Port*LINK*

Multi-Criteria Analysis Detail Report

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Contents

The following analysis was undertaken by InfraPlan Pty Ltd on the request of the Department of Planning, Transport and Infrastructure. The intent of this report is to provide a multi criteria analysis of several route options for the Ade*LINK* Tram network, including the routes as per the Integrated Transport and Land Use Plan (ITLUP), 2015. MCA processes are often applied by State Government Departments and Treasuries to assess project options. This report does not contain any modelling, or engineering data and as such the Ade*LINK* routes are only stated as potential options.

Ade*LINK* has the potential to attract investment, boost economic growth and encourage urban renewal and jobs, and bring residents and visitors to the city centre. Providing high quality public transport services will also help drive market demand for residential development in the CBD, inner and middle metropolitan Adelaide. In 2013, the development of the Integrated Transport and Land Use Plan (ITLUP) involving 2,500 participants stated they support trams as a first priority (83% of inner and 78% of middle suburban residents).

Planning for Ade*LINK* forms part of the overall electrification of public transport in Adelaide. The study comprises several key steps before concluding with a detailed business case for delivering the Ade*LINK* tram network (as shown in the diagram below). This is an essential process for establishing the rationale for funding options. The first step, an extensive multi-criteria assessment (MCA) process to assess route options, is now complete and contained in this report. It involved the testing of the original Ade*LINK* tram network against other potential routes identified in conjunction with Council officers through consultation and workshops.

The MCA Summary Report summarises the routes assessed in the MCA, providing guidance as to the route options to be taken forward to the Design Labs and Community Open Days. The results are also presented as standalone studies for each corridor. Criteria are unweighted to comply with Infrastructure Australia requirements.

It is important to note that the MCA is one step in the process, and will assist in determining the final preferred routes for Ade*LINK*.

Unlike other tram corridors the Port*LINK* corridor accommodates public transport users on the existing heavy rail line. While the Light Rail options 1 and 3 scored higher than option 2 (electrification) several important operational, cost and public transport user criteria will need to be investigated further before a decision can be made in relation to which option(s) will be included in the final business case. These criteria include:

- **In vehicle travel time –** there is a view that trams will be slower than heavy rail and therefore impact on overall travel times. For example, the tram sections on Port Road-North Terrace would be slower compared with current heavy rail access to Adelaide Railway Station. However, third generation trams accelerate and brake faster than heavy vehicle fleets and achieve top speeds of

close to 80km/hr, ideal for closely spaced stops such as the Port*LINK* corridor. Therefore, the difference may be relatively low from most locations along the corridor.

- **Door to door travel time –** Light rail has the flexibility of changing from being a rapid, corridor priority, LRT vehicle to an 'in-road' tram via the street system, penetrating both centres and the CBD (driving superior door to door times and patronage destination catchments). Heavy rail connectivity from and to the Port Adelaide viaduct Station is limited by its location / design while at the CBD end some workers are inconvenienced by the location of the Adelaide Railway Station.
- **Frequency** - Most public transport planners apply the rule of thumb: patronage increases by about 2/3rds due to frequency and 1/3rd due to catchment population growth. An increase in service frequencies may therefore improve the attractiveness of the tram and reduce the dependency upon private car travel. LRT/trams for the North-West Corridor could provide service frequencies as low as 3-5 minutes between Woodville and the City.
- **Capacity and seated versus standing time -** the capacity of the existing Adelaide fleet is only 179 passengers per tram car. New wide bodied and longer trams such as Flexity 2 Tram/LRT vehicle (similar to the Gold Coast tram) with modifications to city platforms and door openings can be configured to carry 284 passengers, 104 seated and 180 standing (248 at a 75% crush load). At 5 minute frequencies trams can accommodate close to 3,000 passengers per hour. The 4000 electric train (3 car consists) can carry up to 240 seated and 300 standing passengers (430 in total at 80% crush load). Therefore, at the existing 15 minute frequency only half the number of passengers can be accommodated by trains (1,600 passengers per hour) compared with higher frequency and larger trams. Nevertheless, trains cater for more seated passengers for a longer part of the journey, and potential standing times need to be assessed.

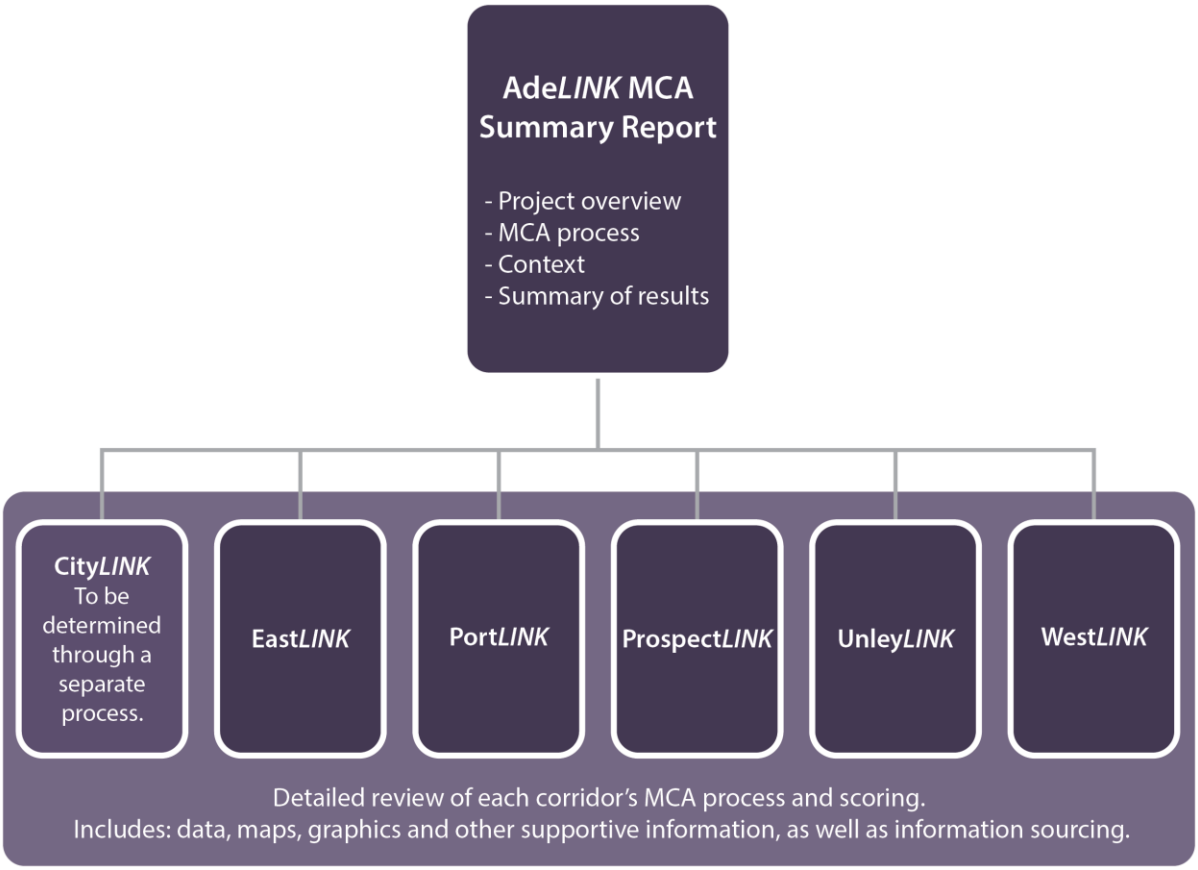
The next phase of the study involves Design Labs, which will explore the integration opportunities between land use, street attributes and tram corridor planning (e.g. station locations) with Council staff and the community. This will provide a framework for more detail planning of the tram lines including stop locations, and identifying constraints and opportunities that will inform the design of each corridor.

Given the further investigations required for Port*LINK*, the Design Labs for this corridor will explore both heavy and light rail options.

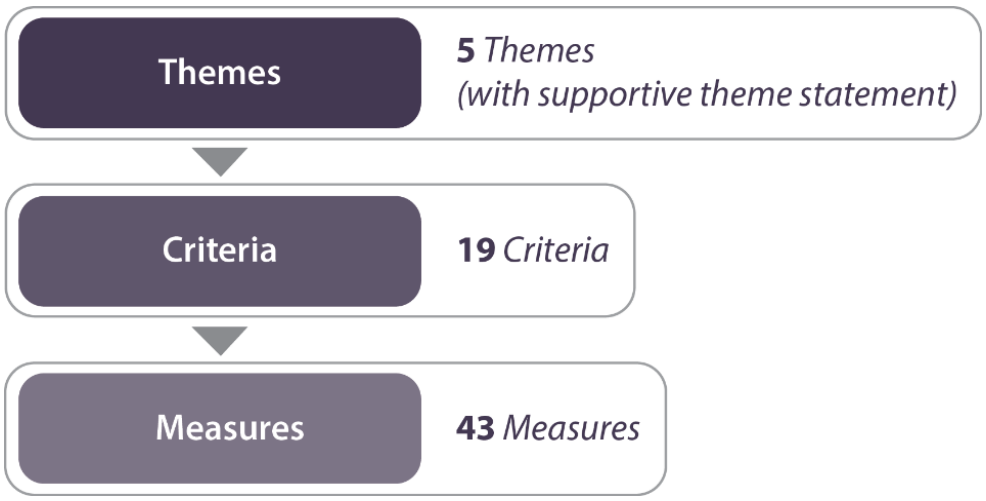
Following the Design Labs, a number of studies will commence in February 2017 to model the urban development outcomes (patronage demand); develop the operation framework of the tram system, including potential stabling options; assessment of road traffic operations and integration with bus and train services; and potential road and track layouts, including the location and style of tram stops within an urban design framework.

Report Structure

This Multi-Criteria Analysis (MCA) Detail Report is to be read in conjunction with the 'Ade*LINK* MCA Summary Report', which provides the project overview, an outline of the MCA process (see Appendix A of this report), contextual framework and a summary of the results. Each corridor-specific 'Detail Report' provides an explanation of the methodology undertaken and details the comparative MCA assessment of each corridor option. This format is illustrated below.



This report details the results for the 43 measures used in the multi-criteria analysis that have been grouped under 5 themes, which form the chapters of this detailed report.



Introduction

This Detail Report follows a preliminary workshop with the Ade*LINK* Project Team and Council representatives undertaken on June 29th, 2016. At this workshop the opportunities and constraints of the ITLUP Ade*LINK* routes and any alternative routes were discussed, along with identifying the criteria to be used in the MCA. InfraPlan subsequently undertook analysis of the route options based upon the identified criteria.

Subsequent meetings with Port Adelaide Enfield and Charles Sturt resulted in the assessment of 4 distinct options for the MCA. Figure 1 (below) illustrates the four options assessed in the MCA, and for which the Criteria and Measures have been applied.

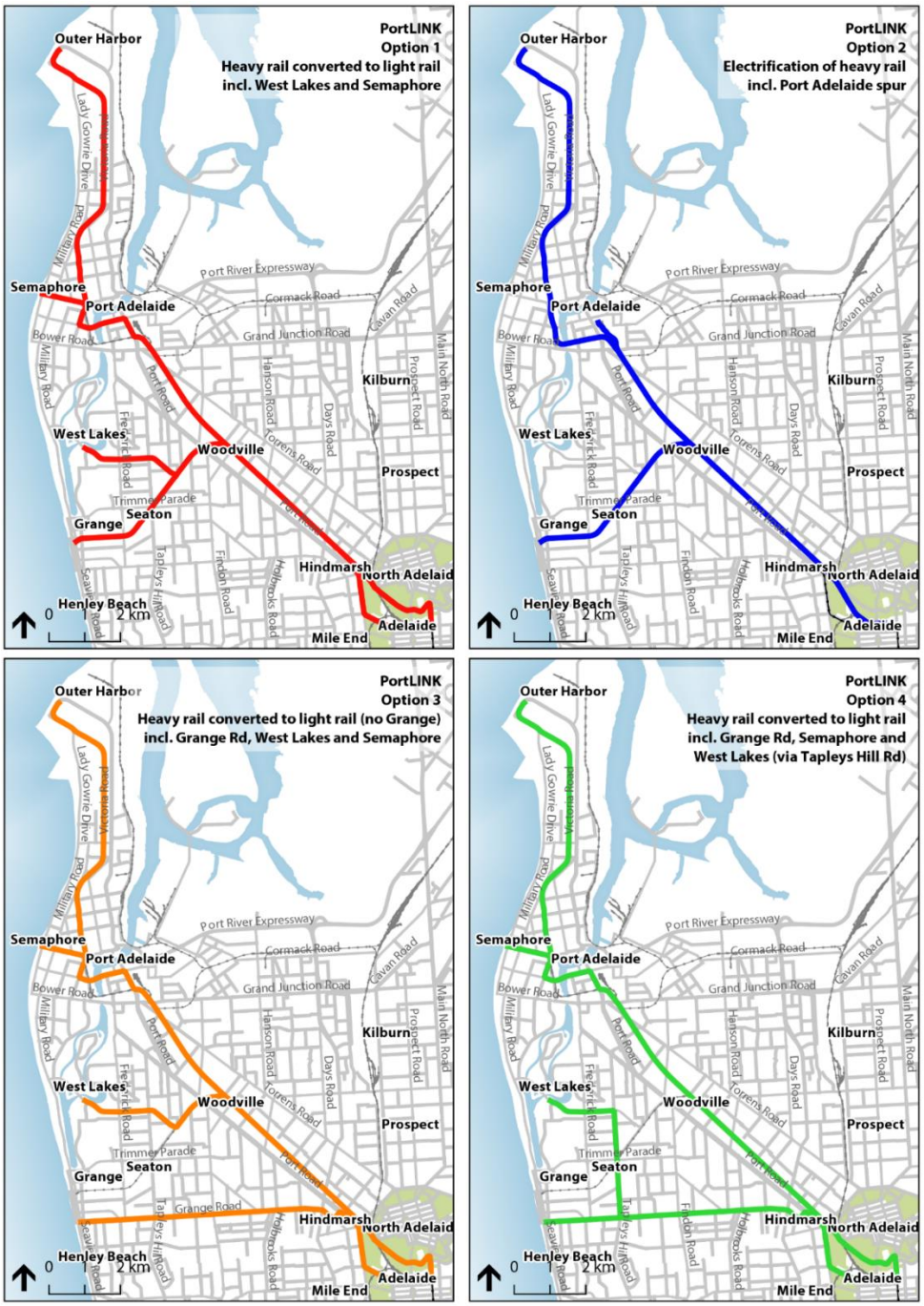


Figure 1: Port*LINK* corridor options.

Theme 1

Place-making and a vibrant city.

Facilitating 30 Year Plan growth targets, uplift potential of the inner and middle suburbs and vibrant main street activity and neighbourhoods.

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1.1 Corridor ability to support the 30 Year Plan vision for infill and corridor development

1.1.1 Number of properties within the 600m corridor that have a 'Capital Value: Site Value' ratio of less than 1.3

The capital value: site value ratio (CV:SV ratio) of a property is a proxy measure of the development potential of a residential property. While it does not necessarily determine if a property will be developed, this measure demonstrates which corridors have more or less properties that may be suitable for redevelopment. The number of potential dwelling yield increase has also been calculated using the Department of Planning, Transport and Infrastructure (DPTI), Minor Infill – Residential Development Potential Analysis (RDPA) tool (on Properties with a CV/SV of <=1.3). Corridors that have a higher dwelling yield potential are rated higher for this measure, given they have a higher potential to support the infill objective of the 30 Year Plan.

Data source: Provided by Department of Planning, Transport and Infrastructure, Population, Land and Housing Analysis Unit.

Confidence Scale Level: A

Port*LINK* Options 3 and 4 yield higher potential increases from residential infill development, given they capture more of the western suburban areas of Seaton and Grange. Port*LINK* options 3 and 4 rate slightly higher in this measure.

Corridor Option	Number of properties with CVSV ratio of 1.3:1 or less	Potential dwelling yield increases (using DPTI RDPA tool)	Dwelling yield as percentage of properties with a CVSV of 1.3:1 or less	**Score**
Port*LINK* 1	8857	5236	59%	**2**
Port*LINK* 2	7532	-	0%	**0**
Port*LINK* 3	10713	6485	61%	**3**
Port*LINK* 4	10786	6709	62%	**3**

1.1.2 Cubic metres of transit supportive zones and policy areas (urban corridor, regeneration etc.) that support increased development potential within 600m of the corridor

Zoning information was sourced from Data SA (administered by DPTI) in June 2016. It was then clipped to 600m catchments of each corridor using GIS, and the area of each zone, policy area and precinct was measured. Each zone was then cross-checked against that Council's Development Plan to ascertain whether or not it supported infill, medium or high density development (or the like) and to what height. If so, the areas of those zones were totalled and multiplied by the allowable heights to determine the maximum development potential for that corridor option.

Confidence Scale Level: A

There is a significant amount of transit supportive zoning areas within a 600m catchment of all Port*LINK* options. Due to the minimal change in route alignment in Option 2, it has been excluded from this measure. As there is little difference in the overall and average (per kilometre) area of transit supportive land Port*LINK* options 1, 3 and 4 rate equally for this measure.

Corridor Option	Summary	**Score**
Port*LINK* 1	Total development supportive area: 231,881,561.62 m^3 Average per km: 6,450,112.98 m^3	**3**
Port*LINK* 2	Total development supportive area: N/A Average per km: N/A	**0**
Port*LINK* 3	Total development supportive area: 253,111,915.44 m^3 Average per km: 6,299,450.36 m^3	**3**
Port*LINK* 4	Total development supportive area: 252,445,911.17 m^3 Average per km: 6,239,394.74 m^3	**3**

1.1.3 Recent approved development applications within 200m of the corridor

DPTI's 'New Investment in Metropolitan Adelaide' map shows developments over $10 million in Adelaide City, developments over 4 storeys within an Urban Corridor Zone of an identified Inner Metropolitan Suburb or developments over $3 million within the Port Adelaide Regional Centre Zone of the City of Port Adelaide Enfield. It is important to note that the number of developments is not an indication of the size, scale and potential influence on urban regeneration.

The map was last updated in April 2016. Completed developments were excluded.

Data source: Metropolitan Adelaide Investment – DPTI, Department of Planning, Transport and Infrastructure, South Australia: http://www.dpti.sa.gov.au/planning/adelaide_investment

Confidence Scale Level: A

All recently approved development applications along the subject routes are confined to the Port Adelaide Centre. As all Port*LINK* options, apart from Option 2, share the same alignment through this area, they are all rated equally.

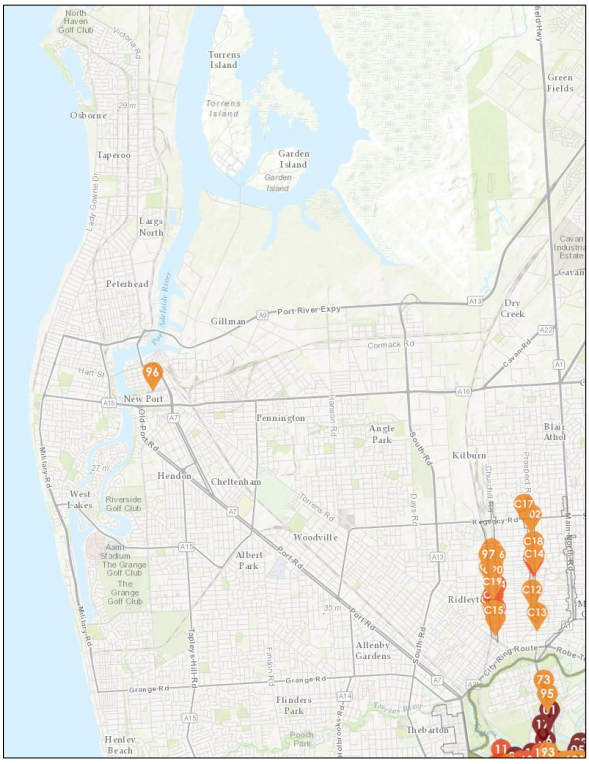


Figure 2: Recently approved development applications.

Corridor Option	No. of projects	Levels	Dwellings	Hotel Rooms	**MCA Score**
Port*LINK* 1	4	52	430	489	**3**
Port*LINK* 2	1	10	-	245	**1**
Port*LINK* 3	4	52	430	489	**3**
Port*LINK* 4	4	52	430	489	**3**

1.1.4 Average size of parcels within the Urban Corridor Zones (proposed or existing) within 600m of the corridor

The average size of cadastral land parcels within Urban Corridor Zones is used to determine which option is likely to have the greatest potential for significant uplift in this zone. For example, it would be easier for a developer to purchase one large land parcel, rather than buy a number of adjacent smaller parcels to construct a larger development.

Cadastral and zoning data was received from DPTI, and analysed using GIS to ascertain the average parcel size within a 600m catchment. Parcels where only a portion of its area lie within the 600m catchment were counted as part of this assessment.

Confidence Scale Level: A

Average parcel sizes within the Urban Corridor Zones of the four Port*LINK* options are the smallest in Option 1 and largest in Option 4. There is little difference in size between Options 4 and 3, therefore these options rate highest for this measure.

