



Prepared for



Australian Government
Department of Infrastructure,
Regional Development and Cities

Modelling for the Federal Infrastructure
Investment Program 2018-19

Outputs from the updated 2031 Model of South East Queensland

October 2018

Modelling for the Federal Infrastructure Investment Program 2018-19

FINAL

Outputs from the updated 2031 Model of South East Queensland

Project No. 18-037

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Contents

Contents	3
List of Figures	4
List of Tables	4
1. Introduction	5
1.1 Timeline of Zenith modelling for the Department.....	5
2. Modelling results.....	7
2.1 Impacts on the road network	7
2.2 Impacts on the public transport network	17
Rail.....	17
Bus.....	20
Light rail.....	23
Appendix A: Model assumptions	27
Appendix B: About Level of Service	37
Appendix C: Additional Maps	39
Appendix D: PM maps.....	46



List of Figures

Figure 2-1: 2031 traffic level of service Greater Brisbane, without 2018-19 Budget projects, AM peak	9
Figure 2-2: 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects AM peak.....	10
Figure 2-3: 2031 traffic level of service Gold Coast, without 2018-19 Budget projects AM peak.....	12
Figure 2-4: 2031 traffic level of service Gold Coast, with 2018-19 Budget projects AM peak	13
Figure 2-5: 2031 traffic level of service Sunshine Coast, without 2018-19 Budget projects AM peak.....	14
Figure 2-6: 2031 traffic level of service Sunshine Coast, with 2018-19 Budget projects AM peak	15
Figure 2-7: 2031 traffic speeds (% freeflow), with 2018-19 Budget projects AM peak.....	16
Figure 2-8: 2031 rail level of service, without 2018-19 Budget projects, AM peak.....	18
Figure 2-9: 2031 rail level of service, with 2018-19 Budget projects, AM peak	19
Figure 2-10: 2031 bus level of service, without 2018-19 Budget projects, AM peak.....	21
Figure 2-11: 2031 bus level of service, with 2018-19 Budget projects, AM peak.....	22
Figure 2-12: 2031 tram level of service, without 2018-19 Budget projects, AM peak	24
Figure 2-13: 2031 tram level of service, AM peak, with 2018-19 Budget projects, AM peak.....	24
Appendix Figure A-1 : Additional Projects in Brisbane*	29
Appendix Figure A-2: Brisbane Metro*	30
Appendix Figure A-3: Additional Projects in Sunshine Coast	31
Appendix Figure A-4: Additional Projects in Gold Coast.....	32
Appendix Figure C-1: Brisbane inner 2031 traffic level of service Greater Brisbane, without 2018-19 Budget projects, AM peak	40
Appendix Figure C-2: Brisbane inner 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects, AM peak	41
Appendix Figure C-3: Chermside 2031 traffic level of service Greater Brisbane, without 2018-19 Budget projects, AM peak	42
Appendix Figure C-4: Chermside 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects, AM peak	43
Appendix Figure C-5: Beerburum 2031 traffic level of service Greater Brisbane, without 2018-19 Budget projects, AM peak	44
Appendix Figure C-6: Beerburum 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects, AM peak	45
Appendix Figure C-7: 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects PM peak.....	46
Appendix Figure C-8: 2031 traffic level of service Gold Coast, with 2018-19 Budget projects PM peak.....	47
Appendix Figure C-9: 2031 traffic level of service Sunshine Coast, with 2018-19 Budget projects PM peak.....	48
Appendix Figure C-10: 2031 traffic speeds (% freeflow), with 2018-19 Budget projects PM peak	49
Appendix Figure C-11: 2031 rail level of service, with 2018-19 Budget projects PM peak.....	50
Appendix Figure C-12: 2031 bus level of service, with 2018-19 Budget projects PM peak.....	51
Appendix Figure C-13: 2031 tram level of service, with 2018-19 Budget projects PM peak	52
Appendix Figure C-14: Brisbane inner 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects, PM peak	53
Appendix Figure C-15: Chermside 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects, PM peak	54
Appendix Figure C-6: Beerburum 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects, PM peak	55

List of Tables

Table 1-1: Chronology of modelling work.....	5
Table 2-1: Level of service categories for the road network.....	7
Table 2-2: Changes in Level of Service on major corridors (AM Peak) – Greater Brisbane.....	7
Table 2-3: Road network performance in vicinity of 2018-19 projects (AM peak) – Gold Coast and Sunshine Coast ..	11
Table 2-4: Level of service categories for metropolitan rail services.....	17
Table 2-5: Level of service categories for bus services	20
Table 2-6: Level of service categories for light rail services	23
Table 2-7: Road network corridor performance – most congested roads (AM peak).....	25



1. Introduction

The Australian Government has recently announced several new projects as a part of the *Strengthening Australia's cities and regions* strategy, which were included in the 2018-19 Federal Budget. For South East Queensland (SEQ), this included:

- M1 Pacific Motorway – Eight Mile Plains to Daisy Hill;
- M1 Pacific Motorway – Varsity Lakes to Tugun;
- Bruce Highway – Pine River to Caloundra;
- Cunningham Highway – Yamanto to Ebenezer (Amberley Interchange);
- Brisbane Metro; and
- Beerburrum to Nambour Rail Upgrade.

We understand the Department of Infrastructure, Regional Development and Cities (the Department) needs insight into how these projects would impact the performance of the transport network in SEQ. This report contains model forecasts for 2031, which includes the projects in the list above. Some additional projects committed by the Queensland State Government have also been included in the model networks. The full list of network assumptions is included in Appendix A:

1.1 Timeline of Zenith modelling for the Department

VLC has undertaken multiple modelling tasks, analysis tasks and model upgrades for the Department over the past several years. These tasks have been summarised in Table 1-1.

Table 1-1: Chronology of modelling work

Models	Application
1. Zenith – model with a 2011 base year, no PT crowding	<p><u>2015 analysis: 'Deficiency reports'</u></p> <p>In mid-2014, VLC was engaged by the Department to undertake a transport network analysis for Sydney, Melbourne, Adelaide, Perth and SEQ. The purpose of this analysis was to assess the performance of each city's transport network in 2011 and in the future (2031). VLC examined the extent to which the actions and infrastructure initiatives proposed by state governments at that time were likely to address future transport needs. Modelling assumptions for 2031 used policy documents current in 2014/15.</p> <p><u>2016 analysis: 'Modelling and analysis reports'</u></p> <p>In 2016, the Department commissioned VLC to undertake further transport analysis work using the modelling completed for the deficiency reports. This work included more detailed investigation into the transport network performance of specific 'sub-regions' in each city. It also looked at specific road and rail corridors in more detail. The Sydney report was drafted internally by the Department with the assistance of PwC, while VLC prepared reports for Melbourne, Perth, Adelaide and SEQ.</p>
2. Zenith – model with a 2011 base year, recalibrated with PT crowding	<p><u>2017 analysis: 'Crowding vs. no crowding reports'</u></p> <p>To assist the Department to understand the impact of running models with and without public transport capacity constraints, VLC prepared a series of brief reports. The modelling scenarios in these reports were identical, except that one scenario had been run with public transport crowding enabled and the other without.</p>



Models	Application
3. Zenith – 2016 base year, with PT crowding	<p><u>2018 model updates</u></p> <p>Models were updated to a 2016 base year. Key changes included:</p> <ul style="list-style-type: none"> • <i>Updated 2016 population and employment:</i> these reflect the 2016 Census. Note that 2031 forecasts have remained unchanged. • <i>Parking charges in the Gold Coast:</i> Parking charges have been applied to the Gold Coast. VLC had difficulty validating the Gold Coast Light Rail service, which has been completed since 2011. A more detailed investigation of pay parking areas in the Gold Coast highlighted the need for parking charge assumptions. <p>The results described in this report use this model.</p>

It is important to note that, while all forecasts previously provided to the Department used earlier versions of Zenith (i.e. had a 2011 base year), modelling in this report uses a new model version with a 2016 base year. For this reason, results in this report are not directly comparable to previous forecasts.



2. Modelling results

2.1 Impacts on the road network

Table 2-2 highlights the changes in Level of Service (LoS) for the major corridors in the Greater Brisbane region with and without the 2018/19 projects. LoS categories used for this analysis are defined as follows:

Table 2-1: Level of service categories for the road network

Level of Service		Volume/ Capacity Ratio		
		Motorway	Arterial	Local
A	Drivers travel at desired speed, and manoeuvre freely, experiencing no delay due to other traffic	<0.50	<0.40	<0.35
B	Drivers will incur occasional minor delays and restrictions to manoeuvre due to other traffic	0.50	0.40	0.35
C	Drivers will experience interrupted travel, with minor delays and stops, but with network operating efficiently providing predictable travel times	0.65	0.60	0.50
D	Drivers will experience occasional major delays, with variable travel times due to conflicting traffic and volumes approaching capacity	0.85	0.75	0.65
E	Drivers will experience frequent major delays, with volumes at or exceeding capacity for short periods, unpredictable travel times	1.00	0.90	0.80
F	Drivers will experience severe congestion and delays, with volumes exceeding capacity for long periods, strong influence on route choice	1.15	1.05	0.95
F*	<i>This is an additional level of service category, proposed by VLC uniquely for this analysis.</i>	1.30	1.20	1.10

See Appendix B for a more detailed explanation of these categories.

Table 2-2: Changes in Level of Service on major corridors (AM Peak) – Greater Brisbane

Project	2031 AM Peak LoS		Commentary
	Without budget projects	With budget projects	
Pacific Motorway – Eight Mile Plains to Daisy Hill	F*	F	<ul style="list-style-type: none"> • The Pacific Motorway, which has been widened south of the Gateway Motorway to Loganlea Road, offers a slightly better level of service through this section, improving from F* to F along the most congested stretch. • Level of service is marginally worse on the Pacific Motorway in areas south of the upgrade. This is likely due to



2031 AM Peak LoS			
Project	Without budget projects	With budget projects	Commentary
			additional traffic using the motorway due to the improved travel times offered by the widened section.
Cunningham Highway, Yamanto to Ebenezer (Amberley Interchange)	F*/F	C/B	• Additional capacity offered by the service road materially improves level of service on this section of road.
Gateway Motorway	D/C	C/A	• The section of the Gateway Motorway that was widened as a part of the Logan Enhancement Project offers a better level of service, improving from D (northbound) and C (southbound) to C (northbound) and A (southbound) in the updated 2031 scenario.

Figure 2-1 shows level of service on the road network in Greater Brisbane 2031 without the 2018-19 projects, while Figure 2-2 shows the same for the updated modelling. More detailed maps of the same are provided in Appendix C:. The patterns of congestion observed in the earlier modelling largely remain. Key consistencies include:

- High traffic volumes on major freeways lead to poor levels of service, including on the Ipswich Motorway, Centenary Highway, Pacific Motorway.
- The Gateway Motorway is the least congested Motorway.

Arterial road networks in areas on the urban fringe are under pressure, which is likely due to the large population growth forecast in these areas.

Results for the PM peak are shown in Appendix D: again showing similar patterns of congestion (except network pressures emerge in the reverse direction of travel to the AM peak). Overall congestion is slightly less pronounced in the PM peak than in the AM peak. This is due to less concentrated demand, with more staggered travel times in the afternoon and evening compared with the morning.



Figure 2-1: 2031 traffic level of service Greater Brisbane, without 2018-19 Budget projects, AM peak

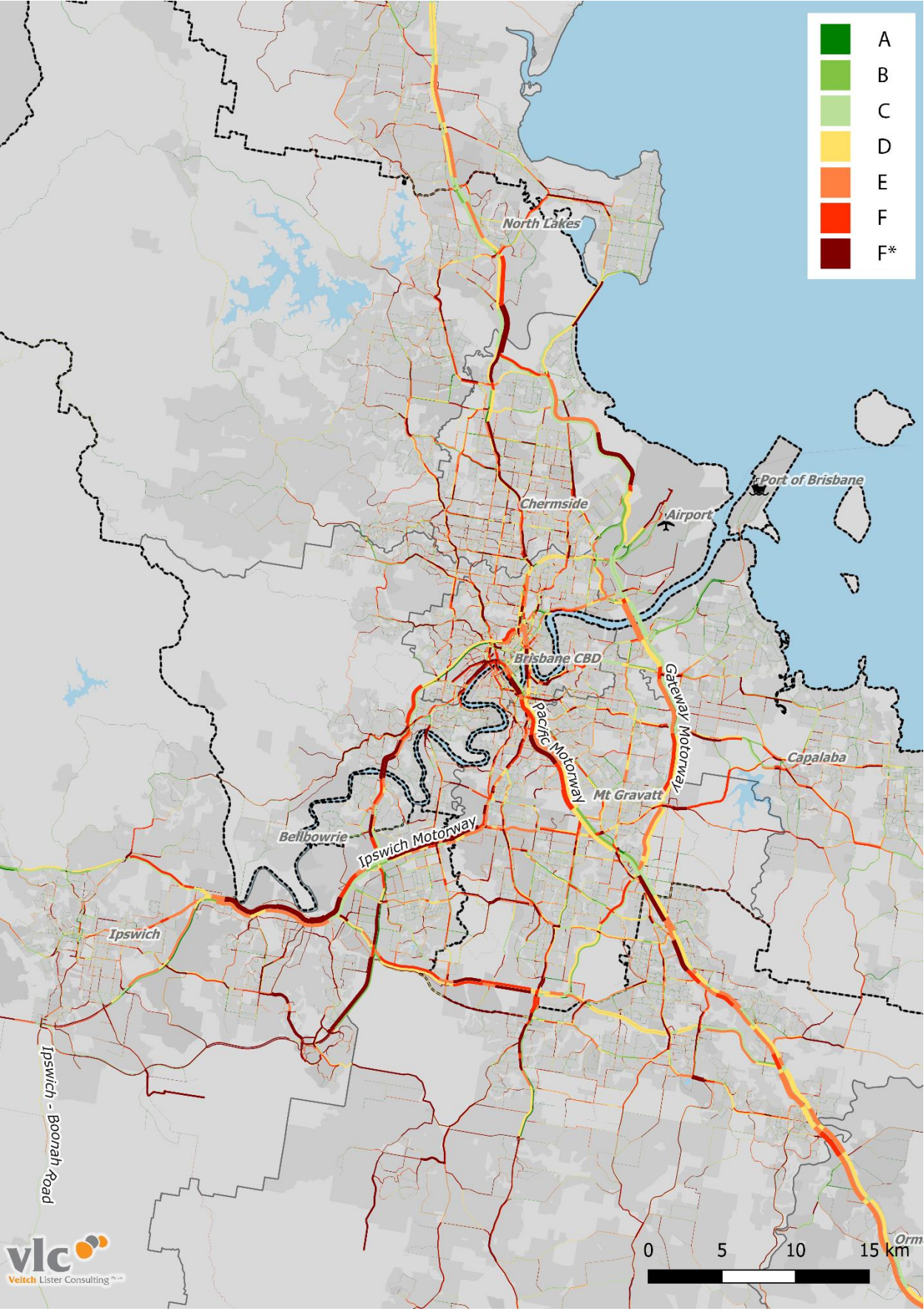




Figure 2-2: 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects AM peak

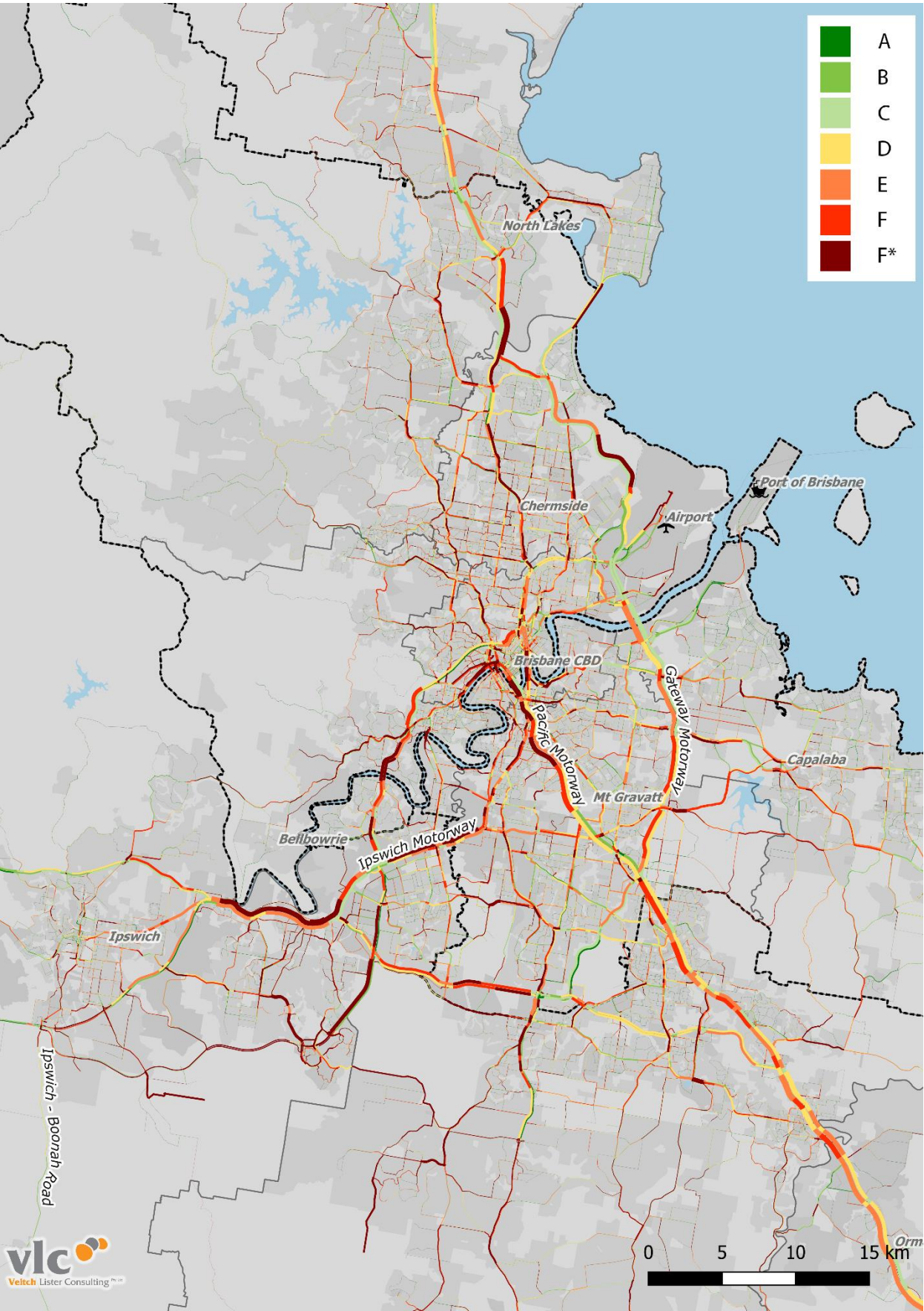




Table 2-3 highlights the changes in Level of Service (LoS) for the major corridors in the Gold Coast and Sunshine Coast regions with and without the 2018/19 projects.

