length AUL would be warranted. A full length AUL however may be impractical and could impact the adjacent Bourbong Street / Scotland Street intersection.

The intersection currently features a continuous median turning lane that allows for channelised turns into Cran Street. It is unlikely that the construction volumes would warrant the upgrading of the existing turn lane to a fully separate channelised right turn lane.

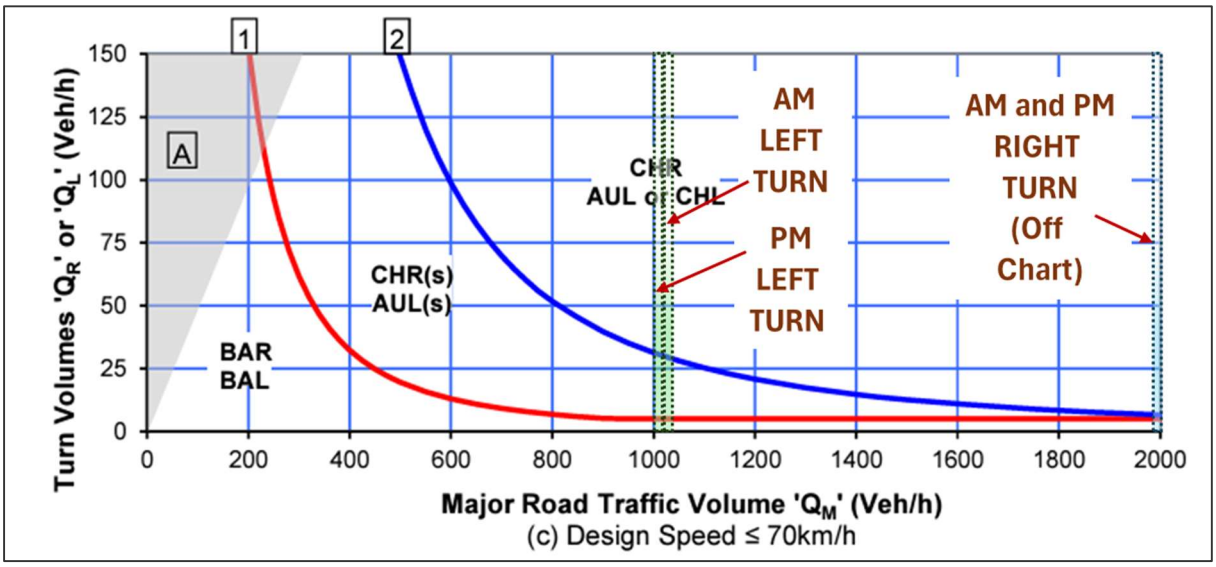


Figure 27: Range for Warrants for Scotland Street / Cran Street Intersection

Cran Street and Scotland Street are B-double routes; however, the intersection has a turning restriction for B-double vehicles. The turn restriction should be reviewed to confirm if it would impact any construction routes and require upgrades to the intersection.

# 5. Conclusions and Recommendations

HIG undertook a traffic assessment of the proposed BEL based on the information available at the conceptual stage. The levee alignment is conceptual and detailed design has not been conducted yet. Traffic impacts due to construction have been determined based on a number of broad assumptions that may change as detailed design is conducted. Once the design has sufficient information to formulate construction vehicle trips, vehicle routing, staging areas and a construction schedule, it is recommended that further traffic analysis be undertaken, and the traffic impact assessment be updated. This may involve undertaking intersection traffic counts to establish detailed baseline traffic data.

Quay Street and Quay Street/Toonburra Street Intersection

- Vehicles exiting the rowing club onto Toonburra or Quay Street will wait south of the levee for an opportunity to enter the street, with visibility unimpeded by the levee.
- The Quay Street/Toonburra Street intersection will not require any upgrades due to the location of the levee.
- There is potential that a section of the levee along Quay Street will be temporary, removed following the flood event. The extents of the temporary section are not known at this time.
- Further investigation is required to determine whether protection is required to the levee to the west of the guard rail. This may involve extending the temporary section of levee to the easts to behind the guard rail, or extending the guard rail in this section to the west.

