From: David I Selth
To: SouthportBurleighRoad; Sham Z Nabi
Cc: Rachael L Poeppmann; Anna R Cush
Subject: RE: Bermuda street changes_ not relevant
Date: Wednesday, 18 November 2015 11:51:00 AM

Sham, Jess
Please meet with these people and discuss the project and what can be done to their driveway if it is on the list.
Usual message about nothing before Govt approval on 18 june. Project is going ahead for the greater good at reduced speed etcc.
Listen to their story.
Thank you,

David Selth
Manager (Delivery) | South Coast Region
Program Delivery And Operations | Department of Transport and Main Roads
Ground Floor | Nerang TMC | 16-18 White Street | Nerang Qld 4211
PO Box 442 | Nerang Qld 4211
P: (07) 55636425 | F: (07) 55636611
M:
E: david.i.selth@tmr.qld.gov.au
W: www.tmr.qld.gov.au

From: SouthportBurleighRoad
Sent: Wednesday, 18 November 2015 9:58 AM
To: David I Selth ; Sham Z Nabi
Cc: Rachael L Poeppmann ; Anna R Cush
Subject: Bermuda street changes_ not relevant

Good morning David / Sham
Please see below correspondence from not relevant
The letter referenced in the email relates to a response sent from Neil Scales on behalf of Jackie Trad MP.
Sham would you mind advising if this property has any proposed amendments.
Jess

Southport–Burleigh Road Project Team
Customer and Stakeholder Management | South Coast Region
Program Delivery And Operations | Department of Transport and Main Roads

not relevant

not relevant

From: SouthportBurleighRoad <SouthportBurleighRoad@tmr.qld.gov.au>
Subject: Bermuda street changes
Date: 5 August 2015 3:54:40 pm AEST
To: not relevant

Good Afternoon

Thank you for your enquiry to the Department of Transport and Main Roads (TMR).

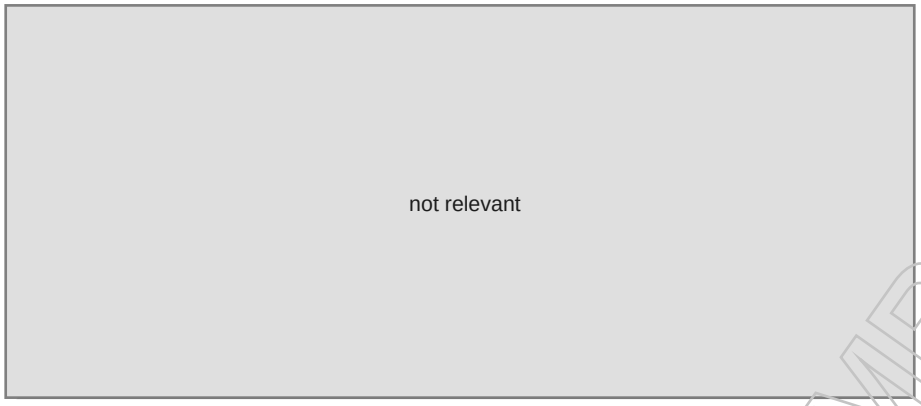
TMR officers are happy to meet with you to discuss the upcoming works and access to your property. Please contact Ms Jessica Banks on 5563 3600 to organise a time to meet at your earliest convenience.

We look forward to meeting with you to discuss your queries further.

Kind Regards

Southport Burleigh Road Communication Team
for Sanjay Ram
District Director, South Coast
Department of Transport and Main Roads
36-38 Cotton Street, Nerang Qld 4211
PO Box 442 Nerang Qld 4211
Telephone +61 7 5563 6600

not relevant



From: David I Selth
To: Rachael L Poeppmann; Sham Nabi; Paul S McCormack; Ahmed S Hummadi
Subject: Electric gates on Bermuda St
Date: Friday, 11 December 2015 12:41:00 PM

Team

To clarify

For properties with a single entrance: TMR will consider installing a electric gate where considered warranted by the project team.

For properties with two entrances.
TMR will consider one electric gate for the primary entrance where no electric gate currently exists at the property if considered warranted by the project team.
The second entrance is the owner's responsibility.

Thank you,

David Selth
Manager (Delivery) | South Coast Region
Program Delivery And Operations | Department of Transport and Main Roads

Floor 1 | 36-38 Cotton Street | Nerang Qld 4211
PO Box 442 | Nerang Qld 4211
P: (07) 55636425 | F: (07) 55636611
M:
E: david.i.selth@tmr.qld.gov.au
W: www.tmr.qld.gov.auTeam

From: David I Selth
To: Paul D Noonan; Alan J Stone
Subject: FW: Request for new TC sign design
Date: Friday, 15 April 2016 1:05:00 PM
Attachments: image001.png
Driveways.pdf
Entering.pdf

Paul, Alan
It appears we have some progress for Bermuda St signage.

Thank you,

David Selth
Manager (Delivery) | South Coast Region
Program Delivery And Operations | Department of Transport and Main Roads

Floor 1 | 36-38 Cotton Street | Nerang Qld 4211
PO Box 442 | Nerang Qld 4211
P: (07) 55636425 | F: (07) 55636611
M:
E: david.i.selth@tmr.qld.gov.au
W:www.tmr.qld.gov.au

From: Derek P Grant
Sent: Friday, 15 April 2016 12:42 PM
To: David I Selth <David.I.Selth@tmr.qld.gov.au>
Cc: Lesley T Ryan <Lesley.T.Ryan@tmr.qld.gov.au>; David C Kelly <david.c.kelly@tmr.qld.gov.au>
Subject: FW: Request for new TC sign design

Hi David,
This is the signage that E&T are suggesting for Southport-Burleigh Road through the housing section.

Kind regards,

Derek P Grant
Manager (Operations) | South Coast Region | SEQ Road Operations
Program Delivery & Operations | Department of Transport and Main Roads

Ground Floor | Nerang TMC | 16-18 White Street | Nerang Qld 4211
PO Box 442 | Nerang Qld 4211
P: (07) 5563 6679 | F: (07) 55969511
M:
E: derek.p.grant@tmr.qld.gov.au
W: www.tmr.qld.gov.au

From: Rohit P Singh
Sent: Friday, 15 April 2016 12:31 PM
To: Lesley T Ryan <Lesley.T.Ryan@tmr.qld.gov.au>
Cc: Gavin A Massingham <Gavin.A.Massingham@tmr.qld.gov.au>; David I Selth <David.I.Selth@tmr.qld.gov.au>; Derek P Grant <Derek.P.Grant@tmr.qld.gov.au>; David B Jorgensen <david.b.jorgensen@tmr.qld.gov.au>; Tom Vucetic <tom.vucetic@tmr.qld.gov.au>; Jon C Douglas <jon.c.douglas@tmr.qld.gov.au>

Subject: RE: Request for new TC sign design

Lesley,
We have developed a sign that could be used on Southport-Burleigh Road that would adequately serve the purpose for which the sign is required (warn drivers on the road to expect slow moving vehicles turning into driveways).

Unfortunately the sign from NSW is a symbolic sign that was considered to be too confusing which could result in drivers getting different messages. I circulated the NSW sign to my other jurisdictional counterpart and have had no support for that sign. NSW has not yet responded to my request for information regarding sign comprehension testing of that sign.

Please let me know if this adequately addresses the district's commitment to the residents and we will be able to issue a sign number.

Rohit Singh
Principal Engineer (Traffic Engineering) | Road Operations
Engineering & Technology | Department of Transport and Main Roads

Floor 11 | Brisbane City - 313 Adelaide Street | 313 Adelaide Street | Brisbane City Qld 4000
GPO Box 1412 | Brisbane City Qld 4001
P: (07) 30667970 | F: (07) n/a
M: [redacted]
E: rohit.p.singh@tmr.qld.gov.au
W: www.tmr.qld.gov.au

cid:image001.png@01D19658.C7276030

From: Lesley T Ryan
Sent: Wednesday, 6 April 2016 2:10 PM
To: Rohit P Singh <Rohit.P.Singh@tmr.qld.gov.au>
Cc: Gavin A Massingham <Gavin.A.Massingham@tmr.qld.gov.au>; David I Selth <David.I.Selth@tmr.qld.gov.au>; Derek P Grant <Derek.P.Grant@tmr.qld.gov.au>; David B Jorgensen <david.b.jorgensen@tmr.qld.gov.au>; Tom Vucetic <tom.vucetic@tmr.qld.gov.au>
Subject: Request for new TC sign design

Hi Rohit

With the upgrade of Southport-Burleigh Road to six lanes the parking is being removed outside a number of residences that is currently in a 70km/h zone. I'm uncertain, but it may be that the speed will be dropped to 60km/h along this section of road. The section concerned falls between La Spezia Court and Rudd Street. I have attached a google maps screen dump.

The residents are concerned as they currently have a shoulder lane that they can use to assist them enter and exit their driveways. They will no longer have this when the upgrade is completed

in approximately 3 months. The footpath is also quite narrow along this section.

The RD and DD have promised the residents that signs will be installed to make motorists aware that people may be entering and exiting driveways on this section of the road. RMS NSW have the attached signs approved for use in NSW and the region would like to request similar approval for this sign for use in Queensland.

If you require any further information on this please let me know.

Regards

Lesley Ryan
Senior Traffic Officer | South Coast Region
Program Delivery And Operations | Department of Transport and Main Roads

Ground Floor | Nerang TMC | 16-18 White Street | Nerang Qld 4211
PO Box 442 | Nerang Qld 4211
P: (07) 55636606 | F: (07) 55636611
E: lesley.t.ryan@tmr.qld.gov.au
W: www.tmr.qld.gov.au

TC22YY

Example

PRELIMINARY

	a	b	c	d	e	f	r
SIZE A	600	8	16	100CN	50	20	40
SIZE B	750	10	20	125CN	63	25	50
SIZE C	900	12	24	150CN	75	30	60

Colour Legend

- Black
- Retroreflective yellow

Notes

1. This sign may be used to warn of the possibility of vehicles being inhibited from entering a driveway or property at a normal turning speed due to some form of constraint such as the opening of automatic gateways or pedestrian traffic.
2. This sign should be used with supplementary sign TC22YY. See example.

Queensland Government

WARNING SIGN
"SLOW TURNING TRAFFIC"

Department of Transport and Main Roads
Infrastructure Management & Delivery Division

PRELIMINARY
15/04/16
Date

Designed	Checked	Scale
TV 04/16	DJ 04/16	Not to Scale

A

TC22xx

Example

PRELIMINARY

	a	b	c	d	e	f	g	r
SIZE A	600	400	8	24	80	80EN/50LC	80CN	40
SIZE B	750	500	10	30	100	100EN/60LC	100CN	50
SIZE C	900	600	12	36	120	120EN/75LC	120CN	60
SIZE D	1200	800	16	48	160	160EN/100LC	160CN	80

Colour Legend

Black

Retroreflective yellow

Notes

1. This sign may be used as a supplementary sign to indicate the existance of driveways on a length of road.
2. This sign should be used with warning sign to TC22xx. See example.
3. The overall length of road to be signed should not exceed 5 km.
4. Repeater signs are to be used every 1km.
5. * Insert appropriate distance. e.g.3

Queensland Government

SUPPLEMENTARY SIGN
"DRIVEWAYS NEXT ... km"

Department of Transport and Main Roads
Infrastructure Management & Delivery Division

PRELIMINARY

15/04/16
Date

Designed	Checked	Scale
TV 04/16	DJ 04/16	Not to Scale

A

From: David I Selth
To: Paul S McCormack
Cc: Rachael L Poeppmann; SBR South
Subject: RE: Accommodation works Bermuda st
Date: Thursday, 8 September 2016 3:53:00 PM

Paul
Please continue as you are, nothing special at this time.
I will be glad when all works are complete and all lanes can open.
If one side is complete prior to the other, then please consider opening and not wait for both sides.

Thank you,

David Selth
Manager (Delivery) | South Coast Region
Program Delivery And Operations | Department of Transport and Main Roads

Floor 1 | 36-38 Cotton Street | Nerang Qld 4211
PO Box 442 | Nerang Qld 4211
P: (07) 55636425 | F: (07) 55636611
M:
E: david.i.selth@tmr.qld.gov.au
W:www.tmr.qld.gov.au

From: Paul S McCormack
Sent: Thursday, 8 September 2016 2:40 PM
To: David I Selth <David.I.Selth@tmr.qld.gov.au>
Cc: Rachael L Poeppmann <Rachael.L.Poeppmann@tmr.qld.gov.au>; SBR South <SBR_South@tmr.qld.gov.au>
Subject: RE: Accommodation works Bermuda st

Hi David

At this stage, the Contractor is anticipating the completion of the driveways only by 14 October 2016. We were planning on leaving the slow lanes closed in each direction until these works were complete (including the gates and so on..)

All of the driveway warning signs have been erected (see photos attached).

I've heard about the rally on Saturday. If need be, we can open up all three lanes in both directions and do isolated lanes closures as we proceed with the works. I think at this stage the residents are quiet because the slow lane is closed, and they can exit and enter relatively easily.

Please let me know if you need anything done.

Cheers,

Paul McCormack
Contract Administrator | South Coast Region
Program Delivery And Operations | Department of Transport and Main Roads

Ground Floor | Nerang TMC | 16-18 White Street | Nerang Qld 4211
PO Box 442 | Nerang Qld 4211
P: (07) 55636600 | F: (07) 55969511
M [redacted]
E: paul.s.mccormack@tmr.qld.gov.au
W: www.tmr.qld.gov.au

From: David I Selth
Sent: Thursday, 8 September 2016 2:08 PM
To: Paul S McCormack <Paul.S.McCormack@tmr.qld.gov.au>
Cc: Rachael L Poeppmann <Rachael.L.Poeppmann@tmr.qld.gov.au>
Subject: Accommodation works Bermuda st

Paul
Could you please advise when the driveway works will be complete for Bermuda St.
Only interested in the driveways, not the gates etcc at the moment.
Also – if related or not – when will the road be opened up to six lanes (or three lanes each side if different timings)
Have the 'driveway warning' signs been erected yet?
Could you please advise.

I expect you know about the protest rally this Saturday.
The local Mp has been requested to attend by the organisers and is seeking TMR advice about Clearways.

My queries above are – just in case he asks.

Thank you,

David Selth
Manager (Delivery) | South Coast Region
Program Delivery And Operations | Department of Transport and Main Roads

Floor 1 | 36-38 Cotton Street | Nerang Qld 4211
PO Box 442 | Nerang Qld 4211
P: (07) 55636425 | F: (07) 55636611
M: [redacted]
E: david.i.selth@tmr.qld.gov.au
W: www.tmr.qld.gov.au

From: David I Selth
To: Paul S McCormack
Cc: Rachael L Poeppmann; Ross J Poidevin; SBR South
Subject: Re: Bermuda Street (Clearways) story - Saturday 10 September 2016
Date: Monday, 12 September 2016 11:01:38 AM

Paul
Thanks
The media about the rally reported 70kph road
Thank you
David

Sent from my iPhone

On 12 Sep 2016, at 10:54 AM, Paul S McCormack <Paul.S.McCormack@tmr.qld.gov.au> wrote:

> Hi David
>
> We have some of the permanent signage in place (northbound) which is signed at 60km/h. The rest of the project has temporary signage in place, again at 60km/h (some locations during works hours are 40km/h).
>
> There will be no more 70km/h speed limits from Rudd through to Vespa from now on.
>
> Cheers,
>
> **Paul McCormack**
> Contract Administrator | South Coast Region
> **Program Delivery And Operations** | Department of Transport and Main Roads
>
> Ground Floor | Nerang TMC | 16-18 White Street | Nerang Qld 4211
> PO Box 442 | Nerang Qld 4211
> P: (07) 55636600 | F: (07) 55969511
> M: [redacted]
> E: paul.s.mccormack@tmr.qld.gov.au
> W: www.tmr.qld.gov.au
>
> ---
>
> **From:** David I Selth
> **Sent:** Monday, 12 September 2016 9:55 AM
> **To:** Paul S McCormack <Paul.S.McCormack@tmr.qld.gov.au>; Ross J Poidevin <Ross.J.Poidevin@tmr.qld.gov.au>
> **Cc:** Rachael L Poeppmann <Rachael.L.Poeppmann@tmr.qld.gov.au>
> **Subject:** RE: Bermuda Street (Clearways) story - Saturday 10 September 2016

Paul
Has the speed limit been reduced to 60kph yet?
Similarly for the Fremar to Monaco and the Central section.
The road will be 60kph for 8km when complete.

Thank you,

David Selth
Manager (Delivery) | South Coast Region
Program Delivery And Operations | Department of Transport and Main Roads

Floor 1 | 36-38 Cotton Street | Nerang Qld 4211
PO Box 442 | Nerang Qld 4211
P: (07) 55636425 | F: (07) 55636611
M:
E: david.i.selth@tmr.qld.gov.au
W:www.tmr.qld.gov.au

From: SouthportBurleighRoad
Sent: Monday, 12 September 2016 9:50 AM
To: Paul S McCormack <Paul.S.McCormack@tmr.qld.gov.au>; David I Selth <David.I.Selth@tmr.qld.gov.au>; Ross J Poidevin <Ross.J.Poidevin@tmr.qld.gov.au>; Romy Dwyer <Romy@thecommsteam.com.au>; Alan J Stone <alan.j.stone@tmr.qld.gov.au>; Paul D Noonan <Paul.D.Noonan@tmr.qld.gov.au>
Cc: SBR_Central <SBR_Central@tmr.qld.gov.au>; DCO_Nerang <DCO_Nerang@tmr.qld.gov.au>
Subject: Bermuda Street (Clearways) story - Saturday 10 September 2016

Hi Team

Please find attached the news broadcast on the protest held at Bermuda Street regarding the request for clearways along SBR, for your information.

Kind regards
Nicole

Southport–Burleigh Road Project Team
Customer and Stakeholder Management | South Coast Region
Program Delivery And Operations | Department of Transport and Main Roads

Ground Floor | Nerang - Gold Coast Office | 36-38 Cotton Street | Nerang Qld 4211
PO Box 442 | Nerang Qld 4211 P: (07) 5563 6600

From: David I Selth
To: SouthportBurleighRoad; Paul S McCormack
Cc: Anna R Cush; Nicole E Sprintall
Subject: RE: Bermuda Street Roadworks - not relevant - follow up.
Date: Tuesday, 5 July 2016 11:44:00 AM
Attachments: image009.png
image010.png
image011.png
image012.png
image013.png
image014.png
image015.png

Rachael
Thanks
When you return, please as you suggest, create a letter to all residents and then commence face to face.
Probably need three similar letters.
One to those where nothing is being done. One to those where it is only the driveway.
The other to those with gate / fence / internal works – if they have not already got one.

Thank you,

David Selth
Manager (Delivery) | South Coast Region
Program Delivery And Operations | Department of Transport and Main Roads

Floor 1 | 36-38 Cotton Street | Nerang Qld 4211
PO Box 442 | Nerang Qld 4211
P: (07) 55636425 | F: (07) 55636611
M:
E: david.i.selth@tmr.qld.gov.au
W:www.tmr.qld.gov.au

From: SouthportBurleighRoad
Sent: Tuesday, 5 July 2016 11:36 AM
To: Paul S McCormack <Paul.S.McCormack@tmr.qld.gov.au>; David I Selth <David.I.Selth@tmr.qld.gov.au>
Cc: Anna R Cush <Anna.R.Cush@tmr.qld.gov.au>; Nicole E Sprintall <Nicole.E.Sprintall@tmr.qld.gov.au>
Subject: FW: Bermuda Street Roadworks - not relevant

This is what I feared would happen and why I wanted to send each individual property the drawing of the driveway widening and a letter saying this is what we are doing and as it is on TMR land we are just doing it.