Table 2-3: Road network performance in vicinity of 2018-19 projects (AM peak) – Gold Coast and Sunshine Coast

Project	2031 AM Peak LoS		Commentary
	Without budget projects	With budget projects	
Bruce Hwy, Pine River to Caloundra	B	A	<ul style="list-style-type: none"> • There are very few pinch points on Sunshine Coast road network.
Pacific Motorway – Varsity Lakes to Tugun	F*	E	<ul style="list-style-type: none"> • Widening has a clear impact on the performance of the Pacific motorway in the Gold Coast, with the level of service for the most congested section improving from F* to E in the AM peak. • General decongestion is expected on the Pacific Motorway in the Gold Coast. This is likely due to a mode shift to public transport as a result of the parking charges (see Table 1-1: Chronology of modelling work)

Figure 2.3 and Figure 2.4 show traffic level of service for Gold Coast without and with the 2018-19 projects respectively, while Figure 2.5 and Figure 2.6 show the same for the Sunshine Coast.



Figure 2-3: 2031 traffic level of service Gold Coast, without 2018-19 Budget projects AM peak

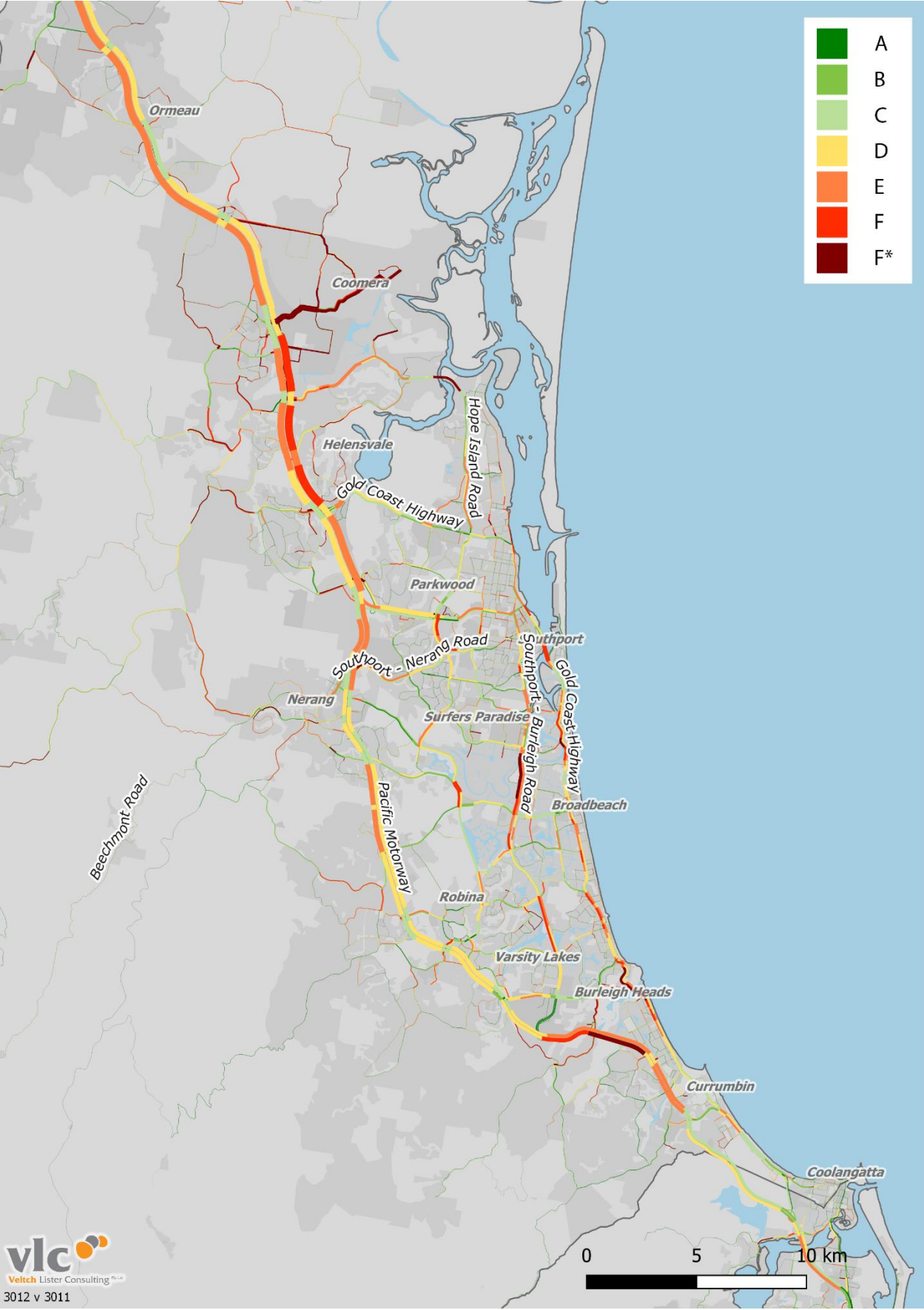




Figure 2-4: 2031 traffic level of service Gold Coast, with 2018-19 Budget projects AM peak

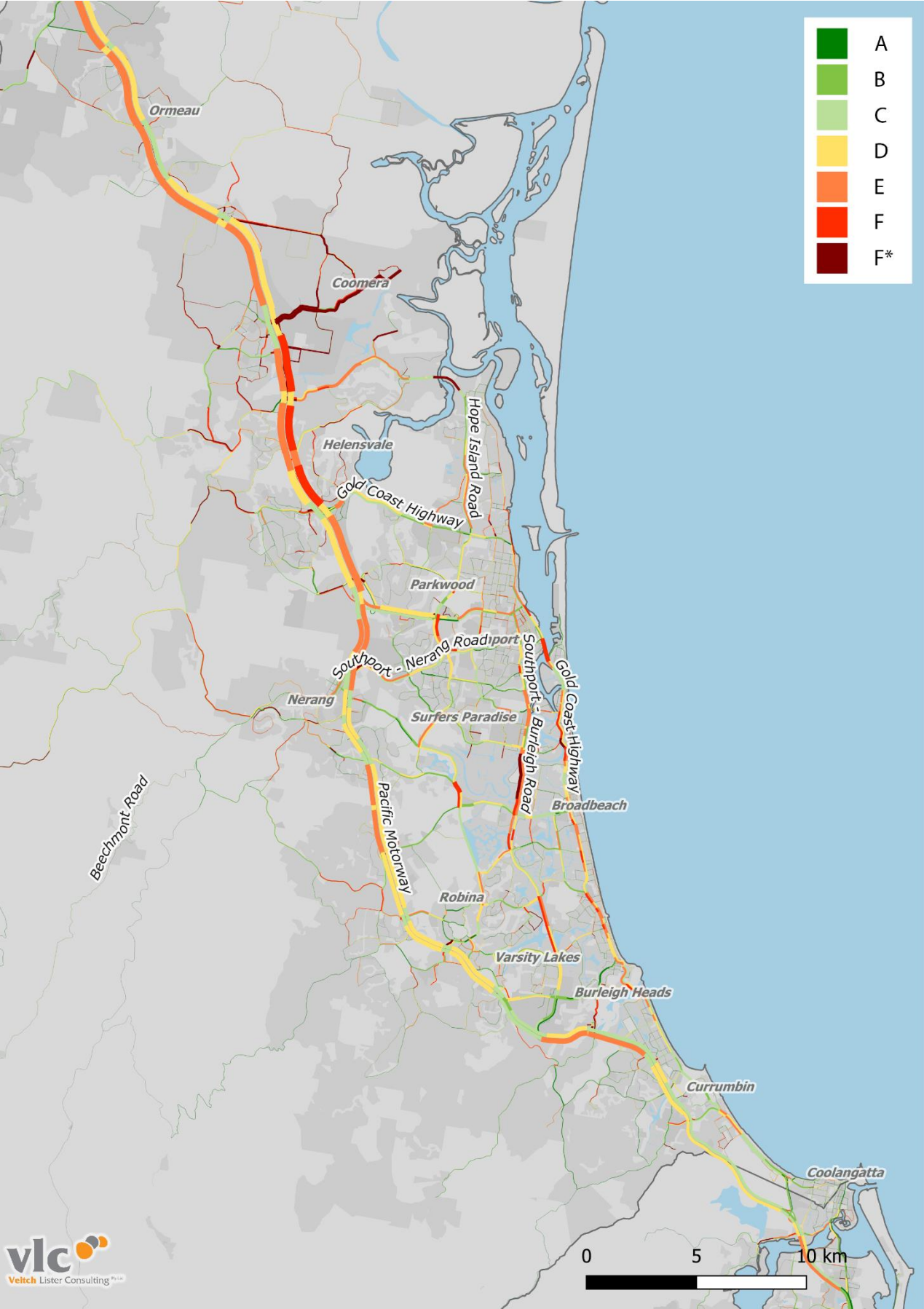




Figure 2-5: 2031 traffic level of service Sunshine Coast, without 2018-19 Budget projects AM peak

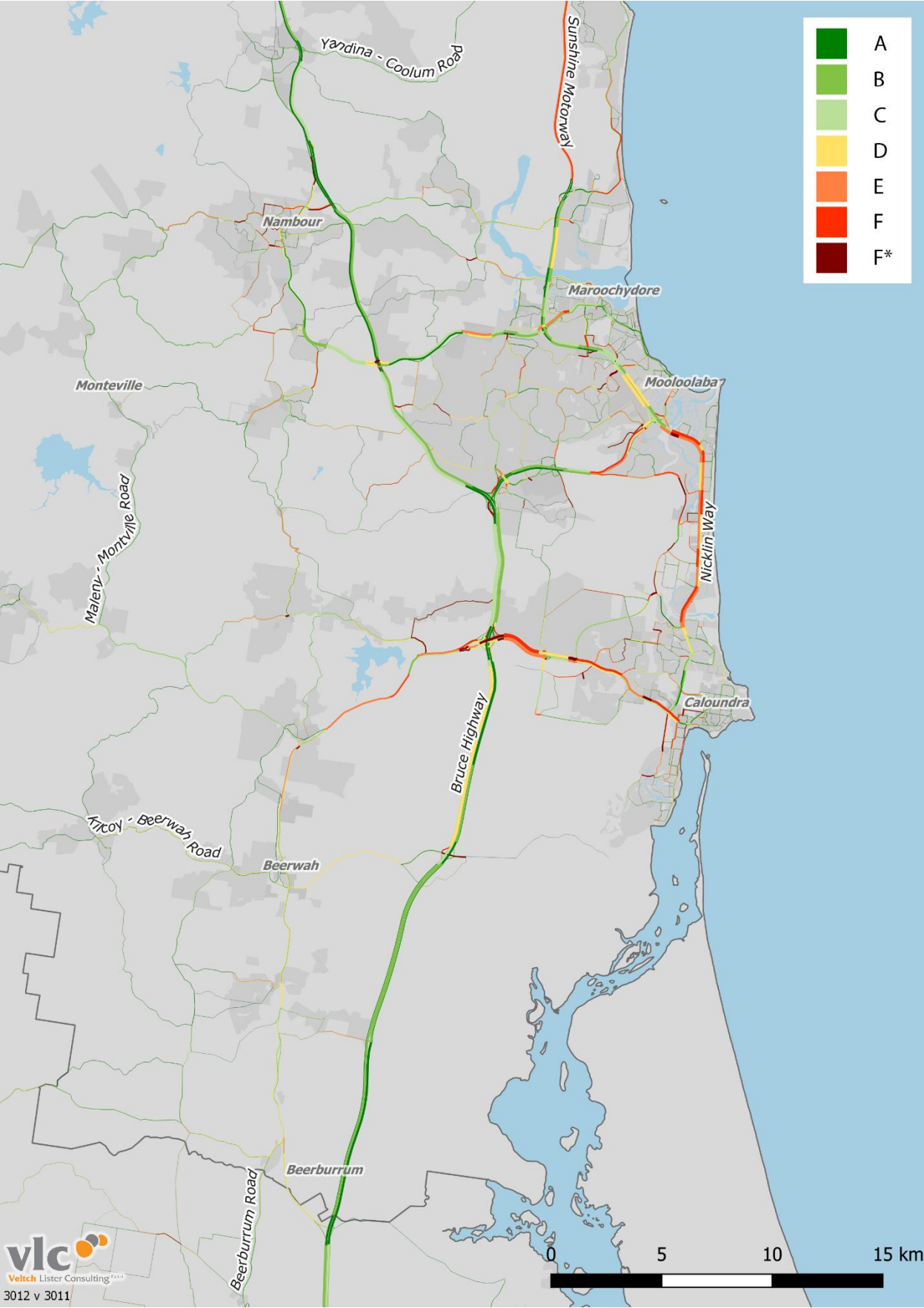




Figure 2-6: 2031 traffic level of service Sunshine Coast, with 2018-19 Budget projects AM peak

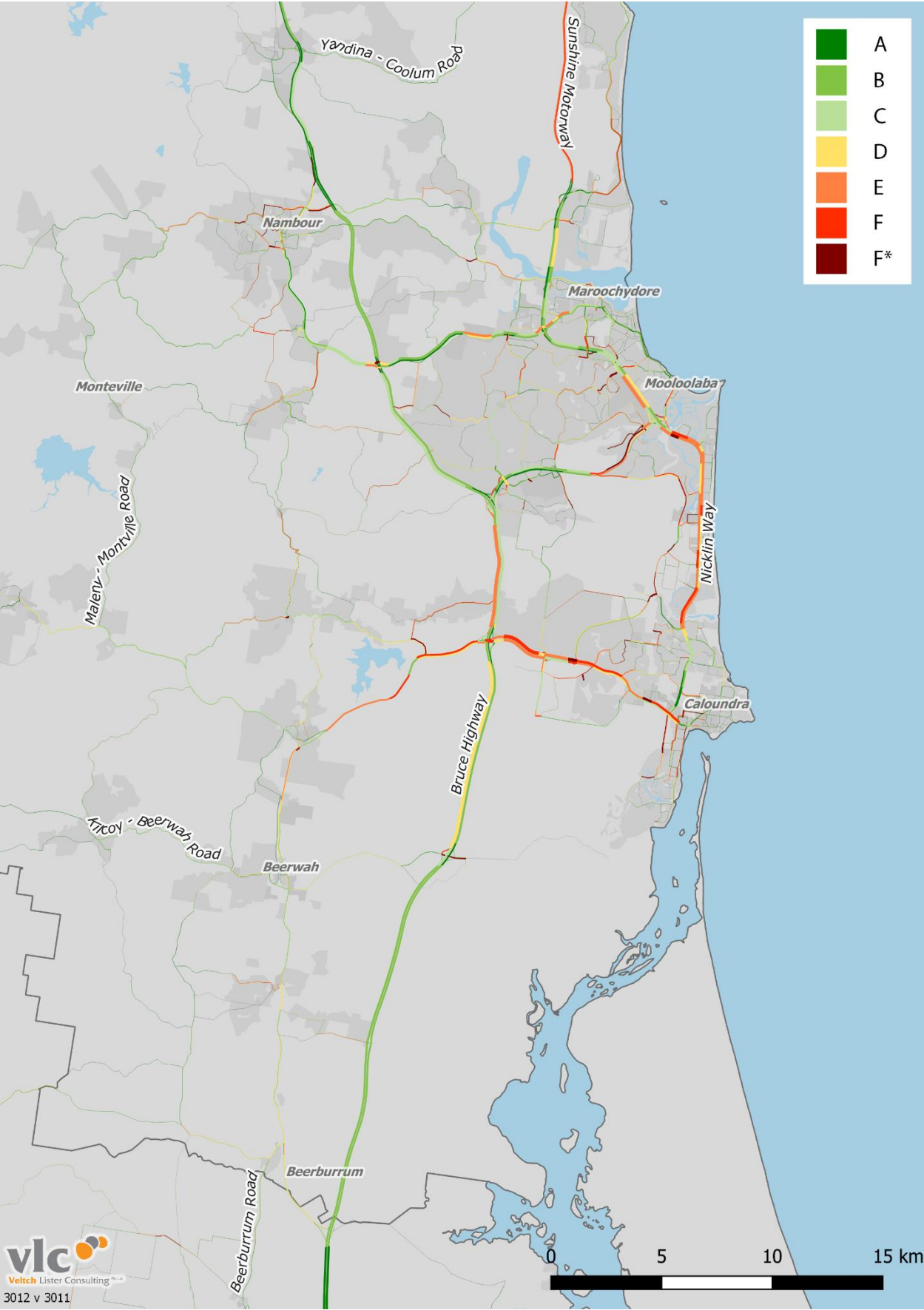
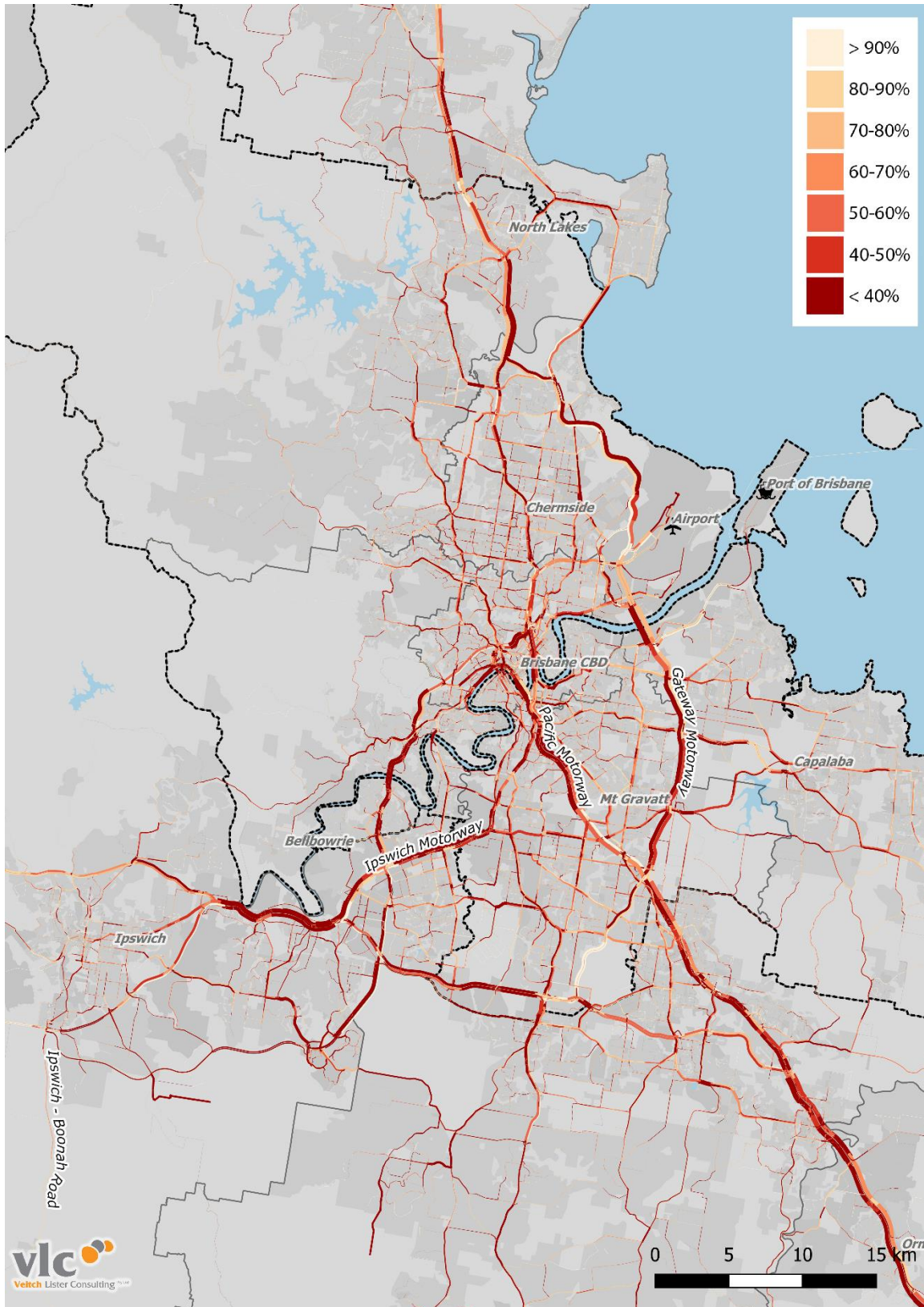




Figure 2-7 shows the travel speeds on the road network as a percentage of the uncongested 'freeflow speed', where the darker the link the slower the average travel speed. There is a clear relationship between travel speed and level of service, with the slowest links in Figure 2-7 closely mirroring the most congested links in Figure 2-2.