Quay Street East

- Parking has been reviewed as follows:
  - It is likely that the wall would result in the loss of a minimum 34 angled parking spaces along the road and may possibly result in further parallel parking losses.
  - Parking may be able to be provided on the stub end of Quay Street East (the western leg of the Quay Street East/Kendall Street intersection), which would likely require realignment of the intersection to provide Kendall Street with priority and formally align Quay Street East and Kendall Street as a continuous road.
  - On-street parking opportunities may be available on the south-east corner of the Quay Street East / Kendall Street intersection but would require the redesign of the existing footpath and crossing points.
  - Temporary parking is also likely to be required to accommodate the on-site workers. This may be able to be provided in a potential temporary car park in Daphne Geddes Park, accessed from Quay Street East. Limited parking may be able to be accommodated on-street, or as part of a site compound.
- High patronage of Red Shed Seafood restaurant during seasonal events such as Easter and Christmas is known to cause traffic issues along Quay Street East. Where possible, parking areas should be maintained during construction to minimise impact on adjacent businesses. Where possible, work activities should be planned to avoid construction during these holiday periods, and construction works should be staged to maximise the road and verge areas in the lead up to holidays to minimise traffic impacts.
- The width of flood gates currently proposed are sufficient to enable sight lines to the east and west along Quay Street East to a minimum AS2890.1 standard to vehicles, pedestrians and cyclists.
- Additional flood gates may be required for maintaining pedestrian footpaths and enabling pedestrian crossings along Quay Street East. A mid-block crossing or means of passing through the wall from north to south should be explored during the detailed design, with consideration to all other criteria required for levee performance.

- The current proposed gate widths allow for garbage bins to fit beside a 3m access driveway or 6m commercial access. Australia post vehicles are assumed to continue to travel along the verge between the property boundary and levee, using the gates to cross to the other verge.
- The proximity of the wall to the existing kerb line will require that appropriate clearances to the traffic lanes be considered. The current proposal has the levee located beyond the shy line, which is 2m at 60km/h. It is recommended that a centre line and edge lines be provided along Quay Street East to minimise potential for drivers deviating to the other side of the road away from the levee. Provision of edge lines will also control parking on the northern side of Quay Street East.
- The current proposed alignment the openings in the wall are outside the clear zone.
- Lighting of the wall will need to be considered for traffic safety, as well as for pedestrians.
- The Saltwater Creek Railway Bridge will be required to be closed temporarily during construction stages. There is an alternative route for pedestrian and cyclist traffic over Kennedy Bridge on Bourbong Street.

Bourbong Street (Scotland Street)

- The construction and post construction traffic is not expected to have any significant impact on the bus route and hail and ride bus stops on Bourbong Street. Relocation of bus stops and rerouting of routes is not expected to be required.
- The preliminary alignment of the wall indicates that the wall on Scotland Street will be located close to the northern kerb line and will impact 3 industrial properties. Flood gates will be required to maintain access to these properties. At this stage, it is unknown whether this section of levee is temporary or permanent. If permanent, it is recommended that the levee be relocated to between the shared path and the property boundary to avoid visibility issues between pedestrians (particularly children), cyclists and vehicles entering the properties. If temporary, and installed for just the duration of the flood event, it is assumed there will be no breaks in the walls, and vehicles will not be turning in or out of accesses, interacting with pedestrians or cyclists.
- It is recommended that a centre line and edge lines be provided along Scotland Street in this section between School Lane and Bourbong Street.
- The width of flood gates will need to be sufficient to enable sight lines to the east and west along Scotland Street to a minimum AS2890.1 standard, being 45m for a non-domestic property (desirable 69m). Assuming an edge line is provided, the required sight distances are achieved. Sight lines between vehicles, cyclists and pedestrians will need confirmation of attaining the minimum AS2890.1 for the final adopted levee alignment.
- Pedestrian/cyclist crossing locations should be incorporated into the detailed intersection design of Scotland Street / Quay Street and Scotland Street / Petersen Street, noting that Scotland Street in this section is part of the Principle Cycle Network, connecting to Quay Street East to the south.
- The current proposed wall location is outside the shy line for the Scotland Street traffic lanes, and assuming edge lines are provided the current location of the breaks in the wall are outside the clear zone and do not require protection.
- The Saltwater Creek Railway Bridge will be required to be closed temporarily during construction stages. There is an alternative route for pedestrian and cyclist traffic over Kennedy Bridge on Bourbong Street.