The reason they have not yet been contacted is because we are only driveway widening here and doing nothing internal.

Yes it will give them the opportunity to complain that nothing internal is being done – but as we have engaged with every stakeholder face to face along this stretch I think we need to go back to each of them and say this is what we are doing.

We are only going to keep receiving emails such as this if we don't send them each something. Ill draft up a letter when I'm back and lets discuss how we tackle the residents that are not having internal works.

Cheers
Rach

Rachael Poeppmann
Customer and Stakeholder Management | South Coast Region
Program Delivery And Operations | Department of Transport and Main Roads

Ground Floor | Nerang - Gold Coast Office | 36-38 Cotton Street | Nerang Qld 4211
PO Box 442 | Nerang Qld 4211
P: (07) 5563 6638 |
01201_COB_Flood it_Sig Block2

Pages 16 through 18 redacted for the following reasons:
- -
not relevant

From:	David I Selth
To:	Rachael L Poeppmann; Paul S McCormack
Cc:	Anna R Cush; Jessica K Banks
Subject:	RE: Letter to Bermuda Street Residents amended draft
Date:	Monday, 16 May 2016 5:03:00 PM

Rachael
Please look at this version
Depending who is calling, there will be two versions, one to just driveway residents and one to owners where works are proposed at or in their property. This is the internal works version. Please downsize this one for the driveway only version which should go to every owner advising that the footpath will change too. Essentially everyone gets a new driveway.
Please adjust and send both through to me for approval.

Good afternoon,

Thank you for meeting with officers from the Department of Transport and Main Roads (TMR) over the past few months to discuss the Southport–Burleigh Road network upgrade and the impacts to your property on Bermuda Street, Broadbeach Waters.

As you are aware, the upgrade will convert the current 4 lanes into 6 and as the access to your property at is now in closer proximity to the widened corridor, TMR has elected to investigate upgrading both the footpath and your driveway where possible and also other works at the property boundary to ensure safer ingress and egress from your property.

Based on your feedback, TMR is now revising the design of the road and footpath prior to undergoing the approval process. Some properties will require internal works, and these designs are currently being reviewed to ensure that all documentation is legally correct.

TMR is still investigating the extent to which the footpaths on both the eastern and western side of Bermuda Street may be upgraded. There are many variables involved including drainage and gradients and these investigations are talking longer than first expected. We understand the frustration of residents, but would like to assure you that we are working as quickly as we can to resolve the many variables that require further investigation. The aim is to provide to you a design and appropriate Agreement for works within your property so that those works can be completed speedily and before the major road upgrade is complete.

Rachael Poeppmann will be in contact with each of you individually in the coming weeks to make an appointment time so that TMR officers can discuss these new arrangements with you. We appreciate your patience whilst we ensure that these upgrades are of benefit to all involved.

Kind Regards
David Selth
Manager, Delivery

Thank you,

David Selth
Manager (Delivery) | South Coast Region
Program Delivery And Operations | Department of Transport and Main Roads

Floor 1 | 36-38 Cotton Street | Nerang Qld 4211
PO Box 442 | Nerang Qld 4211
P: (07) 55636425 | F: (07) 55636611
M: [redacted]
E: david.i.selth@tmr.qld.gov.au
W: www.tmr.qld.gov.au

From: Rachael L Poeppmann
Sent: Monday, 16 May 2016 3:41 PM
To: Paul S McCormack <Paul.S.McCormack@tmr.qld.gov.au>; David I Selth <David.I.Selth@tmr.qld.gov.au>
Cc: Anna R Cush <Anna.R.Cush@tmr.qld.gov.au>; Jessica K Banks <Jessica.K.Banks@tmr.qld.gov.au>
Subject: Letter to Bermuda Street Residents

Hi Guys,

I am receiving A LOT of enquiries from residents on Bermuda street about the driveways. They are growing in anger and we need to tell them something – We need to communicate something to them – even if it is another holding pattern. My normal "I'll let you know as soon as I know something" is no longer working.

I would like to send out a group email/letterbox drop saying something like the following? Can you guys have a look and let me know if I have made this grey enough to send? My fear is that if we don't send them something in writing asap it will only damage the relationships I've managed to maintain with them thus far – which could only be further damaging to the project. I need to ensure that these people keep trusting that I and the team are working behind the scenes on their issues????

Sorry to also put a rush on it but I would like to do this on Wednesday when I am back on site at La Spezia.

Good afternoon,

Thank you for meeting with officers from the Department of Transport and Main Roads (TMR) to discuss the Southport–Burleigh Road network upgrade and the impacts to your property on Bermuda Street, Broadbeach Waters.

As you are aware, the upgrade will convert the current 4 lanes into 6 and as the access to your property at is now in closer proximity to the widened corridor, TMR officers have elected to amend your driveway to ensure safer ingress and egress from your property.

Currently all designs for these upgrades are undergoing the approval process as well as

amendments for each individual property. Some properties will require internal and external works, and these designs are currently with the legal department ensuring that all parties documentation is correct and legally binding.

TMR are also still investigating the length to which the footpaths on both the eastern and western side of Bermuda Street may be upgraded. There are many variables involved including drainage and gradients and these investigations are talking longer than first expected. We understand the frustration of residents, but would like to assure you that we are working as quickly as we can to resolve the many variables that require further investigation

Rachael Poeppmann will be in contact with each of you individually in the coming weeks to make an appointment time so that TMR officers can discuss these new arrangements with you. We appreciate your patience whilst we ensure that these upgrades are of benefit to all involved.

Kind Regards
David Selth
Manager, Delivery

Rachael Poeppmann
Customer and Stakeholder Management | South Coast Region
Program Delivery And Operations | Department of Transport and Main Roads

Ground Floor | Nerang - Gold Coast Office | 36-38 Cotton Street | Nerang Qld 4211
PO Box 442 | Nerang Qld 4211
P: (07) 5563 6638 | M: [redacted]
01201_COB_Flood it_Sig Block2

Pages 22 through 23 redacted for the following reasons:
- -
not relevant

From: David I Selth
To: Paul S McCormack
Cc: SBR South
Subject: Re: Signs on Bermuda st
Date: Monday, 25 July 2016 8:38:33 AM

Paul
I must have missed that one.
As I drove south through the site yesterday I could not see any. Suggest there needs to be a few more. Especially now the traffic will soon be six lanes, but even with the four when on the kerb lane should have them. Just in case there is accident then TMR has demonstrated that all is being done.
Thanks
David

Sent from my iPad

> On 25 Jul 2016, at 8:19 AM, Paul S McCormack <Paul.S.McCormack@tmr.qld.gov.au> wrote:
>
> Hi David
>
> We have some temporary core flute signs in place until the permanent signs are delivered (see photo above).
>
> I'll let you know when the permanent signs are in.
>
>
>
> Cheers,
>
>
>
> Paul McCormack
> Contract Administrator | South Coast Region
> Program Delivery And Operations | Department of Transport and Main Roads
>
> Ground Floor | Nerang TMC | 16-18 White Street | Nerang Qld 4211
> PO Box 442 | Nerang Qld 4211
> P: (07) 55636600 | F: (07) 55969511
> M
> E: paul.s.mccormack@tmr.qld.gov.au
> W: www.tmr.qld.gov.au
>
>
>
>
> -----Original Message-----
> From: David I Selth
> Sent: Saturday, 23 July 2016 9:30 AM
> To: Paul S McCormack <Paul.S.McCormack@tmr.qld.gov.au>
> Subject: Signs on Bermuda st
>
> Paul
> Could of please advise when the warning signage for the driveways will be erected on Bermuda St?
> Thank you
> David
>
> Sent from my iPad
> <IMG_0687.jpg>

Southport Burleigh Road upgrade: Sara Avenue to Rudd Street

Design Exception Report

Prepared by	Michael Wong
Title	Principal Engineer (Technical Services)
Branch	PDO
Division	IMD
Department	Department of Transport and Main Roads
Location	South Coast Region
Version no.	final
Version date	08/10/2015
Status	For approval
DMS ref. no.	450/01061

Contents

Executive Summary

The six lanes upgrade at Southport Burleigh Road encountered design exceptions elements where economical outcome within reasons to achieve Normal Design Domain (or Extended Design Domain where exist) is unviable. These substandard elements comprised lane width, median, working width, shy line, clear zone, footpath, flood immunity, driveway accesses and bus stop. In depth deliberation on separate or combination of substandard elements with respect to risks, users' safety, and feasible mitigations included discussion with other design consultants and personnel from Engineering and Technology Branch. Consensus was reached for consistency of mitigating treatments along the whole six-lane upgrade work.

The recommendations for lane width, working width, shy line, clear zone and driveway accesses to be mitigated by 3.1m lane width with narrow raised median and asymmetrical offset of edge line marking for kerb side lane for southbound direction. The asymmetrical edge lines delineated greater effective working width in southbound direction which is more critical than northbound direction.

Property accesses where reversing deemed an unsafe manoeuvre due to substandard sight distance for affected properties will be negotiated with owners in the consultation process. The resultant proposed access treatment will be updated in this report for record.

The project scope excluded footpath improvement except where affected by intersection design. Substandard footpath at mid-block was assessed on risk and recommended to forward to GC City Council for improvement work under current agreement between LGA and TMR in accordance to 'Cost sharing based on responsibilities within state-controlled roads' policy.

TransLink prefers the two existing bus stops to remain on the proposed kerb side lane despite business case stated their removal. Though highly undesirable for operational effectiveness of new kerb side lanes, low passengers patronage implied likely acceptable currently as tentative measure. Further negotiation on relocation or decommissioning with TransLink is recommended.

Flood immunity deficiency resulted in extra storage via short sections of new RCPs. This, by Hydraulic Branch's analysis, presented little improvement and benefit. However larger scale upgrading of drainage network to meet required immunity would involve extensive upsizing of pipes and may involve properties resumption to improve outlets discharge to Nerang River. This report recommended flood modelling and catchment definition adopted for this exercise warrant further technical evaluation and close collaboration with GC City Council's flood assessment study.

1.0 Introduction

TMR plans to upgrade the Southport-Burleigh Road (hereafter abbreviated as SBR in the report) from North Street to Nerang-Broadbeach Road into a six lanes road. The upgrade work will involve converting the existing parking lanes into through traffic lanes. The proposed work will generally limited to within the kerb and channels located at either side of the existing roadway. This report identifies the key road elements where normal design standards are unachievable and would require design compromise based on design philosophy in 'Guideline for Road Design on Brownfields Sites', where 'Context Sensitive Design' has been adopted widely for this project.

This report discussed the design standards, trade-offs made, alternative options explored, level of safety attainable, future flexibility and cost implications. Consequently a compromised balance of these is presented here for SCR managerial consideration and approval. This report format is based on criteria listed in Appendix A of: EDD and Design Exception Summary Report of the above guide. It was decided a report format is more suitable to present the design issues and respective impacts, instead of fill-in-a-form template contained in Appendix A of the guide.

It should also be noted this report only covered Rudd Street intersection upgrade site; and covered approximately 250m of SBR north of the Rudd Street intersection. The section south of the intersection under the scope has no elements discovered that warranted mitigating design. The EDD/DE report for northern sections under same SBR six lanes upgrading will be submitted separately by respective consultants.

2.0 Basic Project and Site Information

2.01 Job Number

The job number for this project is 230/103/016

2.02 Road

The road being the subject of this report is Southport-Burleigh Road, with local name as Bermuda Street.

2.03 Location

The specific location is the intersection of Southport-Burleigh Road with Rudd Street and Darnay Road, including approximately 250m section north of the intersection.

2.04 Locality Map

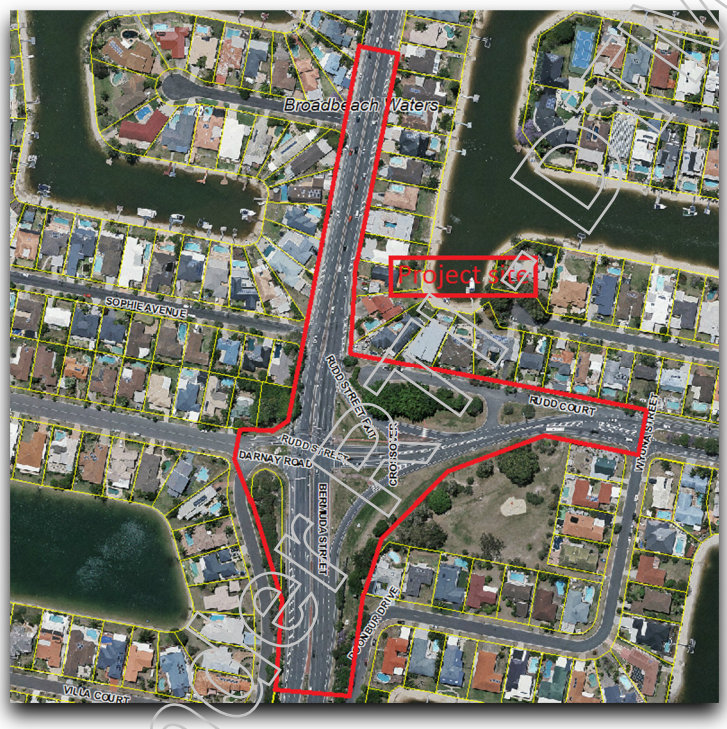


Fig. 1

The project site is outlined in Fig 1 above. The gazettal chainage of Southport-Burleigh Road for this upgrade work is from Ch7300 to Ch7840 approximately.

2.05 Posted Speed

Current posted speed is 70km/h. One of the project's outcomes is to reduce the posted speed to 60km/h in both directions. Northern sections of SBR under the same six lanes upgrade project will consistently adopt a 60km/h posted speed limit.

2.06 V_{85th} Speed

V^{85th} speed is the speed below which 85% of drivers travel under free flowing condition, and 15% of drivers travel over it. This is the design speed used for design consideration.

For design purpose, the 15% of drivers who exceed this speed are considered to be aware of the increased risk they are taking and are expected to maintain a high level of alertness where higher speed effectively reduced their reaction time. The speed data at this site has been carefully considered as shown below because of the uniqueness of V^{85th} speeds captured varies across peaks and off-peaks and also across lanes.

2.06.1 Peak Hours

The site's peak hours are: 7-9am in the morning and 3-6pm in the afternoon. The speed data was sourced from Traffic Survey and Data Management (TSDM).

2.06.2 V85th Speed Variation

The TSDM data showed during both morning and afternoon peak hours, three out of the four lanes have V^{85th} speed above the speed limit of 70km/h. This is considerably higher than expected, given the peak hour traffic volume observed would easily form long queue at signalised intersections at Fremar Street and Rudd Street, which are only 600m apart.

TSDM data further revealed the V^{85th} Speeds are non-uniform across the existing four lanes. The V^{85th} speed recorded for respective lane is as below:

- Southbound outer lane (T1 lane): 65.0km/h during morning peaks; 33.6 km/h during afternoon peaks;
- Southbound inner lane (T3 lane): 78.4km/h during morning peaks; 72.2 during afternoon peaks;
- Northbound outer lane (T2 lane): 71.3km/h during morning peaks; 73.7km/h during afternoon peaks;
- Northbound inner lane (T4 lane): 74.4km/h from 7-8 am; but 33.2km/h from 8-9am; 78.0km/h during afternoon peaks;

Apart from these, TSDM also showed *average* V^{85th} speed for all lanes could reach 80.5km/h during the pre-dawn hours where traffic volume is very low.

It should be mentioned that the speed survey site was located at 380m north of Fremar Street intersection, where it is a relatively long section of straight road without driveways and side roads joining to it. It is reasonable to assume at this locality it captured higher speed.

No separate speed count was conducted for actual V^{85th} speed between Rudd Street intersection and Fremar Road intersection. To gauge the representativeness of the existing TSDM speed data with respect to peak hours traffic between these two intersections, actual driving through with the traffic platoons were carried out. These 'snap shot'

measurement observed the speed clocked at 40~60 km/h in peak hours, and 60~70km/h in-between peak hours. It must be noted these snap-shots measurements were in no way simulating V^{85th} speed count methodology. They only provided an indication of 'platoon of traffic' speed in the context for this exercise with more realism than the TSDM count site which was 380m away. Generally speaking then, the speed of most drivers through these intersections are lower than the actual TSDM count site. However, similar exercise conducted at night showed the off-peak hours speed resembled the TSDM existing speed count site.

2.07 AADT

The annual average design traffic volume from 2012 traffic count was 56,460 vehicles per day. 2013 count showed 54149 vehicles per day and 2014 count amounted to 49689 vehicles per day. The 2013 count showed a high volume of heavy vehicles for northbound direction which was not consistent when compared to the previous years. The surge in volume was likely due to traffic re-routing to avoid congestion during GC light rail construction.

In generally, the two daily peak hour volumes constitute 30% of daily total traffic volumes.

2.08 2031 Projected AADT

The business case based AADT from 2012 count. Its projected AADT volume adopted a growth rates of 1.5% for first five years from 2012; thereafter 2% for the remaining first ten years, and 3% for the rest until 2031. The projected AADT at 2031 is 77000 vehicles per day.

2.09 Percentage of heavy vehicle

The traffic data showed commercial vehicles is around 4% of the AADT.

To set the scene for tall commercial vehicles driving on proposed new kerb side lane, it need to point out that Queensland's legal maximum height is at 4.6m whereas TMR design standard only limited to a design vehicle height of 4.3m. This 4.3m design height created concern for working width requirement for tall vehicles running on kerb side lane where power poles exist behind the kerb. The tallest truck using this road could be a double-deck vehicle transport trailer with potential maximum height of 4.6m. Though department traffic data base does not capture this particular type of tall vehicle because no special permit required, a check on last five years for trucks with 5-axles and above (these trailers have minimum of 5-axles) in TSDM Classified Vehicle Count revealed most of these trucks run

on outer lane (See Table 1 below). And certainly will continue to do so post implementation due to kerb side lane will appear wider compared to inner and middle lanes.

Year	Ave no. 5 & 6 axles truck/day	% on outer lanes
2014	61	82
2013	75	97
2012	21	81
2011	40	53
2010	51	73

Table 1: High vehicles distribution across lanes

Despite these tall trucks represent only a small portion in the commercial vehicle component of the AADT, the scenario that high proportion of them will likely run on the kerb side lane need to have risk based evaluation when the parking lane is converted into the kerb side lane with power poles next to the kerb.

3.0 Design Class for the proposed site

Based on department's 'Guideline for Road Design for Brownfields Sites', the proposed design work involved complex and high risk and/or relatively expensive work, therefore it is deemed as Class A work in accordance to *Table 1.1 Road Design Classes* in the guide.

For Class A work under the Guideline, it is recommended to adopt Extended Design Domain for brownfield site, and Design Exception if an exceptional circumstance exists; and Normal Design Domain for all other instances.