Figure 2-7: 2031 traffic speeds (% freeflow), with 2018-19 Budget projects AM peak





2.2 Impacts on the public transport network

Rail

Figure 2-8 shows level of service on the rail network in 2031 without the 2018-19 projects, while Figure 2-9 shows the same for the updated modelling. Level of service categories for rail are defined in Table 2-4 below.

Table 2-4: Level of service categories for metropolitan rail services

Level of Service	Rail Service Condition Description	Load Factor Relative to Crush Capacity	
		2011	2031
A	No passenger need sit next to another	0.0 - 0.2	0.0 - 0.17
B	All passengers can sit	0.2 - 0.4	0.17 - 0.34
C	Passengers can sit or stand comfortably	0.4 – 0.6	0.34 – 0.6
D	Comfortable standee load for design	0.6 – 0.72	0.6 – 0.73
E	Maximum scheduled load	0.72 - 1.0	0.73 - 1.0
F	Crush load	> 1.0	> 1.0

Source: Adapted from Li and Hensher (2012) and Public Transport Victoria (2012).

The level of service offered by the rail network is generally good in both 2031 scenarios. The 2018/19 projects will not have a significant impact on rail performance hence the relative similarity in performance between the scenarios.



Figure 2-8: 2031 rail level of service, without 2018-19 Budget projects, AM peak

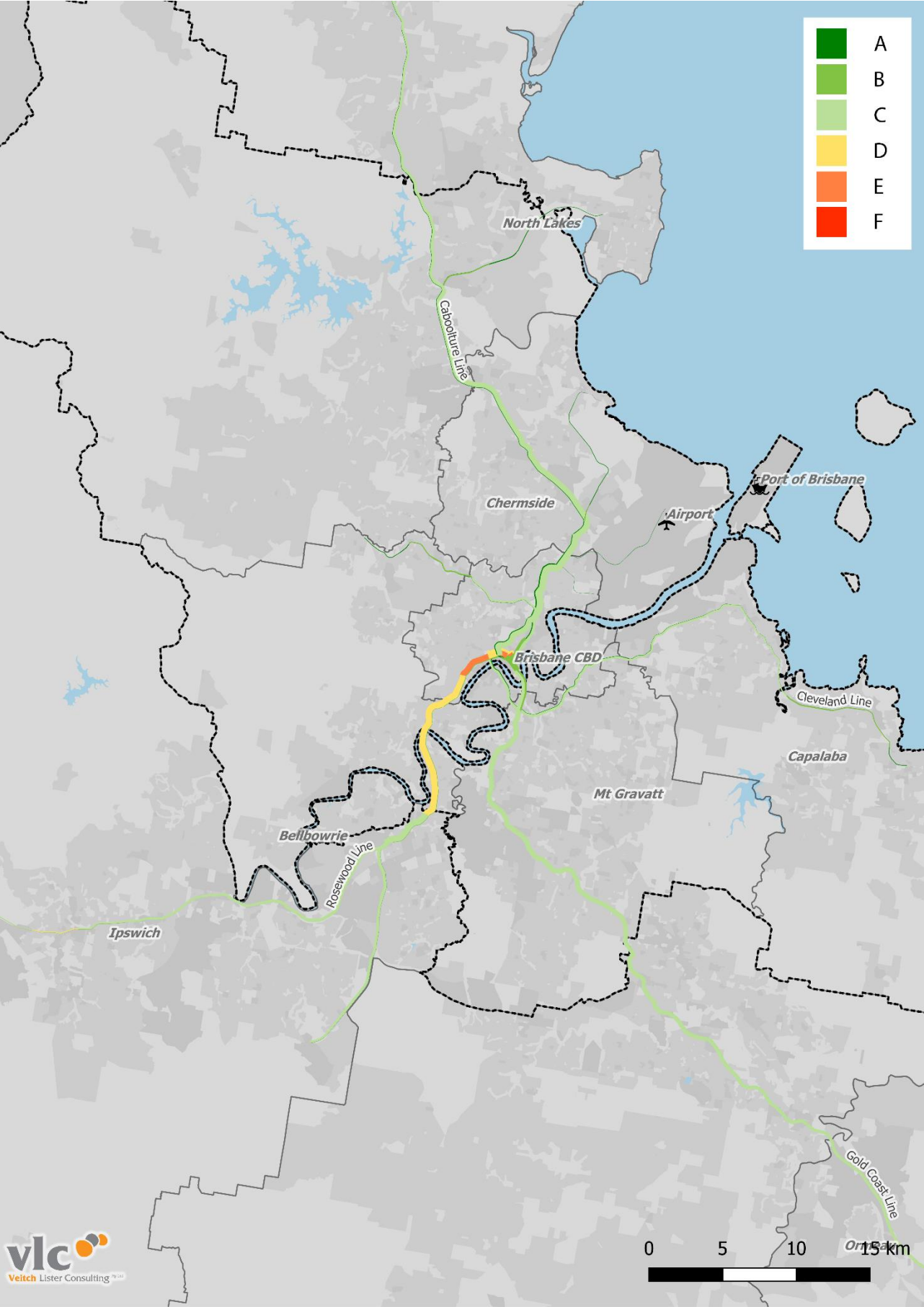
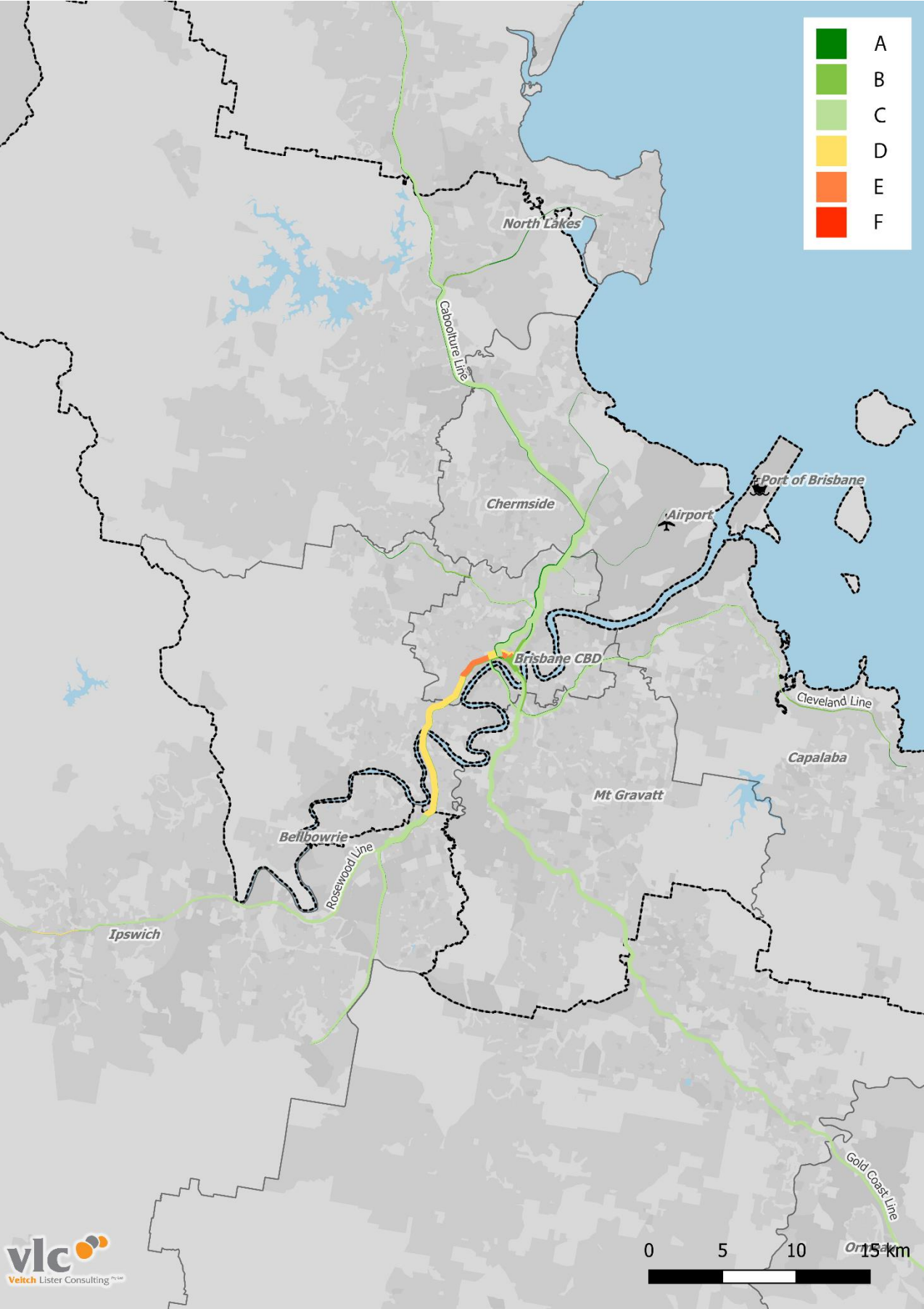




Figure 2-9: 2031 rail level of service, with 2018-19 Budget projects, AM peak





Bus

Figure 2-10 shows level of service on the bus network in 2031 without the 2018-19 projects, while Figure 2-11 shows the same for the updated modelling. Level of service categories for bus are defined in Table 2-5 below.

Table 2-5: Level of service categories for bus services

Level of Service	Bus Service Condition Description	Load Factor Relative to Seating Capacity
A	No passenger need sit next to another	0.0 - 0.5
B	Passengers can choose where to sit	0.5 - 0.75
C	All passengers can sit	0.75 - 1.0
D	Comfortable standee load for design	1.0 - 1.1
E	Maximum scheduled load	1.1 - 1.2
F	Crush load	> 1.2

Source: Adapted from Li and Hensher (2012) and Public Transport Victoria (2012).

As can be seen there is a slight improvement in LoS in Brisbane CBD arising from the Brisbane Metro project in the 2018/19 project scenario.



Figure 2-10: 2031 bus level of service, without 2018-19 Budget projects, AM peak

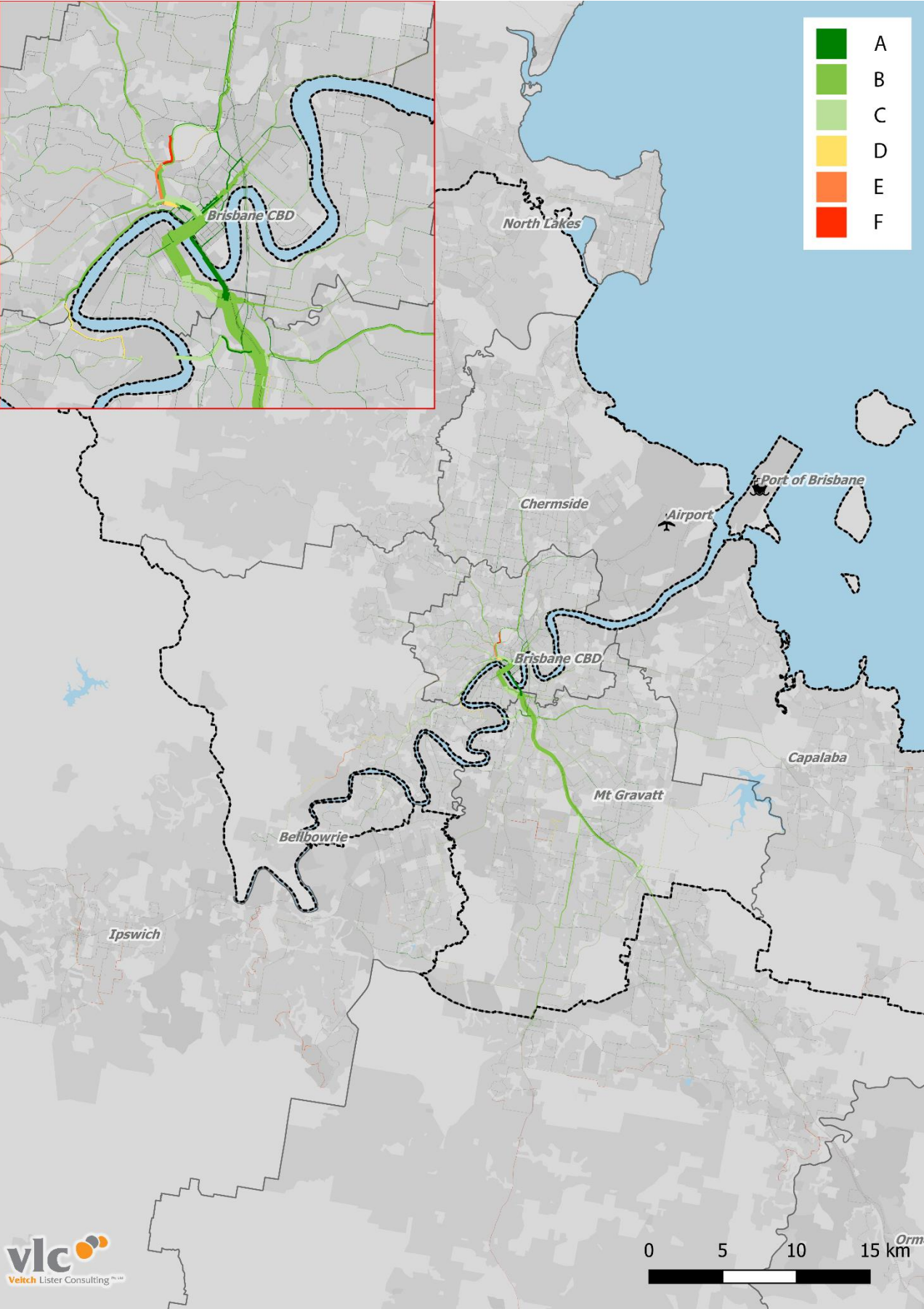
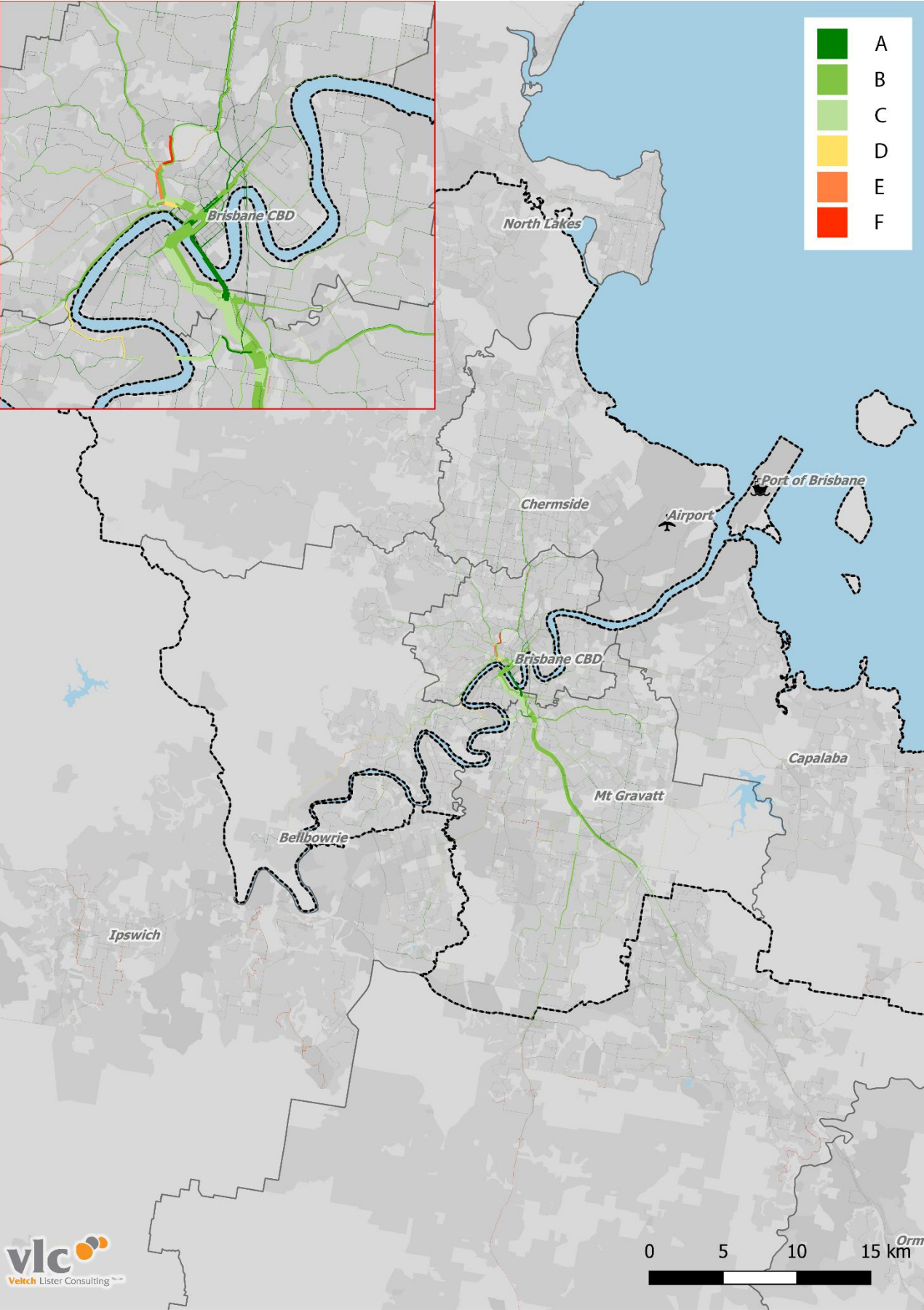




Figure 2-11: 2031 bus level of service, with 2018-19 Budget projects, AM peak





Light rail

Figure 2-12 shows level of service on the Gold Coast light rail in 2031 without the 2018-19 projects, while Figure 2-13 shows the same for the updated modelling. Level of service categories for light rail are defined in Table 2-6 below. Both scenarios offer good LoS for passengers.

Table 2-6: Level of service categories for light rail services

Level of Service	Light Rail Service Condition Description	Load Factor Relative to Seating Capacity
A	No passenger need sit next to another	0.0 - 0.16
B	Passengers can choose where to sit	0.17 - 0.25
C	All passengers can sit	0.26 – 0.33
D	Comfortable standee load for design	0.34 - 0.79
E	Maximum scheduled load	08 - 1.0
F	Crush load	> 1.0

Source: Adapted from Li and Hensher (2012) and Public Transport Victoria (2012).