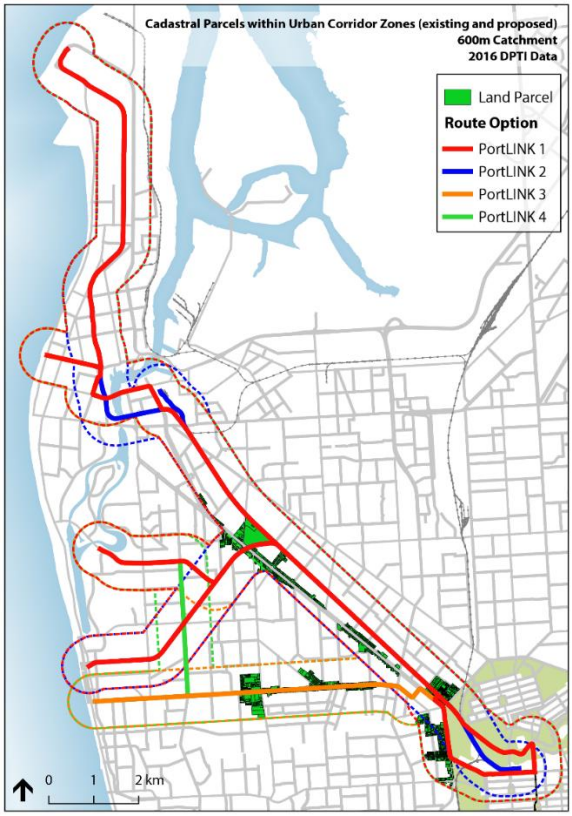


Figure 3: Urban Corridor parcel sizes.

Corridor Option	Summary	Score
Port*LINK* 1	Average parcel size in UrC Zones: 1,515.98 m^2	**0**
Port*LINK* 2	Average parcel size in UrC Zones: 1,579.89 m^2	**1**
Port*LINK* 3	Average parcel size in UrC Zones: 1,595.10 m^2	**2**
Port*LINK* 4	Average parcel size in UrC Zones: 1,601.71 m^2	**2**

1.1.5 Amount of heritage, character or protected zoning provisions that could have implications for future development potential (within 600m of the corridor)

Heritage, character and historic preservation zones by their very nature have limitations on the type, intensity and scale of development that can occur. The desired urban form in these areas is generally lower density with housing of a particular era to protect the character of those precincts.

This type of zoning unfortunately offers relatively lower potential for increased density, and therefore increased transit demand. Therefore, this measure seeks to determine which option has a lower amount of protective zoning (both in total and average per km), and hence could likely support a greater population over time.

Data was acquired from Data SA and processed in GIS to gain the 600m catchments before being assessed manually against each Council's Development Plan to determine if zoning is restrictive.

Confidence Scale Level: A

Similar land area of zoned to limit infill development can be noted for three of the Port*LINK* options. Due to the minimal change in route alignment in Option 2, it has been excluded from this measure. When the land area is calculated as an average per kilometre of route, differences between the three options are not significant, therefore they area scored equally.

Corridor Option	Summary	**Score**
Port*LINK* 1	Amount of protective zoning: 7,121,985.22 m^2 Average per km: 198,108.07 m^2	**1**
Port*LINK* 2	Amount of protective zoning: N/A Average per km: N/A	**0**
Port*LINK* 3	Amount of protective zoning: 7,318,680.77 m^2 Average per km: 182,147.36 m^2	**1**
Port*LINK* 4	Amount of protective zoning: 7,707,098.46 m^2 Average per km: 190,486.86 m^2	**1**

1.2 Ability to support emerging and existing main streets providing a range of local services to the community

1.2.1 Length of active frontage along the corridor

Digital inspection was used to determine the number of active frontages along the corridor options. After assessing the frontage types with Street View, the 'ruler' function was used in Map View to measure the length of active frontages in metres. 'Active Frontages' were identified if they met the following criteria:

- building frontage adjacent footpath (no separation between footpath and built frontage from car parking or similar);
- accessibility (building main access directly off footpath);
- visually permeable façade (majority of the building frontage is not a blank structures/ solid walls); and
- retail or commercial land use.

To ensure a level of consistency and accuracy, pathways and breakages along active frontages were not measured. The MCA score was determined by comparing the overall lengths in metres of each route option. The rating was determined at the discretion of Urban Design Professionals using judgement, but there is likely to be a lack of detail to warrant a high confidence scale overall.

Confidence Scale Level: D

Figure 4: Example of Active Street Frontage: Semaphore Road, Semaphore SA (Google Maps).

As both options 1 and 2 predominantly follow the existing rail corridor there is a minimal number of active frontages. Options 3 and 4 have a significant number of active frontages which would be served on Grange Road, Semaphore Road, and Commercial Road. Potential for further opportunities on West Lakes Boulevard, although there is negligible frontage currently.

Corridor Option	Summary	Score
Port*LINK* 1	2,085m	**0**
Port*LINK* 2	N/A	**0**
Port*LINK* 3	3,444m	**1**
Port*LINK* 4	2,695m	**1**

1.2.2 The number of businesses that are suited to a 'main street' type of environment (using Business Point Data)

A Business Point dataset (Pitney Bowes) was used to assess a sample of businesses along the corridor options. Businesses identified in the database that have street frontage were assessed by ANZSIC code to determine their business type. The following tables calculate the types of businesses that would be compatible to a 'high-street' or 'main street' environment (or attractive to tram passengers). The figures are expressed as a number of compatible businesses as well as a percentage of the total number of businesses along a tram corridor.

Note: The Business Point data set is not exhaustive and does not include all businesses along corridors, but provides a sufficient sample size for comparison of corridors. Also, this assessment does not assume the potential for changing businesses type, nor does it assess the 'quality' of the business offering along the corridors.

Confidence Scale Level: B

Given the lack of businesses with direct frontage onto the existing Port rail corridor, the options with a greater component of on-street tram components rate better in this measure. While Option One has a higher percentage of compatible businesses (courtesy of the on-road component through Port Adelaide), Options 3 and 4 have a higher number of compatible businesses (courtesy of Grange Road, and also includes the businesses within the Port. Therefore, Options 3 and 4 rate higher in this measure.

ANZSIC code	ANZSIC code (Description)	Port*LINK* 1	Port*LINK* 2	Port*LINK* 3	Port*LINK* 4
G	Retail Trade	99	31	163	124
H	Accommodation, Cafes and Restaurants	26	7	40	31
O	Health and Community Services	43	19	56	54
P	Cultural and Recreational Services	10	7	12	10
Q	Personal and Other Services	33	12	61	50
Other non-compatible businesses	e.g. Agriculture, Mining, Construction, Wholesale trade, Electricity, gas and water supply, Property and Business Services, Finance and Insurance, Communication Services etc.	137	80	277	261
TOTAL Compatible		211	76	332	269
Total Businesses		348	156	609	530
Percentage of compatible businesses (or total businesses)		61%	49%	55%	51%

Corridor Option	Summary	Score
Port*LINK* 1	211 compatible businesses	**2**
Port*LINK* 2	76 compatible businesses	**0**
Port*LINK* 3	332 compatible businesses	**3**
Port*LINK* 4	269 compatible businesses	**2**

1.2.3 Transit supportive land use mix within 400m of the existing corridor

Generalised land use within 400m of the potential tram corridor illustrates the nature of an approximate 5-minute walk. Generally, a mix of transit supportive origin and destination uses are most conducive to light rail patronage.

A presence of mostly residential, education, retail commercial and public services typify the desired land use mix.

The data used in this assessment has been sourced from the *'Generalised Land Use' spatial layer available from Data SA* (May 2016), a State administered open data source. It is updated regularly by DPTI.

Confidence Scale Level: A

All four Port*LINK* options share a similar land use mix within 400m of the potential corridor. Due to the nature of the potential corridor alignments, Options 1 and 2 have a lesser amount of transit supportive uses such as education and retail commercial, while having higher amounts of industrial and utility. Therefore, Options 3 and 4 rate highest in this measure.

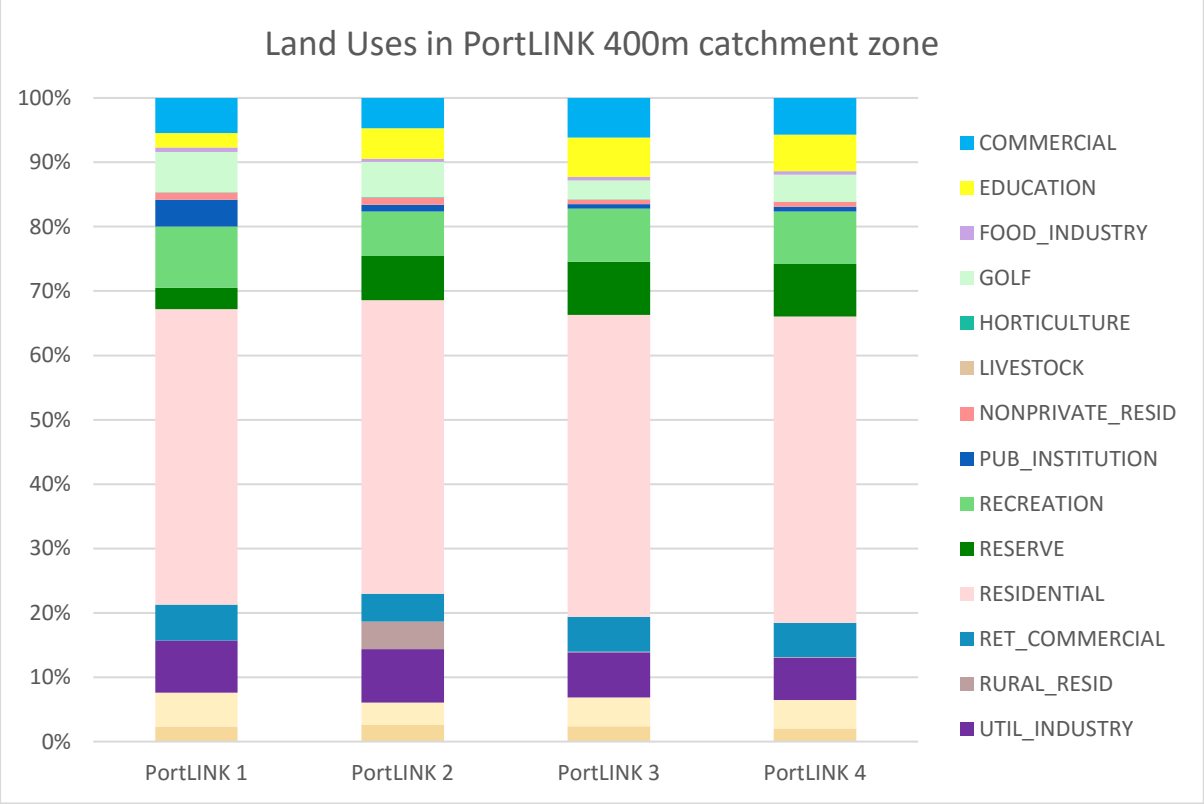


Figure 5: Percentage of land use - 400m catchment.

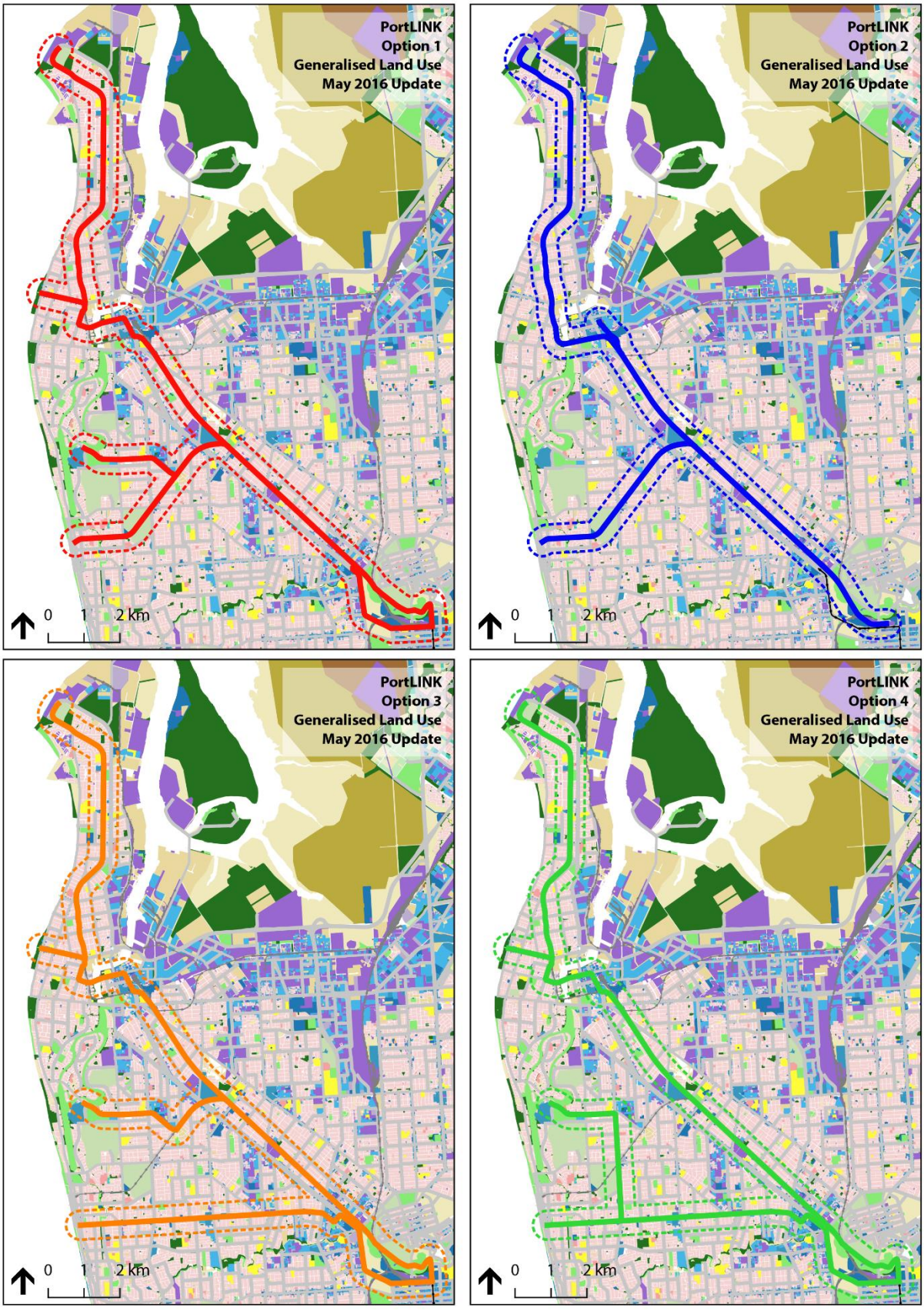


Figure 6: Generalised land use mix - 400m catchment.

Corridor Option	Summary of significant land uses (400m catchment)	**Score**
Port*LINK* 1	Significant land uses: Public institution, Recreation, Residential, Retail commercial, Utility/industry	**2**
Port*LINK* 2	Significant land uses: Residential, Rural residential, Utility/industry	**1**
Port*LINK* 3	Significant land uses: Reserve, Retail commercial, Residential, General commercial, Education	**3**
Port*LINK* 4	Significant land uses: Education, Reserve, Residential, Retail commercial	**3**

1.2.4 Transit supportive and main street land use mix of the immediate corridor frontage (up to 50m)

Activities need to be co-located to meet the needs of the economy and people's lifestyle choices. Compatible uses should be mixed vertically within the same building or horizontally on adjacent sites, and be within walking distance of each other.

The co-location of many compatible uses would reduce car travel and increase walking, cycling and public transport use. Locally, traffic congestion would be reduced, air quality improved, health improved and accessibility maximised.

Vibrant precincts would attract more business and employment, along with leisure, recreational and entertainment facilities. A wide range of uses would support the better provision of services, such as 24-hour shops and public transport. Duplication can be avoided if, for example, the transport service can cater to two markets, such as daytime commuters and people undertaking evening leisure pursuits.

A mix of mostly retail commercial, public services, education and higher density residential uses generally typify vibrant precincts. While some general commercial is acceptable (consulting rooms, offices etc.) a significant amount is not favoured as it does not typically contribute to continual vibrancy. While this data layer does not consider density, a presence of residential use within the 50m catchment could lend itself to increased population densities, if not already.

On the ground, best practice is achieved when:

- key land uses are located within walking distance of each other (e.g. shops, library, childcare centres, cinemas, bus/station interchange);
- the highest densities of housing and employment appropriate to an area are located within walking distance of station stations/stops;
- uses are mixed either vertically within the same building or horizontally on adjacent sites;
- functional requirements, such as servicing, and impacts such as sound, odours and identity in the layout and design of horizontally and vertically mixed uses, are considered; pedestrian and bicycle access is safe, direct and comfortable between uses; and
- plans and regulations encourage home businesses and home workplaces.

The data used in this assessment has been sourced from *the 'Generalised Land Use' spatial layer available from Data SA*, a State administered open data source. It is updated regularly by DPTI.

The data set used for this assessment was published in May 2016.

Confidence Scale Level: A

Along the immediate corridor of the four Port*LINK* options share a similar land use mix, similarly to the 400m catchment. Options 1 and 2 have a substantially higher amount of industrial utility, this being one of the most significant land uses along the Option 2 corridor. Compared to Options 1 and 2, Options 3 and 4 corridors have a higher presence of retail commercial land uses, supportive of light rail patronage. Therefore, Options 3 and 4 rate highest in this measure.

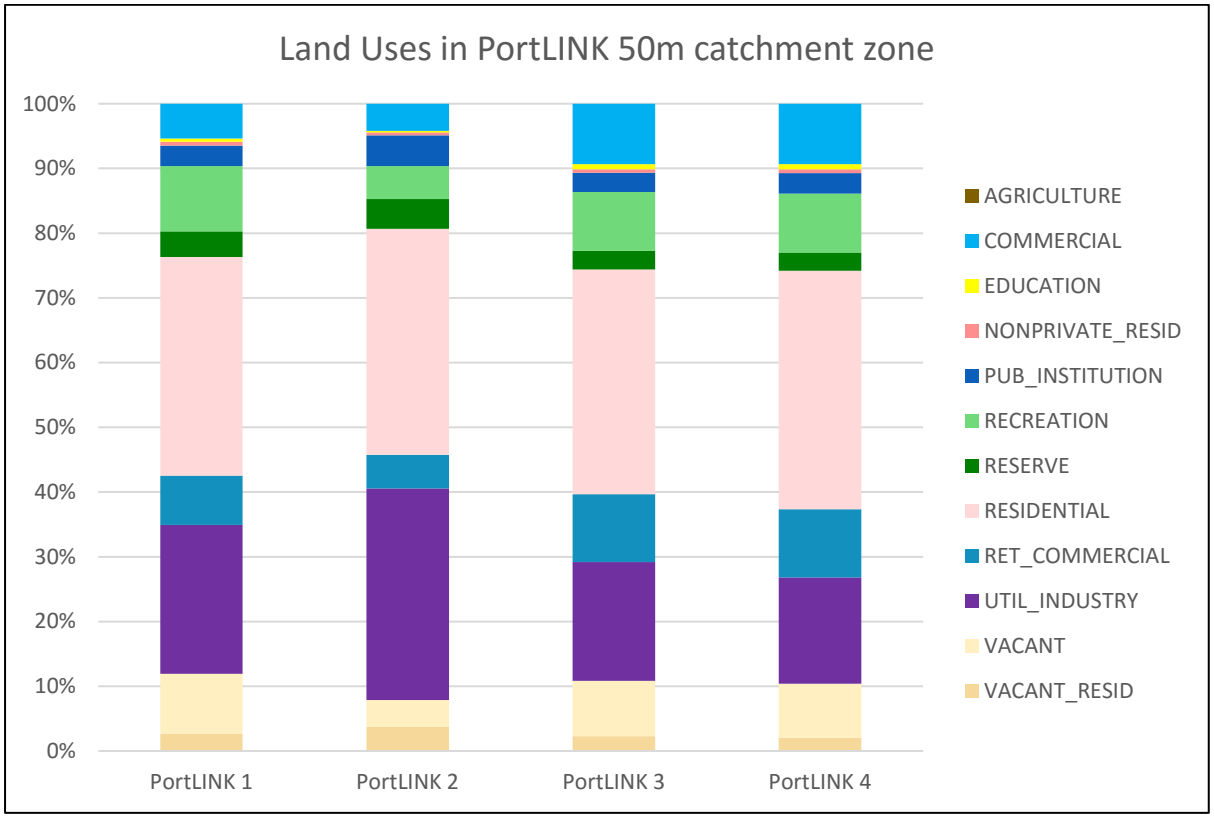


Figure 7: Percentage of land use - Corridor (50m catchment).

Corridor Option	Summary of significant land uses (50m catchment)	**Score**
Port*LINK* 1	• Recreation, • Residential, • Vacant	**2**
Port*LINK* 2	• Public institution, • Residential, • Utility/industry	**1**
Port*LINK* 3	• Education, • General commercial, • Residential, • Retail commercial	**3**
Port*LINK* 4	• Education • General Commercial • Residential • Retail Commercial	**3**

1.3 An environment that is potentially dynamic and adaptable to be 'living space' including open space and landscape amenity.

1.3.1 Amount of publicly accessible open space within 400m of the corridor

For this measure, a dataset of accessible reserves and open space was acquired from *DPTI (2012 record).* Clipped to a 400m walking buffer of each corridor option, the amount of open space for each corridor was calculated in GIS and totalled for that corridor option. Results were also assessed per kilometre.

Confidence Scale Level: B

The amount of land assigned as publicly available open space, in total, is lowest for Port*LINK* Option 2. This is due to the lesser overall length of route in Option 2, however when this is calculated as an average per kilometre of route, there is a similar rate to option 4, therefore options 1 and 3 rate highest for this measure.