It is on this basis and the approved business case, the proposed design did not mandate all existing sub-standard elements to be rectified and made conforming to normal standards. Rather, the design carefully considered minimum capability offered under the below-standards constraints. And where any element found below the required standards, the risk scenario for users with respect to keeping to Design Exception was explored, and recommended with some defensible level of mitigation accordingly.

4.0 Key Project Components

Rudd Street intersection upgrade is part of the six-lanes 7.8km section of Southport-Burleigh Road upgrade design between North Street to the north and Nerang-Broadbeach Road to the south. The proposal is to provide the third lane utilising the existing parking lane or shoulder space throughout this section of SBR.

This report focus only on southern end of the 7.8km upgrade design, which comprises Rudd Street intersection upgrade. The key design works at the intersection are:

- six through lanes for both directions utilising the existing parking lane/shoulder as the third lane;
- provision of dual right turn lanes from northbound SBR into Rudd Street;
- Increase storage capacity for southbound left-turn lane from SBR into Rudd Street.
- The left turn slip lane from Rudd Street into SBR to amend to high-angle entry slip lane.
- Additional high angle slip lane provided for left turn into Darnay Road.
- Closure of Rudd Court at eastern entry and exit point.
- Drainage network improvement investigation. The investigation was to explore extend of improvement affordable, from a range of scenario affecting the numbers of lane to stay opened under different Annual Exceedance Probability AEP (or old terminology ARIs).
- Protection and/or relocation of electrical, telecommunication, city water and sewerage installations.

5.0 Project intent for Rudd Street intersection upgrade

The overall project is to reduce travel time delays and queue lengths at intersections, and provide acceptable levels of service for 2018 and beyond. In the Business Case, traffic modelling predicted a peak travel time saving of around 15 minutes is achievable in 2031 if the upgrade is implemented.

It is understood the design work is to be completed for tender by September 2015. The approved Business Case stated the whole SBR six lanes project has a defined finish date which is governed by the staging of GC2018 Commonwealth Games. In line with the approved business case, this implies the whole project must be practically completed by

December 2017 to enable some level of testing and operations to be conducted before April 2018.

6.0 Accident History

A search from department's database yielded 36 total number of accidents occurred within this section in the last ten years. Among these, there were 22 cases of rear-ended crashes, which made up 61% of the total crashes and being the highest crash type. The second highest crash type showed eight run off road crashes, or hit fixed objects at *road side* including parked cars. The remaining six crashes involved angled collisions at intersections and crashing into street lighting poles and traffic signal posts in the median at intersection.

6.01 Evaluation of Crashes

Given the high representation of rear-ended, run off road and sideswipe crash types at a combined 83%, the crash details are further examined for probable causes. This is to ensure the identified probable causes are mitigated as best possible under this upgrade work. It is a safety concern since the new kerb side lane will allow vehicles, including commercial vehicles driving closer to footpath, power poles and private property fences.

6.02 Risk of Roadside Hazards

Of the eight cases of run off road and hit fixed objects, the accidents involved crashes into private fences, brick walls, traffic light poles and street lighting poles. No record of any power pole was hit but during site visits it was discovered at least two poles suffered damages consistent from crashes due to vehicles impact. One of the poles appeared to have suffered multiple hit which resulted in extra protection by galvanised steel section.

Causes of these eight crashes listed influence from alcohol, drug use and existing medical conditions as the main reasons. There is no practical design provision deemed adequate to mitigate such cause, except roadside barrier such as guardrail. But any form of roadside barrier is deemed impractical in urban environment such as this, apart from becoming another hazard itself. It is reasonable to deduce under prevailing roadside conditions, the future run-off road risk will increase due to less room for error for errant drivers, which results from reduced lane width and the introduction of the third lane closer to fixed solid fences and power poles. Therefore, consequences and severity from such type of crash need to be evaluated in design process.

6.03 Risk from Traffic Conditions

To assess if slower speed in higher traffic volume in peak hours, and higher speed and low traffic volume had any bearing for rear-enders for the existing roadway, the crash data was classified as shown below. The crash outcomes of injured is also tabulated for safety evaluation. The tabulation below shows rear-ended accidents classified according to traffic intensity and severity with respect to peak and off-peak hours.

Time of accident	Rear-ended traffic accident	Nature of injuries
peak hours	*11*	*hospitalisation/medical treatment/minor injuries*
peak hours	*4*	*property damage only*
outside peak hour	*5*	*hospitalisation/medical treatment/minor injuries*
outside peak hour	*2*	*property damage only*

Table 2: Distribution of rear-ended accidents in terms of crash severity and time of occurrence

Note: Crash report showed rear-ended accidents above were results of collisions with slowing traffic in front or stopped vehicles.

From the table above, it shows 68% of the rear-ended accidents occurred at peak hours, and more than half of rear-ended crashes resulted in injuries, minor or otherwise. The occurrence during peak hours is consistent with Austroads report 'AP-R480-15 Investigation of Key Crash Types – rear ended' where unsteady traffic speed and higher density of vehicles are common factors.

As for injuries outcome, Austroads reported the rear-ended crashes seldom resulted in fatality in Australia; but it remained highly probable in causing some form of injuries, most notable are injuries due to whiplash. There is no national statistic to show long term impact from whiplash caused in accidents. Nevertheless Austroads quoted SA studies which showed about 5% of whiplash injuries have long term adverse impact on capability to continue working, apart from affecting the quality of lives of the injured.

7.0 Design Proposal for Known Minima and Limitations

There is no known existing substandard features in both horizontal and vertical alignments, except the clear zone width with respect to the posted 70km/h speed limit.

To implement the approved business case design, the normal design standards would only apply for the horizontal and vertical geometry for this section of SBR. From Sara Avenue to Rudd Street intersection, if NDD standards with respect to lane width, median and shared cycle/footpath are to be adopted, it would require a corridor width ranging from 27.6m to 28.8m. The current corridor width is approximately only 25m at the mid-block section. Therefore, to comply with NDD, the project will require properties resumption to one side of the road, plus services relocations for electrical poles. Given these are all canal-front homes with little front distances to buildings, a resumption of up to 3.8m strip from the frontage likely runs into huge costs for an estimated 7 properties on the western side. Extra cost would be required for those subject to partial resumption for dwelling modification work to individual property to be carried out. In addition, drainage network is grossly inadequate to meet current flood immunity requirements of TMR Drainage Design Manual, and hence would require major upgrading of all the pipe network and outlets. Other underground utilities such as water mains and sewer lines under Gold Coast City Council's jurisdiction will be impacted and extensive relocation, protection or modification works will be anticipated as well. Therefore the anticipated cost for NDD compliant is prohibitive and likely resulted in low BCR value if an estimate was carried out in Business Case. The anticipated costs was probably the factor where Business Case opted for no upgrade work beyond the existing kerbed roadway; although the rationale and estimated costs were not document in the approved Business Case.

To implement the project, it requires either Extended Design Domain or Design Exception where constraints exist. The sections below listed the substandard elements retained and/or proposed. Each section also elaborated potential safe capabilities attainable, and associated impacts for road users.

7.01 Lane width and narrow median

Existing:

Existing SBR consists of 4-lanes two way, with parking lane or shoulder space in each direction. The lane width ranged generally from 3.3m to 3.5m. The parking lane width is approximately 2.5m. The median width generally varies, with the narrowest section measured about 1.2m wide. The existing configuration of general traffic lane, parking lane and median conform to acceptable current standards.

Proposed:

The approved business case required that the six lanes upgrade to confine to the existing kerbed roadway within the corridor. The exception is at intersections where proposed turn-lanes requirements dictate otherwise. In other words, the proposed six lanes configuration will need to fit in the kerb to kerb width of approximately 19.6 m, from north of Sophie Avenue under Package 4 of this project. The same constraint continued into Package 10b under another design consultant's scope.

Under normal design domain, desirable lane width for urban road for general traffic range from 3.3m to 3.5m. If 3.3m lane width is adopted, this would need a width of 19.8m excluding any median. If 3.5m lane width is adopted, the overall width required will be 21m excluding any median. It is obvious neither case can fit within the width of existing roadway.

For minimum lane width, RPDM states a 3.1m minimum width for kerbside lane, and 3.0m for other lanes *if it is on low speed roads with low truck volume*. Austroads Part 3 allows 3.0 m to 3.3m for similar case. It should be noted here both RPDM and Austroads do not indicate clearly what constitutes low truck volume; therefore the interpretation can be subjective. What is clear is the 3.0m is the minimum EDD width for operating speed up to 70km/h for cars. For trucks and buses, minimum lane width requires 3.3m. It is clear the existing 19.6m width is insufficient to accommodate the desirable width, but would need a combination of minima such as lane width and median width, to enable the six lanes to fit within the kerbed roadway. A combination of minima constitute a design exception.

Meetings were held with E&T representative as well as consultants for the two northern sections of SBR. Elements such as lane and median widths, painted double barrier lines in lieu of raised median were discussed at length. The consensus initially was to adopt six lanes of 3.1m each with 0.6m raised median. This initial proposed median of 0.6m was subsequently reduced further to a nominal 0.3m wide to enable more space be provided at the verge. This nominal 0.3m median is below the 1.2m desirable minimum width which would satisfy Austroads requirement where small signs can be transversely located in the median. At this section of the road, since there is no transverse sign proposed and unlikely in the future, it was decided to accept a narrower width median. The decision was also supported for the following reasons:

- Along this section of SBR the only other asset to be located in the median are ITS pits; which had prior agreement with ITS engineers to increase the pits interval to

600m. This will still enable the pits to be built at the median nose area which is wider at signalised intersections.

- Consultation with E&T arrived at the consensus that there was no reported safety problem associated with narrow medians; and it has been adopted elsewhere on multilane road in Brisbane, Gold Coast, Sydney and some local councils. It is considered safer for separation of opposing traffic than a painted double barrier lines; when combined with narrow lane width.
- Despite narrower median will render it impractical to install pedestrian fencing along the median which the region had earlier agreed to in the Concept Stage Safety Audit report, the meeting held the view that the busy six lanes road with narrower median will encourage pedestrian to only cross at designated crossing at intersections. This potentially render the pedestrian fence at the median redundant.

In the context of this upgrade where the posted speed will reduce to 60km/h, and commercial vehicles at 4% of the volume, the range of design options was eventually narrowed down to two basic configurations. One option presented with no-median but with double-barrier lines, and the other with a narrow median of 0.3m nominal width. The double-barrier lines options were deliberated in meetings, and deemed to have higher risk of head-on collision if combined with narrower lane width. In addition, crossing of opposing traffic lanes to access opposite driveways will be prevented by a physical median barrier. The narrow median option was chosen (Option J) as the preferred compromised option. All options are attached in Appendix A of this report for reference.

With 60km/h posted speed, Option J consists of: six lanes of 3.1m each and a median of 0.3m nominal width. However, at gazettal direction, where power poles are close to the kerb and channel, the kerb side lane edge line is proposed to have larger offset to the kerb and channel face, in this case, 0.74m is provided. This effectively increased the verge space from 2.65m to 3.39m at the narrowest section. The alternative to line marking edge line is to reconstruct the kerb and channel to offer the same offset from power poles. This was ruled out due to budgetary constraints currently. However, it was agreed these work can be separately carried out in future if warranted to further improve safety for working width.

For the against-gazettal direction, the kerb side lane edge line will keep to the normal 0.45m offset to the kerb face. The overall verge space from the edge line to the property boundary is 2.82m only. While this is below the desired 3.0m width, it is deemed a compromised situation where existing power poles are next to the fence instead of the kerb, and thus offered relatively greater clear zone than at the gazettal direction.

Impact assessment:

The key consideration with respect to narrow lane width and narrow median width focused on the crash risk from side-swept and head on collisions.

The through lane of 3.1m is better than EDD minimum width of 3.0m, and satisfy RPDM minimum requirement. As for the 3.1m kerbside lane, it only complies under RPDM for low speed and low truck volume road. In this case, it does not meet the minimum desirable width for truck (and buses), which requires 3.3m. TMR derived this from ARRB Transport Research's recommendation in Figure 7.2.1 of RPDM and included a 0.5m clearance width for trucks travel at 60km/h. A bus width can be typically 3.15m if measured from side mirror to side mirror. Therefore a lane width of 3.1m would require better skills and careful driving on the part of commercial vehicle drivers. The consolation at this site is the straight alignment, where wider lane width for curve widening is not required.

For kerbside lane width, TMR's design standard does not include the channel width of the kerb and channel. It becomes a design exception if the channel width is included as part of lane width. However if the channel width is included, the effective lane width in this case is 3.55m at against-gazettal direction, and 3.84m (with 0.74m offset to the kerb face) at gazettal direction. These effective lane width are sufficient for commercial vehicles and buses; and is considered usually suitable to compensate for the tendency of drivers to shy away from the kerb. In fact RPDM states the channel width of the kerb and channel is usually suitable for vehicles for this purpose. This is despite the design requirement for shy line is 1.5m for fixed objects such as the power poles. Consideration could be for power poles to be attached with hazard markers (D4-3A) to alert drivers of their close vicinity, or a site-specific warning signs installed at each end to alert drivers of high vehicles passing this section of SBR. This site-specific sign will need E&T's involvement to ensure legal compliant is met under MUTCD, TRUM and TC Signs Manual. The design eventually opted for standard hazard markers (D4-3A) in consistent application for the whole SBR.

For against-gazettal direction, the power poles are further away next to the fences, the only impact for vehicles is the shy line effect from the kerb, which can be relatively manageable for professional drivers like the commercial drivers. As pointed out above, in fact RPDM states the channel width of the kerb and channel is usually suitable for vehicles for this purpose.

The anticipated risk from narrower lane width is the risk from side swipe accidents, especially driving alongside larger vehicles such as trucks and buses. It was observed on

- *one access requires EDD be applied for SISD and Design exception applied for MGSD (House no.* not relevant

In order to achieve unobstructed sightline while reversing at these properties, where sight distances at these properties will adequately satisfy NDD requirements for MGSD or the NDD/EDD requirements for SISD, the existing fences in the range of 5m to 10m in length would need to be reconstructed.

In order to more accurately validate the outcomes of the theoretical analysis, the design team recommends that a practical evaluation of each of the six properties identified above be undertaken to determine the actual sight distances achieved and to determine if further accommodation works would allow for the vehicles to turn around within the property thus removing the sight distance issue. The extent and type of accommodation works will be assessed on a case by case basis as a result of the Region's community consultation process.

While sight limitation will exist for reversing vehicles, for returning drivers crash risk may exist for slowing and stationary vehicles on the kerbside lane. Austroads recently published report on "Investigation of Key Crash Types: Rear-end Crashes in Urban and Rural Environments" (AP-R480-15) has listed, among other findings, that higher traffic density such as peak hours traffic, and unsteady travel speed are the common factors in rear-end crashes. It is noted there is no feasible design solution, the drivers should take responsibility for duty of care to others; adhering to the road rule to drive to traffic conditions and maintain the 2-seconds rule in keeping a safe distance behind another vehicle.

7.03 Clear zone, shy line and working width

The deficiency in clear zone, shy line and working width are combined and discussed in this section as they are inter-related.

According to RPDM, clear zone required at SBR is 5.0m for a 60km/h posted speed. Where posted speed limit is 50km/h, clear zone required is 4.3m, as is the case for Rudd Street and Darnay Street.

For RPDM shy line requirement, the design would requires 1.5m and 1.0m offset respectively for LHS and RHS of the roadway where fixed object pose as hazards to drivers.

the other hand, under normal free flowing speed condition with adequate headways between vehicles, most drivers would opt for staggered positioning while driving adjacent to trucks and buses, especially on narrower lanes. Therefore, though there is no research to support the staggering phenomenal of drivers' behaviour leading to safer driving, it is considered reasonable that drivers would opt for the staggered scenario above should the need arise. This could potentially reduce side swipe accidents. However, it must be noted here the sideswipe accident risk will still remain due to narrower lane width which offered lesser margin for drivers' error. Low proportion of commercial vehicles will help, and it must be combined with lower speed environment which gives adequate reaction time for a range of drivers, including those less experienced.

The risk of sideswipe accident is expected higher during off-peak than during peak hours. During peak hours, due to slower speed, it is likely adequate for drivers to manoeuvre away to avoid a sideswipe crash. Research from Austroads supported rear-ended accidents are more likely than sideswipe in higher density traffic flow condition combined with unsteady speed.

The reduction of median to 0.3m nominal width would be adequate for separation of opposing traffic but not for prevention of head on collision. Current raised median with barrier kerb is generally of 1.2m to 1.5m wide, but well below clear zone requirement for opposing traffic. However, there was no recorded head on accidents for the last ten years suggested the separation worked satisfactorily. If the design adopted narrow lane width and double barrier lines as proposed in the other option, there will be no clear zone at all offered. For this reason, the combination of narrow lane width and a raised narrow median is expected to offer relatively safer separation than the double barrier lines. The raised median concrete kerb will be painted yellow to offer better delineation for impaired visibility condition such as in the rain or fog. Delineation for wet condition and night driving may also be supplemented by installing retro-reflective raised pavement markers (RRPM) on the side of the kerb. The advantage of a physically raised concrete kerb will also prevent illegal U-turns and right turns into and out of opposite driveways.

For potential of pedestrian crossing the six lanes roadway identified in road safety audit report, it is expected walking across the busy SBR will require to be done in two stages. The narrow median would discourage pedestrian to use it as a refuge for a two-stage crossing. Pedestrian will more inclined to use the safer and designated crossing at the intersections during busy traffic hours. The decision to disregard median pedestrian fence agreed to by TMR was also helped by the low pedestrian count, and which did not show any school children.

7.02 Property accesses and driveways

There is a significant number of existing property fences built of solid walls such as brick walls. Some garages and carports have panel lift doors installed right against the property boundaries at the driveways. The current width between the traffic lane edge line and property boundary is about 5m which included the parking lane, or shoulder at some locations. This enabled the reversing of vehicles out of garages to use the shoulder and parking lane for reversing manoeuvre. The 5m space effectively also allowed the necessary sightline while reversing. While there may be parked vehicles on the parking lane restricting reversing sightline, there is no known complaint of inadequate sightline, nor accident history of collision between reversing vehicle with another approaching vehicle.

The close proximity of the new kerb side lane to garage doors will mean vehicles at the private driveways will experience hindered visibility while reversing out. Although this is not a universal problem for all vehicles, longer vehicles will subject to more restricted sightline. Designer has checked a range of vehicles from small compact hatch back to normal 4WD and dual-cabin utility type 4WD. The longer dual-cabin utility 4WD appeared the most affected.

On one of the site visits, designer captured video footage showing a reversing vehicle out of driveway among parked cars and drove off with relative ease, even during morning peak hours. This occurred at northbound direction which has two signal gaps in between phases. The southbound direction currently has no signal gap at Fremar Street intersection; and would likely benefit from it if gaps can be timed between phases. However E&T held the view this mitigation measure alone is insufficient. Basic criteria such as SISD and MGSD for domestic access need to be evaluated and considered in design provision.

Package 10 consultant, AECOM, has analysed in details for individual property's capability to enter and exit safely; as well as accommodation works where deemed relevant. The analysis also include Package 4 properties. For consistency on the approach, AECOM's analysis work for Package 4 is extracted below for this exercise (*in italic*).