Figure 2-12: 2031 tram level of service, without 2018-19 Budget projects, AM peak

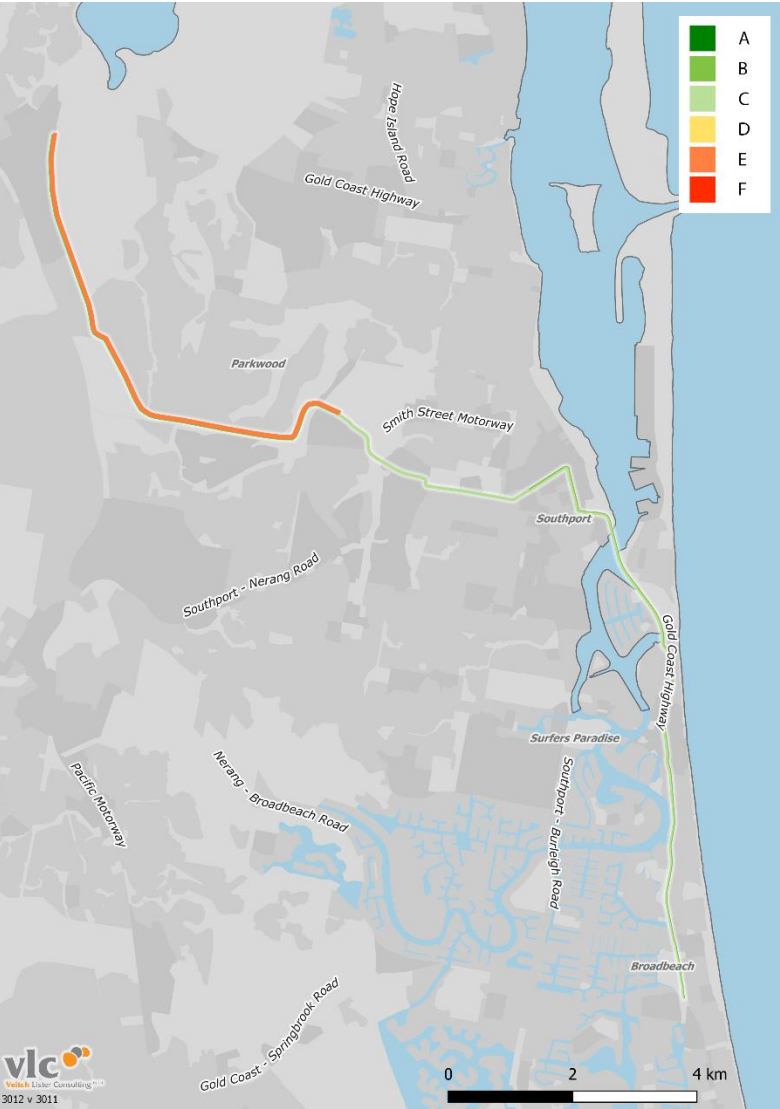


Figure 2-13: 2031 tram level of service, AM peak, with 2018-19 Budget projects, AM peak

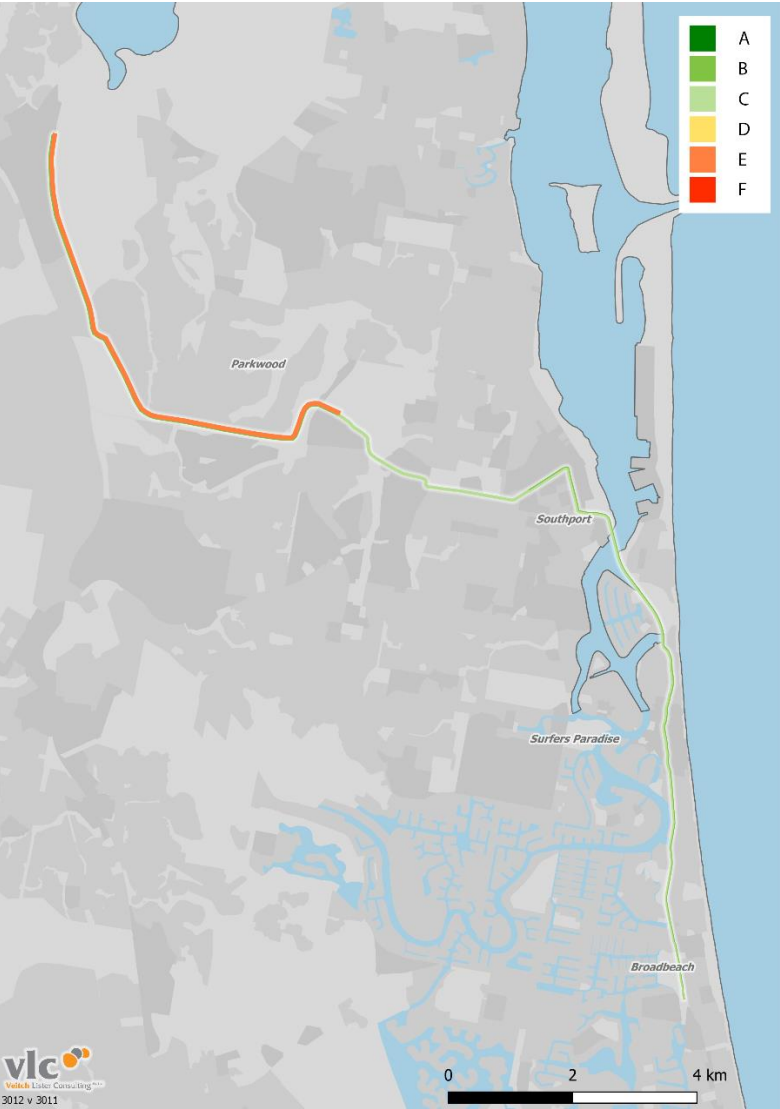




Table 2-7 outlines the most congested sections of road in the Greater Brisbane area.

Table 2-7: Road network corridor performance – most congested roads (AM peak)

Corridor	Worst performing section(s)	2031 AM Peak LoS		Commentary
		Without budget projects	with budget projects	
Gympie Arterial Road	Linkfield Road to Airport Link	F*	F*	<ul style="list-style-type: none"> •Gympie Road is highly congested for extended sections in the southbound direction •LoS does not improve beyond F south of Linkfield Road
Ipswich Motorway	Ipswich to Logan Motorway	F*	F*	<ul style="list-style-type: none"> •The Ipswich Motorway in the peak direction (northbound) is under significant pressure for most of its length •The highest volume section (between the Cunningham / Warrego Highway and the Logan Motorway interchange) is also the worst performing section. •Section between Oxley Road and Ipswich Road also deteriorates to LoS F*
Ipswich Road	Beaudesert Road to Ipswich Motorway	F/F*	F/F*	<ul style="list-style-type: none"> •Multiple bottlenecks are observed along the Ipswich Road corridor northbound. •Congested sections become worse further north in the morning peak – particularly north of Beaudesert Road •The counterpeak direction is also congested in the same section (Pacific Motorway to Beaudesert Road)
Centenary Highway	Cunningham Highway to Logan Motorway Brisbane River to Western Freeway	F*	F*	<ul style="list-style-type: none"> •Very congested are found in the growth areas around Springfield, showing LoS F* for most sections south of the Logan Motorway •The road is still generally congested between the Logan Motorway and Ipswich Motorway, but deteriorates further north of the Brisbane River



Corridor	Worst performing section(s)	2031 AM Peak LoS		Commentary
		Without budget projects	with budget projects	
Logan Motorway	Mt Lindesay Highway to Centenary Highway	F*	F*	<ul style="list-style-type: none"> • In the worst performing section (Mt Lindesay Highway to Centenary Highway), the eastbound direction has a slightly lower LoS than the westbound direction
Beaudesert Road	Logan Motorway to Learoyd Road	F*	F*	<ul style="list-style-type: none"> • Sections south of Learoyd Road are highly congested in the northbound direction
Mt Lindesay Highway	Logan Motorway to Green Road	F*	F*	<ul style="list-style-type: none"> • Between Green Road and Logan Motorway (northbound) some sections operate at LoS F* • The southbound direction experiences some bottlenecks between Browns Plain Road and Logan Motorway, but little congestion elsewhere



Appendix A: Model assumptions

The model assumptions underpinning the scenarios documented in this report are summarised in this section. These assumptions pertain to the major improvements to freeways, highways, arterial and local roads, as well as to the public transport network.

A.1 Network updates

Contained herewith are the descriptions of the additional projects included in the 2031 scenario year for the SEQ model.

There are two project categories contained in this list. These are:

1. Projects identified in the recently released *Strengthening Australia's cities and regions* strategy, specifically projects identified as part of the Australian Government's ten-year Infrastructure Investment Program.
2. Other recently committed projects. These have either been identified in the 2018-19 Queensland State Budget or have been fully funded from other sources.

Note that other support projects have been included in the modelling, where these form part of a 'package' of works that will be delivered together. These support projects are also included in the descriptions below.

A.1.1 Brisbane (Appendix Figure A-1, Appendix Figure A-2)

Strengthening Australia's cities and regions

1. **Brisbane Metro** – Construction of new underground busway station at South Bank, and a new busway tunnel under Adelaide Street, with associated intersection re-configuration at the Victoria Bridge. The Victoria Bridge will be closed to private motorised traffic. Busway stations will be upgraded to have off-board ticket validation, and key services provided by 60 high-capacity rubber-tired, trackless metro vehicles.
2. **Pacific Motorway, Eight Mile Plains to Daisy Hill** – Upgrade of the M1 Pacific Motorway from the Gateway Motorway and Loganlea Road. Widening to four northbound lanes from the Gateway Motorway to Loganlea Road, and four southbound lanes from Rochedale Road to Logan Road.
 - a. **South-East Busway extension to Springwood** – Extension of the busway from Eight Mile Plains to Springwood including a new busway station and park-n-ride at Rochedale. The project forms part of the broader Pacific Motorway upgrade.
3. **Cunningham Highway, Yamanto to Ebenezer (Amberley Interchange)** – Re-alignment and upgrade of the Cunningham Highway south-west of Ipswich, from Warwick Road at Yamanto, to Ebenezer Creek. The project includes a service road for local access, and a grade-separated interchange with Ipswich-Rosewood Road.

Other recently committed projects

4. **Logan Enhancement Project** - Beaudesert Road and Mt Lindesay Highway interchange upgrade (new flyover replacing northbound Mt Lindesay Highway to eastbound Logan Motorway ramp); Wembley Road interchange upgrade (new bridge and ramps relocated); Logan Motorway and Gateway Extension Motorway interchange upgrade (service roads from Mt Lindesay Highway); new south-facing Compton Road ramps; widening of the Gateway Extension Motorway to six lanes. (*Paid for by Transurban*)



A.1.2 Sunshine Coast (Appendix Figure A-3)

Strengthening Australia's cities and regions

1. **Beerburum to Nambour rail duplication** – Upgrading the North Coast Rail Line from Beerburum to Nambour to double track, with an improved alignment. Reduced delays for freight trains and additional capacity for passenger trains will be provided by the upgrade.
2. **Bruce Hwy, Pine River to Caloundra** – Upgrading the Bruce Highway to 6 lanes for the full length between the Pine River Bridge to the Sunshine Coast. This involves works from the Bribie Island interchange at Caboolture to Caloundra Road.

Other recently committed projects

3. **Palmview roads** – New local roads built as part of the Palmview growth area, linking the Sunshine Motorway at Sippy Downs in the north to Caloundra Road in the south. (*Commitment by Sunshine City Council and paid for by the developer of Palmview*)

Other

Since the 2031 updates in 2017, the State Government revised the layout of the Bruce Highway upgrade between Caloundra Road interchange and the Sunshine Motorway. This has been updated in the model as well and is therefore included for information.

4. **Bruce Highway upgrades Caloundra Rd to Sunshine Motorway** – Upgrading the Bruce Highway to six lanes from Caloundra Road to the Sunshine Motorway at Sippy Downs. Both interchanges will be upgraded, and a new two-way service road constructed along the whole section.

A.1.3 Gold Coast (Appendix Figure A-4)

Strengthening Australia's cities and regions

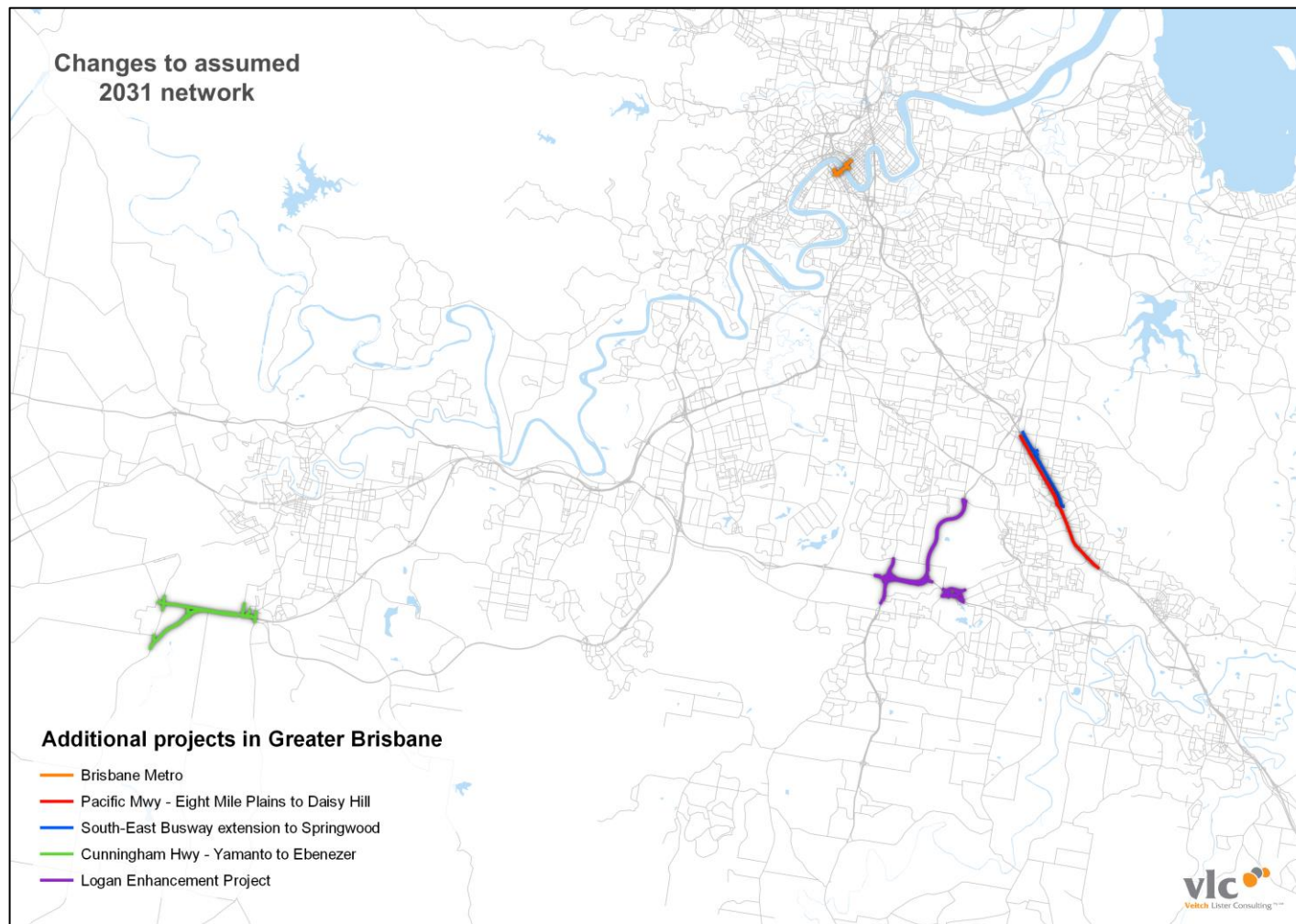
1. **Pacific Motorway, Varsity Lakes to Tugun** – Upgrading the M1 Pacific Motorway from Varsity Lakes to Tugun from four to six lanes, with managed motorways provisions, and improved interchanges and a service road over Tallegbudgera Creek.

Other recently committed projects

N/A



Appendix Figure A-1: Additional Projects in Brisbane*



**Note that this figure shows changes to network infrastructure only. Public transport service improvements associate with Brisbane Metro will extend between Eight Mile Plains Railway Station in the south up to the Royal Brisbane and Women's Hospital in the north.*



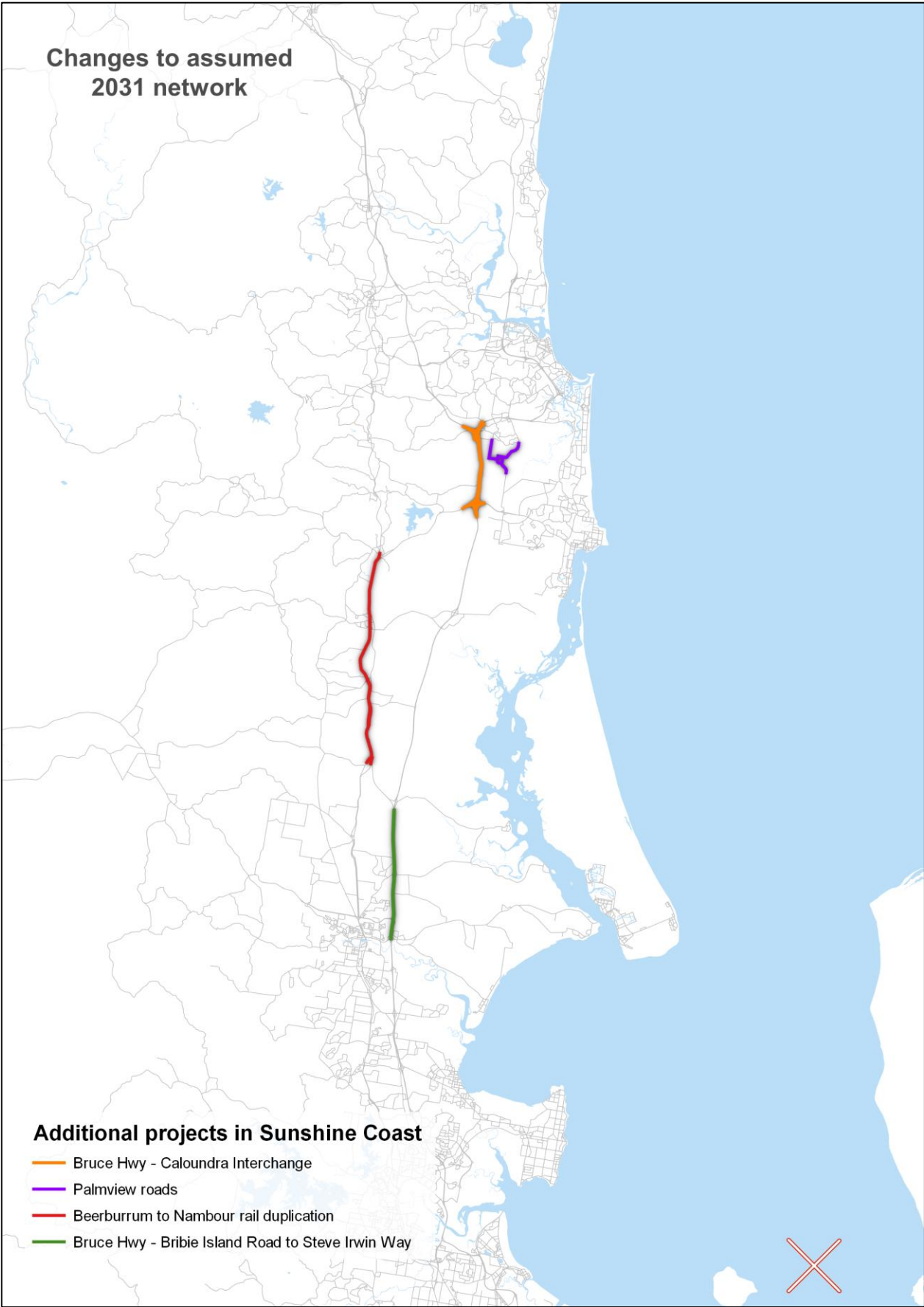
Appendix Figure A-2: Brisbane Metro*



* Note that this figure shows changes to network infrastructure only. Public transport service improvements associate with Brisbane Metro will extend between Eight Mile Plains Railway Station in the south up to the Royal Brisbane and Women's Hospital in the north