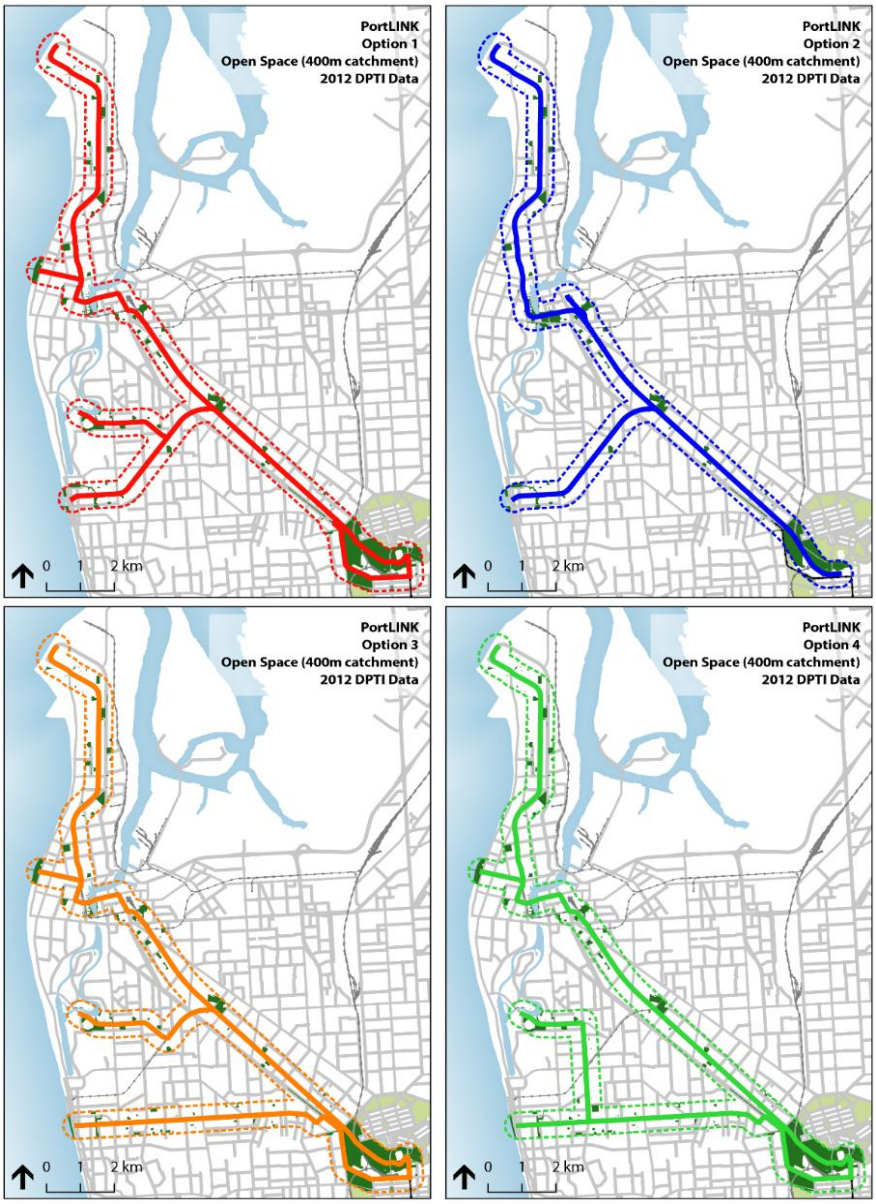


Figure 8: Public open space.

Corridor Option	Summary	Score
Port*LINK* 1	Total public open space: 3,347,588.28 m^2 Average per km: 93,117.89 m^2	**2**
Port*LINK* 2	Total public open space: 2,388,555.24 m^2 Average per km: 83,897.27 m^2	**1**
Port*LINK* 3	Total public open space: 3,386,852.9 m^2 Average per km: 84,292.01 m^2	**2**
Port*LINK* 4	Total public open space: 3,383,134.71 m^2 Average per km: 83,616.77 m^2	**1**

1.3.2 Quality of the amenity of main streets

The methodology to score the amenity of the Main Streets along the Ade*LINK* routes was as follows:

1. A site visit was undertaken of the entire length of each corridor option.
2. The corridor was divided into sections where the amenity of the Main Street varied.
3. Each section was assessed by separately rating the following three components:
    a. visual grain / visual appeal;
    b. sense of security night-time activity; and
    c. people present (the vibe).

The rating of these components ranged from 0 (very poor) to 4 (very good). These components are described below (it is noted that there are other components that contribute to Main Street Amenity (such as the quality of walking and cycling), however these are assessed in other sections of this MCA).

- The ratings were averaged over the section and then colour coded to low, medium or high Main Street amenity.
- A map was prepared illustrating the locations of the low, medium or high amenity along each corridor, refer to Figure 9.
- The MCA score was determined from comparing the amenity illustrated on these maps.

Visual Grain and Visual Appeal: Fine grain and visually interesting main streets

The 'grain' refers to the pattern of the arrangement and size of buildings and allotments; and the degree to which an area's pattern of street-blocks and street junctions is respectively small and frequent, or large and infrequent. Fine grain environments contain more activity and places of interest. They are more supportive of walking, cycling and public transport use. Coarse grain environments are often highly car dependent.

Visually appealing main streets encourage visitors and are; clean, well maintained, landscaped, interesting and diverse, have street furniture. Refer example images below.

Very Poor = 0

- Coarse grain, high fences. Litter. Large areas of roads and car parking.

Very Good = 4

- Fine grain land-use, street scaping, interesting architecture, street furniture, well-maintained.

Sense of Security and Night-Time Activity: A sense of feeling safe, as well as actually being safe, along the main street.

Measures of security include, lighting, visual surveillance, out of hours' activity, good sight lines, activity, refer to example images below.

Very Poor = 0

- Little surveillance from adjoining land uses. No lighting, low activity, little after-hours activity.

Very Good = 4

- Good surveillance from adjoining land uses. Good lighting. High activity.

People Present (the 'Vibe'): A main street where people visit, meet and stay. A vibrant environment that is enjoyable and interesting.

Very Poor = 0

- No activities to attract people, poor general amenity, no shade or shelter.

Very Good = 4

- People often present, activities that encourage 'staying', cafes, seating, shade, shelter.

Confidence Scale Level: D

The rating was determined by urban design professionals using their judgement, and an overall rating was required even though a corridor could vary greatly from section to section.

Majority of the main streets in all four Port*LINK* options could be considered to have low levels of main street amenity. Port*LINK* Option 2 was not included in this assessment as it does not deviate from the existing rail corridor. Precincts of Medium to High main street amenity are confined to the Port Centre and Semaphore Road. As Options 1 and 3 encompass both of these precincts, these Options rate highest for this measure.

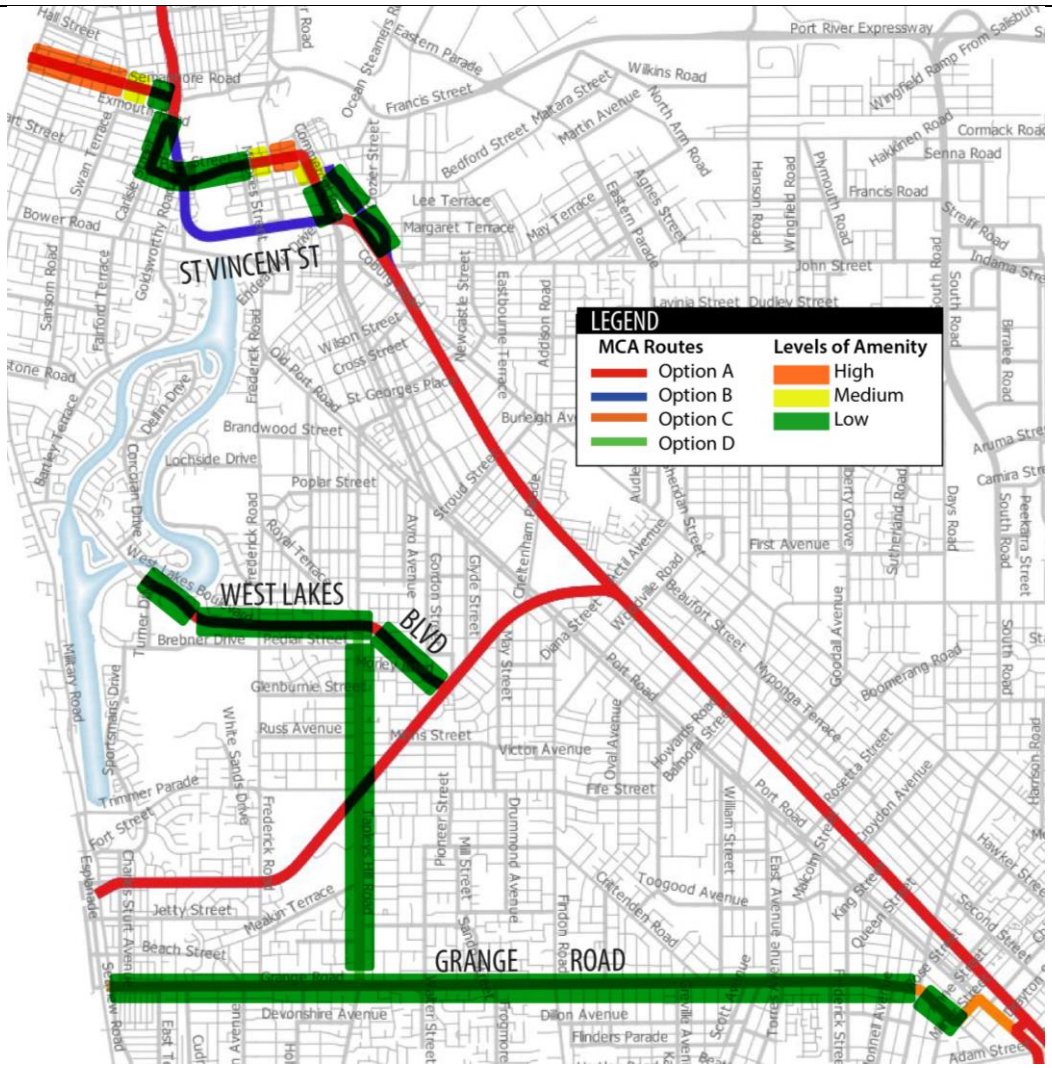
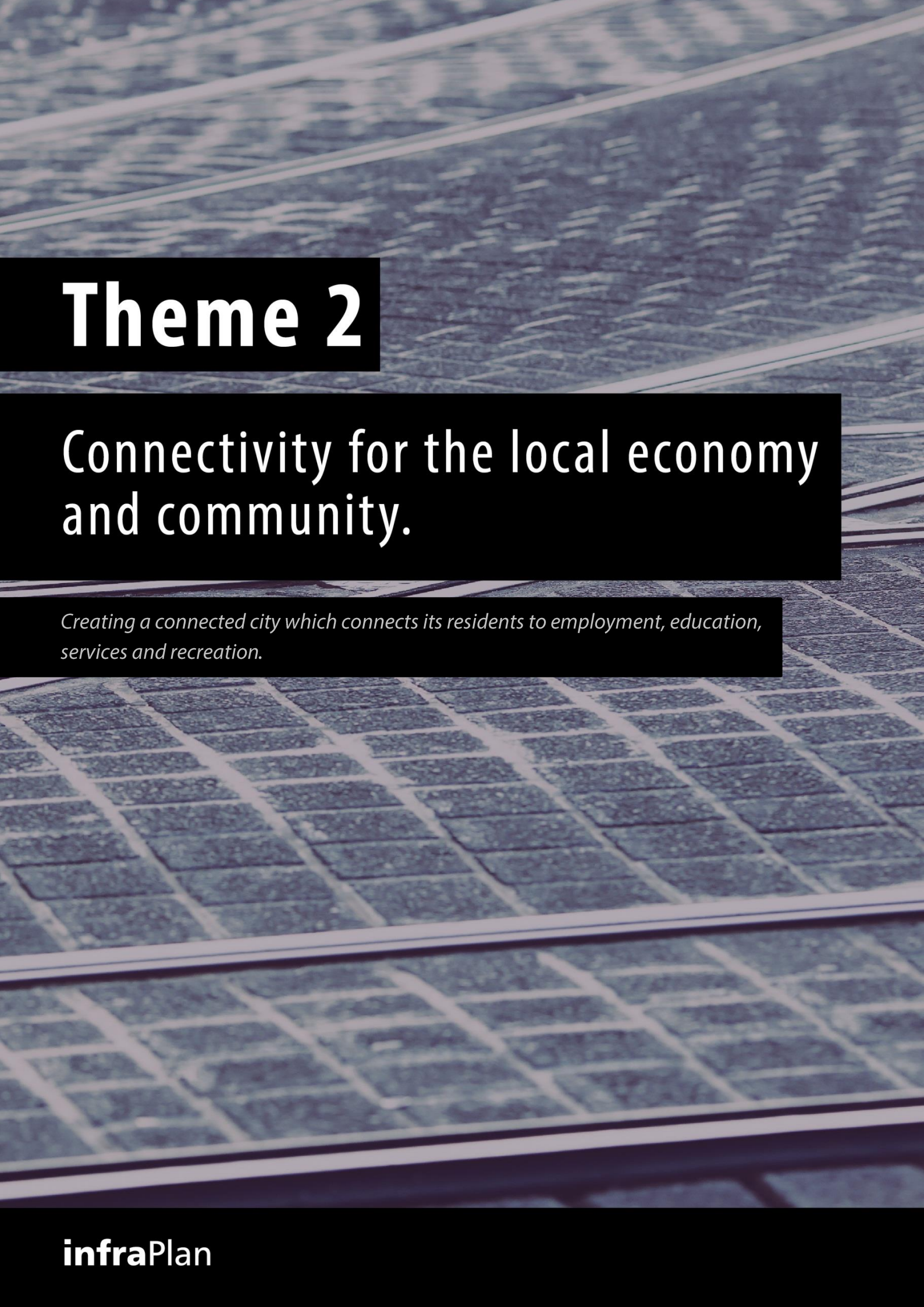


Figure 9: Colour-coded assessment of corridor sections – high, medium or low main street amenity.

Corridor Option	Summary	**Score**
Port*LINK* 1	Poor except for Semaphore Rd & Port CBD	**1**
Port*LINK* 2	Rail corridor N/A	**0**
Port*LINK* 3	Poor except for Semaphore Rd & Port CBD	**1**
Port*LINK* 4	Port CBD only	**0**



Theme 2

Connectivity for the local economy and community.

Creating a connected city which connects its residents to employment, education, services and recreation.

infraPlan

2.1 Connect the inner and middle suburbs to the CBD, enhancing access to employment, education, healthcare, entertainment and other opportunities in the CBD

2.1.1 Peak travel time estimates, based on the corridor's ability to accommodate shared/separated running. Measured by 2km, 4km and end of route (if comparable) from the parklands city edge

Travel time estimates were derived by using vehicle performance specifications sourced from Bombardier for Adelaide's Flexity Classic trams. Acceleration and deceleration capabilities are factored to 70% and 60% respectively to better match usage characteristics. These rates were determined by calibrating against existing timetabled travel times for the Glenelg Tram.

Tram stop locations were estimated, based on an approximate 600m stop spacing and location of stops close to existing points of pedestrian access such as intersections and pedestrian crossings. No land use assessment or destination identification was included, and these stop locations were only identified for the purpose of this travel time assessment.

Maximum running speeds are defined at 55km/h in a segregated corridor, 40km/h in separated running and 30km/h in a shared lane environment. A "slow" category has also been applied where alignment constraints and other known conditions would restrict tram speed to 20km/h. Line testing has shown that the existing tram operates at up to 50km/h in a segregated environment and around 30km/h in the shared environment such as Jetty Road, Glenelg. Signal delays of 15, 30, 45 and 60 seconds have been applied depending on the relationship between the roadway and crossings.

Assumptions around shared or separated running have been made on preliminary assessment of the streetscape and existing operations. Where multiple cross-sectional options exist, a shared lane arrangement has been assumed. Comparison of these two routes extends to a theoretical convergence point. Travel times are approximate only and have not been determined using rail modelling software. The approximation does not take into account reduced cornering speeds but as most corners tend to coincide with stoppages, the influence is somewhat negated.

The score given is relative to the overall difference in travel times for compared options and comparison to existing PT service provision and timetabled travel time between comparable origin and destination.

Confidence Scale Level: C

Port*LINK* is the most difficult route to compare due to the range of options and the inclusion of the existing heavy rail corridor. The various options also provide access from a range of origins. For the travel time summary, each option has been assessed for the following five origins: Outer Harbour, Port Adelaide, West Lakes Interchange, Grange and Semaphore. Not all options have links from all five of these origins and arrival points in the city from each of these origins also vary. These arrival points are Adelaide Railway Station (heavy rail), ARS tram stop (on North Terrace outside the Railway Station) and a potential future tram stop on King William Road north of North Terrace. All Options were scored for each of the five origins and the overall score for the Option was derived as an average of these. If an origin is not served, the Option is awarded the lowest (-2) score.

Peak hour assessment shows that no Option provides improved travel times for all origins. The scale of travel time savings achieved via electrification of heavy rail on the existing rail lines, Option 2 is awarded the best overall scores despite not delivering services from two of the five origins. Option 1 provides the best overall service delivery (access to all origins by rail transport), closely followed by Option 3.

Corridor Option		Port Adelaide	Outer Harbour	Grange	West Lakes	Semaphore	**MCA Score**
Port*LINK* 1	Peak	0	-1	-1	2	0	**0**
Port*LINK* 2	Peak	2	1	2	-2	-2	**1**
Port*LINK* 3	Peak	-2	-1	-2	1	-1	**-1**
Port*LINK* 4	Peak	0	-1	-2	0	-2	**-1**

2.1.2 Number of tertiary students within the 400m catchment

The number of tertiary students living within a 400m catchment of the potential routes was obtained through 2011 ABS census data at SA1 level. Using GIS, this data was clipped to a 400m buffer around the potential routes to determine possible patronage levels of tertiary students.

While the ABS is a reliable source and this data is likely to be indicative of current trends, the collection dates of such data could inflict upon the validity of this count as those who were attending a tertiary institution in 2011 may have completed their studies at the time of this assessment. This issue may be heightened by the trend for tertiary students to remain living at home, meaning there are fewer areas that can be consistently recognised as major hubs of student accommodation.

Confidence Scale Level: B

All four Port*LINK* options present little difference in number of tertiary students per kilometre of route despite their differences in lengths and alignments. Options 1 and 2 perform lower when compared to options 3 and 4 both overall and in average persons per kilometre. Option 4 seems to be the best performer overall with only 33 less students captured overall when compared to option 3. When route length is taken into account, an additional 2 students are present per kilometre when compared to the next best performing option 3.

The score given is relative to the average number of students per kilometre of route.

Corridor Option	Summary	**Score**
Port*LINK* 1	• Entire route: 1,709 students • Per kilometre of route: 55 students	**1**
Port*LINK* 2	• Entire route: 1,377 students • Per kilometre of route: 56 students	**1**
Port*LINK* 3	• Entire route: 2,033 students • Per kilometre of route: 57 students	**1**
Port*LINK* 4	• Entire route: 2,000 students • Per kilometre of route: 59 students	**1**

2.1.3 Number of persons employed in professional, managerial, service etc. jobs within the 400m catchment

The number of employees working within a 400m catchment of the potential routes was obtained through 2011 ABS census data at SA1 level. This was then clipped to a 400m buffer around the potential routes to determine possible patronage levels of the working population. For this reason, employees with occupations that rely on other forms of transport for their employment have been excluded from this count as the nature of such employment is less compatible with light rail patronage.

While the ABS is a reliable source and this data is likely to be indicative of current trends, the collection dates of such data may inflict upon the validity of this count.

Confidence Scale Level: B

While each Port*LINK* option significantly differs in nature and length, the number of employees compatible with light rail usage per kilometre of route is similar for each option. Overall it can be noted that options 1 and 2 host less employees within a 400m catchment both in total and per kilometre of route. Option 4 shows the greatest number of employees per kilometre of route but only contains 3 more persons per kilometre compared to option 3. Option 3 has the greatest number of persons throughout the entire route catchment but is also the longest of the four routes.

The score given is relative to the average number of employees per kilometre of route.

Corridor Option	Summary	**Score**
Port*LINK* 1	• Entire route: 14,58 employees • Per kilometre of route: 450 employees	**1**
Port*LINK* 2	• Entire route: 11,148 employees • Per kilometre of route: 444 employees	**1**
Port*LINK* 3	• Entire route: 15,639 employees • Per kilometre of route: 451 employees	**1**
Port*LINK* 4	• Entire route: 15,324 employees • Per kilometre of route: 454 employees	**1**

2.1.4 Number of corridor residents (up to 600m) that work in the Adelaide CBD.

The number of people working in the Adelaide CBD that live within each corridor option's 600m catchment was calculated using 2011 ABS Census data by SA1 for resident location and SA2 for employment location. Data was clipped and exported using GIS to obtain a total.

Each population was also divided by the corridor length to show the population density per km of that option, highlighting which option provides the greatest city workforce per km of track.

Confidence Scale Level: B

Number of residents within a 600m catchment of the potential routes is highest for route Options 3 and 4. This is potentially due to their extensive route lengths when compared to Options 1 and 2. MCA scores for this measure are based on total population catchment as this better demonstrates overall the potential to bring workers into the city. Therefore, Options 3 and 4 rate highest for this measure.