Existing / Design Configuration

Within this section of the corridor there are 17 private properties which access Southport-Burleigh Road directly via individual concrete driveways. Out of the 17 properties accesses, 10 are located on the eastern verge (southbound carriageway) and 7 are located on the western verge (northbound carriageway). During the design development, a

detailed assessment was undertaken to determine the impact to each of these private property access points and the scope of work required to ensure that safe access / egress could be maintained under the new lane configuration. The initial desktop assessment identified four aspects of each existing driveway layout that had the potential to affect the safety of those utilising the accesses. The four aspects identified are listed and discussed in more detail below:

1) *Entry manoeuvre*
2) *Vehicle storage space (between property fence / gate and the lane edge)*
3) *Exit direction and associated sight distance implications*
4) *Exit manoeuvre*

Entry manoeuvre

The existing lane configuration allows for vehicles making a turn into the driveways to make the manoeuvre from the kerbside lane positioned approximately 2.5 m offset from the existing kerb line. Vehicle turn path analysis was used to confirm that each of the existing driveways was sufficiently wide to accommodate the turning movement for vehicles entering. A 5.2 m long passenger vehicle was adopted as the design vehicle. The analysis indicated that under the constraints of the existing configuration, the average theoretical speed of the vehicles entering existing driveways is 10 km/hr.
This speed was used as a basis for the analysis of the new configuration to determine whether driveway widening is required to accommodate the entry movement from the new kerbside lane which is position directly adjacent to the existing kerb. Under the new lane configuration, a total of 6 driveways have been identified for widening, to accommodate the entry manoeuvre, with this work to be undertaken under the main construction contract. Drawings indicating the extent and scope of widening works are provided as part of the Design Development Report and Contract Documentation.

Vehicle storage space

The existing lane configuration allows vehicles to enter and exit the private properties by utilising the width provided in both the verge and the parking lane. This width varies between 5.2 m and 5.5 m and would be deemed sufficient to store a vehicle safely between the existing property fence / gate and the edge of kerbside lane. Under the new lane configuration the distance between the existing property fence / gate and the edge of the kerbside lane varies between 3.0 m and 3.3 m. The safety issue associated with this reduction in storage space is partially mitigated due to 11 of the 17 properties in this section of the corridor being fitted with an electric gate / roller door. The remaining 6 properties do not have any gates fitted.
It should be noted that the risk still remains in the extenuating circumstance where there could be excessive delays in the electric gates opening, and when the gate's mechanism fails to activate. This would result in queuing traffic in the kerbside lane and carries the risk of rear-end collisions due to suddenly stopping vehicles.

Exiting direction

The direction in which vehicles exit these properties has a significant bearing on the sight distance and consequently the safety of the road users utilising the driveway access and on the main carriageway. Due to the location and type of the existing property boundary fences, the sight distance can vary dramatically depending on if the vehicle exits in a forward or reversing direction. Intuitively, it is safer for a vehicle exiting these driveways in

a forward direction compared to a vehicle reversing, as the driver's eye position results in less of the vehicle encroaching onto the verge when trying to maximise sight distance.

As such, the Region is currently in consultation with each property owner to determine if there is opportunity for vehicles to turn around within the property prior to exiting, thus reducing the risk of sight distance issues. For those properties without a turnaround facility, the Region will investigate the option to undertake accommodation works to assist in the turnaround movement. In the circumstances where there it is physically impossible for the vehicles to turn around with the property, exiting will continue to occur in a reversing direction as it does in the current arrangement.

The assessment of each property has determined that of the 17 properties in the section of the corridor, 5 do not have the facility or physical space to turn around within the property. This assessment was based upon a desktop analysis and an inspection of the properties from the exterior/road corridor.

For these 5 accesses, an additional assessment is currently being undertaken through th community consultation process with inspections occurring from the interior of the properties. The Region is working closely with each property owner to determine if further accommodation works would facilitate the turnaround movement.

An assessment of the sight distance implications on these 5 properties has also been undertaken based on the boundary fence arrangement, the available verge width and any other physical barriers impeding sight lines. The boundary fences are typically 1.8 m to 2.0 m high and constructed out of either timber or brick with the openings in the fences generally only just wide enough to accommodate a passenger vehicle entering / exiting at very low speeds. These two attributes mean that the eye position adopted when undertaking sight distance analysis must be entirely beyond the line of the boundary fence.

It is worth noting that in practice, sight distance may in fact be improved under the new lane configuration due to the removal of the parking lane and therefore the presence of parked vehicles, which currently act as physical barriers to sight lines between exiting vehicles and the through traffic.

The sight distances analysis undertaken investigated the compliance in relation to Safe Intersection Sight Distance (SISD) and Minimum Gap Sight Distance (MGSD) for each movement. A design speed of 70 km/hr was adopted and due to the relatively flat vertical geometry, no grade correction was required.
On this basis, in order to meet the NDD requirements:

- *a SISD of 141 m is required for cars assuming a Reaction Time of 1.5 seconds for an urban environment*
- *a SISD of 168 m is required for trucks assuming a Reaction Time of 1.5 seconds for an urban environment*
- *a MGSD of 97 m is required for vehicles exiting the driveway in a forward direction assuming a t_a of 5 seconds*

- *a MGSD of 175 m is required for vehicles exiting the driveway in a reverse direction assuming a t_a of 9 seconds*

Under the EDD requirements:

- *a SISD of 72 m is required assuming a d=0.46 and an Observation Time of 1.0 seconds (reduced by 0.5 seconds) in accordance with Appendix A.3. These values were adopted due to the low speed, highly urban environment and the reduced Observation Time associated with a simple left in / left out arrangement at the driveway accesses.*

In some circumstances, a more practical approach has been adopted in determining the achievable sight distance at each access. By using the vehicle turn path analysis software, an actual driver eye position (2.2 m from front of car) has been determined based upon the most likely exiting direction / manoeuvre, rather than applying the 3.0 m offset requirement specified in Section 3.3.2 and 3.4 of the AGRD04A. ***Table 1*** *details those locations where this alternative approach has been adopted.*

Exit Manoeuvre

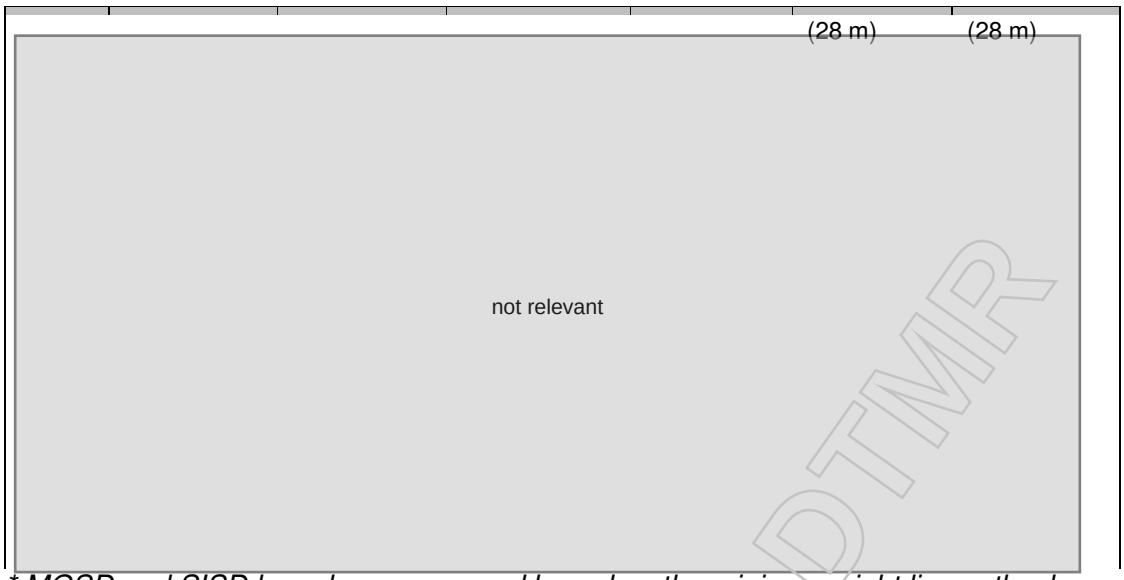
A similar vehicle turn path analysis was undertaken for vehicle exiting each of the driveway accesses. There are a total of 12 properties with the facility to turnaround with the property resulting in vehicles having the ability to exit in a forward direction. Of these 12 properties, 4 require widening on the departure side of the driveway to improve egress safety, with this work to be undertaken under the main construction contract. Drawings indicating the extent and scope of widening works are provided as part of the Design Development Report and Contract Documentation.

Design Development and Mitigation Treatments

A summary of each of the driveways assessed is provided in ***Table 1****, with details regarding the extent and type of accommodation works that are required to improve the safety of residents entering and exiting their properties as much as feasibly possible. The summary also indicates the sight distances achieved at each access and the approach adopted in determining these distances.*

Table 1 Driveway Access Assessment

House No.	Driveway Widening Required (Approach) [Yes / No]	Accom. Works required to turn around	Exiting Direction [Forward / Reverse]	Driveway Widening Required (Departure) [Yes / No]	MGSD Achieved	SISD Achieved
not relevant						



** MGSD and SISD have been assessed based on the minimum sight line setback requirement of 3.0 m measured from the lane edge line in accordance with Figure 3.2 of the AGRD04A.*

 # MGSD and SISD have been assessed based on a reduced sight line setback of 2.2 m based on the alternative approach described above and the assumption that the vehicle is propped in line with the back of the kerb.

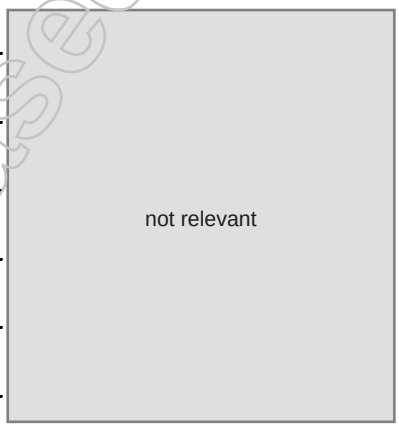
Ψ MGSD and SISD have been assessed based on a vehicle reversing onto Southport-Burleigh Road and propped in the verge such that rear of the vehicle is in line with the back of the kerb.

Extended Design Domain (EDD) / Design Exceptions

The following EDD and Design Exceptions in relation to sight distance at the accesses require approval.

Six accesses require EDD to be applied for both SISD and MGSD and are summarised as follows:

- *House no.*
- *House no.*
- *House no.*
- *House no.*
- *House no.*
- *House no.*



If the assumption for reversing vehicle's position is such that the rear of the vehicle was in line with the lip of the kerb instead of the back of the kerb, the number of properties requiring a design exception for sight distance would be reduced to one. This is at:

For working width requirement from objects such as power poles, the width clearance (Table 7.20 RPDM) from the object for a road surface of 3% crossfall and 60km/h speed, would requires 0.6m. It should be noted here the design vehicle height adopted in RPDM is only 4.3m whereas maximum legal height limit in Queensland is 4.6m, as in the case of a double-deck vehicles transport trailer.

Existing:

The existing brick wall fences are all within the clear zone offset at current 70km/h posted speed. Even if the posted speed is reduced to 60km/h, the clear zone offset would only just comply. Similarly, all power poles are within the clear zone; and inadequate shy line offset when the existing parking lanes are turned into general traffic lanes.

As for the working width requirement for tall vehicles, six of the nine power poles surveyed do not comply. The offset measured ranged from no offset at all, to only 0.3m from the kerb face. Clearly when the parking lane is converted to the third lane, the tall vehicles will be closer to the power poles. As pointed out earlier, the legal height of tallest vehicles using this road is 4.6m which is 0.3m higher than the design height used in RPDM.

The block stoned rubble retaining wall for the sewer pump station is located along similar property line with private properties, hence does not meet clear zone requirement at Darnay Road, nor when measured from SBR.

Proposed:

With the proposed six lanes upgrade, the third lanes will occupy the current parking lanes. Under the business case approved scope of work, private boundary brick walls and the rubble wall for the sewer pumping station will remain at respective current locations. Six of the power poles which do not have working width had earlier been agreed in principle with Energex to be relocate about 400mm away from the kerb face in best case scenario. This was because the available width at the verge and footpath is generally 2.4m to 2.6m along this section of SBR. The concrete footpath and other underground services all restricted the available space for power pole to be relocate away from the kerb face. Besides, Energex standards requires a 1.8m minimum offset from private fences as well. Under these combined constraints, only slight offset from behind the kerb is achievable; which arrived at 400mm mentioned above.

The offset of 400mm is the best possible offset achievable under the crowded space on the verge. Although it still does not meet clear zone requirement of 5m, nor the shy line

requirement of 2m, however, it is more than adequate for working width requirement. And was initially regarded as the best compromised offset attainable for safety of tall vehicles running along kerb side lane.

Subsequent cost estimates from Energex for the relocations of these high voltage lines deemed prohibitive to TMR, which if carried out, will solely benefited working width requirement. On the other hand, the proposed narrower median and lane width have offered satisfactory effective verge space for affected power poles. Therefore the region decided the poles will remain subject to approval as design exception.

Impact assessment:

With this relocation being not finally adopted, this section examines the potential risk for tall vehicles.

It is noted the other option of relocating the power cables to underground proved far more costly if not impossible. This is due to relocation works will involve 33KV lines, 11KV lines and other LV lines competing for already congested underground space with sewer lines, water mains and telecommunication lines. In addition, street lighting will then require independent poles and footings to be located at similar locations occupied currently by the power poles; hence posing similar hazards. Though the hazard can be mitigated by slip-based poles, but the footing size is understandably unable to fit in the limited space. This option was thus ruled out.

Despite the power poles to remain, the risk of collision by tall vehicles has been assessed as reduced. This is chiefly due to the fact that gazettal direction will be provided with up to additional 0.74m offset due to the narrower median now being accepted in Option J. Though this risk assessment appears reasonable by proportion, however there is a lack of restraint to discourage drivers of tall vehicles from driving close to the kerb and channel. Thus this encroachment over the edge line may renders the extra 0.74m offset ineffective as the working width. In the event of high vehicles travelling too close to the kerb face, the crash risk with the power poles remains. Though the chance of a crash from tall vehicles is expected to be low due to drivers are deemed more professionally trained, the severity of crash could be high due to the momentum from the heavy tall vehicles. The crash outcome and impact to the community is difficult to quantify, but it cannot rule out potential road closure and power outage at substantial scale due to the high 110KV and 33KV lines being carried.

To meet clear zone and shy line compliant, the solution would be property resumption; or not to upgrade SBR to six lanes; plus retain the existing parking lanes in conjunction with reducing the posted speed to 60km/h. This will create a bottle neck at this section, and deemed contrary to the approved business case outcomes. It should be noted insufficient clear zone and shy line are not uncommon at state-controlled roads at SCR. Provision of sufficient clear zone and shy line from design perspective is construed as a more forgiving environmental measures for errant drivers. These elements do not in themselves reduce run off road crashes; especially for this section of SBR with good horizontal and vertical alignment. Crash record showed causes of run off road accidents were all due to influence from alcohol and drug, or fatigue and medical conditions, as well as excessive speed. A forgiving road environment with adequate clear zone would not necessary have prevented these crashes, apart from likelihood of reducing the severity of run off road crashes. From design perspective, while all drivers are owed an equal duty of care, there is no requirement for designer to provide additional duty of care to drivers who do not take reasonable care for themselves while driving on the road. From crash history, it is assessed the clear zone width though not compliant with current standards, it is nevertheless considered satisfactory and safe for drivers taking reasonable care for themselves.

A variation of Option J proposed new Type 6 kerb and channel at the extra 0.74m space to better delineate the edge line for the extra working width. This will likely reduce the risk of drivers travelling too close to the power poles.

It is also suggested that continuing safe driving education would be a more viable measure as an alternative to remind drivers to drive more responsibly to road conditions.

7.04 Footpath

Existing:

The existing concrete footpath's width varies, but generally about 1.2 m wide although certain sections have been widened by individual adjacent property owners. The crossfall of the footpath is measured to be greater than 2.5% and do not conform to design standards. It appears in poor conditions for some sections due to lack of repair. There are also numerous uneven joints arising from differential settlement posing tripping hazard. Some sections were noted with water ponding after rain, potential to cause slipping hazard. There are also steep sloping hardstand between the footpath and the fences, presumably constructed by adjacent property owners for unknown reason(s). Power poles

are located at the remaining grassed space adjacent to the kerb which have been discussed in preceding sections. There are other utilities services under the verge space.

Proposed:

The Business Case defined a shared cycle/pedestrian path as an off-road provision. However this is limited to eastern side of the northern section of the six-lane upgrade. For Sara Avenue to Rudd Street intersection, the existing footpath to remain as they are. Hence footpath upgrade work is not part of the scope, except at Rudd Street intersection where affected by the proposed design. Under current cost-sharing based on responsibilities between TMR and Local Government Association Inc., footpath and verge space are under Gold Coast City Council's responsibility. It is therefore suggested that project manager to forward the issues identified in this project to GCCC for further action. Depending on the response from GCCC, the region may construct new concrete footpath in this area, subject to availability of budget. This will be determined at a later stage.

Impact assessment:

The outcome depends largely if GCCC will follow up on TMR's request and finance the cost of repair and reconstruction of the old footpath. It is noted the work can be carried out separately or concurrently with this six-lane upgrade work. An upgraded footpath will remove all unsafe features. Otherwise risks associated from defects listed above will remain. For safety consideration during construction stage, it is advisable the contractor be informed to include such risks for construction workers and appropriate mitigation strategy formulated in their WHS management plan.

7.05 Bus stop

Existing:

There are two existing bus stops, one for each direction. These are located at approximate at Ch7410. Both bus stops do not conform to TransLink current standards. Perhaps at best they comply with TransLink 'Regular' type; but with only J-poles and timetables attached. The following non-compliant items are noted:

a. No TransLink compliant hardstand concrete area provided. The area should have a defined 4.0m width concrete hardstand. And provided with clear 1.2m minimum or 1.5m desirable around to meet disability standards.
b. The boarding point should have crossfall at 1:40 with anti-slip finish. The existing hardstand areas are basically part of the substandard concrete footpath.
c. The J-pole is located less than 750mm from kerb face.
d. No tactile indicators provided at boarding point.

e. The bus bay on the parking lane are not marked with yellow rectangle box.
f. The light poles are located less than 1m from J-poles, contravene with TransLink standards which requires the poles be located 2.5m minimum from the J-pole at the departure end.
g. It is noted the northbound bus stop is located at a gully pit and near to an uneven telecommunication pit lid which both pose as tripping hazards.
h. On the other hand, the southbound stop is partially located across a driveway, on chevron marked narrow shoulder area,
i. The southbound stop is located next to a power pole with virtually NO working width offset for buses pulling up next to the kerb for passengers.

A check on TransLink's timetable and bus routes showed three routes run along these stops. These are routes 731, 741 and 747. Route 731 runs hourly with total 13 trips daily. Route 747 runs half-hourly with 22 total trips daily. Route 747 runs hourly with some break during off-peak hour and total at 11 daily trips. Therefore, there are 46 total trips passing by these stops during daily operating hours. However, general observations suggested there are not many passengers getting off or catching the bus at these locations. This may explain why the bus stops have not been upgraded over the years.