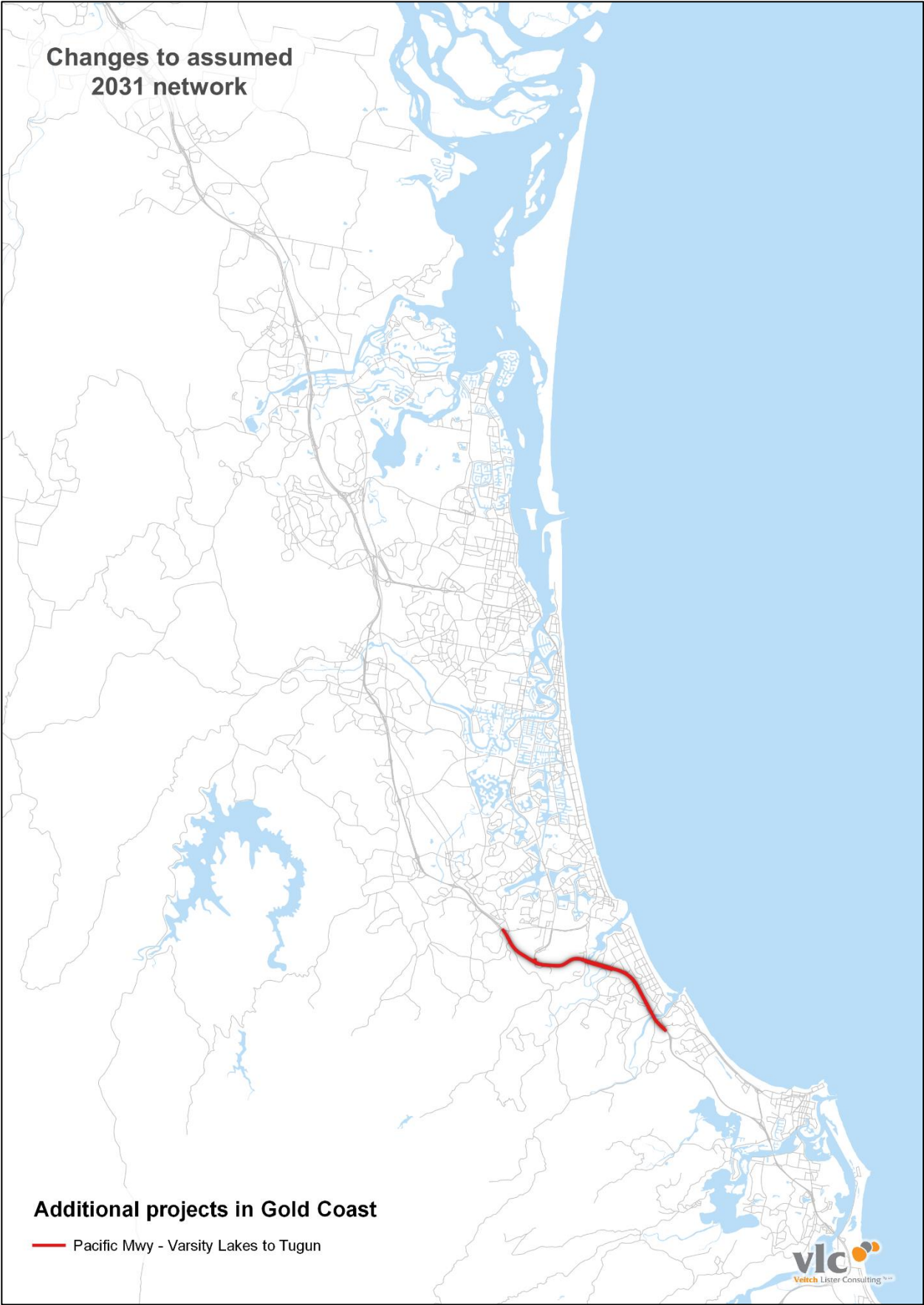


Appendix Figure A-3: Additional Projects in Sunshine Coast





Appendix Figure A-4: Additional Projects in Gold Coast





A.2 Road Infrastructure

Appendix Table A-1 identifies highway and motorway infrastructure projects included in the original 2031 model scenario. This list does not include projects completed between 2011 and the time of writing.

Appendix Table A-1: Freeway infrastructure included in original 2031 modelling (i.e. not including projects described in Section A.1.

Project	Description
Gateway Upgrade North	Widening the Gateway Motorway from four to six lanes from Nudgee to Deagon and associated interchange upgrades at Nudgee Road and Bicentennial Road. Also includes widening of the Deagon Deviation from two to four lanes between Depot Road and Bracken Ridge Road.
Bruce Highway Upgrade (Cooroy to Curra): Section A (Cooroy southern interchange to Sankeys Road)	Realignment and widening (from two to four lanes) of the Bruce Highway between Cooroy and Federal.
Bruce Highway Upgrade (Caloundra Road to Sunshine Motorway)	Upgrading (from four to six lanes) of the Bruce Highway between Caloundra Road and the Sunshine Motorway. Also includes upgrades to both interchanges and the delivery of a 2-way service road for local traffic on the western side of the highway between Steve Irwin Way and Tanawha Tourist Drive.
Bruce Highway Upgrade (Cooroy to Curra): Section C	New four-lane divided highway at the new section of highway between Traveston and Woondum.
Toowoomba Second Range Crossing	41km-long bypass route from the Warrego Highway at Helidon Spa in the east to the Gore Highway at Athol in the west.
Mt Lindesay Highway Upgrade	Widening of the Mt Lindesay Highway between Rosia Road to Stoney Camp Road, and from Camp Cable to Johanna Street. Addition of a Bypass of the Beaudesert Town Centre and service road improvements at North and South Maclean.
M1 Pacific Motorway: Mudgeeraba to Varsity Lakes	Upgrading 5.7 km (from four to six lanes) of Pacific Motorway (M1) between Mudgeeraba (Exit 79) and Varsity Lakes (Exit 85)
Pacific Motorway Upgrade: M1/M3/Gateway merge (Southbound Stage 1)	Upgrading (up to 5 southbound lanes) the Pacific Motorway between Eight Mile Plains and Rochedale South (Exit 19)
Logan Enhancement Project	Upgrading sections of the Gateway Extension and Logan Motorways, improving key congestion hot spots (Mt Lindesay Highway/Beaudesert Road interchange and the Wembley Road/Logan Motorway interchange). Also includes construction of new south-facing ramps at Compton Road.

Appendix Table A-2 identifies significant arterial and sub-arterial infrastructure projects included in our 2031 model scenario. This list does not include projects completed between 2011 and the time of writing. This is not an exhaustive list, but represents those projects considered significant enough to be noteworthy in a large strategic modelling exercise.



Appendix Table A-2: Significant arterial and sub-arterial road improvements included in 2031 Modelling

Project	Description
Southport-Burleigh Road Upgrade	Upgrading (from four to six lanes) of Southport-Burleigh Road for the majority of the 8km section.
Waterford - Tamborine Road Intersection Upgrade	Upgrading 4 intersections located on Waterford–Tamborine Road between Logan Village and Yarrabilba.
Kingsford Smith Drive Upgrade	Upgrading (from four to six lanes) of the Kingsford Smith Drive between Riverview Terrace and Theodore Street.
Rickertt Road Upgrade	Upgrading (from two to four lanes with 80kph speed limit) of Rickertt Road between Green Camp Road and Thorneside Road.
Rode Road Upgrade	Upgrading (from two to four lanes) of Rode Road between Beckett Road and Gympie Road.
Beenleigh Road Upgrade	Upgrading (from four to six lanes) of Beenleigh Road between Boundary Road and Warrigal Road.
Beams Road Upgrade	Upgrading (from two to four lanes) of Beams Road between Sandgate Road and Bridgeman Road.
Linkfield Road Upgrade	Upgrading (from two to four lanes) of Linkfield Road between Gympie Arterial Road and Lacey Road.
Telegraph Road Upgrade	Upgrading (from two to four lanes) of Telegraph Road between Norris Road and Quinlan Street.
Creek Road	Upgrading (from four to six lanes) of Creek Road between Lytton Road and Cavendish Road.
Stanley Street E Upgrade	Upgrading (from four to six lanes) of Stanley Street E between Wellington Road and Cavendish Road.
New Cleveland Road Upgrade	Upgrading (from two to four lanes) of New Cleveland Road between Green Camp Road and Old Cleveland Road.
Wynnum Road - Balmoral Street Upgrade	Upgrading (from four to six lanes) of Wynnum Road - Balmoral Street between Laidlaw Parade and Riding Road.
Logan Road Upgrade	Upgrading (from four to six lanes) of Logan Road between Cornwall Street and Kessels Road.
Toombul Road Upgrade	Upgrading (from four to six lanes) of Toombul Road between Nudgee Road and Melton Road.
Kingsford Smith Drive Upgrade	Upgrading (from four to six lanes) of the Kingsford Smith Drive between French Street and Eagle Farm Road.
Wynnum Road - Manly Road Interim Upgrade	Upgrading (from four to six lanes) of Manly Road between Wynnum Road and New Cleveland Road.
Progress Road Upgrade	Upgrading (from four to six lanes) of Progress Road between the Ipswich Motorway and Boundary Road.
Inala Avenue, King Avenue, Learoyd Road Upgrade	Upgrading (from two to four lanes) of Inala Avenue, King Avenue, Learoyd Road between Blunder Road and Watson Road.
Lutwyche Road Upgrade	Upgrading (from four to six lanes) of Lutwyche Road between Enoggera Creek and Gympie Road.
Rode Road Upgrade	Upgrading (from two to four lanes) of Rode Road between Gympie Road and Bilsen Road.



Project	Description
Mount Gravatt Capalaba Road Upgrade	Upgrading (from two to four lanes) of Mount Gravatt Capalaba Road between Moreton Bay Road and Mount Cotton Road.
Hoyland Street Upgrade	Upgrading (from two to four lanes) of Hoyland Street between Gympie Arterial Road to Norris Road.
Depot Road	Upgrading (from two to four lanes) of Depot Road between Quinlan Street to Braun Street.
Kingsford Smith Dr stage 3	Upgrading (to six lanes) of Kingsford Smith Drive between Riverview Terrace and Breakfast Creek Road
Ipswich Road	Upgrading (from four to six lanes) of Ipswich Road between O'Keefe Street and Keats Street.
Cavendish Road Upgrade	Upgrading (from four to six lanes) of Cavendish Road between Stanley Street and Old Cleveland Road.
Coonan Street Upgrade	Upgrading (from two to four lanes) of Coonan Street between Moggill Road and Radnor Street.
Oxley Road Upgrade	Upgrading (from two to four lanes) of Oxley Road between Ipswich Motorway and Wharf Street.
Newnham Road Upgrade	Upgrading (from two to four lanes) of Newnham Road between Creek Road and Logan Road.
Springfield-Greenbank Arterial Upgrade	Upgrading (from two to four lanes) of Springfield-Greenbank Arterial between Springfield Parkway and ICC Boundary.
Springfield-Greenbank Arterial Upgrade	Upgrading (from four to six lanes) of Springfield-Greenbank Arterial between Main Street and Sinnathamby Boulevard.
Redbank Plains Road Upgrade	Upgrading (from two to four lanes) of Redbank Plains Road between Cunningham Highway and Kruger Parade.
North-South Urban Arterial	New arterial road between Brays Road and Anzac Avenue.
Wynnum Road Upgrade	Upgrading (from four to six lanes) of Wynnum Road between the Rail Underpass (Morningside) and the Gateway Motorway.
Moggill Road/Coonan Street/Keating Street Intersection Upgrade	Upgrading of the Moggill Road/Coonan Street/Keating Street roundabout to a signalised T- Intersection

A.3 Public transport network improvements

Appendix Table A-3 identifies the public transport infrastructure project included in our 2031 model scenario. This list does not include projects completed between 2011 and the time of writing. Each of these infrastructure projects includes associated public transport service improvements.

Appendix Table A-3: Public transport infrastructure improvements included in 2031 Modelling

Project	Description
Cross River Rail	Additional rail crossing of the Brisbane River and alignment between Dutton Park and Bowen Hills, with new stations at Boggo Road (Park Road), Woolloongabba, Albert Street, Roma Street, and Exhibition



A.4 Vehicle capacities

The average seated and total (crush) capacity of public transport vehicles are key inputs to capacity constrained model runs. The assumed seated and crush capacities used in these models runs are listed in Appendix Table A-4.

Appendix Table A-4: Modelled seated and crush capacities, 2011 and 2031

Mode/service	2011 capacity		2031 capacity	
	Seated	Crush	Seated	Crush
Rail	461	936	461	936
Bus	46	67	46	67
CityCat (ferry)	67	78	67	78
CityFerry (ferry)	102	157	102	157
Bay Islands Ferry	100	150	100	150



Appendix B: About Level of Service

As travel demands on a piece of infrastructure increase, so too does the level of 'discomfort' experienced by travellers using that infrastructure.

In the case of public transport, discomfort largely relates to the ability of passengers to travel in a seat, or the level of crowding experienced as a standing passenger. In extreme cases, it can result in travel delays as the unloading and loading of passengers can take considerably longer under crowded conditions. Level of service standards for public transport are relatively easily defined by the seated and crush capacities of rolling stock deployed on different routes and services.

In the case of traffic, discomfort can range from the inability to travel at a desired speed and difficulty manoeuvring, to severe congestion and delays. A level of service analysis provides a qualitative indication of where the transport network would fail to meet desired standards of service under estimated travel demands and traffic volumes. By extension, it illustrates where behavioural changes are likely to impact on forecasts to some degree, if these levels of congestion or crowding result in a change in travel behaviour.

The ability of a road to maintain high levels of service under increasing traffic levels depends upon its design standard and access controls, junction operation and coordination, degree of separation of conflicting movements, as well as its local environment and relation to connecting roads. Higher standards of roads, junctions and network management are able to provide better performance under similar levels of congestion (ratio of volume to capacity) than those of a lower standard. Austroads defines six threshold levels for standardised performance assessment, for which we describe how this affects driver behaviour, and provide typical threshold levels of congestion for three standards of roads.

The application of level of service assessments to traffic forecasts rather than current observed traffic volumes poses some limitations. For example, the Zenith model does not currently have the capability to model peak spreading that is likely to result from extreme congestion. Instead, traffic volumes will continue to be 'pushed through' highly constrained infrastructure, while in reality drivers would likely change their time of departure. For this reason, volume capacity ratios exceeding one should not necessarily be deemed 'unacceptable' when derived from a traffic forecast using a four-step model.

The selection of volume capacity ratio 1.3 as the threshold for 'F*' largely reflects that, while it is relatively easy to measure the volume of traffic that a motorway carries, capacity is more difficult to estimate and to conceptualise. It depends on many different characteristics of the motorway including saturation flow of the lanes, presence of junctions, width of lanes, gradient of the road, presence of trams or parking and many more. It may also vary from day-to-day, affected by factors such as weather and lighting. In strategic models, most of these characteristics are generalised, with the result that traffic demand on some links exceeds the coded capacity. This is expected to happen, which is another reason why, in strategic planning projects, the categorisation of level of service E is stretched to beyond 1. At present, volume capacity ratios extend up to 1.15 before the start of level of service F.

Beyond 1.3, the excess volume over capacity is no longer a function of potential misspecification in the estimate of link capacities, and is almost certainly a function of excess demand. This estimate has been derived from current internal research into speed-flow curves and level of service, which indicates that observed traffic volume capacity ratios peak at around 1.3.

In addition to separate threshold levels for local, arterial and motorway standard roads, VLC is also in the process of developed a fourth category to measure of the performance of managed motorways.



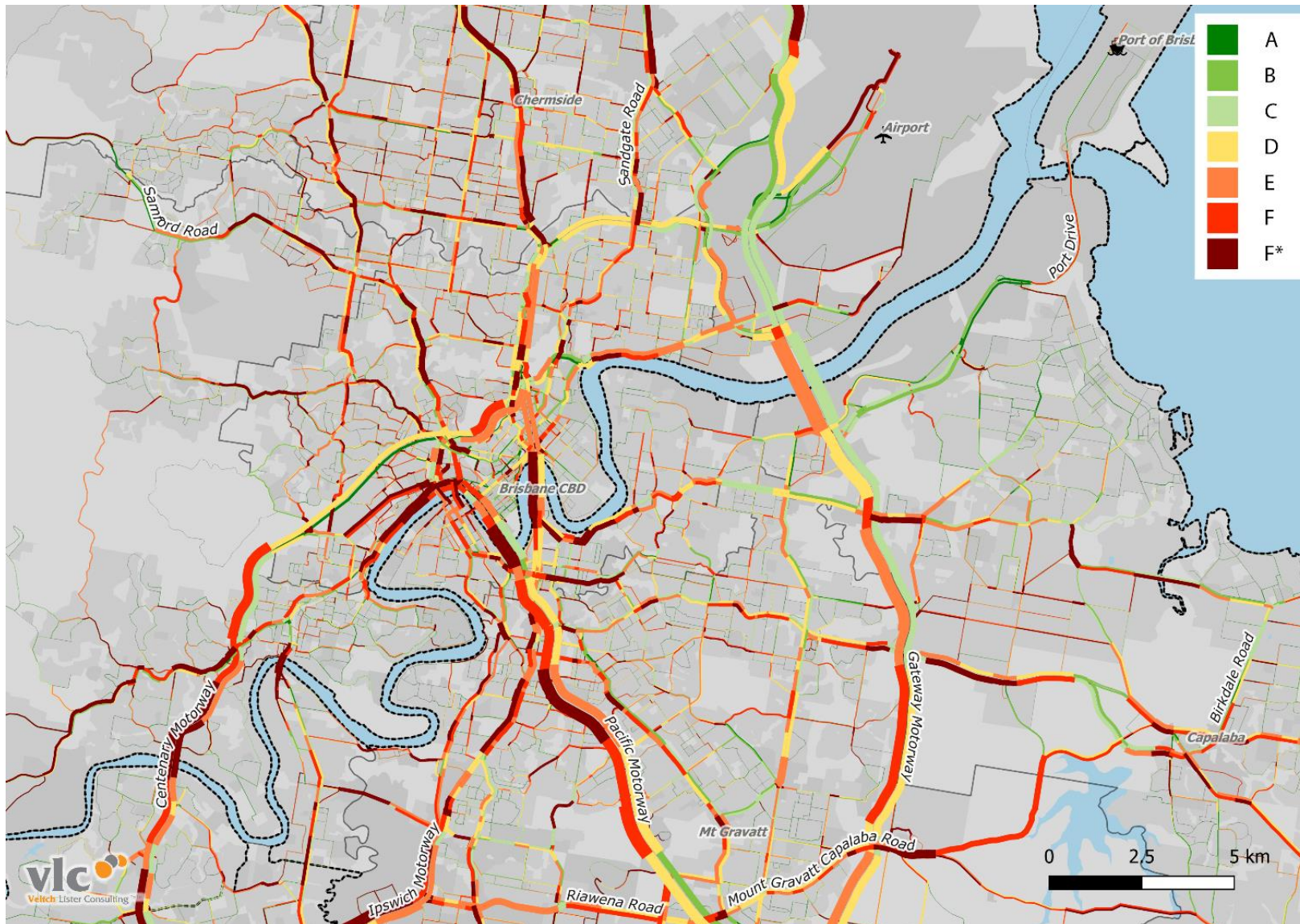
This is because the sustained flow rates for managed motorways are typically higher than unmanaged motorways.