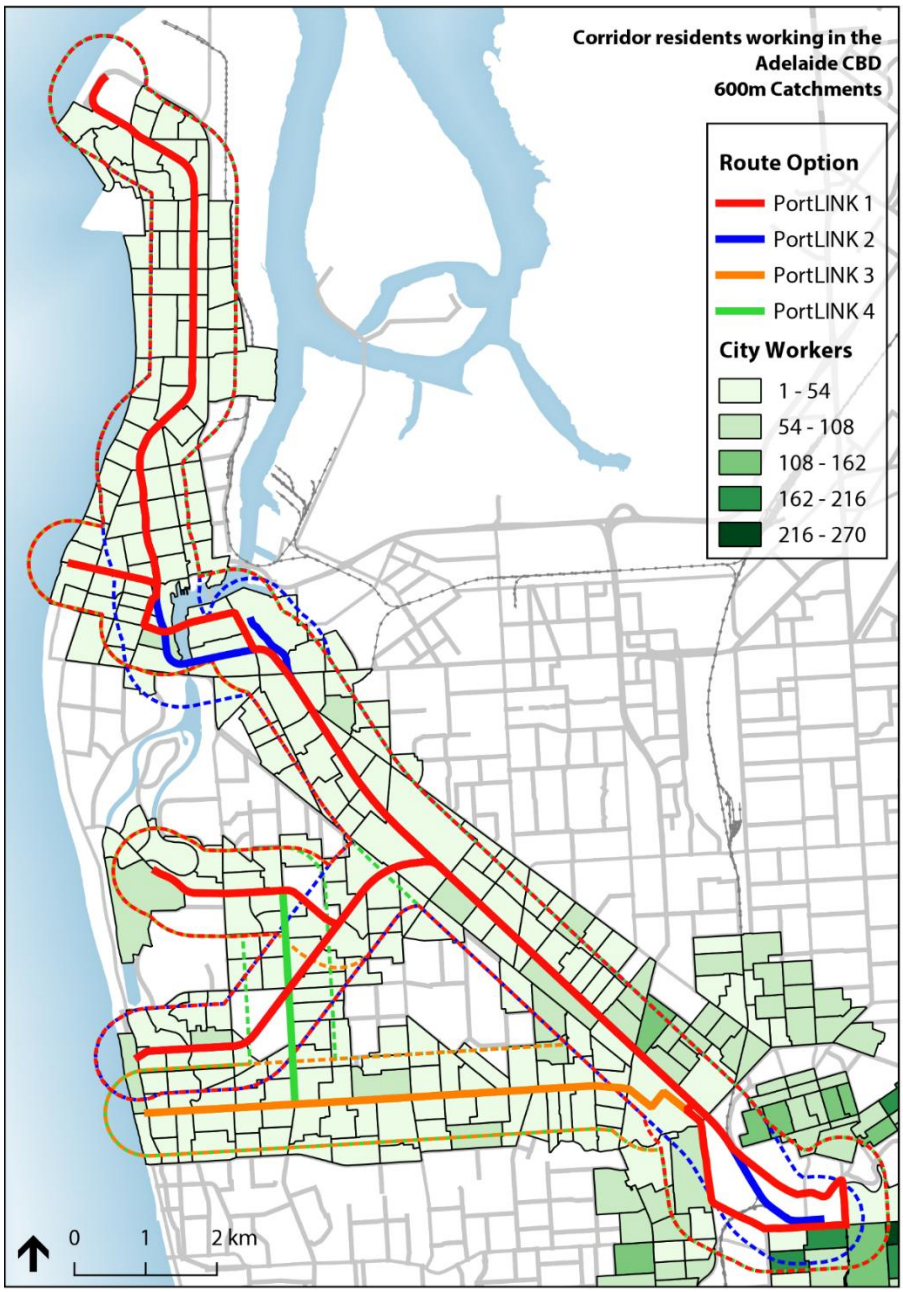


Figure 10: Corridor population employed in the Adelaide CBD.

Corridor Option	Summary	Score
Port*LINK* 1	600m catchment Adelaide city employees: 8,412 600m catchment density per km: 234	**2**
Port*LINK* 2	600m catchment Adelaide city employees: 7,017 600m catchment density per km: 246	**1**
Port*LINK* 3	600m catchment Adelaide city employees: 9,479 600m catchment density per km: 236	**3**
Port*LINK* 4	600m catchment Adelaide city employees: 9,562 600m catchment density per km: 236	**3**

2.2 Connect the city to the inner and middle suburbs, enhancing access to activity centres, employment, education, healthcare, entertainment and other opportunities.

2.2.1 Off-Peak travel time estimates, based on the corridors ability to accommodate shared/separated running. Measured by 2, 5 and 7km from the parklands city edge

Off-Peak travel times were modelled using the same process as the Peak Travel Time assessment (see section 2.1.1) with minor performance conditions to reflect reduced traffic loading, particularly in shared lane environments.

Maximum running speeds are defined at 55km/h in a segregated corridor, 50km/h in separated running and 40km/h in a shared lane environment.

Assumptions around shared or separated running have been made on preliminary assessment of the streetscape and existing operations. Where multiple cross-sectional options exist, a shared lane arrangement has been assumed. Comparison of these routes extends to a theoretical convergence point.

Travel times are approximate only and have not been determined using rail modelling software. The approximation does not take into account reduced cornering speeds but as most corners tend to coincide with stoppages, the influence is somewhat negated.

The score given is relative to the overall difference in travel times for compared options and comparison to existing PT service provision and timetabled travel time between comparable origin and destination.

Confidence Scale Level: C

As in the Peak Travel Time assessment, Option 2 enjoys the best travel time for the three origins it serves, but the advantage is reduced in the Off Peak due to reduced traffic volumes and assumed peak tram travel speeds. The best overall performer, Option 1 ends up with the equal best score. Comparisons to existing public transport services vary but tram options generally show improvement on existing bus and train spur services.

Corridor Option		Port Adelaide	Outer Harbor	Grange	West Lakes	Semaphore	**MCA Score**
Port*LINK* 1	Off Peak	1	-1	-1	2	1	**1**
Port*LINK* 2	Off Peak	2	1	2	-2	-2	**1**
Port*LINK* 3	Off Peak	-1	-2	-2	1	0	**-1**
Port*LINK* 4	Off Peak	1	-1	-2	0	-2	**-1**

2.2.2 Number of significant attractor/generators along the corridor

Significant attractors and trip generators along the potential corridors were assessed to determine which route would be most beneficial in connecting people to such destinations. Potential attractors were chosen and narrowed down for each route, by removing attractors that may have significant patronage generated but unlikely to be accessed by light rail users i.e. Hardware Stores (Bunnings Warehouse, Masters etc.) or may have significant patronage at some times, but irregularly (function centres, halls and so on).

To achieve this, digital inspection was used to identify the significant attractors in each of the potential corridors. Typically, this involved attractors such as schools, shopping centres, activity centres, community facilities and services, employment hubs, and tourist attractions. These were listed in tabular form with major significant attractors underlined and weighted higher for the purpose of MCA comparative scoring.

The rating was determined at the discretion of Urban Design Professionals using their judgement, but there was no data or relevant studies available.

Confidence Scale Level: D

Overall, number of significant and major attractors are similar for all three of the Port*LINK* Options, excluding Option 2. Option 2 has less than half the significant and major attractors when compared to alternate options. Therefore, Option 2 rates lowest for this measure.

Port*LINK* 1	**Port*LINK* 2**	**Port*LINK* 3**	**Port*LINK* 4**
Tertiary Education	**Tertiary Education**	**Tertiary Education**	**Tertiary Education**
TafeSA Port Adelaide Campus	N/A	TafeSA Port Adelaide Campus	TafeSA Port Adelaide Campus
Schools	**Schools**		
Hendon Primary School - West Lakes Blvd Le Fevre Peninsula Primary School - Semaphore Le Fevre High Grange Primary School	Grange Primary School Portside Christian College	Hendon Primary School - West Lakes Blvd Le Fevre Peninsula Primary School - Semaphore Le Fevre High St. Josephs Hindmarsh School Allenby Gardens Primary School Grange Primary School	Hendon Primary School - West Lakes Blvd St. Josephs Hindmarsh School Allenby Gardens Primary School Grange Primary School Seaton Park Primary School - Tapley's Hill Seaton High School
Shopping Villages	**Shopping Villages**	**Shopping Villages**	**Shopping Villages**
Westfield West Lakes Shopping Centre Semaphore Shopping District Fisherman's Wharf Markets - Port Adelaide	Henley Beach Shopping District - LPO, Foodland Port Canal Shopping Centre	Westfield West Lakes Shopping Centre Semaphore Shopping District Welland Shopping District	Westfield West Lakes Shopping Centre Welland Shopping District Findon Shopping Centre

Port Canal Shopping Centre		Findon Shopping Centre Henley Beach Shopping District - LPO, Foodland Fisherman's Wharf Markets - Port Adelaide Port Canal Shopping Centre	Henley Beach Shopping District - LPO, Foodland Fisherman's Wharf Markets - Port Adelaide Port Canal Shopping Centre
Tourism	**Tourism**	**Tourism**	**Tourism**
Semaphore Beach Port Adelaide CBD Grange Beach	Grange Beach	Semaphore Beach Grange Beach Port Adelaide CBD	Grange Beach Port Adelaide CBD
Community Services	**Community Services**	**Community Services**	**Community Services**
Semaphore library Port Adelaide Civic Hub Westminster Aged Care Facility St. Laurence's Court Nursing Home Grange Medical Centre Grange Medical Centre	Westminster Aged Care Facility St. Laurence's Court Nursing Home	Western Hospital Semaphore Library Port Adelaide Civic Hub	Western Hospital Port Adelaide Civic Hub
Activity Centre	**Activity Centre**	**Activity Centre**	**Activity Centre**
Odeon Star Cinemas Pallais Hotel Reading Cinemas Exetor Hotel - Semaphore USC Lion Soccer Club Grange Hotel	USC Lion Soccer Club Grange Hotel	Odeon Star Cinemas Pallais Hotel The Gov - Grange Road Adelaide Entertainment Centre Lady Daly Hotel Coopers Stadium Findon Hotel Exetor Hotel - Semaphore	The Gov - Grange Road Adelaide Entertainment Centre Lady Daly Hotel Coopers Stadium Findon Hotel The Royal Adelaide Golf Club Links Hotel Seaton Hotel
Employment	**Employment**	**Employment**	**Employment**
West Lakes Blvd Industrial Employment District Port Adelaide Employment Hub	Port Adelaide Employment Hub	West Lakes Blvd Industrial Employment District Manton Street Employment District Port Adelaide Employment Hub	West Lakes Blvd Industrial Employment District Manton Street Employment District Port Adelaide Employment Hub

Corridor Option	Summary	**Score**
Port*LINK* 1	• 26 significant attractors • 8 of which are major	**1**
Port*LINK* 2	• 11 significant attractors • 2 of which are major	**0**
Port*LINK* 3	• 32 significant attractors • 10 of which are major	**1**
Port*LINK* 4	• 28 significant attractors • 10 of which are major	**1**

2.2.3 Number of people residing within 600m of the corridor

The population of each corridor option's 600m catchment was calculated using *2011 ABS Census data by Meshblock* (the smallest collection area). Using GIS, data was clipped to a 600m catchment, representing a reasonable walking distance to light rail, before being exported to obtain a total.

Each catchment population was also divided by the corridor length to show the population density per km of route, highlighting which option provides the greatest population per km of track.

Confidence Scale Level: B

Number of people residing within 600m of the potential corridors is highest for route Options 3 and 4. This is potentially due to their extensive route lengths when compared to Options 1 and 2. MCA scores for this measure are based on total population catchment as this better demonstrates overall patronage potential. Therefore, Options 3 and 4 rate highest for this measure. MCA scores for this measure are based on total population catchment.

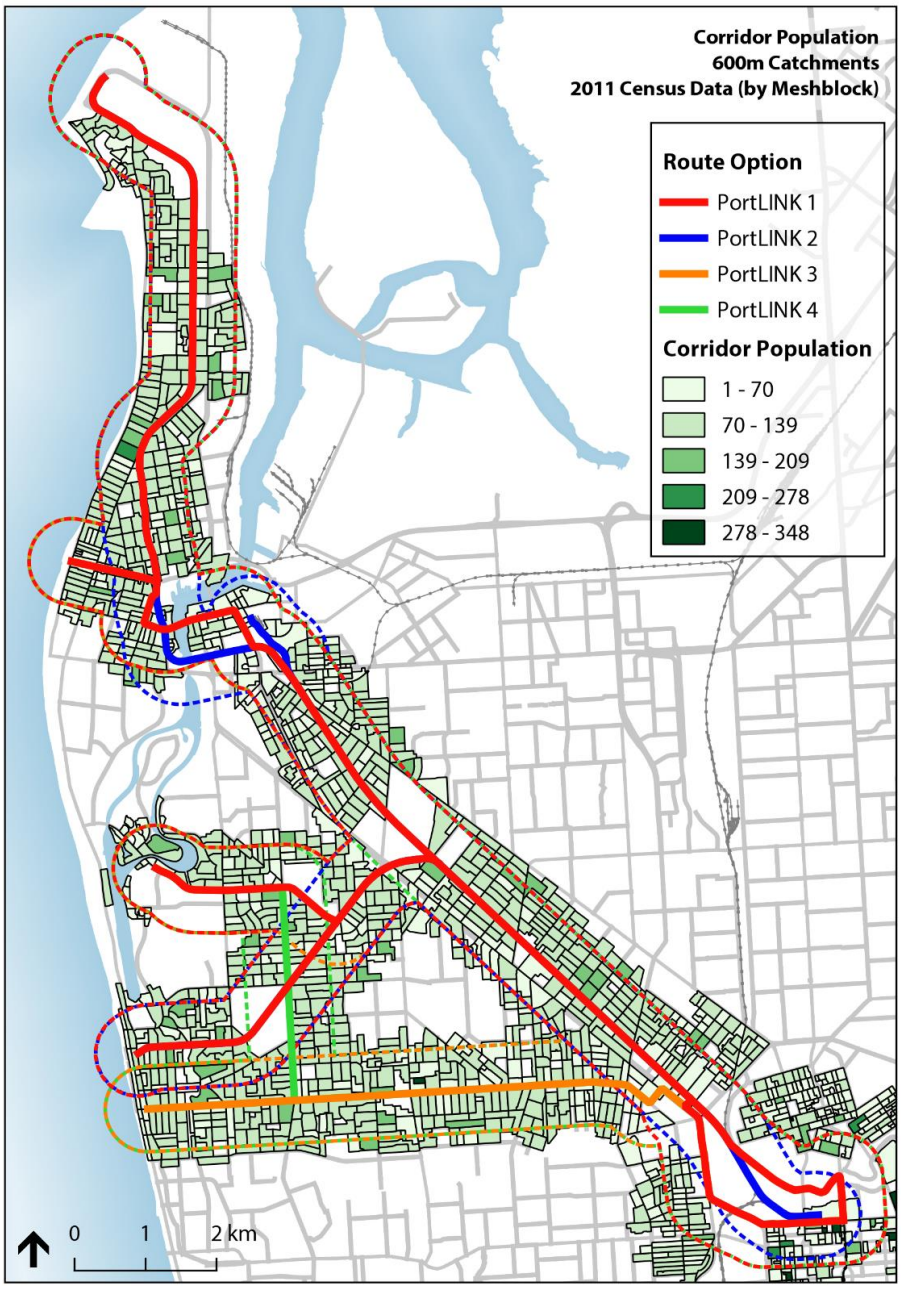


Figure 11: Corridor population density.

Corridor Option	Summary	Score
Port*LINK* 1	600m catchment resident population: 74,366 600m catchment density per km: 2,069	**2**
Port*LINK* 2	600m catchment resident population: 63,818 600m catchment density per km: 2,242	**1**
Port*LINK* 3	600m catchment resident population: 85,308 600m catchment density per km: 2,123	**3**
Port*LINK* 4	600m catchment resident population: 85,367 600m catchment density per km: 2,110	**3**

2.3 Quality of and demand for the end of route activity, including tourism.

2.3.1 Qualitative assessment of end of route existing activity

The existing land use at the end of each route was assessed for activity level.

Confidence Scale Level: B

Compared to the other three Port*LINK* options, Option 2 has fewer termination points and therefore less end of route activity as it does not connect to the Port CBD, Semaphore Beach or West Lakes and does not have the potential to link to Henley Beach. Therefore, Option 2 is rated lowest for this measure.

Corridor Option	Summary	**Score**
Port*LINK* 1	*Port CBD & tourism, Outer Harbour*, Semaphore Main Street & beach, West Lakes, Grange beach, (possible link to Henley Square)	**3**
Port*LINK* 2	*Port tourism, Outer Harbour*, Spur to Port centre, Grange beach	**2**
Port*LINK* 3	*Port CBD & tourism, Outer Harbour,* Semaphore Main Street & beach, West Lakes, Grange beach, (possible link to Henley Beach)	**3**
Port*LINK* 4	*Port CBD & tourism, Outer Harbour, Port CBD, Outer Harbour,* West Lakes, Grange beach, (possible link to Henley Beach)	**3**

2.4 Reduce transport disadvantage and social severance.

2.4.1 Number of households without a motor vehicle within 600m catchment

This measure highlights transport disadvantage as a result of choice or circumstance. Households without a private motor vehicle rely more heavily on public transport to access services, jobs, goods and leisure opportunities.

Data was extracted from the *ABS 2011 Census, via Table Builder at the SA1 level*. Using GIS, this data was then clipped to each of the 600m corridor walking catchments and the total number calculated. Only SA1's fully within, or their majority, were included in the assessment.

Confidence Scale Level: B

Number of households without a car within a 600m catchment of the potential routes is highest in corridor Options 3 and 4. This is potentially due to their extensive route lengths when compared to Options 1 and 2. MCA scores for this measure are based on total household catchment as this can better demonstrate overall benefit to those households without a car. Therefore, Options 3 and 4 rate highest for this measure.

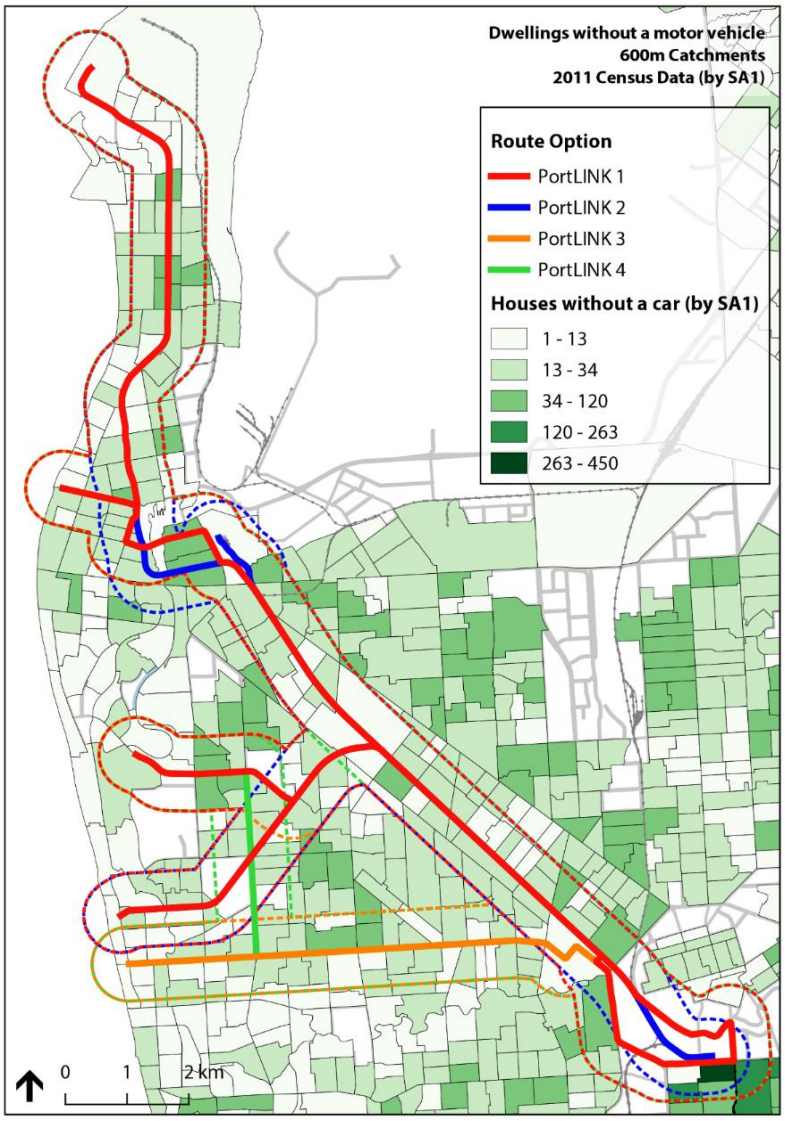


Figure 12: Houses without a motor vehicle.

Corridor Option	Summary	Score
Port*LINK* 1	Dwellings without a motor vehicle: 4,314 Average per km: 120	**2**
Port*LINK* 2	Dwellings without a motor vehicle: 3,769 Average per km: 132	**1**
Port*LINK* 3	Dwellings without a motor vehicle: 4,741 Average per km: 118	**3**
Port*LINK* 4	Dwellings without a motor vehicle: 4,854 Average per km: 120	**3**

2.4.2 Average SEIFA 'relative disadvantage' score of the corridor's 600m catchment

The Socio-Economic Indexes for Areas (SEIFA) is an amalgamation of data compiled by the ABS ranking areas in Australia according to relative socio-economic disadvantage. It is commonly applied to identify a community's socio-economic standing, based on a number of Census variables (including: employment status, level of education and income). A higher score on the SEIFA index means a lower level of disadvantage, while a lower score means a higher level of disadvantage.