Proposed:

Due to unavailable space in the vicinity, as well as budgetary constraint, TransLink has decided the bus stops will remain as they are under this upgrade work. No upgrade of any form will be implemented by the department under this Package 4 work. It was proposed by the northern sections of SBR designers to reinstate rectangular bay for the buses. This section has been instructed to adopt same consistent approach. However as the marked bus bays will be spanning across driveways, there is no clear guidelines from PTIM, AGTM, as well as advices from E&T and GCCC. There are also noted inconsistency in both marked and unmarked bus bays at GC and Brisbane, whether there are driveways presence or otherwise. Discussions with GCCC and E&T so far favoured no marking be applied especially where spanning across driveways. At northern sections, all existing rectangle bays will be reinstated even if they do not comply in most locations. These reinstatement as per existing marked bays will avoid spanning across driveways, except at one location where a disused driveway exists.

Impact assessment:

It is noted these bus stops provision on a general traffic lane on a state-controlled road will be the first at SCR. A search on other state-controlled roads at SCR all showed bus stops

are provided at a minimum on parking lane or shoulder space; though some shared with bicycle lane.

When the kerb side lane is implemented with existing bus stops remaining, vehicles travelling behind buses will expect delay. Given the observed low patronage for these route at these stops, the chance of delay is therefore likely low. However the same scenario is uncertain for future if passengers at these stops increase. The operation effectiveness of the kerb side lane will then be reduced.

Rear-ended crash risk is considered low for vehicles driving behind buses. This could likely due to drivers' anticipation that buses will stop at bus stops, hence drive accordingly with sufficient distance behind. General observation noted most drivers would opt to change lane to avoid following a bus. So it could be argued most divers would stay at greater distance behind and change lane whenever safe to do so. Such opportunity may not be readily available during peak hours. It is noted the southbound bus bay, if marked with yellow box, will be located across private driveway. Though this is highly undesirable, the nuisance delay to affected residents is no different to what is the existing situation. Low patronage at the bus stop may alleviate nuisance delay.

7.06 Network drainage and flood immunity

Existing:

From Queensland Government's published Coastal Hazard Areas Map with Storm Tide Inundation Areas (Version 3, April 2014), the dwelling properties at this section are shown as medium hazard area with less than 1.0m water hazard. However, for the roadway, GC Council information revealed the existing road was inundated in 1974 and other severe storm events. But extend of inundation such as flood levels are uncertain due to lack of records available to the Design team. It is also known from local knowledge that inundation from big storm events has been generally brief, lasting 'a couple' of hours only. This is an indication of inadequate discharge capacity as well as storage capacity in the existing network of pipes.

The existing drainage pipe network in the area run along SBR with a series of gully pits at K&C. and discharge to the canal and Nerang River via adjacent properties along both sides of SBR. E&T's hydraulic investigation reported the gullies and collecting pipes network, including the outlet pipes through private properties under easements are generally 450mm in diameter and no longer adequate with the fully built environment such as this. These pipes network are well below capacities and would also require major upgrade to meet current standards in Drainage Design Manual; which stipulates a lane width of minimum 2.5m clearance from adjacent flood spread.

In a preliminary stormwater drainage study done in 2014 by GCCC, under a Q100 storm and 1 hour duration modelling, Rudd Street/SBR intersection will remain trafficable with 0.03m to 0.25m depth of inundation. Darnay and Rudd Street will have 0.03 to 0.25m in the vicinity of the intersection with SBR. However further north around Ch7.45km, SBR will subject to inundation depth 0.25m to 0.5m covering the whole roadway; flood depth will be greatest at the kerb and channel, with more than 0.5m depth (Refer attachment ??). For ARI 10-years and 1 hour duration, E&T's modelling showed water will overtop the centre median leading to all lanes inundated. Whereas for an ARI 2-years event, the model showed all northbound lanes inundated; only one lane can remain open in the southbound direction.

In summary, the existing drainage network do not comply with current standards in TMR Drainage Design Manual.

Proposed:

Due to the need to better understand post-upgrade impact on any storm event, and also to better manage stormwater risk, E&T Hydraulic Branch was engaged to carry out in depth modelling and analysis. This was done to enable the department to gain better understanding of existing shortfall, potential and feasible improvement, and better management of stormwater event. The Region had intended to implement, subject to budget constraint, portion of network to enable localised improvement where inundation from modelling is most severe. The hydraulic investigation by E&T focused on two main options at AEP 39% (ARI 2-years) and AEP 10% (ARI 10-Years). The two options are:

- Option 1 – 'do nothing option'. The existing drainage network is to be left as it is. No drainage improvement of any kind to be carried out.
- Option 2 - new 450mm RCP and gullies network in addition to the existing network, to improve storage and reduce inundation period. However work only limited to northbound lane.

Two other further options were considered. These are partial work or sub-options of Option 2 above. The E&T report named these as Option 3 and Option 4. Full details of all the options can be read in E&T's hydraulic report. This design exception report only covers the 'exception' aspect of drainage for managerial approval decision. Project manager subsequently directed to adopt Option 3, which will provide additional 450mm diameter PCPs for northbound direction but excluded southbound direction.

Impact assessment:

The impact from all these options, and in particular in adopting Option 3 improvement, can best be seen in terms of time the road will be subject to inundation. The time of inundation results is extracted from E&T's report and presented below.

Scenario	10% AEP Inundation (minutes)	39% AEP Inundation (minutes)
Existing	46	23
Option 1	46	25
Option2	45	23
Option 3	45	23
Option 4	43	20

It can be seen from above the six-lane upgrade (Option 1) without drainage improvement will make inundation longer by 2 minutes under 39% AEP (ARI 2-years event). Option 3 has same effect as Option 2 but cheaper option due to shorter length of improvement work. However, the time of inundation compared to existing condition is virtually no different; hence no advantage gained, but only justifiable for not causing worse off scenario at post implementation.

All options considered do not meet current Drainage Design Manual's allowable flow width criteria (Section 11 RDM) and hence remained design exception. Driving through flooded road will experience disadvantages such as unclear lane lines for guidance, hidden hazards from submerged object and potholes, stalling of cars in the water and so on. The most disadvantaged stakeholders are those entering and existing adjacent properties at the low level areas, where the inundation is much higher at the kerb and channel and their driveways. There are about nine units of most affected properties.

The improvement under Option 3 will result in practically similar outcome to existing flooded condition, the safety of road users may continue to be managed by TMR's existing flood management protocol for traffic governing closure of roads during flood inundation. The biggest problem is the few adjacent properties' residents entering and existing the driveways where inundation is deepest. It is recommended resident be kept aware of this short period of inundation affecting their driveways, if they do not already aware of.

8.0 Recommendation

The recommended design options for each element above are shown in the attached layout plan and typical cross-sections plans. Each element where design standards not met are discussed in details, including respective impact on safety and functionality of the design features inherent in the below-standards design. To achieve compliant to current standards, all the minima identified would require properties resumptions or large scale accommodation work for all adjacent properties which was already ruled out in the business case.

Particular focus on local features such as traffic volume and vehicle classifications, speed scenario, accident history and types, peak hour traffic flow scenario, sightline obstruction on reversing, public utilities and so on, were carefully reviewed for respective user impact post implementation. These then combined with engineering judgement and common sense to achieve a context sensitive design as proposed.

Where necessary, collaborative effort from E&T and external consultants have been drawn upon for brain storming discussions and arriving at consensus; so that consistent design are adopted to avoid causing confusion to road users. These collaborative consensus are exemplified in lane width, narrow raised median, working width and reversing sightline provision.

It need to emphasise here while context sensitive design has been generally adopted throughout this project's design process, user safety is an important factor and has remained the chief priority. It has been balanced with due consideration of other factors such as budget, environmental, community impact during and post construction, future maintenance as well as project's whole of life cost and benefit scenario.

In addition to proposed design in prior sections of this report, the followings are *additional* mitigating measures recommended:

A. The suggested new kerb and channel Type 6 (300mm channel) shown in Option K to be constructed separately post implementation, if warranted from further monitoring of safety performance of the completed work. This in particular, from monitoring the tall commercial vehicles travelling close to the existing power poles.

B. Traffic signals at Fremar Road and Rudd Street intersections to incorporate adequate gaps between phases to provide opportunity for residents to reverse out safely. Current northbound have two gaps from Rudd Street intersection signals whereas southbound has no gap from Fremar Road intersection.

C. Consider Clearway provision for off-peak hours and weekend; which will cause minimal adverse impact on traffic but will benefit the residents with some parking spaces, either for visitors or tradesmen calling to do works.

D. To provide hazard marker on power poles adjacent to kerb and channel. Or consider provide site-specific traffic warning signs at kerb side lane for drivers of high vehicles. Other signs may be used to alert other drivers on vehicles slowing to enter driveways. Any new signs will need to be legally designated in TC signs and adhere to TRUM manual, so E&T approval is mandatory.

E. Drainage catchment and network are recommended to be further investigated in collaboration with GCCC on going flood study, to derive greater certainty on level of flood immunity in any storm event. This will aid in storm event management in TMR responses to the community.

F. Bus stops locations at general traffic lanes to be monitored for operational effectiveness as well as safety of other drivers. Further consultation with TransLink is recommended. This may explore options such as decommissioning, relocation or combination with other stops.

9.0 Post implementation management

It is also proposed upon completion of the project, an on-going monitoring schedule be formulated to monitor the safety performance of these elements. The monitoring can be on-going or for a limited period.

The safety performance monitoring measure can be from a database of complaints and suggestions from affected residents. Stakeholder Management Team can be tasked to collect and forward such data to Traffic Engineering Practice Team. Secondly it can be monitored via high mount longer range traffic surveillance cameras. These cameras can be installed at Rudd Street intersection and Fremar Street intersection. The camera footage

will also benefit the near-misses analysis where hitherto not normally reported. The camera footage could also provide vital information for future road safety design, storm event, and may even aid research for road safety study. Traffic Operation Team may be tasked with this work and forward periodic data to Traffic Engineering Practice Team.

Longer term stormwater risk from the inundation modelling developed is recommended to be examined in depth with collaboration from GCCC. Other on-going or periodic surveillance could be in the form of speed count to monitor post-implementation operation speed changes through the section.

10.0 Supporting information

References used for this report:

- Road Planning and Design Manual, RPDM
- Traffic and Road Use Management manual, TRUM
- Manual of Uniform Traffic Control Devices, MUTCD
- Austroads Part 3, Part 4
- Austroads report 'AP-R480-15 Investigation of Key Crash Types – rear ended'
- Guideline for Road Design on Brownfield Sites, TMR
- TransLink Public Transport Infrastructure Manual, May 2012.

Drawings:

- Layout plan – refer SL-2 to SL6 in Appendix B
- Cross-sections plan – refer TC-1 in Appendix B

ARMIS:

- Crash data. Data available from department's internal business unit and hence excluded from appendix.

TSDM:

- Traffic volume and speed data. Data available from department's internal business unit and hence excluded from appendix.

Traffic signal phasing:

- Rudd and Fremar intersections signal phasing runs from Road Operation and Network Optimisation (SCR) – Appendix C

11.0 RPEQ Certification

In conforming to department's brownfield guideline, this report encompassed the process and reasoning that led to respective element's design exception decision which resulted from the approved Business Case. The report considered the alternatives and evaluated foreseeably on impacts for road users from the design decisions made.

I considered the proposed technical mitigating treatments appropriate and the decision to adopt the design exceptions proposal as acceptable.

_____

Michael Wong RPEQ Reg: 8826 Date:

12.0 Regional Director approval

☐ I approve the use of the mitigating treatments for the Design Exception proposed as detailed in the report and plans.

☐ I reject the use of the mitigating treatments for the Design Exception proposed and submit the following alternative for RPEQ consideration.

Regional Director/Regional Director's Delegate name and signature

_____

Sanjay Ram RPEQ Reg:11606 Date:

District Director, South Coast region

Appendix A

Road cross-section options

Appendix B

Design drawings

Appendix C

Existing signal phasing runs at intersections

{ post meeting at E&T (Bernard Worthington, Sham Nabi, Michael Kavourakis, Adrian Wong),

1. Footpath cannot be out of scope, because we make it worst by bring traffic closer to ped. Risk assessment to be done before forwarding to GCCC.
2. Reversing from driveways ?????!!!!
3. Narrow lane and narrow median acceptable
4. Monitoring regime NEEDED to ensure design expectation for substandard features are captured. Plans to deal with unsafe situations to be drafted. Even to the extreme of reverting back to parking lane to be line marked.

11.0 RPEQ Certification

In conforming to department's brownfield guideline, this report encompassed the process and reasoning that led to respective element's design exception decision which resulted from the approved Business Case. The report considered the alternatives and evaluated foreseeably on impacts for road users from the design decisions made.

I considered the proposed technical mitigating treatments appropriate and the decision to adopt the design exceptions proposal as acceptable.

not relevant

Michael Wong RPEQ Reg: 8826 Date: 28 Sept 2015

Endorsed 1/10/15

not relevant

D. SELTH Manager Delivery

12.0 Regional Director approval

☑ I approve the use of the mitigating treatments for the Design Exception proposed as detailed in the report and plans.

☐ I reject the use of the mitigating treatments for the Design Exception proposed and submit the following alternative for RPEQ consideration.

Regional Director/Regional Director's Delegate name and signature

not relevant

Sanjay Ram RPEQ Reg:11606 Date: 07/10/15

District Director, South Coast region

From: Sham Nabi
To: Ross J Poidevin
Subject: Fw: Southport Burleigh Road: Fremar Street to Sara Avenue - DER Update
Date: Saturday, 9 January 2016 5:58:22 PM
Attachments: 60334601-GEN-RP-014-E Package 10b Design Exception Report.pdf
Private Property Access Design Exception B_Pkg 4.docx

AECOM part pf the DER attached.

From: not relevant @aecom.com>
Sent: Wednesday, 16 December 2015 3:45 PM
To: Sham Nabi
Cc: Mansell, Chris; Wong, Adrian
Subject: Southport Burleigh Road: Fremar Street to Sara Avenue - DER Update

Hi Sham

As requested, we attach an updated "Interim Issue" of the Design Exception Report for the corridor upgrade design between Fremar Street and Sara Avenue.

The two major items updated were the:

* inclusion of references to minor driveway widening and localised footpath works within the verge
* update to the accommodation works table to reflect the latest version that you handed over to Paul

We have also included an updated version of the Package 4 accommodation works table, so that you can forward it to Michael Wong for inclusion in his report.

Please feel free to give me a call if you have any questions.

Thanks

Michael

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1.1 Private Property Access

1.1.1 Existing / Design Configuration

Within this section of the corridor there are 17 private properties which access Southport-Burleigh Road directly via individual concrete driveways. Out of the 17 properties accesses, 10 are located on the eastern verge (southbound carriageway) and 7 are located on the western verge (northbound carriageway). During the design development, a detailed assessment was undertaken to determine the impact to each of these private property access points and the scope of work required to ensure that safe access / egress could be maintained under the new lane configuration. The initial desktop assessment identified four aspects of each existing driveway layout that had the potential to affect the safety of those utilising the accesses. The four aspects identified are listed and discussed in more detail below:

1) Entry manoeuvre
2) Vehicle storage space (between property fence / gate and the lane edge)
3) Exit direction and associated sight distance implications
4) Exit manoeuvre

1.1.1.1 Entry manoeuvre

The existing lane configuration allows for vehicles making a turn into the driveways to make the manoeuvre from the kerbside lane positioned approximately 2.5 m offset from the existing kerb line. Vehicle turn path analysis was used to confirm that each of the existing driveways was sufficiently wide to accommodate the turning movement for vehicles entering. A 5.2 m long passenger vehicle was adopted as the design vehicle. The analysis indicated that under the constraints of the existing configuration, the average theoretical speed of the vehicles entering existing driveways is 10 km/hr.

This speed was used as a basis for the analysis of the new configuration to determine whether driveway widening is required to accommodate the entry movement from the new kerbside lane which is position directly adjacent to the existing kerb. Under the new lane configuration, a total of 6 driveways have been identified for widening, to accommodate the entry manoeuvre, with this work to be undertaken under the main construction contract. Drawings indicating the extent and scope of widening works are provided as part of the Design Development Report and Contract Documentation.

1.1.1.2 Vehicle storage space

The existing lane configuration allows vehicles to enter and exit the private properties by utilising the width provided in both the verge and the parking lane. This width varies between 5.2 m and 5.5 m and would be deemed sufficient to store a vehicle safely between the existing property fence / gate and the edge of kerbside lane. Under the new lane configuration the distance between the existing property fence / gate and the edge of the kerbside lane varies between 3.0 m and 3.3 m. The safety issue associated with this reduction in storage space is partially mitigated due to 11 of the 17 properties in this section of the corridor being fitted with an electric gate / roller door. The remaining 6 properties do not have any gates fitted.

It should be noted that the risk still remains in the extenuating circumstance where there could be excessive delays in the electric gates opening, and when the gate's mechanism fails to activate. This would result in queuing traffic in the kerbside lane and carries the risk of rear-end collisions due to suddenly stopping vehicles.

1.1.1.3 Exiting direction

The direction in which vehicles exit these properties has a significant bearing on the sight distance and consequently the safety of the road users utilising the driveway access and on the main carriageway. Due to the location and type of the existing property boundary fences, the sight distance can vary dramatically depending on if the vehicle exits in a forward or reversing direction. Intuitively, it is safer for a vehicle exiting these driveways in a forward direction compared to a vehicle reversing, as the driver's eye position results in less of the vehicle encroaching onto the verge when trying to maximise sight distance.

As such, the Region is currently in consultation with each property owner to determine if there is opportunity for vehicles to turn around within the property prior to exiting, thus reducing the risk of sight distance issues. For those properties without a turnaround facility, the Region will investigate the option to undertake accommodation works to assist in the turnaround movement. In the circumstances where there it is physically impossible for the vehicles to turn around with the property, exiting will continue to occur in a reversing direction as it does in the current arrangement. The assessment of each property has determined that of the 17 properties in the section of the corridor, 5 do not have the facility or physical space to turn around within the property. For these 5 accesses, a thorough assessment of the sight distance implications has been undertaken based on the boundary fence arrangement, the available verge width and any other physical barriers impeding sight lines.

The boundary fences are typically 1.8 m to 2.0 m high and constructed out of either timber or brick with the openings in the fences generally only just wide enough to accommodate a passenger vehicle entering / exiting at very low speeds. These two attributes mean that the eye position adopted when undertaking sight distance analysis must be entirely beyond the line of the boundary fence.

It is worth noting that in practice, sight distance may in fact be improved under the new lane configuration due to the removal of the parking lane and therefore the presence of parked vehicles, which currently act as physical barriers to sight lines between exiting vehicles and the through traffic.

The sight distances analysis undertaken investigated the compliance in relation to Safe Intersection Sight Distance (SISD) and Minimum Gap Sight Distance (MGSD) for each movement. A design speed of 70 km/hr was adopted and due to the relatively flat vertical geometry, no grade correction was required.

On this basis, in order to meet the NDD requirements:

- a SISD of 141 m is required for cars assuming a Reaction Time of 1.5 seconds for an urban environment
- a SISD of 168 m is required for trucks assuming a Reaction Time of 1.5 seconds for an urban environment

- a MGSD of 97 m is required for vehicles exiting the driveway in a forward direction assuming a t_a of 5 seconds
- a MGSD of 175 m is required for vehicles exiting the driveway in a reverse direction assuming a t_a of 9 seconds

Under the EDD requirements:

- a SISD of 72 m is required assuming a d=0.46 and an Observation Time of 1.0 seconds (reduced by 0.5 seconds) in accordance with Appendix A.3. These values were adopted due to the low speed, highly urban environment and the reduced Observation Time associated with a simple left in / left out arrangement at the driveway accesses.