Appendix C: Additional Maps

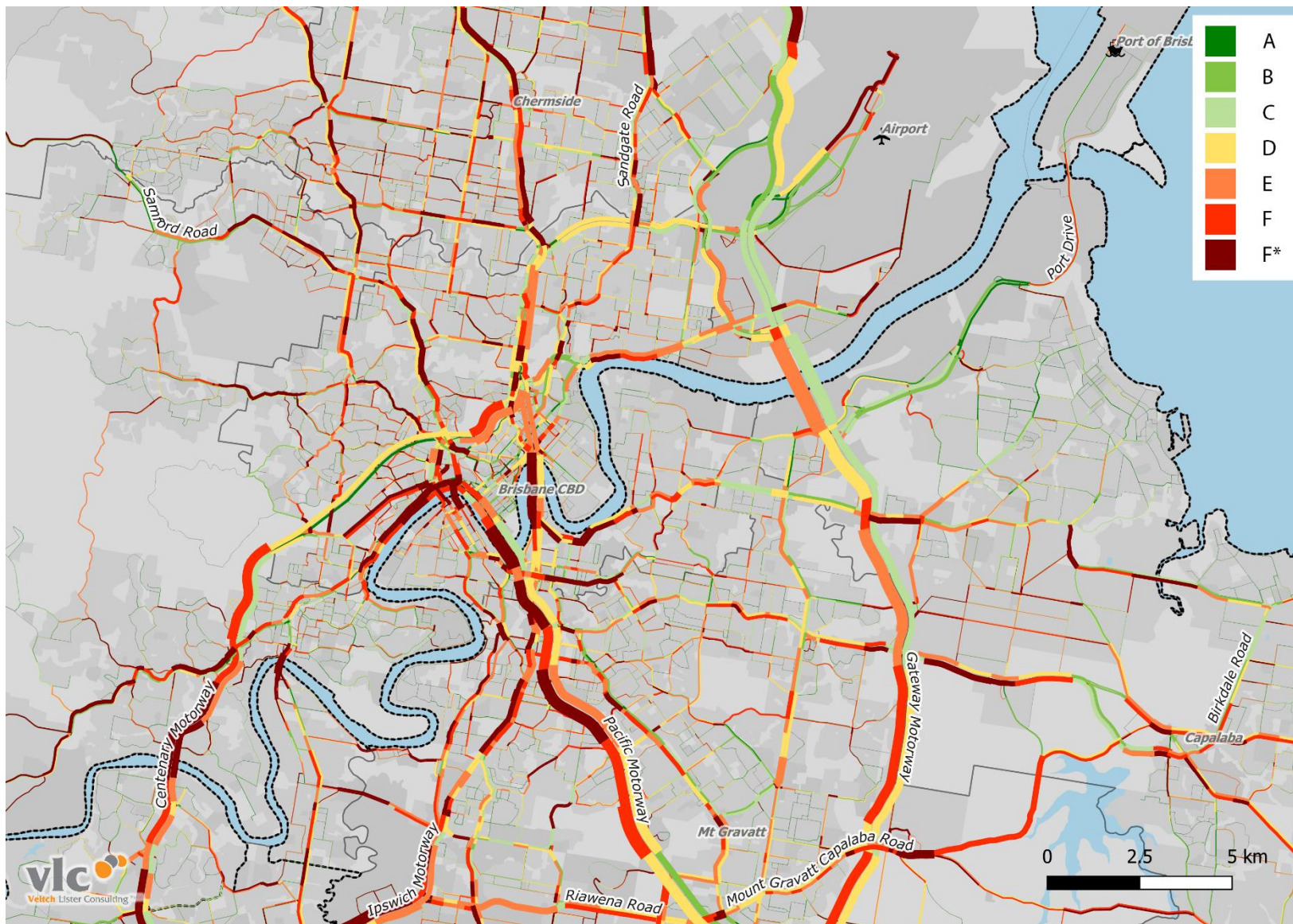


Appendix Figure C-1: Brisbane inner 2031 traffic level of service Greater Brisbane, without 2018-19 Budget projects, AM peak



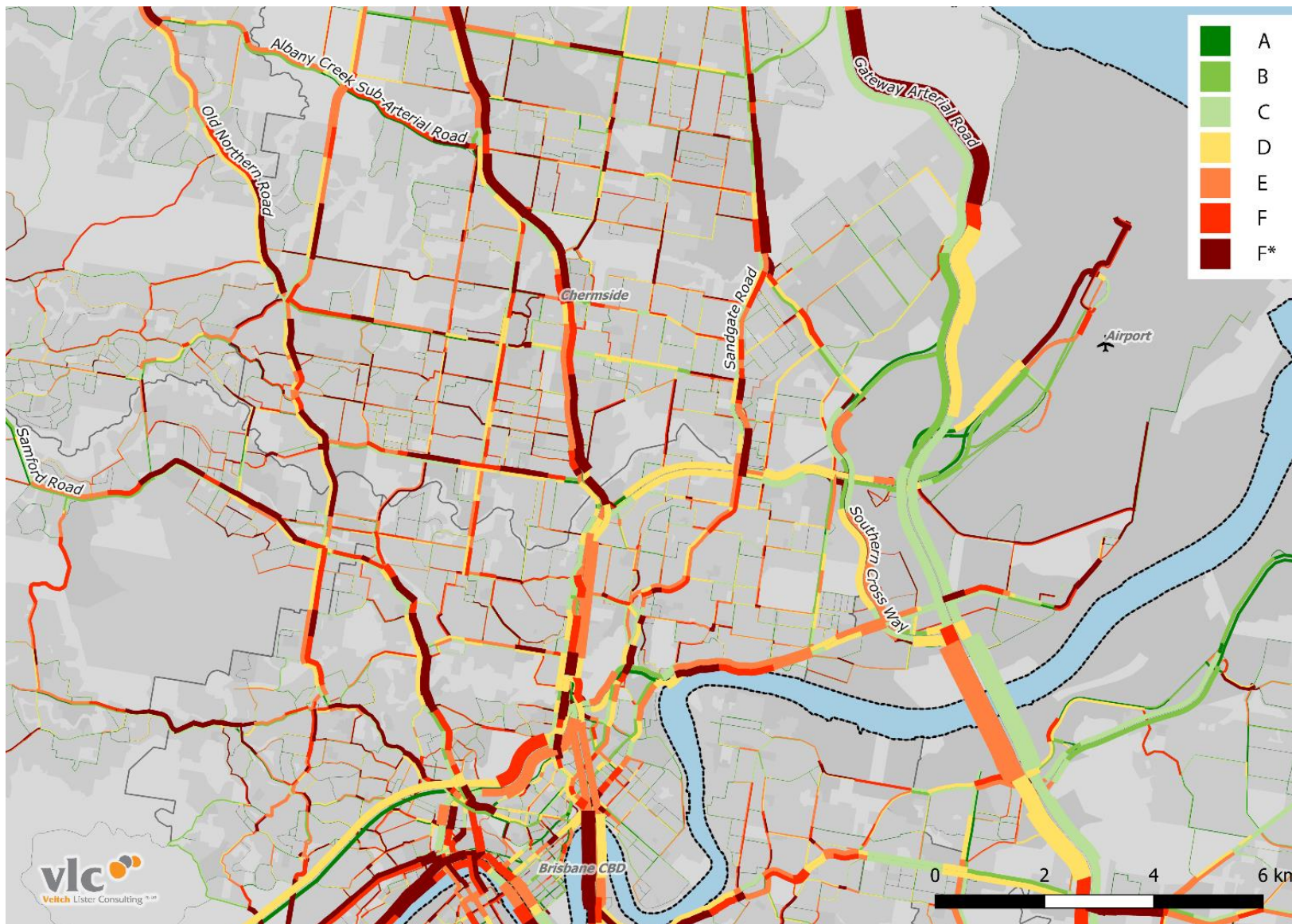


Appendix Figure C-2: Brisbane inner 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects, AM peak



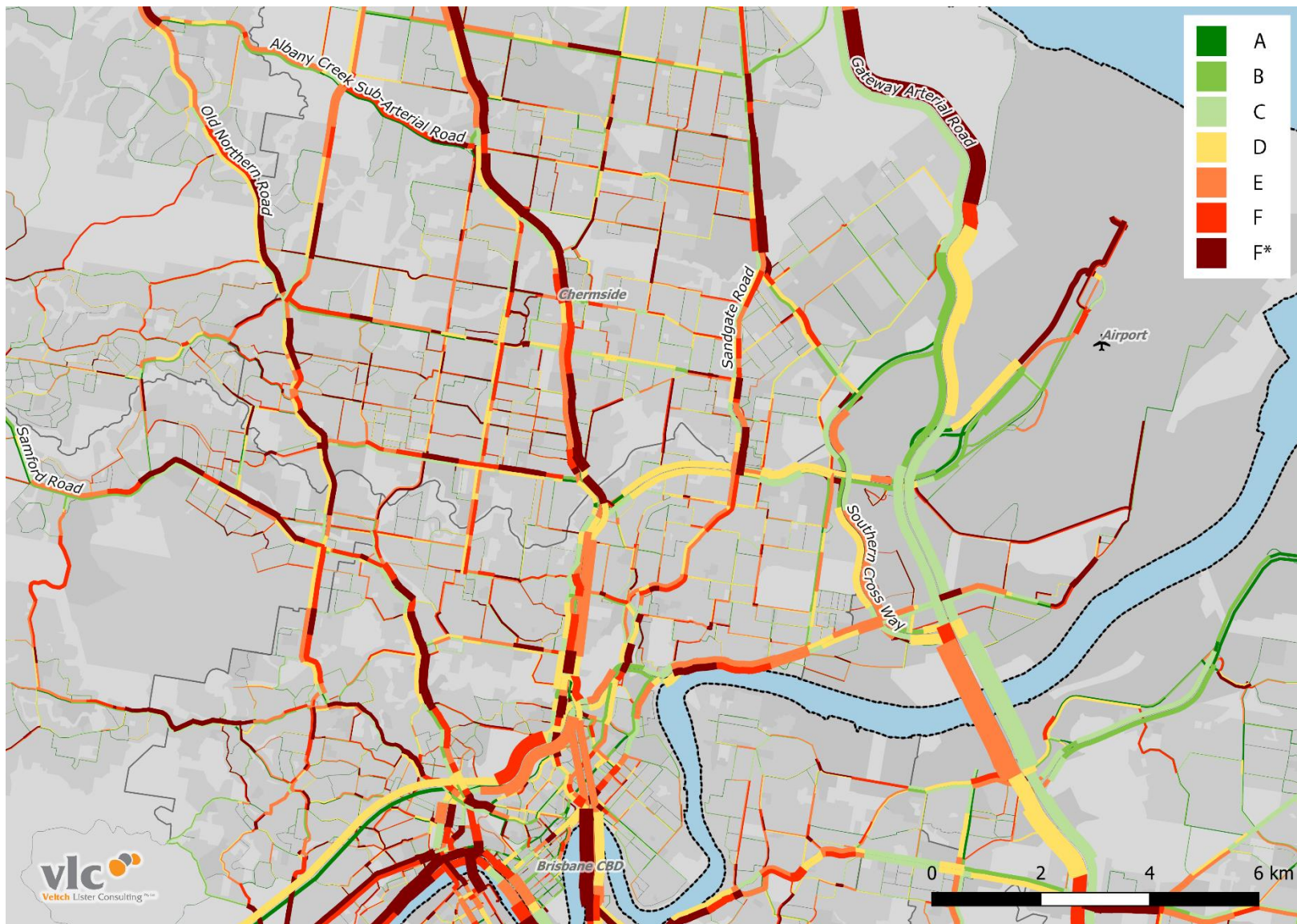


Appendix Figure C-3: Chermside 2031 traffic level of service Greater Brisbane, without 2018-19 Budget projects, AM peak



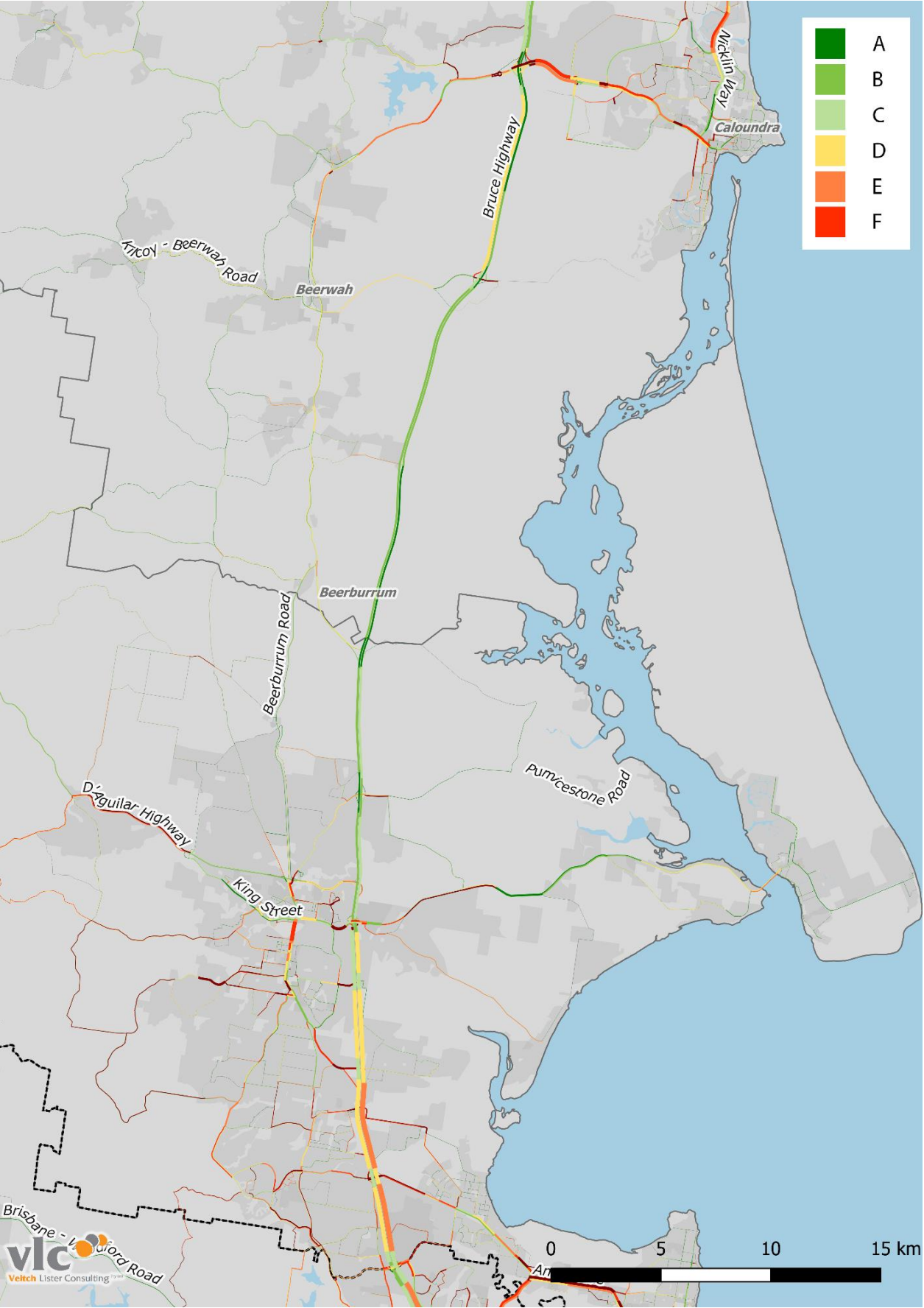


Appendix Figure C-4: Chermside 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects, AM peak



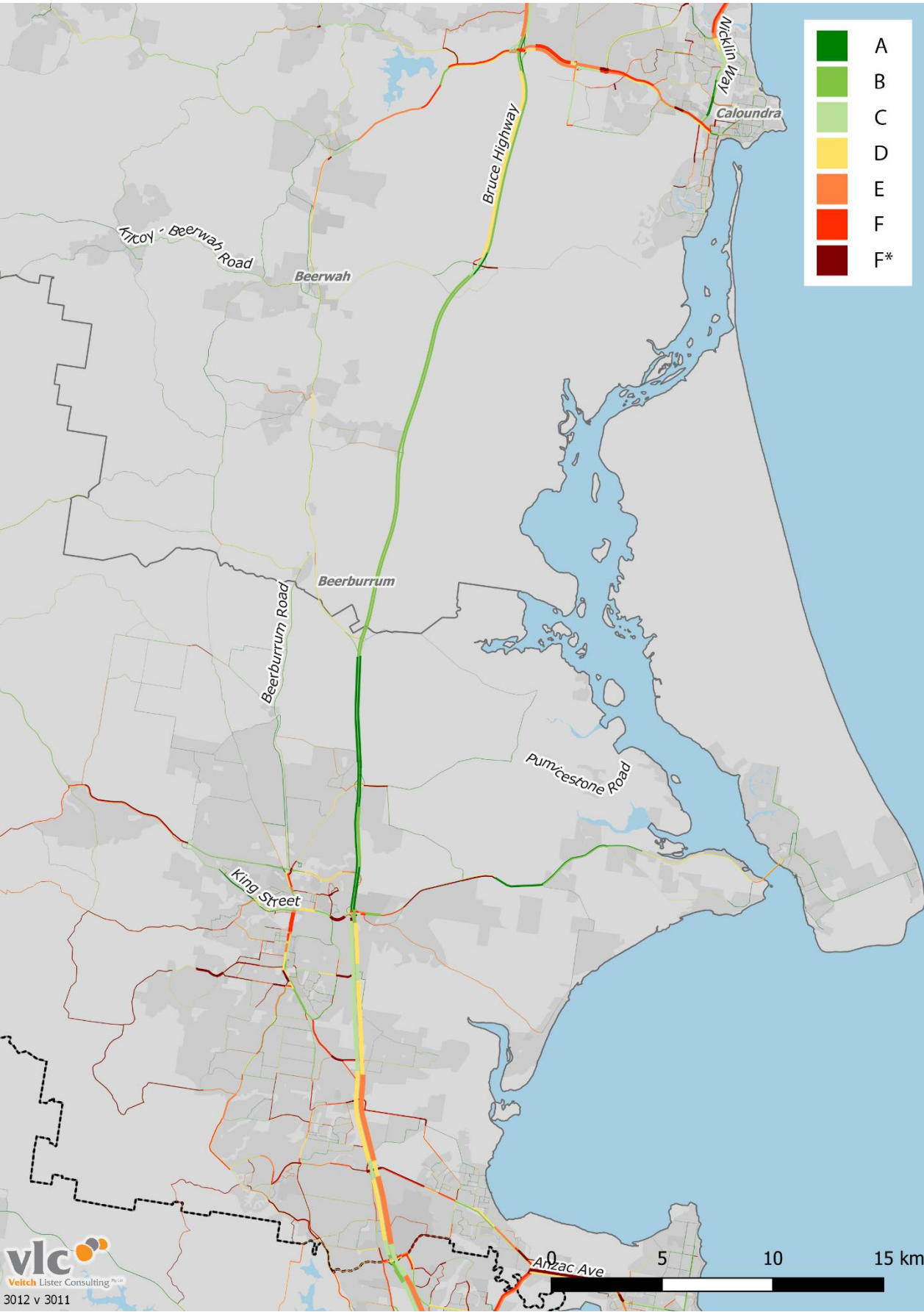


Appendix Figure C-5: Beerburrum 2031 traffic level of service Greater Brisbane, without 2018-19 Budget projects, AM peak