The most frequently applied SEIFA index is the *Index of Relative Socio-Economic Disadvantage*, which includes the broadest range of social disadvantage indicators and summarises a range of information about the economic and social conditions of people and households within an area (geographies at SA1 level). This is the index applied for this analysis with scores averaged over 600m catchments.

Confidence Scale Level: B

There is little difference between the average SEIFA scores of the catchment areas all four Port*LINK* Options, as displayed in Figure 13 (overleaf). Therefore, all options rate equally for this measure.

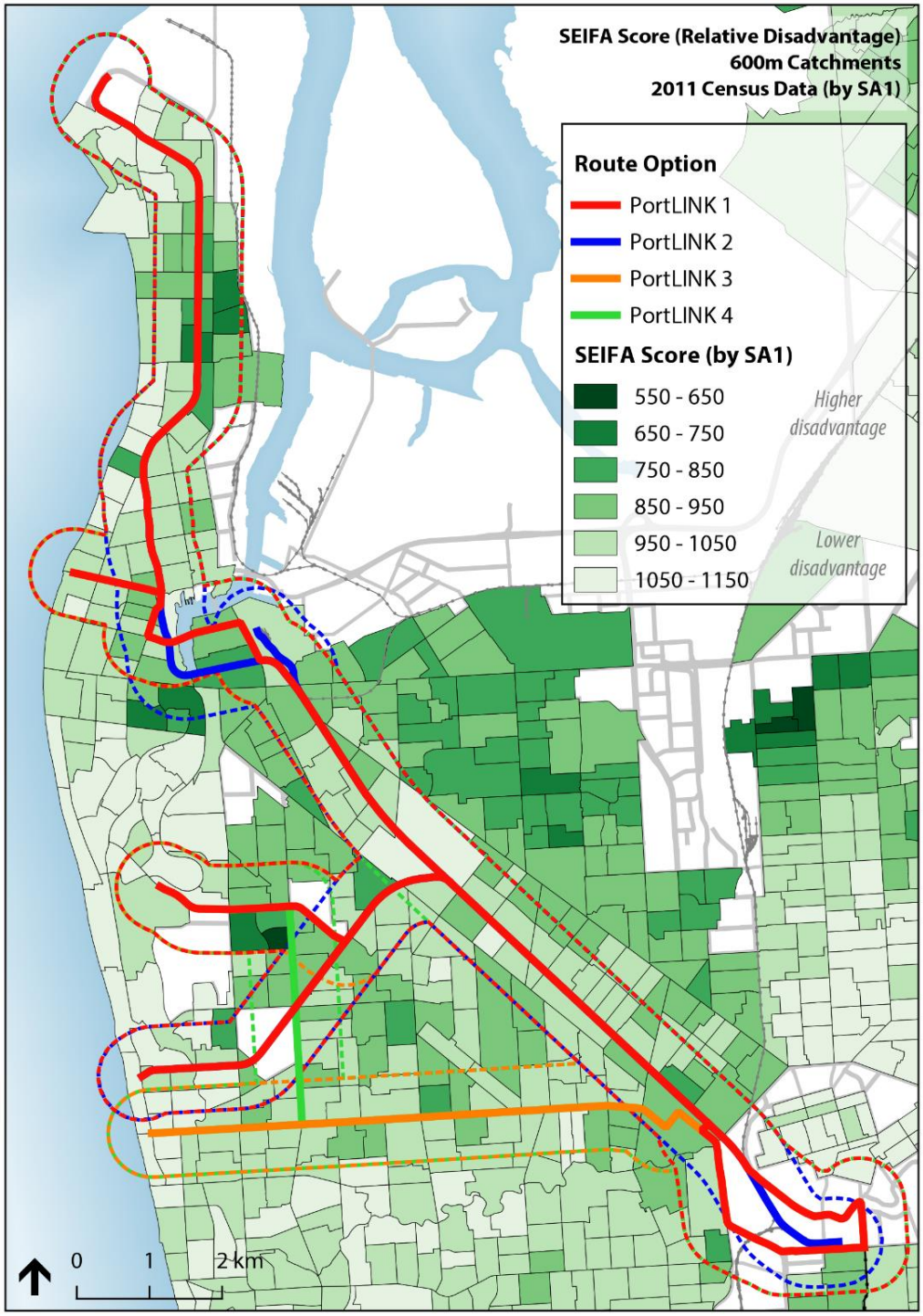
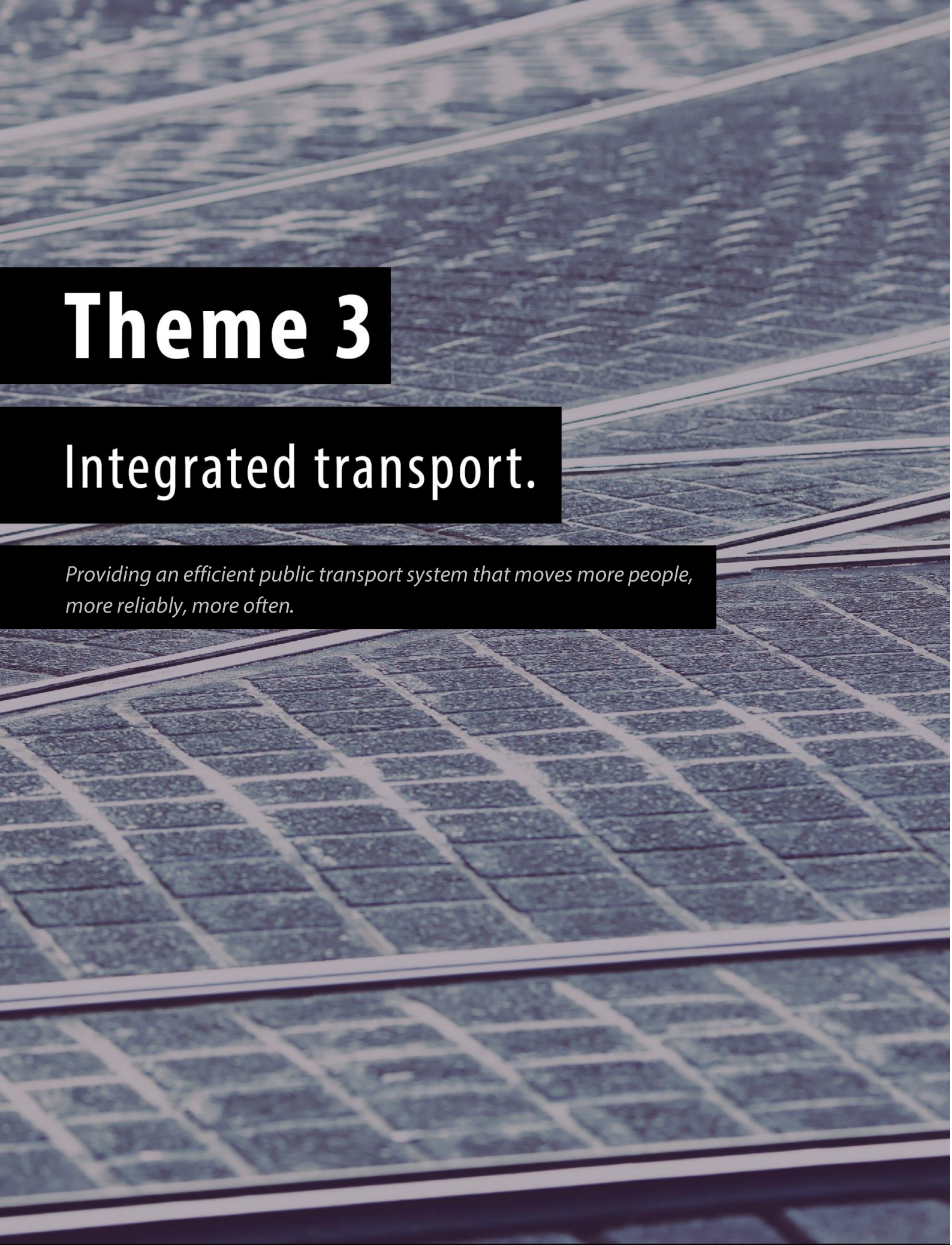


Figure 13: SEIFA relative disadvantage scores.

Corridor Option	Summary	Score
Port*LINK* 1	Average SEIFA score: 967.26	**1**
Port*LINK* 2	Average SEIFA score: 962.91	**1**
Port*LINK* 3	Average SEIFA score: 968.66	**1**
Port*LINK* 4	Average SEIFA score: 968.69	**1**



Theme 3

Integrated transport.

Providing an efficient public transport system that moves more people, more reliably, more often.

infraPlan

3.1 Improve the customer's perception of the public transport experience, including safety, frequency of services and reliability.

3.1.1 Length of shared running lanes versus separated running lanes

Scoring for this measure is based on a preference for running that provides improved conditions for trams, ranked as follows:

- segregated (i.e. dedicated corridor);
- separated (on-road, but separated from traffic); and
- shared running.

Assessment runs from the end of the line to the Inner Ring Route.

Where multiple lane arrangements may be possible, this assessment assumes that the number of existing lanes are retained and trams share the inner lane with car traffic. This results in a lower average travel speed for trams due to turning traffic, extended delays at signals and so on.

Data source: Desktop assessments of existing road cross sections, lane arrangements and road furniture.

As potential designs and cross sections have not yet been undertaken for Port*LINK,* some assumptions have been made. Future investigations and geometric design is likely to result in some variation from the assumed arrangements assessed here. Due to the degree of assumption and unknown design detail both routes are assumed to use shared running.

Confidence Scale Level: D

PortLINK provides a variety of options utilising the existing rail corridor and on-street running. The overall length of the options varies greatly as different corridors are utilised to access destinations. Option 2 is entirely contained within the existing heavy rail corridor, providing fully segregated running but limiting the access and visibility of new transport modes. Options 3 and 4 open a corridor not otherwise accessed by fixed rail transport, adding considerable network coverage and exposure.

Corridor Option	Segregated running	Separated running	Shared running	**Score**
Port*LINK* 1	13.6km	15.5km	4.9km	**0**
Port*LINK* 2	29.2km	-	-	**1**
Port*LINK* 3	17.8km	6.4km	12.4km	**-1**
Port*LINK* 4	19.7km	6.6km	14.3km	**-1**

3.1.2 Levels of competing traffic: traffic volumes on corridor (existing)

Traffic volumes have been assessed along the selected routes. Traffic volumes have the potential to impact on the travel time of trams, and therefore possible resulting in a less viable travel option. Corridors with higher traffic volumes attract a lower comparative rating.

Data source: Data.sa.gov.au, last updated on 30-06-2016 Department of Planning, Transport and Infrastructure.

Confidence Scale Level: A

The options for this measure are not directly comparable, given that Options 3 and 4 are the only tram corridor options with a significant amount of the route not within the existing corridor (i.e. along Grange Road, Tapleys Hill Road or West Lakes Boulevard), they are expected to have a higher impact on vehicle traffic. Given the role that Tapleys Hills Road plays in carrying commercial and private vehicles, Option 4 ranks lower than Option 3, and Options 1 and 2 which predominantly utilise the tram corridor (with the exceptions of Semaphore Road and West Lakes Boulevard for Option 1) are rated as neutral.

Corridor Option	Summary (AADT)	**Score**
Port*LINK* 1	A majority of the route is within the existing corridor: the sections with non-existing 'in-road' tram running are on Semaphore Road (8,200 vpd), Hart Street Bridge (6,300) West Lakes Boulevard (19,800) and War Memorial Drive (7,700)	**0**
Port*LINK* 2	Entire route contained within existing rail corridor, therefore no traffic volumes calculated.	**0**
Port*LINK* 3	A majority of the route is within the existing corridor: the sections with non-existing 'in-road' tram running are on Semaphore Road (8,200 vpd), Hart Street Bridge (6,300) West Lakes Boulevard (19,800), War Memorial Drive (7,700) and Grange Road (31,300 between Crittenden and Holbrooks Road)	**-1**
Port*LINK* 4	A majority of the route is within the existing corridor: the sections with non-existing 'in-road' tram running are on Semaphore Road (8,200 vpd), Hart Street Bridge (6,300) West Lakes Boulevard (19,800), War Memorial Drive (7,700), Grange Road (31,300 between Crittenden and Holbrooks Road) and Tapleys Hills Road (29,600 near Grange Road intersection)	**-2**

3.2 Least direct road impacts including movement of traffic, freight

3.2.1 Average Annual Daily Traffic (AADT) for cars and commercial vehicles

Traffic volumes (including commercial traffic) have been assessed along the selected routes. This is a proxy measure for the reliance of the route for traffic and the potential impact that a tram corridor may have on the road and network operation. Corridors with higher traffic and/or commercial vehicle volumes attract a lower comparative rating.

Data source: Data.sa.gov.au, last updated on 30-06-2016 Department of Planning, Transport and Infrastructure.

Confidence Scale Level: A

The options for this measure are not directly comparable, given that Options 3 and 4 are the only tram corridor options with a significant amount of the route not within the existing corridor (i.e. along Grange Road, Tapleys Hill Road or West Lakes Boulevard), they are expected to have a higher impact on vehicle traffic. Given the role that Tapleys Hills Road plays in carrying freight and vehicles, Option 4 ranks lower than Option 3, and Options 1 and 2 which predominantly utilise the tram corridor (with the exceptions of Semaphore Road and West Lakes Boulevard for Option 1) are rated as neutral.

	Port*LINK* 1	Port*LINK* 2	Port*LINK* 3	Port*LINK* 4
Traffic Volumes (selected and comparable sections)	A majority of the route is within the existing corridor: the sections with non-existing 'in-road' tram running are on Semaphore Road (8,200 vpd), Hart Street Bridge (6,300) West Lakes Boulevard (19,800) and War Memorial Drive (7,700)	Entire route contained within existing rail corridor, therefore no traffic volumes calculated.	A majority of the route is within the existing corridor: the sections with non-existing 'in-road' tram running are on Semaphore Road (8,200 vpd), Hart Street Bridge (6,300) West Lakes Boulevard (19,800), War Memorial Drive (7,700) and Grange Road (31,300 between Crittenden and Holbrooks Road)	A majority of the route is within the existing corridor: the sections with non-existing 'in-road' tram running are on Semaphore Road (8,200 vpd), Hart Street Bridge (6,300) West Lakes Boulevard (19,800), War Memorial Drive (7,700), Grange Road (31,300 between Crittenden and Holbrooks Road) and Tapleys Hills Road (29,600 near Grange Road intersection)
Commercial Traffic Volume	A majority of the route is within the existing corridor: the sections with non-existing 'in-road' tram running are on Semaphore	Entire route contained within existing rail corridor, therefore no traffic volumes calculated.	A majority of the route is within the existing corridor: the sections with non-existing 'in-road' tram running are on Semaphore	A majority of the route is within the existing corridor: the sections with non-existing 'in-road' tram running are on Semaphore

	Road (8,200 vpd), Hart Street Bridge (6,300) West Lakes Boulevard (19,800), War Memorial Drive		Road (270 cv), Hart Street Bridge (205) West Lakes Boulevard (790), War Memorial Drive (270), Grange Road (1,700 between Crittenden and Holbrooks Road)	Road (270 cv), Hart Street Bridge (205) West Lakes Boulevard (790), War Memorial Drive (270), Grange Road (1,700 between Crittenden and Holbrooks Road) and Tapleys Hills Road (2400 near Grange Road intersection)
Score	**0**	**0**	**-1**	**-2**

3.2.2 Volume to capacity ratio (v:c) of the road corridor

Scoring favours those roadways with a lower volume to capacity ratio. This is a proxy measure of congestion levels where a road with V:C ratio = 1.0 is operating at maximum capacity and therefore heavily congested. Roads with a lower V:C ratio (ie up to 1.0) will receive a higher score.

Projection of future traffic impact is not possible at this stage as transport modelling has not been undertaken for the full range of Ade*LINK* route options. The transport projections include only the links as shown in ITLUP and therefore can only be used to assess impacts from those routes and thus comparative impacts are difficult to assess.

Outputs from DPTI's strategic transport model (MASTEM) for 2016 have been used. This data provides an indication of the relatively between each section of the corridors. AM Peak traffic assessed for city bound traffic lanes on all routes.

Confidence Scale Level: E

Port*LINK* routes have been assessed by components with the overall score for each route being determined as a combined impact of the component parts. The following is a summary of those component parts followed by the route Option score table.

A. Port Adelaide – Carlisle Street, Hart Street, St Vincent Street & Commercial Road

V:C ratio is below 0.12 in the AM Peak (tram) direction from Carlisle Street at the Glanville Train Station to Hart Street at Nelson Street, Port Adelaide. St Vincent Street shows a V:C ratio of 0.32 between Nelson Street and Commercial Road in the AM Peak (tram) direction, 0.47 in the opposite direction and Commercial Road shows 0.25 with equivalent flow in the northbound carriageway. All of these roadways have V:C ratios that suggest free flow conditions in both directions during the AM Peak period.

B. Semaphore Road – Glanville Train Station to The Esplanade

The whole of Semaphore Road is shown to have V:C ratios of less than 0.1 in both directions during the AM Peak.

C. West Lakes Boulevard– Tapleys Hill Road to Clark Terrace

This section of West Lakes Boulevard is shown to have V:C ratios of no greater than 0.12 in both directions during the AM Peak.

D. West Lakes Boulevard – West Lakes Shopping Centre to Tapleys Hill Road

The section from West Lakes Shopping Centre to Frederick Road shows an AM Peak direction V:C ratio of 0.23, the section from Frederick Road to Tapleys Hill Road shows a V:C ratio of 0.15.

E. Grange Road – Seaview Road to Tapleys Hill Road Milner Street

Between Seaview Road and Military Road the V:C ratio is 0.67, falling to 0.23 east of Military Road. The V:C ratio peaks at 0.31 east of Frederick Road, falling to 0.26 on approach to Tapleys Hill Road.

F. Grange Road – Tapleys Hill Road to Port Road via Manton Street & Milner Street

V:C ratio stars at 0.4 east of Tapleys Hill Road, peaks at 0.51 between Hart Street and Falkirk Avenue and falls back to 0.42 on approach to Findon Road. Heading eastwards V:C ratios start at 0.41, rise to 0.63 on approach to Holbrooks Road, peak at 0.73 in the short section to East Avenue then vary from 0.61 to 0.52 on approach to South Road from the west. Manton street V:C ratios peak at 0.35 immediately east of South Road. Milner Street shows a V:C ratio of 0.49 on approach to Port Road.

G. Tapleys Hill Road – West Lakes Boulevard to Grange Road

V:C ratio starts at West Lakes Boulevard with a value of 0.28 in the southbound direction during the AM Peak, increases to 0.4 at Russ Avenue and 0.61 on approach to the rail crossing at Trimmer Parade. This falls again to 0.56 south of the level crossing and rises to 0.61 on approach to Grange Road.

None of the affected roadways are shown to be operating at greater than 65% for any significant length with the bottle neck between Holbrooks Road and East Avenue the only section higher than this at 73% during the AM Peak. All assessed road sections experience free flow conditions during the AM Peak under existing conditions. The additional in-road running for the Grange Road options means a slightly larger impact is assessed as a result of these lines.

Route	Summary	**Score**
Port*LINK* 1	A, B, C & D – No road sections with V:C ratios above 0.47, capacity available within road routes.	**0**
Port*LINK* 2	N/A – No on-road sections so no impacts. Level crossing operations may improve with EMUs	**0**
Port*LINK* 3	A, B, C, D, E & F – Grange Road sections have greatest road impacts.	**-1**
Port*LINK* 4	A, B, C, E, F & G – Grange Road sections have greatest road impacts. Small sections of high V:C ratio on Tapleys Hill Road may make this worse than Port*LINK* 3 but within limited scoring range.	**-1**

3.3 Least direct impacts on severance for pedestrians and cyclists.

The DPTI Functional Hierarchy for South Australia's Land Transport Network designates the corridors that function as Major Cycling Routes, Priority Pedestrian Areas, and High Activity Pedestrian Areas.

Major Cycling Routes are arterial roads where bicycle transportation is emphasised. They are direct, continuous links to the Adelaide CBD, district centres and major employment areas, as well as access to key cycle trip generators (e.g. strip and local shopping, educational institutions and places of cultural and social activity). Their desired outcomes are:

- cycling travel times are optimised;
- space is specifically provided for cyclists, including continuous designated and dedicated road space or paths (i.e. no squeeze points);
- separation is provided between cyclists and moving traffic; and
- priority for cyclists is provided.

Potential adverse impacts to cycling from a tram corridor could include:

- restrictions into/out of side streets may reduce permeability across the corridor; and
- there may be insufficient road width to accommodate trams as well as all existing street infrastructure such as on-street parking and bicycle lanes. The final design will need to assess how these are provided or the trade-offs required. Trade-offs to maintain bicycle lanes could include removing on-street parking, reducing footpath width, shared running instead of separated running.

However, improvements to the Major Cycling Route could result if buses are removed from the route. Currently, cyclists share the same space as buses and conflicts arise due to their regular weaving and stopping. Their removal would potentially provide clear kerbside space for cyclists. Trams are fixed, predictable and in the centre of the road (typically), thereby not impacting on the cycle lane in that configuration.

Priority Pedestrian Areas and High Pedestrian Areas are also identified in the Functional Hierarchy.

These pedestrian areas are locations where significant pedestrian activity exists or intended. The safety of pedestrians must be an important consideration in the management of the road system. The extent and level of treatment at these locations will vary depending on the surrounding land use and interaction with other transport functions along the corridor. The ultimate aim is to provide for the convenient, safe and efficient movement of pedestrians by implementing traffic management measures and other initiatives.