Peterson Street

- The preliminary alignment of the wall along Petersen Street indicates that the wall will be located close to the western kerb line. The wall will end adjacent to one industrial access but is expected to be in the range of 300mm height and have minimal impact to sight lines.

- As noted in Section 4.8, it is recommended that the pedestrian/cyclist crossing location across Petersen Street be incorporated into the detailed intersection of Scotland Street / Petersen Street. If the alignment along Scotland Street is relocated to between the shared path and the property boundary as per the recommendations in Section 4.3, it is recommended that a gate be provided to access the verge in this section. If the alignment is not altered, a pedestrian crossing location across Petersen Street should be incorporated into the detailed design of the Scotland Street / Petersen Street intersection to maintain the Principle Cycle Network and pedestrian connectivity along this route.
- Sight distances from Petersen Street to the north along Scotland Street meet Austroads Guide to Road Design SISD requirements, being a minimum 90m. If a pedestrian/cyclist crossing location is incorporated into the intersection design, appropriate sight distances must be maintained between vehicles, pedestrians and cyclists.

Cran Street

- The preliminary alignment of the wall along Cran Street indicates that the wall will be located close to the western kerb line. The wall will cross 5 accesses to Lot 1 on RP54418 on the north-western side of Cran Street, with the first access at the southern end of the wall, and the fifth approximately 70m to the north. Flood gates will be required to maintain property access. In this section, the wall is expected to be between approximately 0.1m and 0.8m in height and is not expected to impede sight lines between pedestrians, cyclists and vehicles.
- Pedestrian movements along Cran Street are expected to be minimal but must be considered during detailed design.
- At the southern end of Cran Street it is recommended that a centreline and edge lines be provided to ensure that the start of the permanent section of wall is outside the clear zone of the traffic lane (2m).
- In the narrower section of Cran Street within private property, the current alignment of the wall is outside the clear zone and shy line, with no changes recommended to the road or wall alignment in this section.
- It is recommended that access to the area between the levee and the western property boundary be restricted.
- The gate widths for the accesses on Cran Street are not available at this time, however it is understood they will be a minimum of 5.5m. This minimum width will allow for garbage bins to fit beside a 3m access driveway. Australia post vehicles are assumed to access mail boxes where necessary via the gate, noting that the site appears to be industrial and the primary access to Lot 1 on RP54418 appears to be via Lot 6 on RP904416 to the south.

Bourbong Street / Kendall Street Intersection

- The preliminary wall alignment does not directly impact the intersection, though it is expected that turning traffic at the intersection will be increased throughout the construction period.
- It is probable that the Bourbong Street / Kendall Street intersection should be upgraded to include at a minimum an AUL(s) and a CHR to cater to both the expected construction traffic volumes, as well as the likely existing traffic volumes. A formal traffic survey at the intersection should be conducted to confirm.
- The existing stop sign appears to be unwarranted, which should be confirmed as part of any upgrades to the intersection. It is expected that an investigation would determine a give way sign is appropriate.
- The intersection design should be confirmed to accommodate the expected construction design vehicle, which may include a b-double vehicle (Kendall Street is not a b-double route).