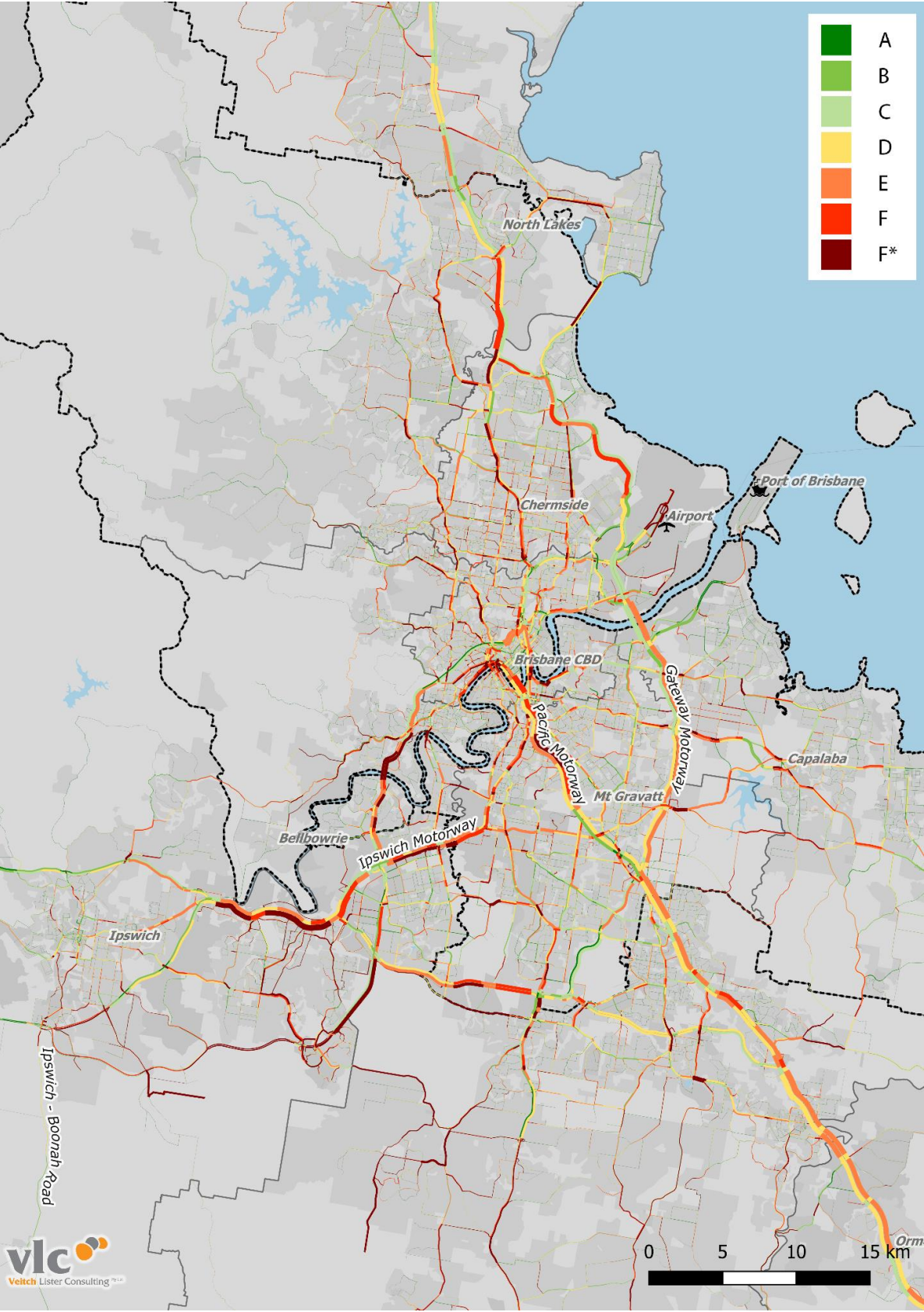
Appendix Figure C-6: Beerburrum 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects, AM peak





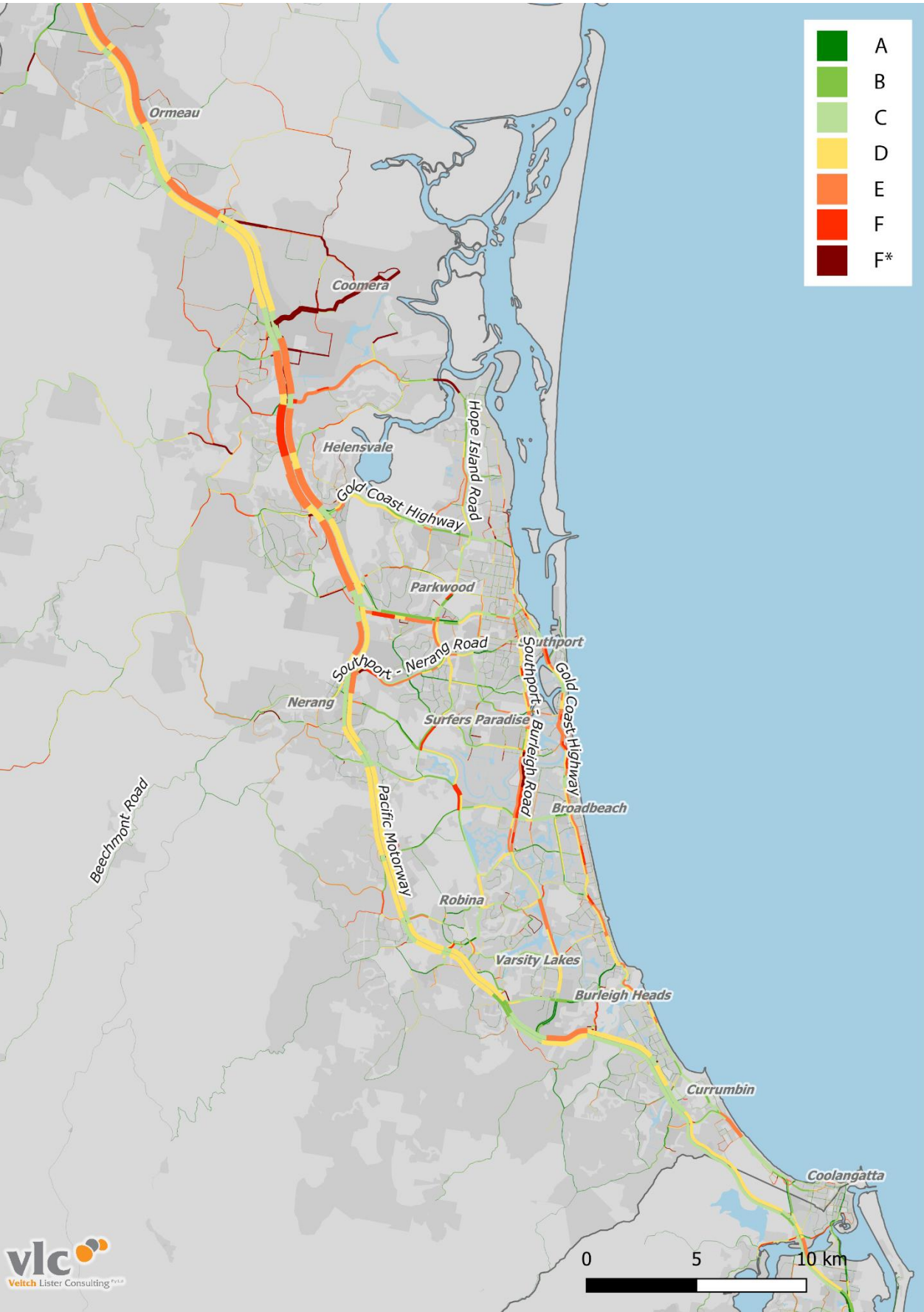
Appendix D: PM peak maps

Appendix Figure D-1: 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects PM peak



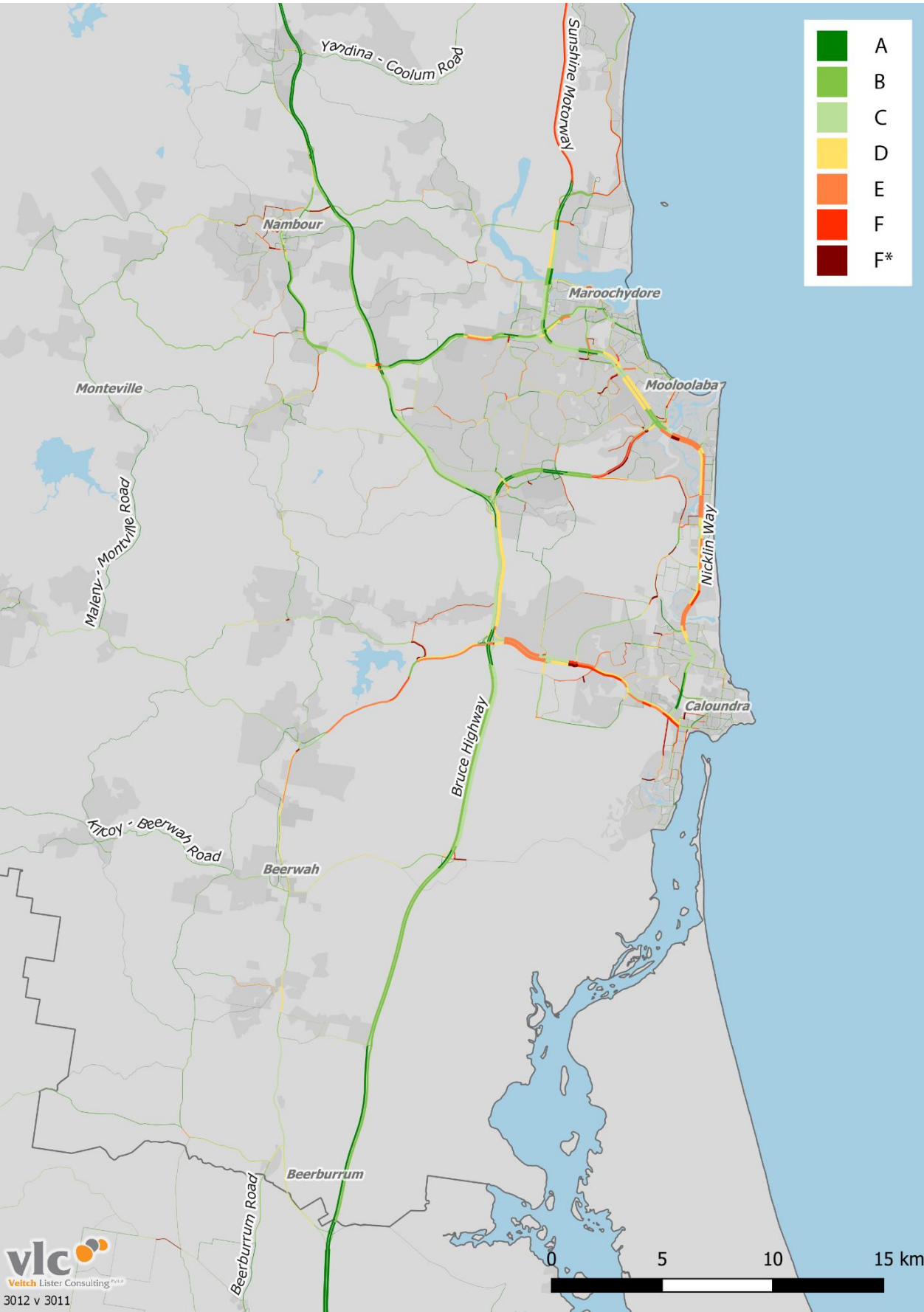


Appendix Figure D-2: 2031 traffic level of service Gold Coast, with 2018-19 Budget projects PM peak



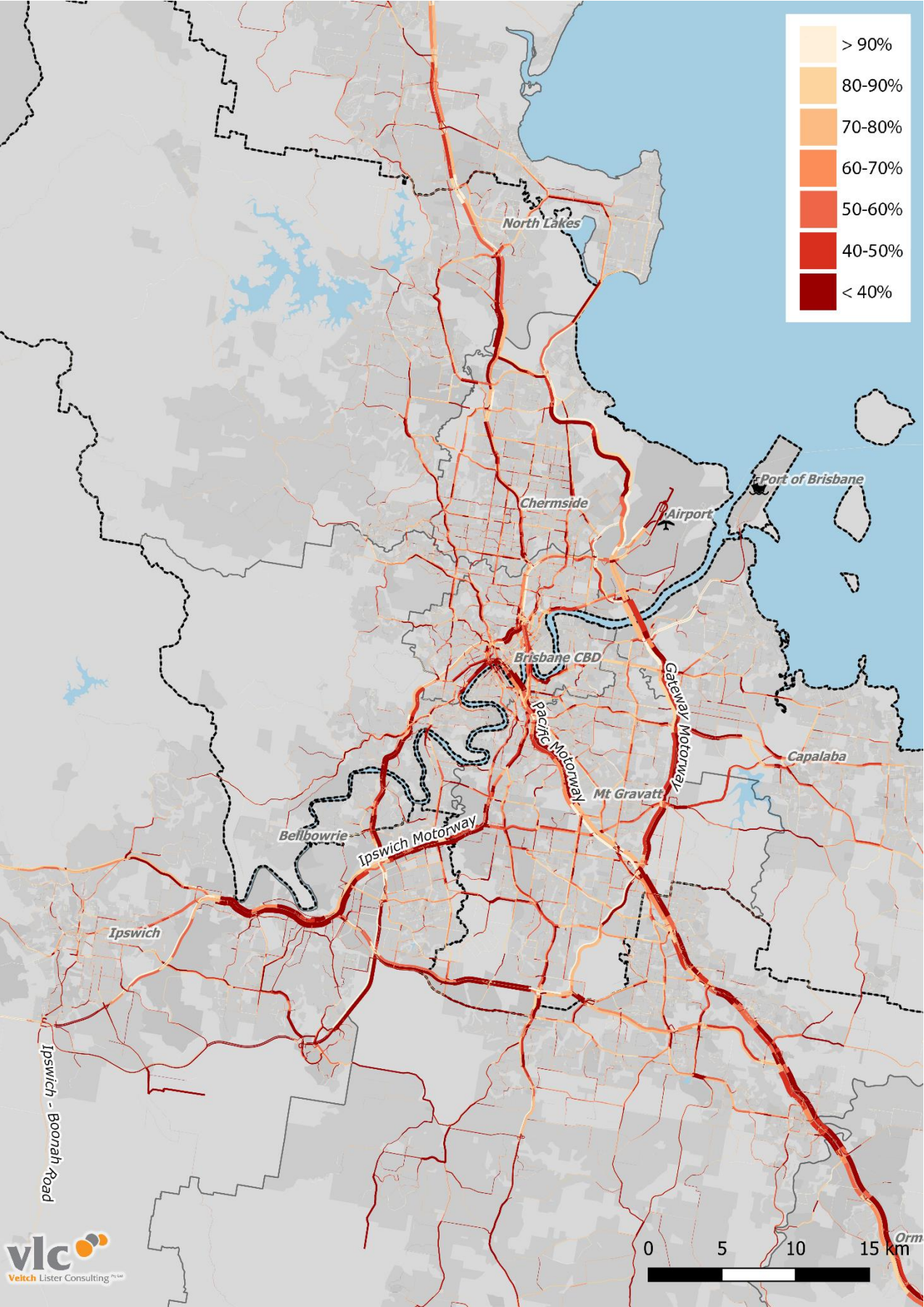


Appendix Figure D-3: 2031 traffic level of service Sunshine Coast, with 2018-19 Budget projects PM peak



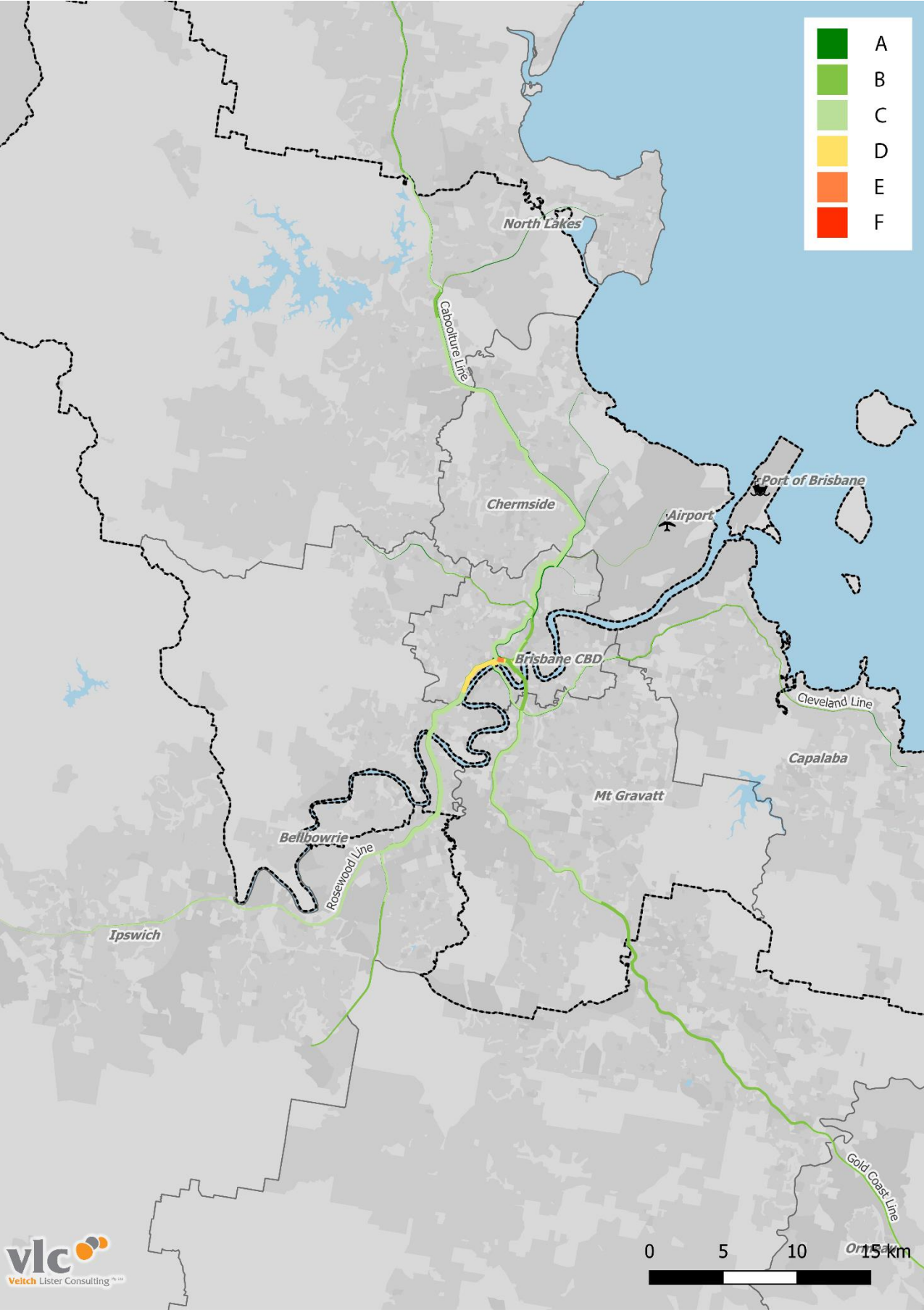


Appendix Figure D-4: 2031 traffic speeds (% freeflow), with 2018-19 Budget projects PM peak