In high activity pedestrian areas, it is important to provide safe and convenient connections at key locations along an arterial route for access to destinations of high pedestrian activity. In addition to the above pedestrian area categories, any arterial roads accessed by public transport should provide for safe and regularly spaced crossings for pedestrians.

Desired Outcomes of Priority Pedestrian Areas are:

- provide for safe and efficient movement on a wider footpath area;
- be well lit and accessible for persons with a disability;
- facilitate permeability and continuous access for pedestrians across and along the road corridor;
- promote direct and convenient pedestrian movement by minimising crossing distance and delay at intersections throughout the day;
- provide a safe walking environment through reduced vehicle speeds and high levels casual surveillance (e.g. from adjacent buildings);
- provide a comfortable walking environment, including the provision of street trees, street furniture and other amenities; and
- promote a sense of place and encourage public activities.

In addition to the above pedestrian area categories, any arterial roads accessed by public transport should provide for safe and regularly spaced crossings for pedestrians. Pedestrian areas along tram corridors can be impacted both positively and negatively as follows:

- safer roadway because the trams result in traffic calming;
- improved road crossings at tram stops – medians;
- increased passive surveillance and personal safety; and
- reduced footpath width if additional road space required.

3.3.1 Number of times the route crosses over a Bike*Direct* Route

The Bike*Direct* network was overlayed onto each route option (refer to Figure 14, overleaf) and the number of Bike*Direct* crossings were counted on both sides of the road. Crossings that are at signalised intersections were not counted because these would not be affected. It is assumed that the tram line may result in some impacts to permeability for other Bike*Direct* crossings. These impacts would need to be mitigated and/or managed satisfactorily and so the number of crossings would impact on the design flexibility.

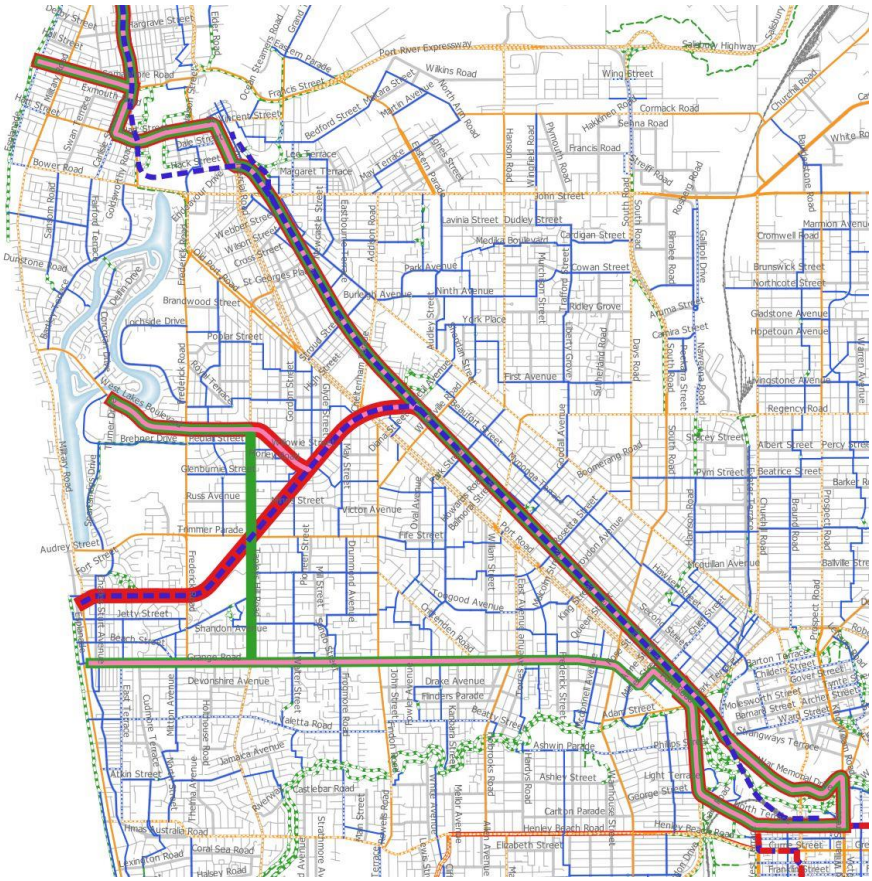


Figure 14: Port*LINK* A with BikeDirect routes overlayed.

Confidence Scale Level: C

Of the four Port*LINK* Options, Option 2 would have the least impacts on existing cycling facilities as it remains in the existing rail corridor. Due to the extensive on-road length of Options 3 and 4 there are a greater number of Bike*Direct* routes potentially affected. Therefore, Options 3 and 4 rate lower for this measure.

Corridor Option	Summary	**Score**
Port*LINK* 1	3 crossings possibly affected.	**-1**
Port*LINK* 2	Existing rail corridor, no impacts	**2**
Port*LINK* 3	Grange Rd is a major cycling route. 17 crossings possibly affected.	**-2**
Port*LINK* 4	Grange Rd & Tapleys Hill Rd are major cycling routes. 24 crossings possibly affected.	**-2**

3.3.2 Impact on (removal) or ability to retain routes along the corridor

The impact to the cycle routes along each corridor will be determined by the final design. It is likely that shared vehicle/tram lanes would have less impacts on the cycle lanes, however in some cases separated lanes may require additional road width that could have implications for cycle lanes and/or car parking depending upon road width and configuration. It is assumed that on Major Cycling Routes, the bicycle lanes would be retained or upgraded as part of the corridor design. This will need to be confirmed as part of future planning stages.

Confidence Scale Level: C

When compared to Port*LINK* Option 2, the other three Port*LINK* Options have the potential to affect a number of existing cycling facilities. While there is possibility to retain routes along wider stretches of the route, this cannot be properly determined until final design.

Corridor Option	Summary	**Score**
Port*LINK* 1	Existing bike lanes on & Semaphore Rd (4km). • Commercial Road bike lanes (600m) – likely to remain • St Vincent St (1.5km bike lanes), car parking or bike lanes may be affected • Carlisle St (0.5km bike lanes) narrow roadway and impacts likely • Semaphore Rd (1.5km bike lanes) likely to remain, width could be achieved by reducing median width	**-1**
Port*LINK* 2	Along rail corridor, no impacts to Greenway	**0**
Port*LINK* 3	Impacts to existing bike lanes as per Port*LINK* 1 plus: • West Lakes Blvd (1km bike lanes only) likely to remain • Grange Rd (9km bike lanes) likely to remain	**-1**
Port*LINK* 4	Impacts to existing bike lanes as per Port*LINK* 1 plus: • Tapleys Hill Rd, West Lakes Blvd (4.6km) - likely to remain	**-1**

3.3.3 Number of pedestrian refuges or crossings impacted (requiring removal)

The methodology to determine the number of pedestrian refuges and crossings possibly requiring removal primarily involved a desktop analysis through digital inspection. High resolution satellite imagery was utilised to count the number of median refuges and pedestrian actuated crossings (PAC's). Signalised intersections were not included because it is assumed that they would be retained.

The higher the number of pedestrian crossings reflects the higher level of pedestrian activity. It is assumed that the design of the tram corridor would improve pedestrian amenity, accessibility and permeability and this is reflected in the scoring. It was considered that some routes would be improved for pedestrian cross-ability with the installation of pedestrian crossings at tram stops.

The rating was determined at the discretion of Urban Design Professionals using their judgement, but there may be a lack of detail and overall analysis to warrant an accurate impact of the removal of pedestrian crossing and refuges in some areas.

Confidence Scale Level: D

Options 1, 3 and 4 have a greater number of crossings potentially impacted by light rail. Due to the little pedestrian amenity along a significant amount of the subject corridors, it can be assumed that design solutions, particularly at stops, would improve the existing crossings and create higher levels of pedestrian amenity.

Corridor Option	Summary	**Score**
Port*LINK* 1	• PAC'S: 2 • Refuges: 11 • Total: 13	**1**
Port*LINK* 2	N/A	**0**
Port*LINK* 3	• PAC'S: 5 • Refuges: 18 • Total: 23	**1**
Port*LINK* 4	• PAC'S: 8 • Refuges: 13 • Total: 21	**1**

3.4 Ability to integrate with and/or replace current public transport services (including bus, train, O-Bahn)

3.4.1 Impacts on existing bus services and potential substitution by potential tram route options

This assessment identifies duplication of services and the potential removal or rationalisation of bus services based on potential Port*LINK* tram routes. Impacts resulting from Port*LINK* options were assessed from the city arrival points of a potential tram stop on King William Road north of North Terrace, existing Adelaide Railway Station Tram stop on North Terrace, and the Adelaide Railway station for train arrivals. Port*LINK* options are largely focussed on conversion of the existing heavy rail Outer Harbour line which clearly changes the nature of rail services but this analysis ignores these on the premise that rail service will be improved on the whole. Bus impacts are therefore limited to the on-road sections of the potential routes. This analysis treats each of the on-road sections individually and concludes with commentary of the impacts associated with each individual route.

The impacts are challenging to quantify, given that the judgement on replacement of bus services was conducted without understanding of patronage levels and demand, or undertaking any transport modelling. The commentary below is therefore based upon potential bus route options, which would need significant investigations to determine any route changes. Bus route changes are not proposed at this time.

Data source: Assessment of existing public transport routes and timetables available on the Adelaide Metro website. http://www.adelaidemetro.com.au/

Confidence Scale Level: C

The Port*LINK* options have been assessed in their component parts with a final summary and score of each Option given at the end.

Port Adelaide – Commercial Road, St Vincent Street and Harts Bridge

Route no.	Route description	Impacted road section
117 **118**	Port Adelaide Interchange to City via West Lakes Interchange Port Adelaide Interchange to City	Commercial Road to St Vincent Street and Harts Bridge to Carlisle Street
150 **350**	Osborne to City Largs Bay to West Lakes Centre Interchange	Commercial Road to St Vincent Street and Harts Bridge to Carlisle Street
230 **232**	Port Adelaide Interchange to city Port Adelaide Interchange & Rosewater to city	Commercial Road to St Vincent Street and Harts Bridge to Carlisle Street
252 **254** **N254**	Port Adelaide Interchange to city Port Adelaide Interchange to city	Commercial Road to St Vincent Street and Harts Bridge to Carlisle Street

333	North Haven to Port Adelaide Interchange	Commercial Road to St Vincent Street and Harts Bridge to Carlisle Street
361	Port Adelaide Interchange to Tea Tree Plaza Interchange	Commercial Road to St Vincent Street and Harts Bridge to Carlisle Street
School services		
652	Alberton to St Michael's Junior College – AM only	
653	Alberton to St Michael's Senior College & Nazareth College – AM only	
655	St Michael's Junior College to Port Adelaide – PM only	
664	Nazareth College to Alberton – PM only	
665	Seaton High School to Port Adelaide – PM only	
668	Henley High School to Port Adelaide – PM only	

Carlisle Street (and Causeway Road crossing)

Route no.	Route description	Impacted road section
333	North Haven to Port Adelaide Interchange – 7 days	Hart Street to Causeway Road

Impacts in Port Adelaide are limited to access to the interchange area as almost all buses (excepting routes 150 and 350) either originate or terminate at this interchange. Road treatments to enhance the transport interchange character and presence on the street would assist in minimising perceived impacts while improving overall public transport provision and service access. Routes could be shortened or revised to remove duplications.

Semaphore Road

Route no.	Route description	Impacted road section
N254	Semaphore to city – Saturday night after midnight only	Rail crossing to end of line

As a specialised night service, the inclusion of a tram in Semaphore Road would likely be considered as an improvement on the limited existing public transport provided.

Grange Road (including Manton Street)

Route no.	Route description	Impacted road section
115	West Lakes Interchange to City	Manton Street and Grange Road to Crittenden Road
117	Port Adelaide Interchange to City via West Lakes Interchange	
118	Port Adelaide Interchange to City	
B10	West Lakes Centre Interchange to Magill	Grange Road from South Road to Military Road
B12	West Lakes Centre Interchange to city	

300	Suburban Connector, clockwise and anti-clockwise loops	Grange Road from Findon Road to Seaview Road
100 **101**	Arndale Centre Interchange to Glen Osmond Arndale Centre Interchange to Flinders University	Grange Road between Holbrooks Road and Crittenden Road
School services		
653	Alberton to St Michael's Senior College & Nazareth College – AM only	
654	Henley Beach to Nazareth College & St Michael's Junior School – AM only	
655	St Michael's Junior College to Port Adelaide – PM only	
663	Nazareth College to Fulham – PM only	
670	Marymount College & Brighton Secondary School to Findon – PM only	
671	Fulham Gardens to Brighton Secondary School & Marymount College – AM only	

Overlap of services to Crittenden Road is only 2.2km but given the similarity of arrival in the city, it may be preferable to run buses as local collectors that feed to trams to access the CBD. The 300 service could be relocated to Trimmer Parade, continuing to provide convenient transfer opportunities but removing the parallel service.

100 and 101 services run parallel to trams for a very short period. The biggest concern with these routes is the possible delays to both trams and buses due to right turn movements from shared lanes.

Military Road

B10 and B12 services run parallel to the potential tram to Grange along the full length of Grange Road (B10 turns north at Frederick Road). Rationalisation of services could remove these routes, providing local collector services at the western end to link to West Lakes or relying on other services that perform similar functions.

Tapleys Hill Road

Route no.	Route description	Impacted road section
288	West Lakes Centre Interchange to city via Tapleys Hill Road, Valetta Road & Ashley Street. M-F only	Grange Road to Trimmer Parade

One route affected between Grange Road and Trimmer Parade. It would be possible to redirect this one route to a parallel roadway. Given low frequency and parallel routes offered, elimination of this service may also be a possibility.

West Lakes Boulevard

Route no.	Route description	Impacted road section
155 **157**	West Lakes Centre Interchange to city via West Lakes Boulevard and Port Road Largs Bay to city via West Lakes Centre Interchange, West Lakes Boulevard and Port Road	Port Road to West Lakes Centre Interchange

J7	West Lakes Centre Interchange to Marion Centre Interchange	Port Road to West Lakes Centre Interchange
115 **117**	West Lakes Interchange to City Port Adelaide Interchange to City via West Lakes Interchange	Tapleys Hill Road to West Lakes Centre Interchange
J8	West Lakes Centre Interchange to Marion Centre Interchange	Tapleys Hill Road to West Lakes Centre Interchange
350	Largs Bay to West Lakes Centre Interchange	Frederick Road to West Lakes Centre Interchange
372	West Lakes Centre Interchange – Anti-clockwise loop service via Seaton, Military Road, Trimmer Parade, Clark Terrace & Frederick Road.	Frederick Road to West Lakes Centre Interchange
B10	West Lakes Centre Interchange to Magill	Frederick Road to West Lakes Centre Interchange
School services		
660 **661** **665**	St Michael's Senior College to West Lakes Centre Interchange – PM only Nazareth College to Delfin Island – PM only Seaton High School to Port Adelaide – PM only	

The tram route via West Lakes Boulevard would be a replacement of the 155 service and duplicates the 157 service from West Lakes to the City, though via the rail corridor rather than Port Road. Other routes run parallel for shorter periods, both on approach to the West Lakes Interchange and within the route. Some parallelism may be desirable to facilitate transfers while further rationalisation of routes may redirect sections.

Corridor Option	Summary	Score
Port*LINK* 1	Impacts on many routes are minor, additional coverage would improves overall service provision.	**-1**
Port*LINK* 2	No direct impact to bus services, direct replacement of existing heavy rail services.	**0**
Port*LINK* 3	Impacts are relatively minor and manageable, in some cases by replacement of existing bus services. Additional coverage would improve overall service provision.	**-1**
Port*LINK* 4	Impacts are medium but manageable, in some cases by replacement of existing bus services, though some Grange Road routes would maintain a degree of parallel running and turning movements across tram tracks. Additional coverage would improve overall service provision.	**-2**

3.5 Impact on the current network role and function (e.g. freight routes versus commuter routes)

3.5.1 Alignment (or conflict) to the SA DPTI functional hierarchy

Transport corridors are required to serve more than one transport function. Roads are not all the same. While many roads look similar, each road needs to provide its own specific function (or combination of functions) depending on its location in the transport network, the type and volume of users and the adjacent land use. The land use and urban design along these corridors has significant implications on the role and function of the corridor (and vice versa) and highlights the importance of integrated land use/transport planning.

To ensure integrated land use/transport planning, the role and function of corridors must be defined. The Department of Planning, Transport and Infrastructure defines the role and function of these corridors in A Functional Hierarchy for South Australia's Land Transport Network. A functional hierarchy identifies which transport corridors are important for different modes of transport. The relevant functions and route identification for comparison between corridors are: public transport, pedestrian access, freight, major traffic routes, and peak hour traffic. Each of these functions are compared between the tram route alternatives, and is broadly assessed in terms of how compatible/conflicting a tram route would be with the defined role and function.

Data source: A Functional Hierarchy for South Australia's Land Transport Network, Department of Planning, Transport and Infrastructure, 2013.

Confidence Scale Level: A

Given all of the Port*LINK* options utilise the existing dedicated existing Outer Harbour Line for a majority of the route, all options rate well as Public Transport corridors. Options 3 and 4 rate highly as they incorporate longer lengths of High Pedestrian Areas. Option 4 is disadvantaged by Tapleys Hill Road being identified as a Major Traffic Route and a Freight route. For these reasons, most options rate similarly, with Option 3 having the slightly higher rating.

Hierarchy	Port*LINK* 1	Port*LINK* 2	Port*LINK* 3	Port*LINK* 4
Public Transport Corridor	Dedicated Corridor along the existing rail corridor, Grange Line. High Frequency Corridor along West Lakes Boulevard. Standard frequency along Semaphore Road	Dedicated Corridor along the existing rail corridor, Grange Line.	Dedicated Corridor along the existing rail corridor, Grange Line (for first section). High Frequency Corridor along West Lakes Boulevard and Grange Road. Standard frequency along Semaphore Road	Dedicated Corridor along the existing rail corridor, Grange Line and High Frequency Corridor along West Lakes Boulevard and Grange Road. Standard frequency Tapleys Hill Road

Pedestrian Access	Priority Pedestrian Area in Port Adelaide. Some High Activity Pedestrian Area in/near Hindmarsh). Local Pedestrian Activity Area along Semaphore Road	Some High Activity Pedestrian Area in/near Hindmarsh). Local Pedestrian Activity Area along Semaphore Road	Priority Pedestrian Area in Port Adelaide. Some High Activity Pedestrian Area in/near Hindmarsh). Local Pedestrian Activity Area along Semaphore Road. Public Transport Corridor along Grange Road	Priority Pedestrian Area in Port Adelaide. Some High Activity Pedestrian Area in/near Hindmarsh). Local Pedestrian Activity Area along Semaphore Road. Public Transport Corridor along Grange Road
Major Traffic Route	Not applicable	Not applicable	Not applicable	Tapleys Hill Road is a Major Traffic Route
Freight Route	Not applicable	Not applicable	Not applicable	Tapleys Hill Road is a Freight Route
Peak Hour Route	Not applicable	Not applicable	Grange Road, West Lakes Boulevard Peak Hour Route	Grange Road, West Lakes Boulevard Peak Hour Route
Score	**1**	**1**	**1**	**-1**
Note: green colours demonstrate compatibility with the Functional Hierarchy, red colours demonstrate variance				

3.6 Impact to signalised intersections

3.6.1 Number of intersections that the route has to cross

This assessment compared the number of signalised intersections along the route options to the point where they converge or are at a comparable point on the city fringe. This assessment considers only the number of signalised intersections and does not attempt to quantify the time delay or overall performance impact on tram operations or an individual tram timetable performance.

The assessment quantifies the number of intersections but not operations of trams, traffic control or measures to integrate tram movements into existing signal phasing.