In some circumstances, a more practical approach has been adopted in determining the achievable sight distance at each access. By using the vehicle turn path analysis software, an actual driver eye position (2.2 m from front of car) has been determined based upon the most likely exiting direction / manoeuvre, rather than applying the 3.0 m offset requirement specified in Section 3.3.2 and 3.4 of the AGRD04A. **Table 9** details those locations where this alternative approach has been adopted.

1.1.1.4 Exit Manoeuvre

A similar vehicle turn path analysis was undertaken for vehicle exiting each of the driveway accesses. There are a total of 12 properties with the facility to turnaround with the property resulting in vehicles having the ability to exit in a forward direction. Of these 12 properties, 4 require widening on the departure side of the driveway to improve egress safety, with this work to be undertaken under the main construction contract. Drawings indicating the extent and scope of widening works are provided as part of the Design Development Report and Contract Documentation.

1.1.2 Design Development and Mitigation Treatments

A summary of each of the driveways assessed is provided in **Table 9**, with details regarding the extent and type of accommodation works that are required to improve the safety of residents entering and exiting their properties as much as feasibly possible.

The summary also indicates the sight distances achieved at each access and the approach adopted in determining these distances.

Table 1 Driveway Access Assessment

House No.	Driveway Widening Required (Approach) [Yes / No]	Accom. Works required to turn around	Exiting Direction [Forward / Reverse]	Driveway Widening Required (Departure) [Yes / No]	MGSD Achieved	SISD Achieved	Consultation with property owner required?
not relevant							

House No.	Driveway Widening Required (Approach) [Yes / No]	Accom. Works required to turn around	Exiting Direction [Forward / Reverse]	Driveway Widening Required (Departure) [Yes / No]	MGSD Achieved	SISD Achieved	Consultation with property owner required?
not relevant							

* MGSD and SISD have been assessed based on the minimum sight line setback requirement of 3.0 m measured from the lane edge line in accordance with Figure 3.2 of the AGRD04A.

MGSD and SISD have been assessed based on a reduced sight line setback of 2.2 m based on the alternative approach described above and the assumption that the vehicle is propped in line with the back of the kerb.

Ψ MGSD and SISD have been assessed based on a vehicle reversing onto Southport-Burleigh Road and propped in the verge such that rear of the vehicle is in line with the back of the kerb.

1.1.3 Extended Design Domain (EDD) / Design Exceptions

The following EDD and Design Exceptions in relation to sight distance at the accesses require approval.

Six accesses require EDD to be applied for both SISD and MGSD and are summarised as follows:

- not relevant

In order to achieve NDD for these properties, the setback of the existing fences in excess of 10 m in length would be required.

Southport-Burleigh Road (Fremar St to Andrew Avenue)
Department of Transport and Main Roads
16-Dec-2015
Doc No. 60334601-GEN-RP-014

Design Exception Report

Southport-Burleigh Road (Fremar Street to Andrew Avenue)

Design Exception Report

Southport-Burleigh Road (Fremar Street to Andrew Avenue)

Client: Department of Transport and Main Roads

ABN: 39 407 690 291

Prepared by

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Quality Information

Document Design Exception Report

Ref 60334601

Date 16-Dec-2015

Prepared by not relevant

Reviewed by not relevant

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	27-Aug-2015	Draft for TMR Review	not relevant Project Manager	Original Signed
B	16-Sep-2015	Updated for Integration with Package 4	not relevant Project Manager	Original Signed
C	18-Sep-2015	For District Director Approval	not relevant Project Manager	Original Signed
D	21-Sep-2015	For District Director Approval	not relevant Project Manager	Original Signed
E	16-Dec-2015	Interim Issue With Driveway Updates	not relevant Project Manager	not relevant

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1.0 Project Overview

1.1 Background

In February 2014, AECOM and SMEC were commissioned by the Department of Transport and Main Roads (TMR) to prepare a Business Case for the upgrade of Southport - Burleigh Road between North Street and Nerang-Broadbeach Road, with AECOM taking responsibility for the section between Vespa Crescent and Monaco Street.

In November 2014, AECOM was subsequently commissioned to undertake the Preliminary and Detailed Design of the same section of corridor, with the inclusion of the following additional scope items.

- extension of the original six lane configuration over the Nerang River and Monaco Street bridges
- continuation of the six lane configuration south of Andrew Avenue.

To accommodate TMR's priorities and delivery timeframes, the Preliminary and Detailed Design of the extended scope was divided into three smaller sections detailed below:

- Package 3: Vespa Crescent to Monaco Street (original scope with the addition of the bridge widenings).
- Package 10a: Monaco Street to Fremar Street.
- Package 10b: Fremar Street to Andrew Avenue.

This report outlines the design exceptions for the Package 10b works which is located between CH. 6800 and CH. 7300 and includes the signalised intersection at Fremar Street, as shown in **Figure 1.**

Figure 1 Package 10b Extents

1.2 Purpose

The purpose of this report is to document the departures from the design standards, the process of mitigating the associated risks and the specific Extended Design Domain (EDD) and Design Exceptions required for the project, with a view to gaining Regional Director approval. **Section 2.0** of this report outlines each design departure in detail.

1.3 Design Standards and References

Unless stated otherwise in this report, the design for this project was carried in accordance with the design brief and the relevant engineering standards listed in the **Design Development Report**.

2.0 Design Exceptions

2.1 Scope of Works

Within the project brief and throughout the design development phase of the project, the Region defined the scope of works along Southport-Burleigh Road as being limited to the extent of the existing carriageway width, typically from kerb to kerb, with exception to localised driveway and fence widening.

By restricting the scope of work to the existing carriageway / corridor extents, there are a number of design issues that have not been be addressed in their entirety as part of this project. This is primarily due to the constrained nature of the site, the high number of private properties directly adjacent to the corridor, the presence of multiple services within the existing verges and budgetary limitations. The aspects of the design where design departures apply are as follows:

- Cross section
- Roadside hazards (clear zone)
- Pedestrian facilities
- Cycle facilities
- Public transport facilities
- Drainage
- Pavement structural life
- Private property access

Whilst full improvements were not able to be undertaken, measures such as reducing the speed limit, and provisions such as additional signage, pavement marking delineation, reduction to the speed limit, additional stormwater gullies and accommodation works were included in the design to minimise the risk of the safety issues associated with retaining these existing features.

2.2 Cross Section

2.2.1 Existing and Design Configuration

A summary of the existing and proposed cross section configurations for Southport-Burleigh Road is provided in **Table 1.**

Table 1 Cross Section

Element	Existing	Design
Number of Lanes	4 (2 lanes in each direction)	6 (3 lanes in each direction)
Median	0.9 m – 5.5 m	0.3 m – 5.5 m
Lane Width	3.3 m + 3.3 m	3.5 [#] m + 3.1 m + 3.1 [#] m
Parking Lane*	2.0 m	Removed
Verge Width[#]	2.5 m – 3.5 m	2.5 m – 3.5 m
Footpath	1.2 m – 1.5 m	1.2 m – 1.5 m

*measured to lip of channel

[#]measured to kerb face

2.2.2 Extended Design Domain (EDD) / Design Exceptions

A comparison of the design criteria in relation to the cross section of Southport-Burleigh Road has been undertaken based on a design speed of 70 km/h and a 19.0 m long prime mover / semi-trailer design vehicle. A summary of the minimum design criteria and the design exceptions are provided in **Table 2**.

Table 2 Design Exceptions

Element	Reference Document	NDD Limit	EDD Limit	Existing	Design
Lane Width	Appendix A of AGRD03	3.3 m (cars) 3.5 m (trucks / buses)	3.0 m (cars) 3.3 m (trucks / buses)	3.3 m	3.1 m
Median	Table 7.1 of Chapter 7 of RPDM (1st edition)	0.9 m	n/a	0.9 m – 5.5 m	0.3 m – 5.5 m
Verge Width[#]	n/a	5.2 m *	n/a	2.5 m – 3.5 m	2.5 m – 3.5 m
Footpath	Section 6 of AGRD06A	1.2 m	n/a	1.2 m – 1.5 m	1.2 m – 1.5 m

[#]measured to kerb face

*Assumed requirement to accommodate the storage of a passenger vehicle during access and egress movements from private properties

In order to minimise impacts to private property, services and the adjacent footpaths, the upgrade of Southport-Burleigh Road to six lanes involved the reconfiguration of the carriageway by converting the existing parking lanes to through traffic lanes and narrowing the existing inner lanes from 3.3 m to 3.1 m. The proposed lane width as indicated in the table above meets the minimum EDD requirements for cars however does not achieve the width requirement for trucks / buses. A design exception is therefore required as the minimum lane width requirement for trucks cannot be provided.

The nominal 0.3 m median is below the 0.9 m absolute minimum width stipulated in Table 7.1 of Chapter 7 of RPDM (1st edition) which constitutes a design exception.

2.2.3 Design Development and Mitigation Treatments

The provision of a cross section (27.8 m) which meets each of the Normal Design Domain (NDD) requirements shown in **Table 2**, would result in partial property resumptions (up to 6.0 m) for approximately 38 properties fronting Southport-Burleigh Road. Furthermore, there would be significant cost impacts in adopting the NDD widths with major relocations required for the various existing services currently located within the existing verges. Due to budgetary constraints, the difficulties associated with partial resumptions and the community impact associated with service relocations, the Region agreed to adopt the 3.1 m lanes and a reduced median width of 0.3 m with a view to limiting the extent and scope of the works to within the confines of the existing carriageway.

The reduced median consists of a specially designed semi-mountable kerb that is 0.2 m wide x 0.125 m. The dimensions of the kerb profile were agreed with the Region and TMR's E&T branch. Since there are no transverse signs, traffic signals, turn bays or traffic barriers proposed along this section of median, the narrower width was deemed acceptable. The decision was also supported for the following reasons:

- Consultation with E&T arrived at the consensus that there have been few reported safety related issues associated with use of narrower medians particular on roads with straight horizontal geometry and that it has been adopted elsewhere on multi-lane roads in Brisbane, Gold Coast, Sydney and some local Council roads with great success.
- The physical median is considered safer as it provides better separation of opposing traffic when compared to double barrier lines, especially when combined with narrow lane widths.
- The median kerb was adopted in lieu of a double barrier line to provide a physical deterrent for vehicles attempting to illegally make a right turn into private properties or side roads on the opposite side of the carriageway.
- The median kerb will be painted yellow to provide additional delineation between the two carriageways.
- Provision for an ITS conduit in the median was proposed by the Region which required some form of physical protection from vehicle loads, resulting in a median being required.
- The narrow median will also provide benefits from a pedestrian safety perspective by discouraging mid-block crossings and preventing the median being used as a refuse for a two-stage crossing.

2.3 Roadside Hazards

2.3.1 Existing / Design Configuration

There are a large number of existing roadside hazards currently located within the clear zone under the existing lane configuration – the closest being a series of power poles in the verges, with the next closest the property boundary fences along the full length of this section of the corridor. As a result of the reconfiguration of the kerbside parking lanes into through traffic lanes, the risk of an errant vehicle impacting these hazards has increased. The clear zone criteria for the existing and design configuration is summarised in **Table 3**.

Table 3 Clear Zone

Element	Reference Document	Requirement	Existing	Design
Clear Zone	Cl. 4.2.2 in Part 6 of RPDM (2nd edition)	6.0 m	2.7 m to 3.0 m (clearance to power pole)	0.7 m to 1.0 m (clearance to power pole)

2.3.2 Design Exceptions

The clear zone requirement in Section 4.2.2 of the RPDM (2nd edition) has not been achieved on Southport-Burleigh Road which constitutes a design exception.

2.3.3 Design Development and Mitigation Treatments

Relocation of the existing hazards to a location outside the clear zone was considered during the design development phase, however given the extremely constrained nature of the corridor, it was deemed infeasible to do so. The issues limiting the opportunity for relocation are as follows:

- Existing property boundary fence locations are fixed, with multiple resumptions required to relocate
- Multiple existing underground services including water, sewer and telecommunication are located within the verge, with no space to underground the overhead electrical cables associated with the power poles
- The footpath located in the verge is located centrally and is 1.2 m - 1.5 m wide, resulting in power poles needing to either be located adjacent to the kerb or the property boundary, such that the footpath width is maintained
- Energex have strict requirements regarding the offset of overhead wires to property boundaries resulting in resumptions being required to accommodate relocated power poles to the back of the verge

The combination of the extremely narrow existing verge and the presence of other underground services contributed to significant cost implications when investigating options to completely eliminate the existing power pole hazards.

The most effective means to reducing the safety risks associated with the proposed cross section and the roadside hazards was to reduce the posted speed limit from 70 km/hr to 60 km/hr on Southport-Burleigh Road.

In addition to the speed reduction, the focus during the development of the proposed cross section was to maximise the offset between the traffic lanes and the existing hazards located within the existing verge. This was achieved by minimising the median and lane widths, and aligning the carriageway as far to the west as possible.

To further minimise the risk of collision with the power poles, additional width has been allocated to the kerbside lanes, with an effective lane width of 3.5 m measured to the kerb face. This additional width will help reduce the risk of collisions in two ways.

1) The painted edge line is positioned 3.1 m from the adjacent lane essentially providing a shoulder that has an average width of 800 mm, delineating the lane and pushing vehicles away from the hazard.
2) The additional width will assist in accommodating larger vehicles (trucks and buses) that are most likely to use the kerbside lane, and that have the potential to lean toward the hazard as a result of the crossfall.

To delineate the hazard and increase driver awareness in relation to the hazard, the design also incorporates a series of hazard marker signs installed on each of the existing power poles. The use of these signs is in accordance with the MUTCD Part 2 Clause 4.6.7.

2.4 Pedestrian Facilities

2.4.1 Existing / Design Configuration

2.4.1.1 Footpath width and separation

The existing footpaths located in the existing eastern and western verges along Southport-Burleigh Road vary in width from 1.2 m to 1.5 m and therefore meet the minimum width requirement of 1.2 m outlined in Section 6 of the AGRD06A. The eastern footpath is positioned directly adjacent to the existing property fences and has a clearance ranging between 1.2 m to 1.6 m to the new kerbside lane edge. The existing western footpath is positioned directly adjacent to the existing kerb, with a steep turf / concrete batter (approximately 1:1 slope for 300 mm high) located between the flat concrete footpath and the property boundary fence, resulting in very limited separation between pedestrians and the new kerbside lane edge.

There is no change to the footpath layout under the design arrangement with all of the existing footpaths to remain in their current locations.

2.4.1.2 Kerb ramps

The existing kerb ramps located within the project site are not DDA compliant. These kerb ramps are located at the Fremar Street and Andrew Avenue intersections with Southport-Burleigh Road.

The Region has taken the decision to only install DDA compliant kerb ramps at all locations where the existing kerb ramps require reconstruction due to the reconfiguration of the Fremar Street intersection. Six existing kerb ramps have been upgraded.

Using this logic, the existing kerb ramps, located on the left slip lane into Fremar Street and those located at the Andrew Avenue intersection have not been upgraded to DDA compliant ramps as the existing kerbs in the areas adjacent are not impacted by the road design.

2.4.1.3 Pedestrian Crossings

Under the existing arrangement, there is a formal zebra pedestrian crossing on each of the left turn slip lanes of the Freamr Street intersection. As part of the design, the existing zebra crossings and associated signage on the have been removed to provide consistency throughout the intersection and the network. The Region confirmed that the formal zebra crossing points were removed on each leg of the Rudd Street intersection as part of the reconfiguration design and as such, this logic has also been applied to the Fremar Street intersection.

It should be noted that the crossing on the slip lane into Fremar Street does not meet the minimum sight distance requirements under the existing or the design arrangement due to the presences of large trees and other vegetation on the inside of the approach curve to the crossing point. A summary of the sight distance criteria for the pedestrian crossing is provided in **Table 4**.

Table 4 Pedestrian Crossing Sight Distance

Element	Reference Document	Requirement	Existing	Design
Pedestrian Crossing Sight Distance	Cl. 3.3 of AGRD04A	120 m (CSD) 64 m (ASD)	40 m (CSD & ASD)	40 m to 50 m (CSD & ASD) *Depending on the extent of vegetation trimming

2.4.2 Design Exceptions

2.4.2.1 Footpath width and separation

Not Applicable.

2.4.2.2 Kerb ramps

Two existing kerb ramps at the Fremar Street intersection and two existing kerb ramps at the Andrew Street intersection have not been upgraded. Approval is required for these four locations where the existing kerb ramps will remain non-compliant.

2.4.2.3 Pedestrian Crossings

The location of the existing crossing on the slip lane into Fremar Street does not meet the minimum ASD and CSD sight distance requirements stipulated in Section 3.3 of the AGRD04A. The maximum sight distance that can be achieved at the current crossing location is 40 m, as a result of the existing horizontal geometry and the presence of a number of large trees on the approach to the crossing, with significant improvements unachievable. As such, a design exception is required for the CSD and ASD requirements.

2.4.3 Design Development and Mitigation Treatments

2.4.3.1 Footpath width and separation

Along the western verge in particular, consideration was given to the option to widen the existing footpath in order to provide more separation between the new kerbside lane and pedestrians. Although the additional costs purely associated with the additional concrete widening would be relatively low, further investigation identified potentially significant impacts to the adjacent property boundary fences and the existing services located beneath the verge, if the widening was implemented. The investigation revealed that in order to widen the concrete footpath, the steep batter would need to be removed resulting in the undermining of at least eight front boundary fences (typically rendered brick), which would consequently require reconstruction. There would also be impact to the underlying water main and the water meter boxes at each property. The cost implications associated with addressing these two issues render the option to widen the footpath infeasible.

The investigation also indicated that regardless of the amount of footpath widening undertaken in the western verge, the effective width would be reduced locally at regular intervals due to the presence of power poles and road signage posts, forcing pedestrians to move closer to the kerbside lane.

The speed limit has been reduced from 70 km/hr to 60 km/hr on Southport-Burleigh Road to mitigate some of the safety risks associated with the lack of separation between traffic and pedestrians.

Worth noting is the pedestrian volumes that utilise the western verge. A traffic count was undertaken at the Fremar Street intersection in 2015, indicating extremely low pedestrian numbers using the footpaths in this area. The traffic count results show only 30 pedestrians per day making a north / south movement along the western verge.

As a result of the factors above, and due to the associated cost and operational implications of upgrading the footpath, the Region took the decision not to implement the widening.

2.4.3.2 Kerb ramps

New kerb ramps have been designed in accordance with TMR Standard Drawings 1446, 1447, KRG1 and KRG2 and Figure 24(c) of AS1428.1.

2.4.3.3 Pedestrian Crossings

Amendments to the location of this crossing were investigated however were deemed unlikely to be effective due to the pedestrian desire line through this leg of the intersection.

To maximise the sight distance and increase driver awareness as to the presence of this pedestrian crossing on the left slip lane into Fremar Street, the design includes some vegetation trimming and the installation of advance warning signage on the approach to the crossing.