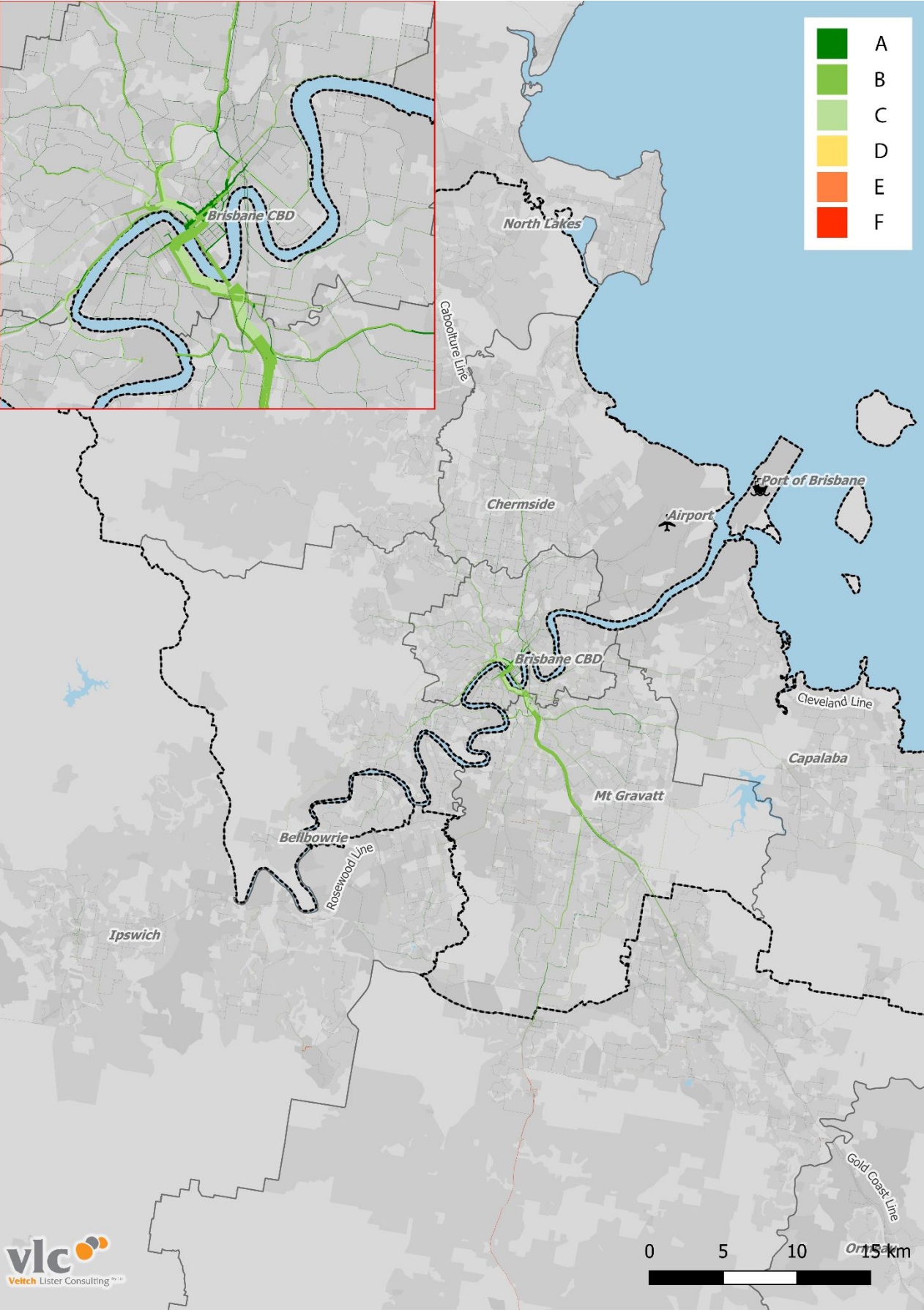


Appendix Figure D-5: 2031 rail level of service, with 2018-19 Budget projects PM peak



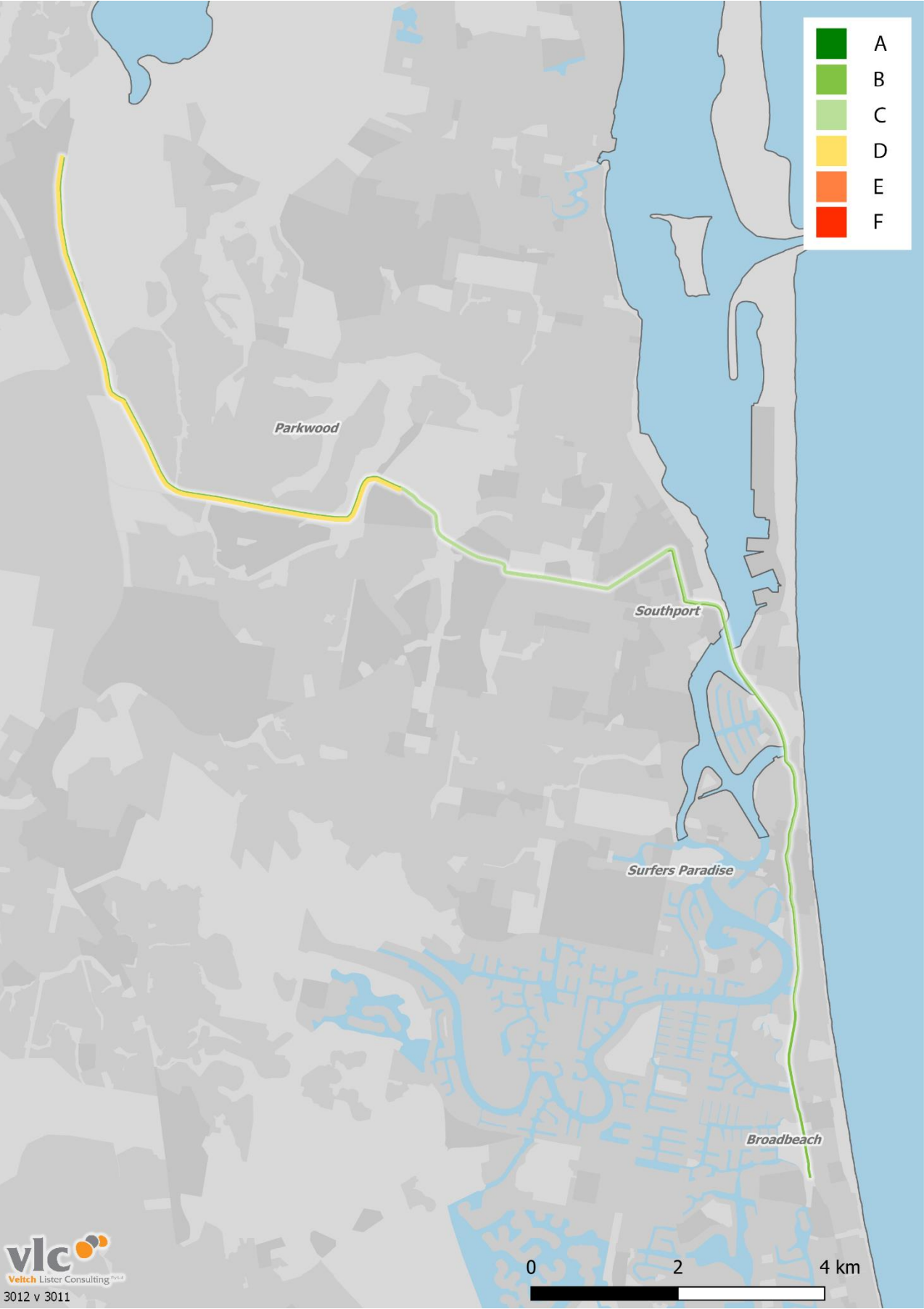


Appendix Figure D-6: 2031 bus level of service, with 2018-19 Budget projects PM peak



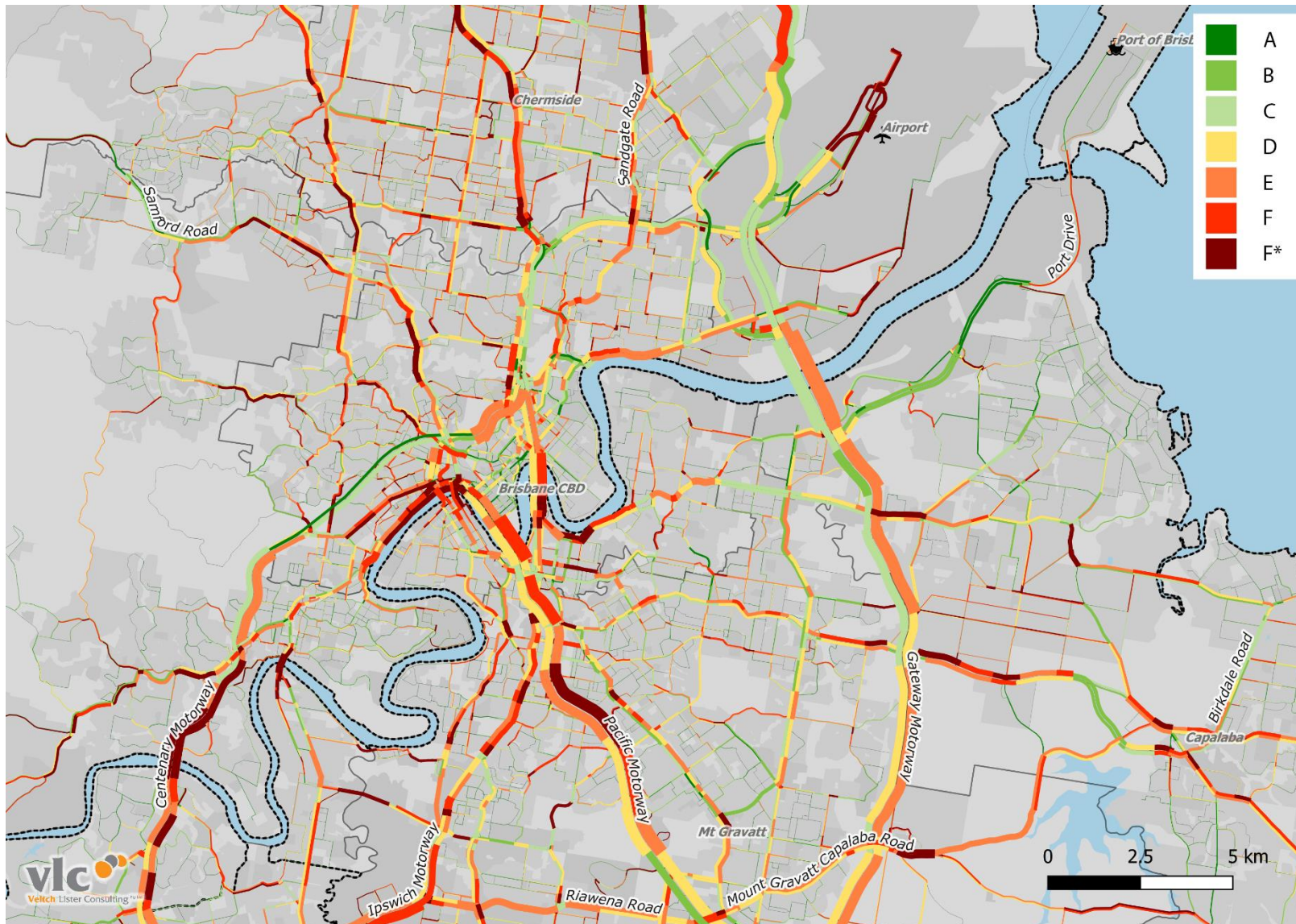


Appendix Figure D-7: 2031 tram level of service, with 2018-19 Budget projects PM peak



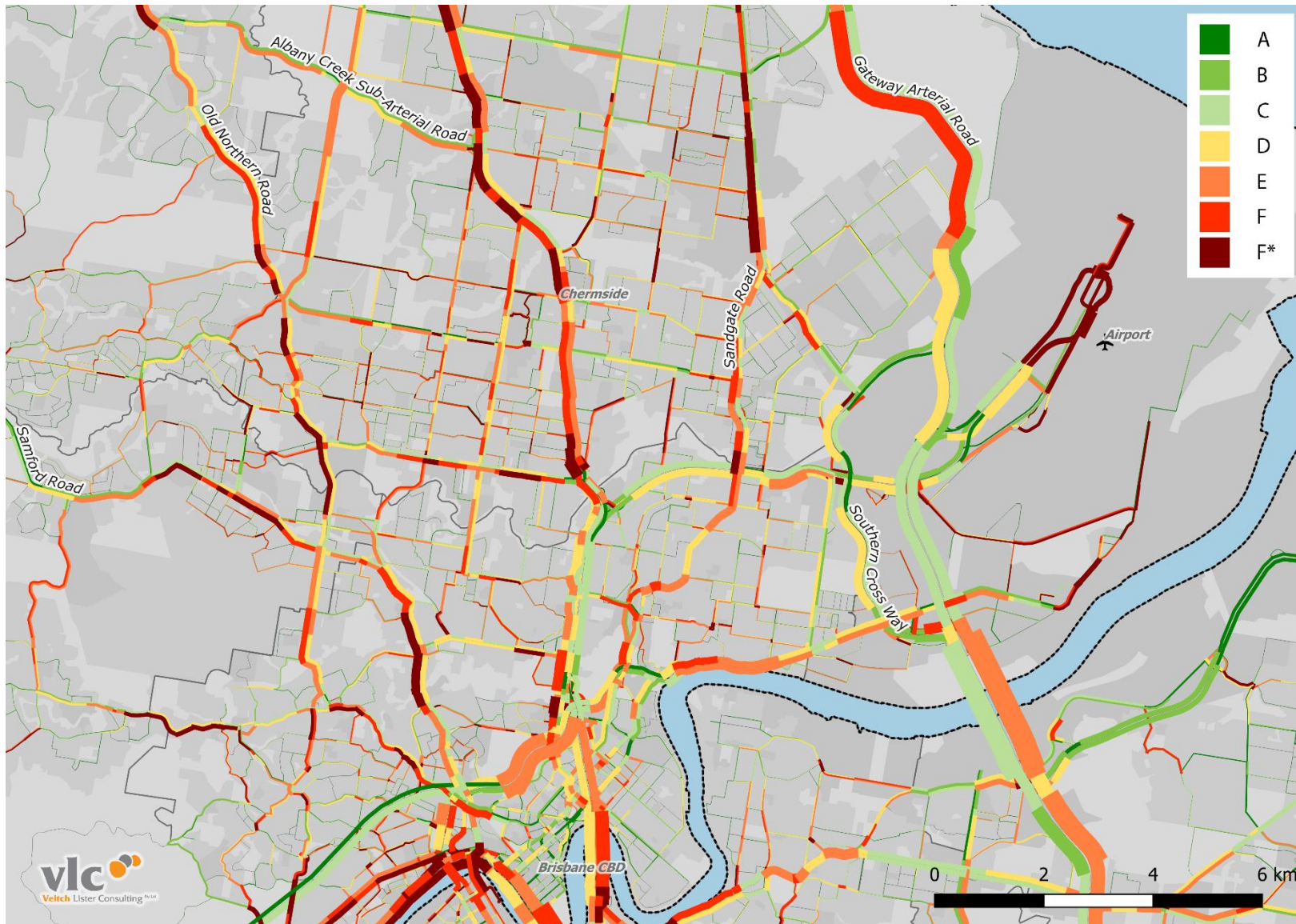


Appendix Figure D-8: Brisbane inner 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects, PM peak



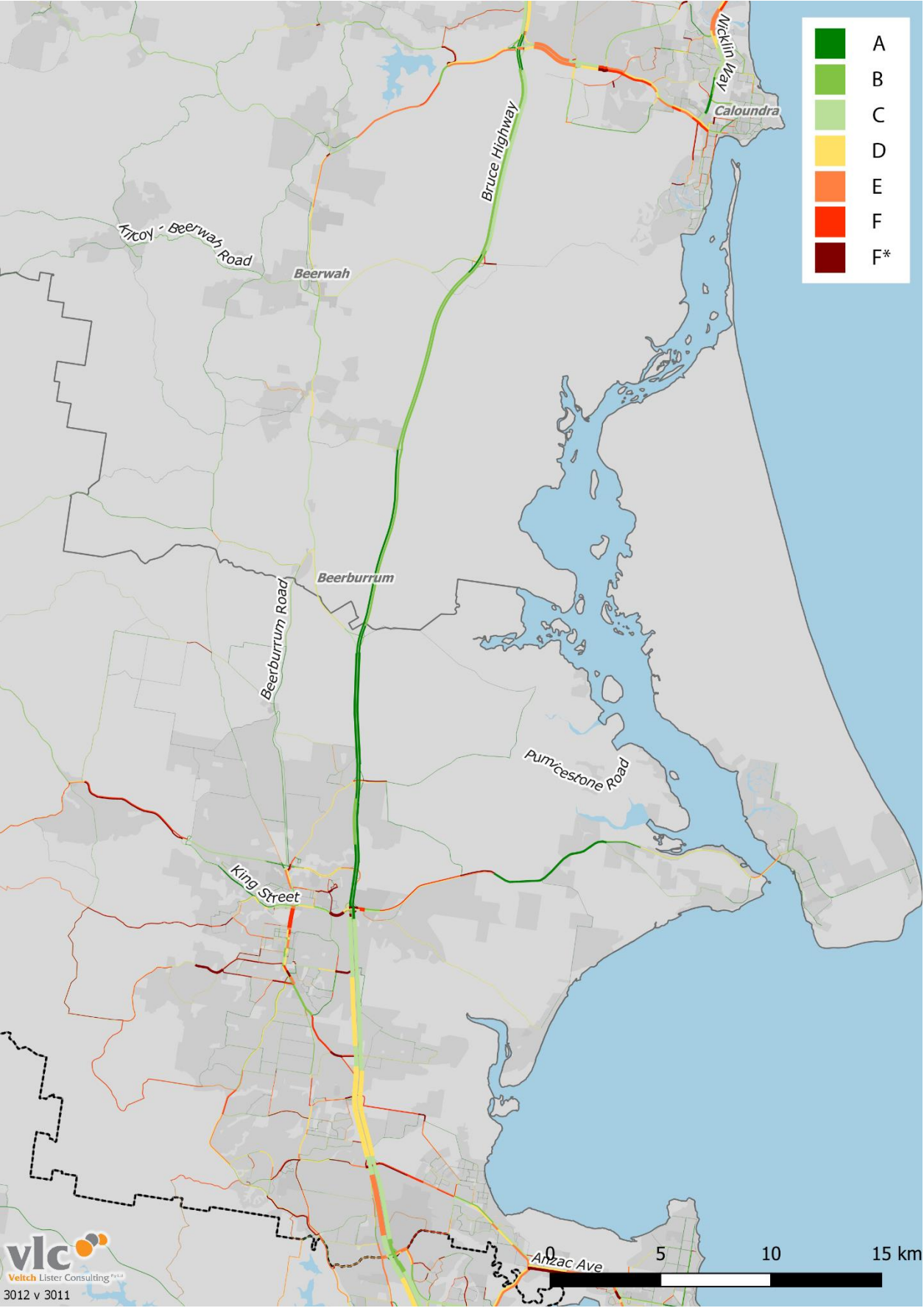


Appendix Figure D-9: Chermside 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects, PM peak





Appendix Figure D-10: Beerburum 2031 traffic level of service Greater Brisbane, with 2018-19 Budget projects, PM peak





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