- SIDRA intersection modelling has not been undertaken at this time due to the absence of intersection count data and unknown traffic generation during construction.

Bourbong Street / Quay Street / School Lane Intersection

- Turning movement volumes at the Scotland Street / Quay Street East / School Lane intersection were not available for this assessment.
- The preliminary wall alignment requires that a flood gate be installed diagonally across Scotland Street. Austroads Guide to Road Design requires a SISD of 90m minimum. Based on the current proposed alignment, the flood gate will need to be widened by 7m to the south to accommodate this sight line.
- The proposed wall will need to account for clear distances for turning vehicles and allow for visibility to pedestrian and cyclist movements across Scotland Street. Widening of the gate 7m to the south should enable sufficient visibility to be provided however further review should be undertaken based on updated geometry. The pedestrian crossing location may need to be shifted to the west towards School Lane to ensure sight distances at the intersection to pedestrians are available.
- Give-way signage and linemarking should be considered on School Lane.
- Channelised turn treatments are unlikely to be warranted at the intersection, however the road width should not be reduced by the wall. The intersection design should be confirmed to accommodate the expected construction design vehicle, which may include a b-double vehicle (neither Quay Street East nor Scotland Street are b-double routes).

Bourbong Street / Scotland Street / Peterson Street Intersection

- Whilst traffic generation due to construction has not been quantified, it is expected to add to the existing turn volumes at the intersection. Intersection traffic count data was not available at the time of this investigation.
- It is probable that the Bourbong Street / Scotland Street Intersection should be upgraded to include at a minimum an AUL(s) and a CHR to cater to both the expected construction traffic volumes, as well as the likely existing traffic volumes. An AUL is considered likely to be warranted during the construction period. A formal traffic survey at the intersection should be conducted to confirm.
- The intersection design should be confirmed to accommodate the expected construction design vehicle, which may include a b-double vehicle (the LGR Scotland Street is not a b-double route).
- The pedestrian/cyclist crossing location across Petersen Street should be incorporated into the detailed intersection of Scotland Street / Petersen Street, noting the existing shared footpath is part of the Principle Cycle Network.
- Sight distances from Petersen Street to the north along Scotland Street meet Austroads Guide to Road Design SISD requirements, being a minimum 90m. If a pedestrian/cyclist crossing location is incorporated into the intersection design, appropriate sight distances must be maintained between vehicles, pedestrians and cyclists.
- SIDRA intersection modelling has not been undertaken at this time due to the absence of intersection count data and unknown traffic generation during construction.

Bourbong Street / Scotland Street / Peterson Street Intersection

- Turning movement volumes at the Scotland Street / Cran Street intersection were not available for this assessment.
- The preliminary wall alignment does not directly impact the intersection, though it is expected that turning traffic at the intersection will be increased throughout the construction period.
- If left turn volumes into Cran Street, including construction traffic, are expected to exceed 5vph during peak hour, it is highly probable that an AUL(s) turn lane would be

warranted at the Scotland Street / Cran Street intersection, which will be exacerbated during the possible 3-year construction period. If total left turn volumes during the construction period are expected to exceed 30vph, which may be possible under construction, it is probable that a full length AUL would be warranted. A full length AUL however may be impractical and could impact the adjacent Bourbong Street / Scotland Street intersection.

- The intersection currently features a continuous median turning lane that allows for channelised turns into Cran Street. It is unlikely that the construction volumes would warrant the upgrading of the existing turn lane to a fully separate channelised right turn lane.
- Cran Street and Scotland Street are B-double routes; however, the intersection has a turning restriction for B-double vehicles. The turn restriction should be reviewed to confirm if it would impact any construction routes and require upgrades to the intersection.

In general, the levee will not impact on any bus routes or bus stops during or post construction. The levee will also not impact on the cycle or pedestrian network aside from where listed above.