2.5 Cycle Facilities

2.5.1 Existing / Design Configuration

There are no dedicated cycle facilities on Southport-Burleigh Road in the existing arrangement and the Region have indicated that due to the constrained cross section, inclusion of on-road facilities would not occur as part of this project.

To provide a consistent message to road users, the Region also directed the removal of the green painted cycle lane on the approach to the Fremar Street intersection. To accommodate cycle movements around the Fremar Street intersection, a concrete ramp and path has been provided in the design on the western approach to the intersection, such that cyclists can exit the roadway at a safe location.

The existing network of concrete paths within Albert Park will facilitate northbound cycle movements, with the traffic signals and footpaths within the existing eastern verge facilitating southbound movements toward Rudd Street.

An investigation into the path widths throughout the site was undertaken to determine whether the minimum shared path width requirement of 2.5 m could be achieved in accordance with Part 6A of the RPDM (2nd edition). The existing / design path widths are provided in **Table 5**.

Table 5 Shared Path Width Requirements

Element	Reference Document	Requirement	Existing	Design
Path width	Part 6A of the RPDM (2nd edition)	2.5 m (Shared path)	1.8 m (Albert Park) 1.2 m (eastern verge)	1.8 m (Albert Park) 1.2 m (eastern verge)

In order to achieve the required shared path width, significant costs would be required to widen the entire footpath network within the project site. Given the budgetary constraints, limited verge width and the location of existing power poles on Southport-Burleigh Road, widening the footpath to accommodate cyclists was not undertaken.

2.5.2 Design Exceptions

As a result of the constrained corridor, shared path width requirements have not been met and as such a design exception is required.

2.5.3 Design Development and Mitigation Treatments

Through the design development process, the Region identified Rio Vista Boulevard as the primary north / south cycle route and indicated that upgrades to that corridor would occur in the near future. This resulted in the Region eliminating the requirement for on-road cycle facilities on Southport-Burleigh Road. The primary east / west link will be via Darnay Street and Rudd Street, with cycle facilities provided at that intersection. Informal cycle movements between Fremar Street and Rudd Street (en route to Rio Vista Boulevard) may occur on the carriageway or via foot along the existing footpath network.

Due to cycles being diverted onto the existing footpath network, which is not sufficiently wide to safely accommodate both cyclists, signage requiring cyclist to dismount has been included as part of the design to minimise the risk of pedestrian and cyclist interactions.

2.6 Public Transport Facilities

2.6.1 Existing / Design Configuration

As a result of the lane reconfiguration at the existing southbound bus stop location (approx. CH. 6860), a temporary relocation is required. The existing bus stop will be relocated to the southern / departure side of the Fremar Street intersection (approx. CH. 7000) until such time that the next stage of the corridor upgrade is implemented – likely after a period of between eight and twelve months.

Due to the high number of property accesses along the eastern verge, this temporary location was selected in order to provide the minimum length required in accordance with the Translink "Regular Bus Stop (Minimum Works)". However due to the relatively narrow verge width available, the minimum concrete boarding slab width requirement of 2.07 m could not been achieved. Refer to **Table 6** for a summary of the boarding slab widths for both the existing and design configuration.

Table 6 Bus Stop Requirements

Element	Reference Document	Requirement	Existing	Design
Bus stop boarding slab width	Public Transport Infrastructure Manual	2.07 m	0.6 m	0.6 m

2.6.2 Design Exceptions

Although this is a temporary bus stop, the reduced width of the boarding slab is still considered to be a design exception and requires approval.

2.6.3 Design Development and Mitigation Treatments

Although the standard boarding slab width requirements could not be achieved, the width at the temporary stop location will match that of the existing. Given that this is a temporary location, a reduced boarding slab width of 0.6 m has been deemed appropriate by the Region and Translink. The design of the next stage of the corridor upgrade will include a compliant arrangement in accordance with the Translink requirements.

2.7 Drainage Design

2.7.1 Existing / Design Configuration

The existing drainage network through this section of the corridor has a capacity equivalent to a 2 year ARI event. Due to budgetary limitations, the Region advised that the scope of the drainage works would only involve improvement to the flooded width on Southport-Burleigh Road where possible.

Under the proposed design, the flooded width on Fremar Street and Andrew Avenue will remain the same as the existing situation. The flooded width on Southport-Burleigh Road has decreased from the existing condition which is highlighted in **Table 7**.

Table 7 Flooded Width

Element	Reference Document	Requirement	Existing	Design
Flooded width (10 year ARI)	Cl. 11.2.2.1 of TMR Road Drainage Manual	< 1.0 m flooded width from kerb face	5.3 m flooded width from kerb face	3.5 m flooded width from kerb face

Upgrading the existing drainage network to meet the requirements in the TMR Road Drainage Manual (2010) would have involved an upgrade to the entire network extending over 200 m west along Fremar Street which the Region confirmed would not be feasible given the budgetary limitations.

2.7.2 Design Exceptions

Although the flooded width on Southport-Burleigh Road is improved, the drainage upgrade does not meet the requirements outlined in Figure 11.2.2.1 (a) in the TMR Road Drainage Manual (July 2010) and therefore a design exception is required.

2.7.3 Design Development and Mitigation Treatments

The primary focus for the drainage design was to improve the flooded width. The flooded width on Southport-Burleigh Road has decreased from the existing condition such that two full lanes remain free from water on both the northbound and southbound carriageways during a 10 year ARI event. This is a significant improvement from the existing configuration where only one full lane in both directions remains free from water.

2.8 Pavement Design

2.8.1 Existing / Design Configuration

The initial pavement design recommendation involved the utilisation of a full depth asphalt treatment for the areas of the existing pavement showing signs of failure, and the use of a full depth granular pavement with a cement modified working platform in areas of pavement widening. These treatments were developed in accordance with Part 2 of the Department of Transport and Main Roads Pavement Design Supplement (Nov 2013).

Due to budgetary limitations and the high likelihood of a pavement rehabilitation program on this section of road in the near future, the Region directed the following short-term pavement treatments be adopted in lieu of the initially recommended treatments:

- 50 mm asphalt mill and re-surface – where the existing pavement appeared to be in satisfactory condition
- 100 mm asphalt inlay for areas showing signs of failure (cracking, potholing, rutting and significant asphalt patching)
- full depth granular pavement to match the existing adjacent pavement profile, without the use of a cement modified working platform

The theoretical design life for these short-term pavement treatments was assessed and is provided in **Table 8**.

Table 8 Pavement Design Life

Element	Reference Document	Requirement	Existing	Design
Pavement design life	Cl. 7.4.2 of Pavement Design Supplement	20 years design life	Not applicable	1 year

The risks associated with the use of these short-term pavement treatments are discussed in detail within the Pavement Design Report and are summarised below:

- 100 mm thick layers applied on existing granular materials for the prevailing traffic loading conditions are prone to fatigue cracking, since they are not thin enough (< 50mm) nor sufficiently thick (> 150mm). The theoretical structural capacity resulting from implementing this treatment was assessed to be insufficient even for a year after opening, as the asphalt binder course theoretically fails in fatigue before reaching the first year.
- The condition of the existing granular base after the existing asphalt wearing course has been removed may require the removal and replacement of the unsuitable granular material, or the increase in asphalt thickness through the use of a corrector course to reinstate the volume of unsuitable material removed.

2.8.2 Design Exceptions

Given that the proposed pavement design does not meet the minimum criteria in the Pavement Design Supplement, a design exception is required for the adoption of the short-term treatments.

2.8.3 Design Development and Mitigation Treatments

Due to the selection of the short-term pavement treatments, an allowance for the removal and replacement of unsuitable pavement material has been included to repair isolated pavement failures.

It is also recommended that ongoing maintenance in the form of crack sealing and pothole patching is undertaken to maximise the performance of the rehabilitated / re-surfaced pavements until such time that TMR proceed with the planned pavement rehabilitation program.

2.9 Private Property Access

2.9.1 Existing / Design Configuration

Within this section of the corridor there are 33 private properties which access Southport-Burleigh Road directly via individual concrete driveways. Out of the 33 properties accesses, 23 are located on the eastern verge (southbound carriageway) and 10 are located on the western verge (northbound carriageway). During the design development, a detailed assessment was undertaken to determine the impact to each of these private property access points and the scope of work required to ensure that safe access / egress could be maintained under the new lane configuration. The initial desktop assessment identified four aspects of each existing driveway layout that had the potential to affect the safety of those utilising the accesses. The four aspects identified are listed and discussed in more detail below:

1) Entry manoeuvre
2) Vehicle storage space (between property fence / gate and the lane edge)
3) Exit direction and associated sight distance implications
4) Exit manoeuvre

2.9.1.1 Entry manoeuvre

The existing lane configuration allows for vehicles making a turn into the driveways to make the manoeuvre from the kerbside lane positioned approximately 2.5 m offset from the existing kerb line. Vehicle turn path analysis was used to confirm that each of the existing driveways was sufficiently wide to accommodate the turning movement for vehicles entering. A 5.2 m long passenger vehicle was adopted as the design vehicle. The analysis indicated that under the constraints of the existing configuration, the average theoretical speed of the vehicles entering existing driveways is 10 km/hr.

This speed was used as a basis for the analysis of the new configuration to determine whether driveway widening is required to accommodate the entry movement from the new kerbside lane which is position directly adjacent to the existing kerb. Under the new lane configuration, a total of 11 driveways and 3 fences have been identified for widening, to accommodate the entry manoeuvre, with this work to be undertaken under the main construction contract. Drawings indicating the extent and scope of widening works are provided as part of the Design Development Report and Contract Documentation.

2.9.1.2 Vehicle storage space

The existing lane configuration allows vehicles to enter and exit the private properties by utilising the width provided in both the verge and the parking lane. This width varies between 5.2 m and 5.5 m and would be deemed sufficient to store a vehicle safely between the existing property fence / gate and the edge of kerbside lane. Under the new lane configuration the distance between the existing property fence / gate and the edge of the kerbside lane varies between 3.0 m and 3.3 m. The safety issue associated with this reduction in storage space is partially mitigated due to 31 of the 33 properties in this section of the corridor being fitted with an electric gate / roller door. The assessment of the driveway accesses identified only 2 properties with manually opening gates and the Region have committed to replacing these gates with electric gates under the main construction contract, to further mitigate the risk of vehicles unsafely overhanging the new through lanes for an extended period of time.

It should be noted that the risk still remains in the extenuating circumstance where there could be excessive delays in the electric gates opening, and when the gate's mechanism fails to activate. This would result in queuing traffic in the kerbside lane and carries the risk of rear-end collisions due to suddenly stopping vehicles.

2.9.1.3 Exiting direction

The direction in which vehicles exit these properties has a significant bearing on the sight distance and consequently the safety of the road users utilising the driveway access and on the main carriageway. Due to the location and type of the existing property boundary fences, the sight distance can vary dramatically depending on if the vehicle exits in a forward or reversing direction. Intuitively, it is safer for a vehicle exiting these driveways in a forward direction compared to a vehicle reversing, as the driver's eye position results in less of the vehicle encroaching onto the verge when trying to maximise sight distance.

As such, the Region is currently in consultation with each property owner to determine if there is opportunity for vehicles to turn around within the property prior to exiting, thus reducing the risk of sight distance issues. For

those properties without a turnaround facility, the Region will investigate the option to undertake accommodation works to assist in the turnaround movement. In the circumstances where there it is physically impossible for the vehicles to turn around with the property, exiting will continue to occur in a reversing direction as it does in the current arrangement.

The assessment of each property has determined that of the 33 properties in the section of the corridor, 10 do not currently have the facility or physical space to turn around within the property. This assessment was based upon a desktop analysis and an inspection of the properties from the exterior / road corridor.

For these 10 accesses, an additional assessment is currently being undertaken through the community consultation process with inspections occurring from the interior of the properties. The Region is working closely with each property owner to determine if further accommodation works would facilitate the turnaround movement.

An assessment of the sight distance implications on these 10 properties has also been undertaken based on the boundary fence arrangement, the available verge width and any other physical barriers impeding sight lines. The boundary fences are typically 1.8 m to 2.0 m high and constructed out of either timber or brick with the openings in the fences generally only just wide enough to accommodate a passenger vehicle entering / exiting at very low speeds. These two attributes mean that the eye position adopted when undertaking sight distance analysis must be entirely beyond the line of the boundary fence.

It is worth noting that in practice, sight distance may in fact be improved under the new lane configuration due to the removal of the parking lane and therefore the presence of parked vehicles, which currently act as physical barriers to sight lines between exiting vehicles and the through traffic.

The sight distances analysis undertaken investigated the compliance in relation to Safe Intersection Sight Distance (SISD) and Minimum Gap Sight Distance (MGSD) for each movement. A design speed of 70 km/hr was adopted and due to the relatively flat vertical geometry, no grade correction was required.

On this basis, in order to meet the NDD requirements:

- a SISD of 141 m is required for cars assuming a Reaction Time of 1.5 seconds for an urban environment
- a SISD of 168 m is required for trucks assuming a Reaction Time of 1.5 seconds for an urban environment
- a MGSD of 97 m is required for vehicles exiting the driveway in a forward direction assuming a t_a of 5 seconds
- a MGSD of 175 m is required for vehicles exiting the driveway in a reverse direction assuming a t_a of 9 seconds

Under the EDD requirements:

- a SISD of 72 m is required assuming a d=0.46 and an Observation Time of 1.0 seconds (reduced by 0.5 seconds) in accordance with Appendix A.3. These values were adopted due to the low speed, highly urban environment and the reduced Observation Time associated with a simple left in / left out arrangement at the driveway accesses.

In some circumstances, a more practical approach has been adopted in determining the achievable sight distance at each access. By using the vehicle turn path analysis software, an actual driver eye position (2.2 m from the front of the car) has been determined based upon the most likely exiting direction / manoeuvre, rather than applying the 3.0 m offset requirement specified in Section 3.3.2 and 3.4 of the AGRD04A. **Table 9** details those locations where this alternative approach has been adopted.

2.9.1.4 Exit Manoeuvre

A similar vehicle turn path analysis was undertaken for vehicle exiting each of the driveway accesses. There is a total of 24 properties with the facility to turnaround within the property resulting in vehicles having the ability to exit in a forward direction. Of these 24 properties, 12 require widening on the departure side of the driveway to improve egress safety, with this work to be undertaken under the main construction contract. Drawings indicating the extent and scope of widening works are provided as part of the Design Development Report and Contract Documentation.

2.9.2 Design Development and Mitigation Treatments

A summary of each of the driveways assessed is provided in **Table 9**, with details regarding the extent and type of accommodation works that are required to improve the safety of residents entering and exiting their properties as much as feasibly possible.

The summary also indicates the sight distances achieved at each access and the approach adopted in determining these distances.

Table 9 Driveway Access Assessment

House No.	Driveway Widening Required (Approach) [Yes / No]	Accom. Works required to turn around	Exiting Direction [Forward / Reverse]	Driveway Widening Required (Departure) [Yes / No]	MGSD Achieved	SISD Achieved	Consultation with property owner required?
not relevant							
45	Yes	No	F	Yes	NDD[#]	NDD[#]	No
43	No	No	R	No	DE[Ψ] (42 m)	DE[Ψ] (42 m)	Yes
41	No	No	F	No	NDD*	NDD*	No
not relevant							

House No.	Driveway Widening Required (Approach) [Yes / No]	Accom. Works required to turn around	Exiting Direction [Forward / Reverse]	Driveway Widening Required (Departure) [Yes / No]	MGSD Achieved	SISD Achieved	Consultation with property owner required?
not relevant							

* MGSD and SISD have been assessed based on the minimum sight line setback requirement of 3.0 m measured from the lane edge line in accordance with Figure 3.2 of the AGRD04A.

MGSD and SISD have been assessed based on a reduced sight line setback of 2.2 m based on the alternative approach described above and the assumption that the vehicle is propped in line with the back of the kerb.

Ψ MGSD and SISD have been assessed based on a vehicle reversing onto Southport-Burleigh Road and propped in the verge such that rear of the vehicle is in line with the back of the kerb.

2.9.3 Extended Design Domain (EDD) / Design Exceptions

Under the assumptions described above and the theoretical analysis undertaken in relation to the position of the driver's eye and the maximum safe distance between the rear of the exiting vehicle and the edge of the through lane, the following property accesses will require Design Exceptions for both SISD and MGSD:

- not relevant
- House no. 43 (Lot 141 RP117192)
- not relevant

If the assumption in relation the vehicle's reversed position was such that the rear of the vehicle was in line with the lip of the kerb rather than the back of the kerb, the number of properties requiring a Design Exception for sight distance would be reduced to two.

The affected properties would be:

- not relevant

The theoretical analysis has indicated that for the sight distances at these properties to adequately satisfy the NDD requirements for MGSD or the NDD/EDD requirements for SISD, the front boundary fence would need to be reconstructed in a location such that the sight line is not interrupted. This length of reconstruction will vary for each property and would range between 5 m to 10 m in length.

In order to more accurately validate the outcomes of the theoretical analysis, the design team recommends that a practical evaluation of each of the eight properties identified above be undertaken to determine the actual sight distances achieved, and to determine if further accommodation works would allow for the vehicles to turn around within the property thus removing the sight distance issues. The extent and type of accommodation works will be assessed on a case by case basis as a result of the Region's community consultation process.

3.0 Design Exception Summary

Table 10 below summarises the Design Exceptions for this project.

The design items which would require a Design Exception under the existing corridor arrangement and still require a Design Exception under the proposed arrangement have been shaded in **purple**.

The design items which require a Design Exception as a result of the proposed arrangement, or which have been worsened as a result of the proposed design arrangement are shaded in **grey**.

The design items which require a Design Exception however have improved on the existing arrangement are shaded in **green**.

Table 10 Design Exceptions Summary

Design Aspect	Reference Document / Clause	Design Standard	Existing Achieved	Design Achieved
Lane width	AGRD03 / Appendix A	3.3 m (EDD for trucks)	3.3 m	3.1 m
Median	Chapter 7 of RPDM (1st edition) / Table 7.1	0.9 m	0.9 m	0.3 m
Power poles within clear zone	Part 6 of RPDM (2nd edition) / Cl. 4.2.2	6.0 m (clear zone)	2.7 to 3.0 m (clearance to power pole)	0.7 to 1.0 m (clearance to power pole)
Fremar Street slip lane pedestrian crossing	ARGD04A / Cl. 3.3	120 m (CSD) / 64 m (ASD)	40 m (CSD & ASD)	40 m to 50 m (CSD & ASD) *Depending on the extent of vegetation trimming
Albert Park Lagoon footpath	Part 6A of RPDM (2nd edition) / Cl. 7.5.3	2.5 m wide	1.8 m (Albert Park) 1.2 m (Eastern Verge)	1.8 m (Albert Park) 1.2 m (Eastern Verge)
Bus stop boarding slab width	Public Transport Infrastructure Manual / Appendix B	2.07 m	0.6 m	0.6 m
Flooded width (10 year ARI)	Road Drainage Manual / Cl. 11.2.2.1	<1.0 m flooded width from kerb face	5.3 m flooded width from kerb face	3.5 m flooded width from kerb face
Pavement design life	Pavement Design Supplement / Cl. 7.4.2	20 years design life	n/a	1 year
Driveway Access Sight Distance	AGRD04A	SISD (cars) = 141 m SISD (trucks) = 168 m MGSD (forward) = 97 m MGSD (reverse) = 175 m	Varies depending on the presences of vehicles parked in the existing parking lane	8 properties do not achieve SISD nor MGSD for those vehicles exiting in reverse

4.0 Approval

The table below confirms TMR's approval / acceptance of the Design Exceptions outlined in this report and incorporated into the final design documents.