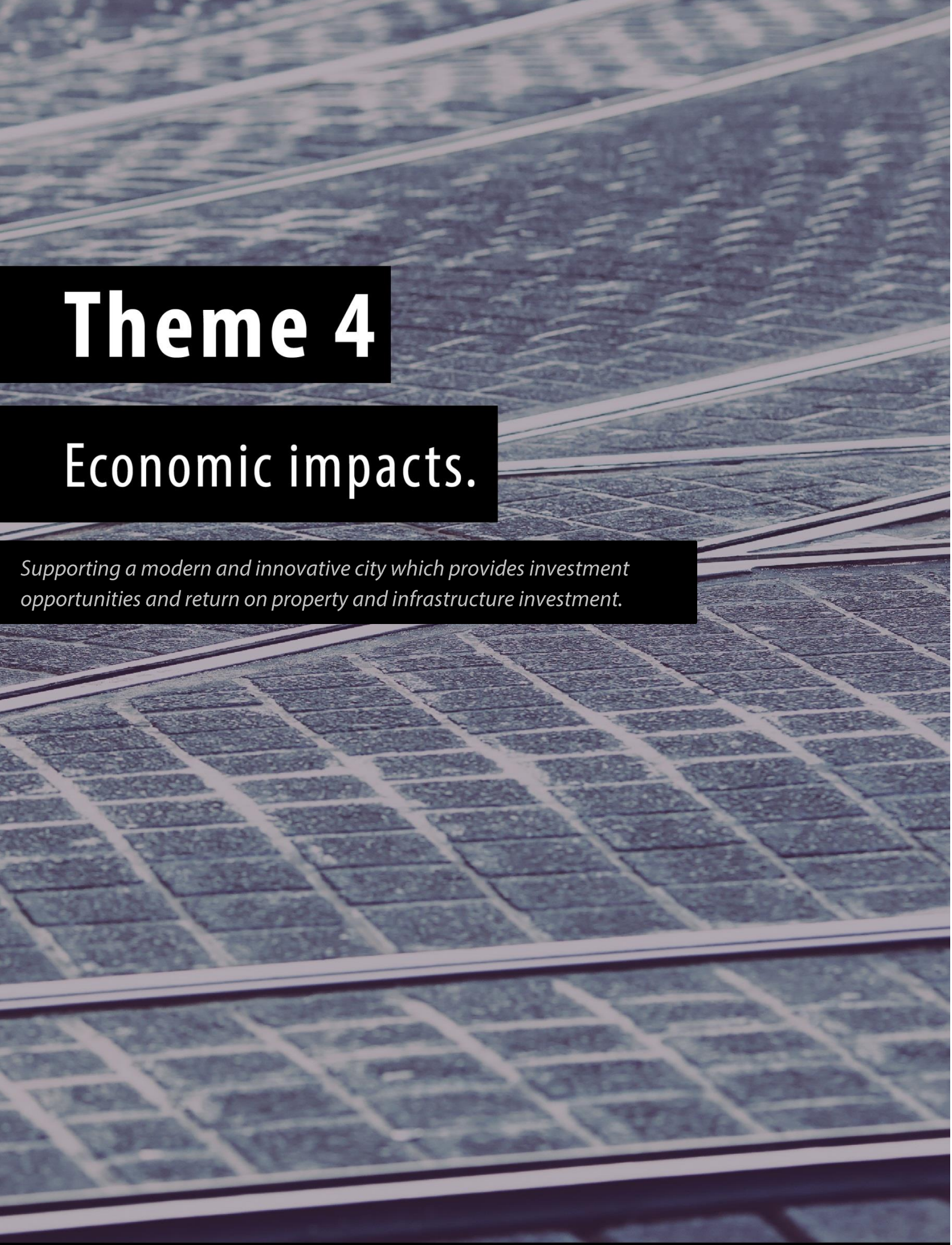
Note that pedestrian activated crossings are not included in the totals as trams could be granted priority where these crossings are not linked to tram stops.

Data source: Assessment of aerial photography of the Adelaide Metropolitan area.

Confidence Scale Level: C

Option 2 includes no on-road running so has no impact on signalised intersections. The number of intersections impacted is reflective of the overall extent of on road running. Note, this assessment does not include intersections on the existing line from the Adelaide Entertainment Centre to the City.

Route	Summary	**Score**
Port*LINK* 1	12 signalised intersections	**-1**
Port*LINK* 2	0 signalised intersections	**0**
Port*LINK* 3	17 signalised intersections	**-2**
Port*LINK* 4	18 signalised intersections	**-2**



Theme 4

Economic impacts.

Supporting a modern and innovative city which provides investment opportunities and return on property and infrastructure investment.

infraPlan

4.1 Patronage Potential (Revenue)

4.1.1 2036 AM peak patronage

Data Sources

Preliminary investigations have indicated the following patronage potential based on strategic transport modelling (MASTEM) for Port*LINK* 1:

- Outer Harbour/Grange Line conversion (to LRT) = 3,193 passengers in the AM peak Hour
- Grange Line Conversion = 880 passengers in the AM peak hour
- West Lakes Extension = 512 passengers in the AM Peak hour
- Semaphore Extension = 371 passengers in the AM peak hour

A total 4,956 passengers in the AM Peak Hour were estimated as per MASTEM modelling for Port*LINK* Option 1.

Given the time constraints it was not possible to undertake MASTEM modelling for the four tram corridors with a different set of development assumptions for comparison, instead a first principles approach was adopted as described below.

2011 Census data

Household occupancy, Journey to Work (JTW) data from 2011 census was referred to, for an understanding of the existing conditions along the corridor options. Household occupancy and public transport usage along the existing Glenelg tram corridor was referred to, however was not deemed applicable due to the different land use composition. Therefore, the daily trips likely to be generated from potential new dwellings was assessed for estimating the patronage potential along each corridor.

Assumptions

Net Developable Floor Area within 600m catchment

The corridor's ability to support The 30-Year Plan for Greater Adelaide vision for infill and corridor development was used as a starting point to determine the potential developable volume (cubic metres) - i.e. the development potential within 600m of the corridor.

The estimated developable volume was then translated into nett developable floor area using an average 3.0m floor height.

The following assumptions were applied for further detailed estimation of developable floor areas for a number of land uses within 600m catchment of the corridor

1. Mixed-use developments
    a. maximum building height allowance = 9m
    b. 40% of estimated developable volume discounted for open space, parking, mandatory setbacks etc. i.e. 60% of ***potential developable volume*** used for estimating ***developable floor area***
    c. Developable floor area was further split into three main land use categories – 20% retail/café, 20% commercial/office and 60% residential
    d. dwelling units in mixed-use developments were assumed to have an average floor area of 150 m2
2. Residential developments
    a. Maximum building height allowance = 16.5m

   b. 50% of estimated developable volume discounted for open space, parking, mandatory setbacks etc. i.e. 50% of potential developable volume used for estimating developable floor area
   c. dwelling units in residential developments were assumed to have an average size of 200 m2
3. Urban Corridor Zone & Main Street Zone development
   a. 30% of estimated developable volume discounted for open space, parking, mandatory setbacks etc. i.e. 70% of ***potential developable volume*** used for estimating ***developable floor area***
   b. Developable floor area was further split into three main land use categories – 20% retail/café, 20% commercial/office and 60% residential

*dwelling units in mixed-use developments were assumed to have an average floor area of 125 m^2.

The net developable floor areas for commercial/retail land uses and potential increase in dwellings within 600m catchment were estimated based on the above assumptions.

While commercial/retail floor areas were estimated a number of other factors were beyond the scope of this study (i.e. type of development, uptake). Therefore, estimated dwelling potential was used for estimating patronage for the subject corridor.

Daily and peak hour trip generation

A generation rate of 9 trips/day for houses and 5.6 trips per day for medium density flats is a general indication of trip generation. It is envisaged that residential development along tram corridor (with 600m catchment) could be a mix of high density flat buildings, sub-divisions (infill) and individual (detached/semi-detached) dwellings.

Considering dwelling density potential, an average daily trip rate of 7 trips per household was used for estimating total trips from the corridor.

Peak hour trip generation is also typically 10% of daily traffic. Therefore, a peak hour traffic generation rate of 10% of daily rate was used for estimating peak hour demand.

Confidence Scale Level: C

The lower confidence rating was determined due to some assumptions that were made while estimating dwelling potential and associated trip generation.

The Port*LINK* 3 and 4 corridors were estimated to have higher dwelling development potential (approximately 20% more) compared to Port*LINK* 1 and 2. Research has shown that residential developments supported by a high quality, high frequency public transport connectivity has higher potential for increased patronage. Therefore, when compared to Port*LINK* 1 and Port*LINK* 2, options Port*LINK* 3 and 4 were estimated to have higher peak hour patronage potential.

For these reasons Port*LINK* 3 and 4 were rated higher (+1) for this measure.

Corridor Option	Summary	Score
Port*LINK* 1	Existing no. of dwellings within 600m catchment = 34,735 Existing Public Transport Users = 2,635 Potential developable Residential floor area = 8,962,200 m2 Potential new dwellings = 47,266 Daily New trip potential = 330,861 New Peak Hour trips = 33,086 10% PT Trips (New) = 3,309 in peak hour 2036 AM peak hour patronage potential = 5,944 passengers	**1**
Port*LINK* 2	Same as Port*LINK* 1 (no difference due to electrification assumed) Existing no. of dwellings within 600m catchment = 34,735 Existing Public Transport Users = 2,635 Potential developable Residential floor area = 8,962,200 m2 Potential new dwellings = 47,266 Daily New trip potential = 330,861 New Peak Hour trips = 33,086 10% PT Trips (New) = 3,309 in peak hour 2036 AM peak hour patronage potential = 5,944 passengers	**1**
Port*LINK* 3	Existing no. of dwellings within 600m catchment = 29,524 Existing Public Transport Users = 3,015 Potential developable Residential floor area = 10,741,700 m2 Potential new dwellings = 56,434 Daily New trip potential = 395,000 New Peak Hour trips = 39,500 10% PT Trips (New) = 3,950 in peak hour 2036 AM peak hour patronage potential = 6,965 passengers	**2**
Port*LINK* 4	Existing no. of dwellings within 600m catchment = 39,791 Existing Public Transport Users = 3,030 Potential developable Residential floor area = 10,721,100 m2 Potential new dwellings = 56,339 Daily New trip potential = 394,400 New Peak Hour trips = 39,440 10% PT Trips (New) = 3,940 in peak hour 2036 AM peak hour patronage potential = 6,974 passengers	**2**

4.1.2 Outcome of criteria 2036 AM peak patronage translated into revenue

An average 60% of tram users were assumed to be equivalent full fare payers (aggregating concession ticket holders and other free passengers and converting to equivalent full fare payers). An assumed $5 per trip fare and annualisation factor of 250 (days/year) were considered for estimating revenue potential.

It was assumed that the existing bus service along these corridors (where deemed duplication of service) would be removed which in-turn would impact positively on net patronage potential for trams as existing bus transport users would shift to the tram. Shifting of existing public transport users to a future tram would need to be assessed in detail once the preferred alignment has been selected.

For Port*LINK* 2 pervious MASTEM outputs (developed for North West LRT Study, 2013) were referred. NWLRT MASTEM assessment had included an assumed a 25% increase in daily patronage (from 2012 to 2021) due to electrification of train line called as "spark effect". This 25% increase was due to electrification of the line compared to Do Minimum (continue running Diesel Trains).

However, when compared to LRT option, electrification of the existing train line did not offer significant benefit in daily patronage. Therefore, for the purpose of Port*LINK* MCA, InfraPlan have assumed no difference in patronage for Port*LINK 1 & 2*.

Confidence Scale Level: C

The lower confidence rating was determined due to some assumptions that were made while estimating dwelling potential and associated trip generation.

Both, Port*LINK* 3 and 4 were estimated to generate an additional +$7.75 m/year in fare revenue when compared to Port*LINK* 1. For this reason, both Port*LINK* 3 and 4were rated higher than Port*LINK* 1 and 2.

Corridor Option	Summary	**Score**
Port*LINK* 1	Total future patronage potential = 5,944 during peak hour Total Daily Trips = 59,436 Annual Fare Collection = $44.58 m	**1**
Port*LINK* 2	Same as Port*LINK* 1 (no difference due to electrification assumed) Total future patronage potential = 5,944 during peak hour Total Daily Trips = 59,436 Annual Fare Collection = $44.58 m	**1**
Port*LINK* 3	Total future patronage potential = 6,965 during peak hour Total Daily Trips = 69,654 Annual Fare Collection = $52.24 m	**2**
Port*LINK* 4	Total future patronage potential = 6,974 during peak hour Total Daily Trips = 69,737 Annual Fare Collection = $52.30 m	**2**

4.2 Constructability and business impacts

4.2.1 Potential risks to underground services

Construction of rail infrastructure may require relocation or removal of underground infrastructure to ensure access and prevent damage both to and from underground services. This assessment has identified where underground services (from Location SA) are located within the lane that is likely to also facilitate the trams, and where they are located outside of these lanes. Impacts on services within the tram running lanes are anticipated to be greatest and therefore have a greater weighting in determining overall impacts. Routes with a lower overall impact on underground services will receive higher scores.

While it is assumed that Location SA is up to date with underground infrastructure items, and geo-located spatial positioning is accurate, the interface with aerial photography means that the precise location of the infrastructure within the road reserve and location with respect to existing lane markings is less reliable.

Data sources: Desktop assessment of underground services within the road reserves of each of the routes using the Location SA web viewer at http://location.sa.gov.au/viewer/.

Precise location and condition of infrastructure is unknown and an engineering survey is required to fully assess the impact of construction. Stormwater pipes are not included in this assessment as they are not shown on Location SA web viewer.

Confidence Scale Level: C

Once again, impacts to underground services is closely linked to the extent of on road running. Hence Option 2 has no impact and Option 4 has the greatest level of potential impact on underground services.

Route	Summary	Score
Port*LINK* 1	Existing corridor plus West Lakes Boulevard from Albert Park station, on road in Port Adelaide and Semaphore Road spur. Shortest length of impacted services in inner lanes, outer lanes and overall impacts Inner lane total: 4.0km, outer lane total: 10.6km	**0**
Port*LINK* 2	No impact to services as option is limited to the existing rail infrastructure and corridor.	**1**
Port*LINK* 3	Grange service delivered via Grange Road which adds significant impact length above Option A. Inner lane total: 16.0km, outer lane total: 23.7km	**-1**
Port*LINK* 4	Adds Tapleys Hill Road impacts over Option 3. Eastern end of West Lakes Boulevard has no services in the roadway so is no saving on Option 3. Inner lane total: 21.0km, outer lane total: 27.0km	**-2**

4.3 Potential for property uplift and value capture

4.3.1 Property value uplift potential

Data Sources

The estimated development potential (year 2036) using land use and development plan requirements was used as a starting point for estimating property uplift along Port*LINK* corridors.

Overseas research into property uplift and value capture for light rail corridors was referred to determine quantum of property uplift.

Assumptions

The following rates were used when estimating property uplift along tram corridor

- $3,000 per m^2 for residential developments
- $5,000 per m^2 for commercial and retail developments
- 10% of total value potential based on OS research

Confidence Scale Level: D

Confidence scale was determined due to a number of assumptions that were made while estimating dwelling potential and associated trip generation. Investigations into potential property uplift will occur as part of subsequent studies. **Hence figures identified below should be considered for relativity purposes only, and not actual estimations.**

Using a 10% increase in property uplift due to a tram corridor (including conversion from heavy to light rail) could potentially increase property prices by $13.84b for Port*LINK* 3 & 4 which is $1.8b higher than $11.99bn for Port*LINK* 1.

Route	Summary	Score
Port*LINK* 1	29,982,800 m2 residential development potential 6,591,500 m2 commercial + retail development potential $11.99 b in property uplift at 10%	**0**
Port*LINK* 2	Same as Port*LINK* 1 (no difference due to electrification assumed) 29,982,800 m2 residential development potential 6,591,500 m2 commercial + retail development potential $11.99 b in property uplift at 10%	**0**
Port*LINK* 3	2,100,000 m2 residential development potential 906,650 m2 commercial + retail development potential $13.82 b in property uplift at 10%	**1**
Port*LINK* 4	2,100,000 m2 residential development potential 906,650 m2 commercial + retail development potential $13.84 b in property uplift at 10%	**1**

4.4 Least route impacts on (property acquisition, trees, services, car parking, heritage items)

4.4.1 Number of on street parks affected

A digital inspection was undertaken to count the number of on-street carparks along each route option. Where bays were not line marked, a digital ruler was used to measure the distance in metres of a stretch road designated to on-street parking. This figure was then divided by 6.5 (m) (the average length of a car park) in order to ascertain the approximate number of carparks available between side-streets. Angled parking bays were measured separately from non-angled parking.

To ensure a level of consistency and accuracy, ground-truthing was used to determine No Stopping areas and bus stops.

Confidence Scale Level: C.

Overall, Port*LINK* Options 3 and 4 would have the greatest impact on existing on-street parking due to their extended on-road route lengths. While Port*LINK* Option 1 would impact on a significant number of parking spaces, it is less than a third of those impacted by Options 3 and 4. Option 2 has no impact as it remains in the existing rail corridor.

Corridor Option	Summary	**Score**
Port*LINK* 1	Total: 430 parking spaces	**-1**
Port*LINK* 2	N/A	**0**
Port*LINK* 3	Total: 1,488 parking spaces	**-2**
Port*LINK* 4	1,929 parking spaces	**-2**

4.4.2 Impacts on median, including trees and islands (calculation to be determines upon review of actual corridors, but to include removal of trees)

The number of trees that may require removal on each route was calculated through the use of high resolution satellite imagery. The number of trees situated on medians of a corridor options were counted.

Confidence Scale Level: D.

The rating was determined as the impact to trees will be determined during the design stage. There is a lack of detail and overall analysis to warrant an accurate impact at the MCA stage. The assessment assumes that trams would be located in the centre of the road, and require trees to be removed (i.e. worst case scenario). The assessment does also not take into account replacement and additional vegetation that would be considered as part of the detail planning of the corridors.

Apart from Port*LINK* Option 2, all options could require tree removal. This is highest for Option 3 and least in Option 1. Due to the low confidence scale Port*LINK* options 1, 3 and 4 are rated equally for this measure.

Corridor Option	Summary	**Score**
Port*LINK* 1	118 trees	**-1**
Port*LINK* 2	N/A	**0**
Port*LINK* 3	214 trees	**-1**
Port*LINK* 4	126 trees	**-1**

4.4.3 Number of heritage items along the corridor frontage (up to 50m)

This measure is used to assess in foresight the potential of heritage places having an impact on the delivery of a particular route option. Planning in the vicinity of heritage item needs to be undertaken carefully to ensure the preservation of sites. Hence heritage places, particularly higher tiered items, may have implications for maintaining the character of surrounds, encroachment from any road widening, etc. Contributory items (items within character preservation zones) were omitted, as this type of zone was assessed in Theme 1.

The data used in this assessment has been sourced from the 'Heritage Places (Point Data)' spatial layer available from Data SA, a State administered open data source. It is updated regularly by DPTI, with the data set used for this assessment current as of August 2016.

Confidence Scale Level: A

As depicted in Figure 15, the average number of State and Local Heritage Items per kilometre of route is similar for all four Port*LINK* Options. As Option 2 has the lowest number of all the routes, and impacts are likely to be lesser due to potential alignment remaining in the existing rail corridor, option 2 rates highest in this measure.

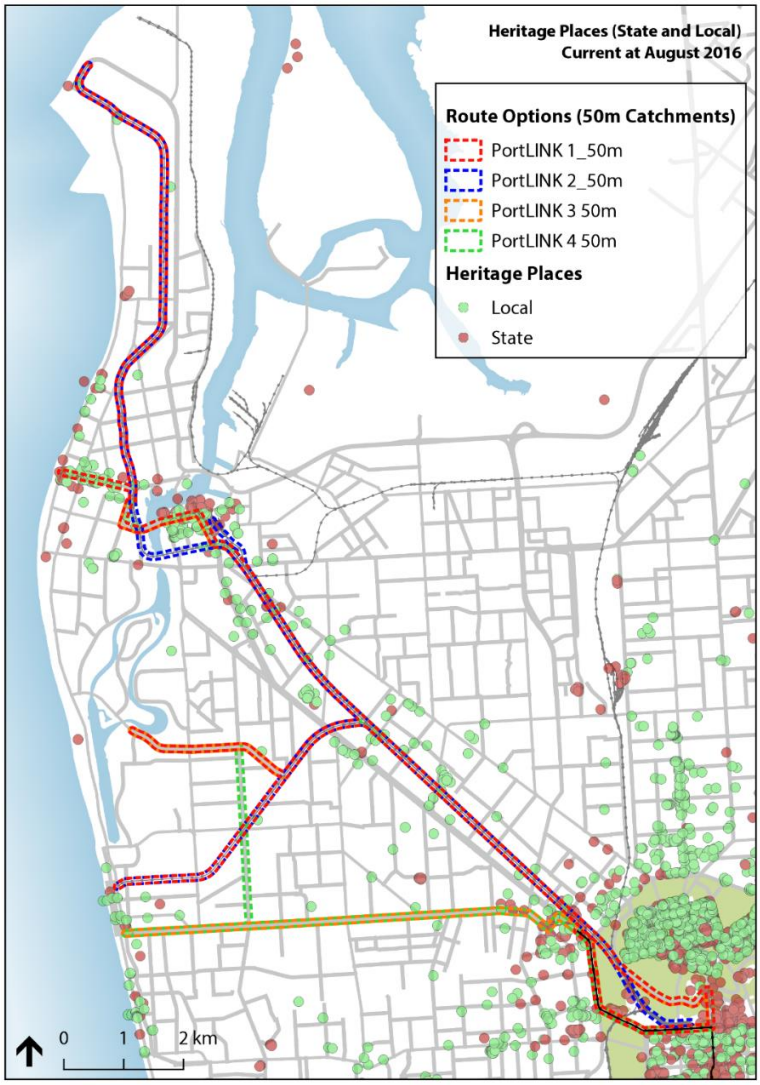


Figure 15: State and local heritage places.

Corridor Option	Summary	Score
Port*LINK* 1	Total heritage items: 83 State: 9 Local: 74 Average per km: 12.9	**-2**
Port*LINK* 2	Total heritage items: 71 State: 6 Local: 65 Average per km: 11.6	**-1**
Port*LINK* 3	Total heritage items: 86 State: 10 Local: 76 Average per km: 13.3	**-2**
Port*LINK* 4	Total heritage items: 86 State: 10 Local: 76 Average per km: 13.3	**-2**

4.5 Potential for contributions from government land

4.5.1 Amount of local and state government owned land along the corridor (within 600m)

Contributions from government owned land might include electrical sub-station locations, tram stabling and so on.

Data for this measure was acquired from DPTI. It included detail of the specific land owner and was therefore cleansed to remove government owned lands (local or state) that would be unlikely to contribute to the project in any way. These included: Aboriginal Lands Corp, Adelaide Park Lands, cemeteries, existing railway line corridors, SA Water Corp and existing water bodies (i.e. West Lakes). Schools, reserves and other community services remain in the dataset.

Confidence Scale Level: B

The Port*LINK* options with the most significant amount of government owned land within 600 metres of the potential corridor are Options 3 and 4. These two Options have the highest overall land size and number of parcels. Therefore, Options 3 and 4 rate highest for this measure.

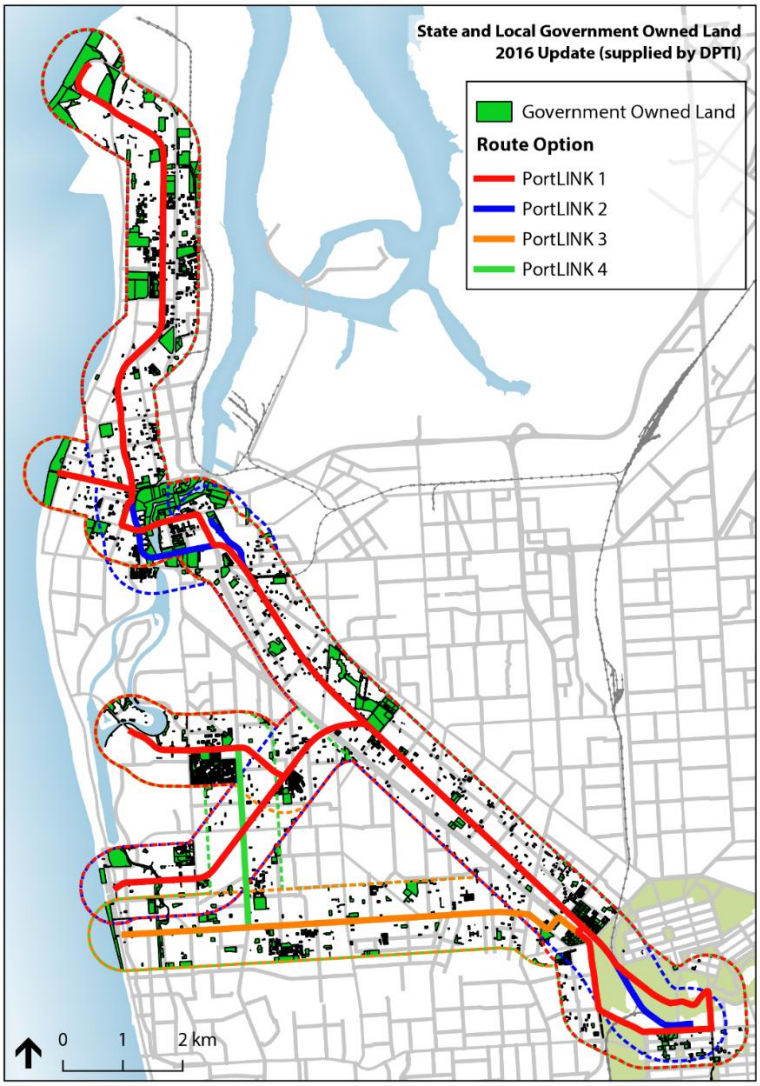


Figure 16: Parcels of State and Local Government owned land.

Corridor Option	Summary	Score
Port*LINK* 1	Amount of government owned land: 5,563,152.2 m^2 Number of parcels: 3,404 Average size: 1,634.3 m^2	**2**
Port*LINK* 2	Amount of government owned land: 4,725,226.03 m^2 Number of parcels: 2,812 Average size: 1,680.38 m^2	**1**
Port*LINK* 3	Amount of government owned land: 5,892,134.28 m^2 Number of parcels: 3,656 Average size: 1,611.63 m^2	**3**
Port*LINK* 4	Amount of government owned land: 5,816,638.31 m^2 Number of parcels: 3,479 Average size: 1,671.93 m^2	**3**

4.5.2 Measure the amount of SA Housing Trust land along the corridor (within 600m)

The data used for this measure was refined from that used in the Government Owned Land measure to show which corridors may provide greatest potential for the SA Housing Trust to renew and intensify public housing stock or sell land to allow for new private developments within a reasonable walking distance of 600m from the tram corridor.

The data was received from DPTI.

Confidence Scale Level: A

The most significant amount of SA Housing Trust owned land can be found in Port*LINK* Options 3 and 4. Option 1 is lower in this measure as it's alignment does not capture parcels along Grange Road. As Option 2 misses the same parcels as Option 1 and also does not link to West Lakes, it also misses a large number of parcels in the Seaton area. Therefore, Options 3 and 4 rate highest in this measure.

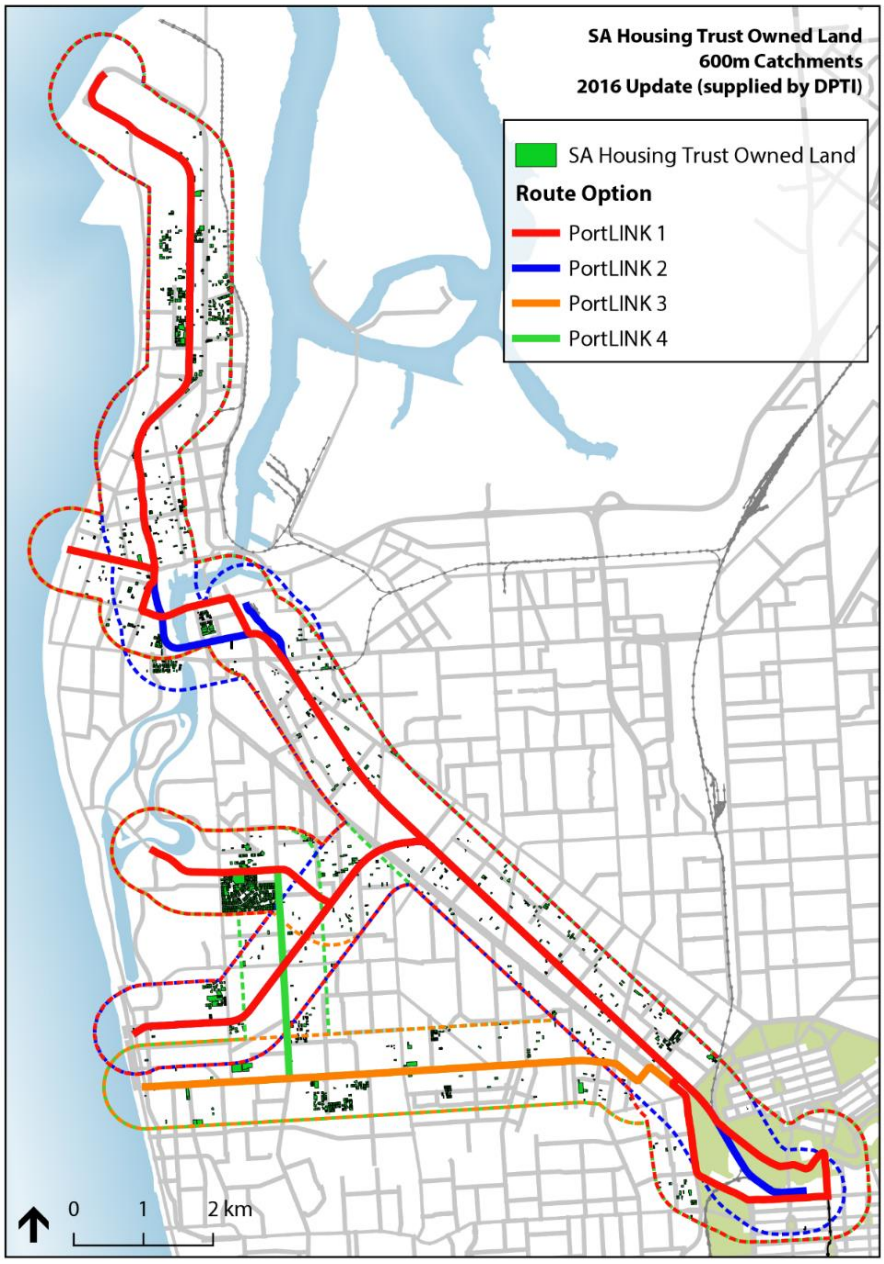


Figure 17: SA Housing Trust owned parcels.

Corridor Option	Summary	Score
Port*LINK* 1	Amount of SA Housing Trust land: 1,007,693.14 m^2 Number of parcels: 1,765 Average size: 570.93 m^2	**2**
Port*LINK* 2	Amount of SA Housing Trust land: 719,516.64 m^2 Number of parcels: 1,346 Average size: 534.56 m^2	**1**
Port*LINK* 3	Amount of SA Housing Trust land: 1,142,892.06 m^2 Number of parcels: 1,942 Average size: 588.51m^2	**3**
Port*LINK* 4	Amount of SA Housing Trust land: 1,130,570.68 m^2 Number of parcels: 1,914 Average size: 590.68 m^2	**3**

4.5.3 Amount of Urban Renewal Authority land along the corridor (within 600m)

This data was refined from that used in the Government Owned Land measure. It shows how much land is already owned by the State administered Urban Renewal Authority (Renewal SA) is within 600m of each corridor and is highly likely to be redeveloped.

The data was received from DPTI.

Confidence Scale Level: A

There are a number of Renewal SA owned properties positioned along the existing rail corridor, which is included in the route alignments of all four Port*LINK* options. Aside from this, Port*LINK* Options 2 and 4 miss out on the catchment of Renewal SA parcels in the Woodville West area. Therefore, Options 1 and 3 rate highest for this measure.

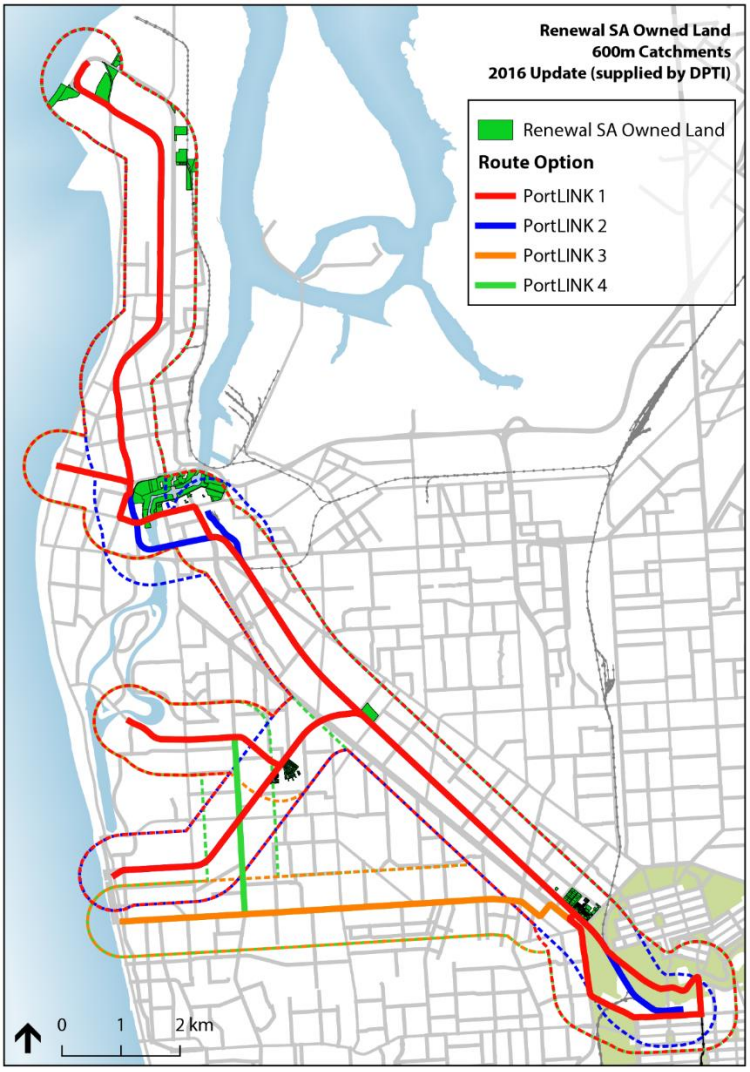


Figure 18: Parcels of Renewal SA Owned Land

Corridor Option	Summary	Score
Port*LINK* 1	Amount of Renewal SA land: 1,167,388.11 m^2 Number of parcels: 424 Average size: 2,753.27 m^2	**3**
Port*LINK* 2	Amount of Renewal SA land: 1,050,716.54 m^2 Number of parcels: 414 Average size: 2,537.96 m^2	**1**
Port*LINK* 3	Amount of Renewal SA land: 1,167,388.11 m^2 Number of parcels: 424 Average size: 2,753.27 m^2	**3**
Port*LINK* 4	Amount of Renewal SA land: 1,107,604.4 m^2 Number of parcels: 279 Average size: 3,969.91 m^2	**2**

Theme 5

Environmental sustainability.

Improving Adelaide's position as a sustainable and carbon neutral city including reduced car dependency.

infraPlan

5.1 An environment that enables walking and public transport use

5.1.1 Enables walking and public transport use

Environments that enable walking and public transport use are made up of a variety of factors including the quality of footpaths, road crossings, the street network, personal safety, shelter, visual interest and impacts from traffic. These factors were rated individually and then the total corridor scores were compared to determine an MCA score of between -1 and +1.

Port*LINK*	Port*LINK* 1	Port*LINK* 2	Port*LINK* 3	Port*LINK* 4
Good quality footpaths	1	1	0	0
Ability to cross road frequently	1	0	0	0
Fine grain street network	-1	-1	0	0
Personal safety/security/passive surveillance	0	-1	1	1
Shelter / shade	1	1	0	0
Visual interest	1	1	0	0
Minimal impact from high traffic volume, speed, noise	1	1	0	0
Total	***4***	***2***	***1***	***1***

Confidence Scale Level: D (Given that one score is determined for the entire route – the varying environments along the route do not allow for firm assessment).

Route alignments for Options 3 and 4 incorporate environments typically dominated by through traffic such as Grange and Tapleys Hill Road. As majority of Options 1 and 2 are confined to the existing rail corridor, pedestrian amenity is higher. Therefore, Options 1 and 2 rate higher in this measure.

Please note: as one score is determined for the entire route, the varying environments along the route do not allow for firm assessment.

Corridor Option	Summary	**Score**
Port*LINK* 1	Visual interest, road crossings, less impact from traffic	**1**
Port*LINK* 2	Crossings only where rail maze / crossings exist, Greenway has less passive surveillance	**1**
Port*LINK* 3	Less visual interest, shade/shelter	**0**
Port*LINK* 4	Poor visual interest, shade/shelter	**0**

5.1.2 Enables cycling

Environments that enable cycling are made up of a variety of factors including the quality of cyclist facilities, road crossings and the street network. These factors were rated individually and then the total corridor scores were compared to determine an MCA score of between -1 and +1.

Port*LINK*	Port*LINK* 1	Port*LINK* 2	Port*LINK* 3	Port*LINK* 4
High quality cycling facilities	1	1	0	-1
Ability to cross road	1	1	0	0
Fine grain street network	0	0	0	0
Total	***2***	***2***	***0***	***-1***

Confidence Scale Level: D.

Due to the existing greenway following the Outer Harbour rail corridor, Options 1 and 2 which predominantly follow this corridor score higher for this measure. As Options 3 and 4 have reduced cycling facilities they are scored lower.

Please note: as one score is determined for the entire route, the varying environments along the route do not allow for firm assessment.

Corridor Option	Summary	**Score**
Port*LINK* 1	Outer Harbour Greenway & Grange Greenway, Link to Coast Park via Semaphore Rd. Semaphore Rd has high quality cycling facilities (separated and on-road).	**1**
Port*LINK* 2	Outer Harbour Greenway & Grange Greenway, link to Inner-Harbour Shared Path via Port spur. Coarse grain as crossings only at rail mazes /crossings.	**1**
Port*LINK* 3	Grange Rd = less cycling amenity than 1 or 2. Link to Coast Park via Semaphore Rd. Semaphore Rd has high quality cycling facilities (separated and on-road).	**0**
Port*LINK* 4	Grange Rd & Tapleys Hill Rd = less cycling amenity than 1, 2 or 3.	**-1**

Appendix A: Multi-Criteria Analysis Process

The process evaluates both monetised and non-monetised project components in a transparent manner to inform decision makers on investment decisions. The tool is designed to augment the present practice of benefit cost analysis with the economic, environmental and social impacts that land use projects have upon transport patterns, and vice versa, which may otherwise be treated in an inconsistent fashion or be overlooked.

In conjunction with DPTI and Council officers, the InfraPlan team developed the MCA to consider all aspects of the Ade*LINK* project, producing 43 measures to be scored under 5 themes for each corridor option. The results are presented as standalone studies for each corridor. The outcomes of this MCA are unweighted, such is the Infrastructure Australia preference.

Purpose of the Multi-Criteria Analysis

- A MCA process will assist in evaluating the ITLUP route option, compare possible alternative routes and determine the most appropriate route (or routes) for more detailed assessment, including Design Labs.
- The MCA is a higher level process than the Design Lab to provide information to augment the Design Lab process.
- Agreed criteria to ensure transparent land use and transport outcomes are achieved in final route identification.
- The MCA is consistent with State/Federal Treasury Guidelines and information is transferable to the Business Case for funding (supports a Benefit Cost Assessment).
- Allows for a wide range of input, including professional advice and relevant data and analysis (final scores are limited by quality of this input).

The MCA accords with Item 2 of the Infrastructure Australia (IA) Business Case Template: Stage 3 Option Assessment Template (see Appendices) which only stipulates, '*Nominators should refine the long list to short list; a multi-criteria analysis (MCA) is suggested. The analysis should include consideration of:*

- *The extent to which each option addresses the problems / opportunities;*
- *The timeframe over which the option is expected to address the problem / opportunity (i.e. the duration of time for which benefits will be sustained in addressing the challenge);*
- *Economic, social and environmental impacts;*
- *Indicative capital and operational costs of the initiative; and delivery risk and challenges; and*
- *Other considerations for the initiative as appropriate.'*

The more detailed Business Case will need to determine the Base Case projects to the 'Do minimum' or 'Do nothing' scenarios which are still to be determined. However, to determine the Base Case projects, the MCA is of benefit.

How does the Multi-Criteria Analysis Work?

The Steps

1. Determine how the tool is to be applied. This may be determined by the selected projects to be compared, or by the end purpose of the comparison.
2. If applicable, assign a **Weighting Scale** in the Comparison Summary page to be applied to the assessment criteria. In this instance, results are not weighted.
3. Under each Project Assessment tab, assign a **Confidence Level** (A to E) for the relevant data for each appraisal element. In some cases, the rating for each element will be consistent across all compared projects, in others they will vary.
4. Assign a **Rating** from -3 to +3 for the project on its achievement of each appraisal element.
5. The **Comparison Summary** page allows for comparison of the projects assessed.

Confidence Level

There are two principal approaches to the confidence level – numeric or alphabetic. The numeric approach enables the confidence level to be incorporated into an indicator's overall score via multiplication. This makes for a simpler, but perhaps less transparent output, since the final summary table does not present the calculations which lead to an overall score – i.e. whether it was due to a high rating or confidence limit. Readers may find the results difficult to interpret.

An alphabetic system, on the other hand, leaves the final user of results in no doubt about the origin of a weighted score for an indicator – and automatically highlights which indicators require further clarification or supporting evidence and which are reliable. An alphabetic system with 5 grades A-E is presented below.

Confidence SCALE A-E	
A	Recent, relevant and accurate studies with appropriate detail and analysis to form a rigorous and defensible basis for the assessment. Assessment has a very high degree of confidence.
B	Substantial information – perhaps patchy in parts (date, accuracy, detail?) – but sufficient to provide an accurate assessment with a fair degree of confidence.
C	Some background information, but either dated, lacking appropriate detail or accuracy to form the basis for a firm assessment. Not suitable for a score greater than –2 or +2
D	Professional judgment within area of expertise. However, no relevant studies or data available. Not suitable for score greater than +1 or –1
E	Best guess of professional assessing outside their area of expertise, gut feel, no relevant studies or data. Not suitable basis for score greater than +1 or less than –1

A description of the nature and quality of data suggested for each appraisal element and each grade of the Confidence Scale is given in the Assessment Criteria tab. This table provides users of this tool with a clear guide to rating the available data and can be used to guide the gathering of new data to target particular areas of need.

It is important that users of the tool can indicate where a choice is based on primary evidence, recent experience in similar projects, established engineering or other physical principles etc., and where choices of ratings are based on speculation, anecdotal evidence, unsubstantiated evidence or a professional estimate, rather than actual data.

Rating

The rating scale ranges from -3 for significantly negative or unwanted outcomes to +3 for major positive outcomes. A rating is selected for each appraisal element. Confidence levels A and B have a rating scale of ±3, level C will restrict the impact rating to ±2 and confidence levels D and E restrict the impact rating to ±1. A neutral rating of zero is also available for indicators that are not expected to change as a result of development of the Project.

Rating	
+3	Major positive impacts resulting in substantial and long term improvements or enhancements of the existing environment.
+2	Moderate positive impact – possibly of short, medium or longer term duration. Positive outcome may be in terms of new opportunities, and outcomes of enhancement or improvement.
+1	Minimal positive impact, possibly only lasting over the short term. May be confined to a limited area.
0	Neutral – no discernible or predicted positive or negative impact.
-1	Minimal negative impact - probably short term, able to be managed or mitigated, and does not cause substantial detrimental effects. May be confined to a small area.
-2	Moderate negative impact. Impacts may be short, medium or long term and most likely respond to management actions
-3	Major negative impacts with serious, long term and possibly irreversible effects leading to serious damage, degradation or deterioration of the physical, economic or social environment. Require a major re-scope of concept, design, location, justification, or require major commitment to extensive management strategies to mitigate the effect.

Comparison Summary

Output from the project assessments is given on the Comparison Summary sheet, where the overall ratings of the projects can be compared.