Title	Name	Signature	Date
AECOM Project Director	not relevant		
AECOM Project Manager			
TMR Project Manager	Sham Nabi		
District Director (South Coast)	Sanjay Ram		

AECOM

Southport-Burleigh Road (Fremar St to Andrew Avenue)
Department of Transport and Main Roads
11-Jan-2016
Doc No. 60334601-GEN-RP-014

Design Exception Report

Southport-Burleigh Road (Fremar Street to Andrew Avenue)

Design Exception Report

Southport-Burleigh Road (Fremar Street to Andrew Avenue)

Client: Department of Transport and Main Roads

ABN: 39 407 690 291

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AECOM in Australia and New Zealand is certified to the latest version of ISO9001, ISO14001, AS/NZS4801 and OHSAS18001.

Quality Information

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Reviewed by not relevant

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	27-Aug-2015	Draft for TMR Review	not relevant Project Manager	Original Signed
B	16-Sep-2015	Updated for Integration with Package 4	not relevant Project Manager	Original Signed
C	18-Sep-2015	For District Director Approval	not relevant Project Manager	Original Signed
D	21-Sep-2015	For District Director Approval	not relevant Project Manager	Original Signed
E	16-Dec-2015	Interim Issue With Driveway Updates	not relevant Project Manager	Original Signed
F	11-Jan-2016	New Driveway Grade Issue Included	not relevant Project Manager	not relevant

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1.0 Project Overview

1.1 Background

In February 2014, AECOM and SMEC were commissioned by the Department of Transport and Main Roads (TMR) to prepare a Business Case for the upgrade of Southport - Burleigh Road between North Street and Nerang-Broadbeach Road, with AECOM taking responsibility for the section between Vespa Crescent and Monaco Street.

In November 2014, AECOM was subsequently commissioned to undertake the Preliminary and Detailed Design of the same section of corridor, with the inclusion of the following additional scope items:

- extension of the original six lane configuration over the Nerang River and Monaco Street bridges
- continuation of the six lane configuration south of Andrew Avenue.

To accommodate TMR's priorities and delivery timeframes, the Preliminary and Detailed Design of the extended scope was divided into three smaller sections detailed below:

- Package 3: Vespa Crescent to Monaco Street (original scope with the addition of the bridge widenings).
- Package 10a: Monaco Street to Fremar Street.
- Package 10b: Fremar Street to Andrew Avenue.

This report outlines the design exceptions for the Package 10b works which is located between CH. 6800 and CH. 7300 and includes the signalised intersection at Fremar Street, as shown in **Figure 1.**

Figure 1 **Package 10b Extents**

1.2 Purpose

The purpose of this report is to document the departures from the design standards, the process of mitigating the associated risks and the specific Extended Design Domain (EDD) and Design Exceptions required for the project, with a view to gaining Regional Director approval. **Section 2.0** of this report outlines each design departure in detail.

1.3 Design Standards and References

Unless stated otherwise in this report, the design for this project was carried in accordance with the design brief and the relevant engineering standards listed in the **Design Development Report**.

2.0 Design Exceptions

2.1 Scope of Works

Within the project brief and throughout the design development phase of the project, the Region defined the scope of works along Southport-Burleigh Road as being limited to the extent of the existing carriageway width, typically from kerb to kerb, with exception to localised driveway and fence widening.

By restricting the scope of work to the existing carriageway / corridor extents, there are a number of design issues that have not been be addressed in their entirety as part of this project. This is primarily due to the constrained nature of the site, the high number of private properties directly adjacent to the corridor, the presence of multiple services within the existing verges and budgetary limitations. The aspects of the design where design departures apply are as follows:

- Cross section
- Roadside hazards (clear zone)
- Pedestrian facilities
- Cycle facilities
- Public transport facilities
- Drainage
- Pavement structural life
- Private property access

Whilst full improvements were not able to be undertaken, measures such as reducing the speed limit, and provisions such as additional signage, pavement marking delineation, reduction to the speed limit, additional stormwater gullies and accommodation works were included in the design to minimise the risk of the safety issues associated with retaining these existing features.

2.2 Cross Section

2.2.1 Existing and Design Configuration

A summary of the existing and proposed cross section configurations for Southport-Burleigh Road is provided in **Table 1.**

Table 1 Cross Section

Element	Existing	Design
Number of Lanes	4 (2 lanes in each direction)	6 (3 lanes in each direction)
Median	0.9 m – 5.5 m	0.3 m – 5.5 m
Lane Width	3.3 m + 3.3 m	3.5# m + 3.1 m + 3.1# m
Parking Lane*	2.0 m	Removed
Verge Width#	2.5 m – 3.5 m	2.5 m – 3.5 m
Footpath	1.2 m – 1.5 m	1.2 m – 1.5 m

*measured to lip of channel

#measured to kerb face

2.2.2 Extended Design Domain (EDD) / Design Exceptions

A comparison of the design criteria in relation to the cross section of Southport-Burleigh Road has been undertaken based on a design speed of 70 km/h and a 19.0 m long prime mover / semi-trailer design vehicle. A summary of the minimum design criteria and the design exceptions are provided in **Table 2**.

Table 2 Design Exceptions

Element	Reference Document	NDD Limit	EDD Limit	Existing	Design
Lane Width	Appendix A of AGRD03	3.3 m (cars) 3.5 m (trucks / buses)	3.0 m (cars) 3.3 m (trucks / buses)	3.3 m	3.1 m
Median	Table 7.1 of Chapter 7 of RPDM (1st edition)	0.9 m	n/a	0.9 m – 5.5 m	0.3 m – 5.5 m
Verge Width#	n/a	5.2 m *	n/a	2.5 m – 3.5 m	2.5 m – 3.5 m
Footpath	Section 6 of AGRD06A	1.2 m	n/a	1.2 m – 1.5 m	1.2 m – 1.5 m

#measured to kerb face

*Assumed requirement to accommodate the storage of a passenger vehicle during access and egress movements from private properties

In order to minimise impacts to private property, services and the adjacent footpaths, the upgrade of Southport-Burleigh Road to six lanes involved the reconfiguration of the carriageway by converting the existing parking lanes to through traffic lanes and narrowing the existing inner lanes from 3.3 m to 3.1 m. The proposed lane width as indicated in the table above meets the minimum EDD requirements for cars however does not achieve the width requirement for trucks / buses. A design exception is therefore required as the minimum lane width requirement for trucks cannot be provided.

The nominal 0.3 m median is below the 0.9 m absolute minimum width stipulated in Table 7.1 of Chapter 7 of RPDM (1st edition) which constitutes a design exception.

2.2.3 Design Development and Mitigation Treatments

The provision of a cross section (27.8 m) which meets each of the Normal Design Domain (NDD) requirements shown in **Table 2**, would result in partial property resumptions (up to 6.0 m) for approximately 38 properties fronting Southport-Burleigh Road. Furthermore, there would be significant cost impacts in adopting the NDD widths with major relocations required for the various existing services currently located within the existing verges. Due to budgetary constraints, the difficulties associated with partial resumptions and the community impact associated with service relocations, the Region agreed to adopt the 3.1 m lanes and a reduced median width of 0.3 m with a view to limiting the extent and scope of the works to within the confines of the existing carriageway.

The reduced median consists of a specially designed semi-mountable kerb that is 0.2 m wide x 0.125 m. The dimensions of the kerb profile were agreed with the Region and TMR's E&T branch. Since there are no transverse signs, traffic signals, turn bays or traffic barriers proposed along this section of median, the narrower width was deemed acceptable. The decision was also supported for the following reasons:

- Consultation with E&T arrived at the consensus that there have been few reported safety related issues associated with use of narrower medians particular on roads with straight horizontal geometry and that it has been adopted elsewhere on multi-lane roads in Brisbane, Gold Coast, Sydney and some local Council roads with great success.
- The physical median is considered safer as it provides better separation of opposing traffic when compared to double barrier lines, especially when combined with narrow lane widths.
- The median kerb was adopted in lieu of a double barrier line to provide a physical deterrent for vehicles attempting to illegally make a right turn into private properties or side roads on the opposite side of the carriageway.
- The median kerb will be painted yellow to provide additional delineation between the two carriageways.
- Provision for an ITS conduit in the median was proposed by the Region which required some form of physical protection from vehicle loads, resulting in a median being required.
- The narrow median will also provide benefits from a pedestrian safety perspective by discouraging mid-block crossings and preventing the median being used as a refuse for a two-stage crossing.

2.3 Roadside Hazards

2.3.1 Existing / Design Configuration

There are a large number of existing roadside hazards currently located within the clear zone under the existing lane configuration – the closest being a series of power poles in the verges, with the next closest the property boundary fences along the full length of this section of the corridor. As a result of the reconfiguration of the kerbside parking lanes into through traffic lanes, the risk of an errant vehicle impacting these hazards has increased. The clear zone criteria for the existing and design configuration is summarised in **Table 3**.

Table 3 Clear Zone

Element	Reference Document	Requirement	Existing	Design
Clear Zone	Cl. 4.2.2 in Part 6 of RPDM (2nd edition)	6.0 m	2.7 m to 3.0 m (clearance to power pole)	0.7 m to 1.0 m (clearance to power pole)

2.3.2 Design Exceptions

The clear zone requirement in Section 4.2.2 of the RPDM (2nd edition) has not been achieved on Southport-Burleigh Road which constitutes a design exception.

2.3.3 Design Development and Mitigation Treatments

Relocation of the existing hazards to a location outside the clear zone was considered during the design development phase, however given the extremely constrained nature of the corridor, it was deemed infeasible to do so. The issues limiting the opportunity for relocation are as follows:

- Existing property boundary fence locations are fixed, with multiple resumptions required to relocate
- Multiple existing underground services including water, sewer and telecommunication are located within the verge, with no space to underground the overhead electrical cables associated with the power poles
- The footpath located in the verge is located centrally and is 1.2 m - 1.5 m wide, resulting in power poles needing to either be located adjacent to the kerb or the property boundary, such that the footpath width is maintained
- Energex have strict requirements regarding the offset of overhead wires to property boundaries resulting in resumptions being required to accommodate relocated power poles to the back of the verge

The combination of the extremely narrow existing verge and the presence of other underground services contributed to significant cost implications when investigating options to completely eliminate the existing power pole hazards.

The most effective means to reducing the safety risks associated with the proposed cross section and the roadside hazards was to reduce the posted speed limit from 70 km/hr to 60 km/hr on Southport-Burleigh Road.

In addition to the speed reduction, the focus during the development of the proposed cross section was to maximise the offset between the traffic lanes and the existing hazards located within the existing verge. This was achieved by minimising the median and lane widths, and aligning the carriageway as far to the west as possible.

To further minimise the risk of collision with the power poles, additional width has been allocated to the kerbside lanes, with an effective lane width of 3.5 m measured to the kerb face. This additional width will help reduce the risk of collisions in two ways.

1) The painted edge line is positioned 3.1 m from the adjacent lane essentially providing a shoulder that has an average width of 800 mm, delineating the lane and pushing vehicles away from the hazard.
2) The additional width will assist in accommodating larger vehicles (trucks and buses) that are most likely to use the kerbside lane, and that have the potential to lean toward the hazard as a result of the crossfall.

To delineate the hazard and increase driver awareness in relation to the hazard, the design also incorporates a series of hazard marker signs installed on each of the existing power poles. The use of these signs is in accordance with the MUTCD Part 2 Clause 4.6.7.

2.4 Pedestrian Facilities

2.4.1 Existing / Design Configuration

2.4.1.1 Footpath width and separation

The existing footpaths located in the existing eastern and western verges along Southport-Burleigh Road vary in width from 1.2 m to 1.5 m and therefore meet the minimum width requirement of 1.2 m outlined in Section 6 of the AGRD06A. The eastern footpath is positioned directly adjacent to the existing property fences and has a clearance ranging between 1.2 m to 1.6 m to the new kerbside lane edge. The existing western footpath is positioned directly adjacent to the existing kerb, with a steep turf / concrete batter (approximately 1:1 slope for 300 mm high) located between the flat concrete footpath and the property boundary fence, resulting in very limited separation between pedestrians and the new kerbside lane edge.

There is no change to the footpath layout under the design arrangement with all of the existing footpaths to remain in their current locations.

2.4.1.2 Kerb ramps

The existing kerb ramps located within the project site are not DDA compliant. These kerb ramps are located at the Fremar Street and Andrew Avenue intersections with Southport-Burleigh Road.

The Region has taken the decision to only install DDA compliant kerb ramps at all locations where the existing kerb ramps require reconstruction due to the reconfiguration of the Fremar Street intersection. Six existing kerb ramps have been upgraded.

Using this logic, the existing kerb ramps, located on the left slip lane into Fremar Street and those located at the Andrew Avenue intersection have not been upgraded to DDA compliant ramps as the existing kerbs in the areas adjacent are not impacted by the road design.

2.4.1.3 Pedestrian Crossings

Under the existing arrangement, there is a formal zebra pedestrian crossing on each of the left turn slip lanes of the Freamr Street intersection. As part of the design, the existing zebra crossings and associated signage on the have been removed to provide consistency throughout the intersection and the network. The Region confirmed that the formal zebra crossing points were removed on each leg of the Rudd Street intersection as part of the reconfiguration design and as such, this logic has also been applied to the Fremar Street intersection.

It should be noted that the crossing on the slip lane into Fremar Street does not meet the minimum sight distance requirements under the existing or the design arrangement due to the presences of large trees and other vegetation on the inside of the approach curve to the crossing point. A summary of the sight distance criteria for the pedestrian crossing is provided in **Table 4**.

Table 4 Pedestrian Crossing Sight Distance

Element	Reference Document	Requirement	Existing	Design
Pedestrian Crossing Sight Distance	Cl. 3.3 of AGRD04A	120 m (CSD) 64 m (ASD)	40 m (CSD & ASD)	40 m to 50 m (CSD & ASD) *Depending on the extent of vegetation trimming

2.4.2 Design Exceptions

2.4.2.1 Footpath width and separation

Not Applicable.

2.4.2.2 Kerb ramps

Two existing kerb ramps at the Fremar Street intersection and two existing kerb ramps at the Andrew Street intersection have not been upgraded. Approval is required for these four locations where the existing kerb ramps will remain non-compliant.

2.4.2.3 Pedestrian Crossings

The location of the existing crossing on the slip lane into Fremar Street does not meet the minimum ASD and CSD sight distance requirements stipulated in Section 3.3 of the AGRD04A. The maximum sight distance that can be achieved at the current crossing location is 40 m, as a result of the existing horizontal geometry and the presence of a number of large trees on the approach to the crossing, with significant improvements unachievable. As such, a design exception is required for the CSD and ASD requirements.

2.4.3 Design Development and Mitigation Treatments

2.4.3.1 Footpath width and separation

Along the western verge in particular, consideration was given to the option to widen the existing footpath in order to provide more separation between the new kerbside lane and pedestrians. Although the additional costs purely associated with the additional concrete widening would be relatively low, further investigation identified potentially significant impacts to the adjacent property boundary fences and the existing services located beneath the verge, if the widening was implemented. The investigation revealed that in order to widen the concrete footpath, the steep batter would need to be removed resulting in the undermining of at least eight front boundary fences (typically rendered brick), which would consequently require reconstruction. There would also be impact to the underlying water main and the water meter boxes at each property. The cost implications associated with addressing these two issues render the option to widen the footpath infeasible.

The investigation also indicated that regardless of the amount of footpath widening undertaken in the western verge, the effective width would be reduced locally at regular intervals due to the presence of power poles and road signage posts, forcing pedestrians to move closer to the kerbside lane.

The speed limit has been reduced from 70 km/hr to 60 km/hr on Southport-Burleigh Road to mitigate some of the safety risks associated with the lack of separation between traffic and pedestrians.

Worth noting is the pedestrian volumes that utilise the western verge. A traffic count was undertaken at the Fremar Street intersection in 2015, indicating extremely low pedestrian numbers using the footpaths in this area. The traffic count results show only 30 pedestrians per day making a north / south movement along the western verge.

As a result of the factors above, and due to the associated cost and operational implications of upgrading the footpath, the Region took the decision not to implement the widening.

2.4.3.2 Kerb ramps

New kerb ramps have been designed in accordance with TMR Standard Drawings 1446, 1447, KRG1 and KRG2 and Figure 24(c) of AS1428.1.

2.4.3.3 Pedestrian Crossings

Amendments to the location of this crossing were investigated however were deemed unlikely to be effective due to the pedestrian desire line through this leg of the intersection.

To maximise the sight distance and increase driver awareness as to the presence of this pedestrian crossing on the left slip lane into Fremar Street, the design includes some vegetation trimming and the installation of advance warning signage on the approach to the crossing.

2.5 Cycle Facilities

2.5.1 Existing / Design Configuration

There are no dedicated cycle facilities on Southport-Burleigh Road in the existing arrangement and the Region have indicated that due to the constrained cross section, inclusion of on-road facilities would not occur as part of this project.

To provide a consistent message to road users, the Region also directed the removal of the green painted cycle lane on the approach to the Fremar Street intersection. To accommodate cycle movements around the Fremar Street intersection, a concrete ramp and path has been provided in the design on the western approach to the intersection, such that cyclists can exit the roadway at a safe location.

The existing network of concrete paths within Albert Park will facilitate northbound cycle movements, with the traffic signals and footpaths within the existing eastern verge facilitating southbound movements toward Rudd Street.

An investigation into the path widths throughout the site was undertaken to determine whether the minimum shared path width requirement of 2.5 m could be achieved in accordance with Part 6A of the RPDM (2nd edition). The existing / design path widths are provided in **Table 5**.

Table 5 Shared Path Width Requirements

Element	Reference Document	Requirement	Existing	Design
Path width	Part 6A of the RPDM (2nd edition)	2.5 m (Shared path)	1.8 m (Albert Park) 1.2 m (eastern verge)	1.8 m (Albert Park) 1.2 m (eastern verge)

In order to achieve the required shared path width, significant costs would be required to widen the entire footpath network within the project site. Given the budgetary constraints, limited verge width and the location of existing power poles on Southport-Burleigh Road, widening the footpath to accommodate cyclists was not undertaken.

2.5.2 Design Exceptions

As a result of the constrained corridor, shared path width requirements have not been met and as such a design exception is required.

2.5.3 Design Development and Mitigation Treatments

Through the design development process, the Region identified Rio Vista Boulevard as the primary north / south cycle route and indicated that upgrades to that corridor would occur in the near future. This resulted in the Region eliminating the requirement for on-road cycle facilities on Southport-Burleigh Road. The primary east / west link will be via Darnay Street and Rudd Street, with cycle facilities provided at that intersection. Informal cycle movements between Fremar Street and Rudd Street (en route to Rio Vista Boulevard) may occur on the carriageway or via foot along the existing footpath network.

Due to cycles being diverted onto the existing footpath network, which is not sufficiently wide to safely accommodate both cyclists, signage requiring cyclist to dismount has been included as part of the design to minimise the risk of pedestrian and cyclist interactions.

2.6 Public Transport Facilities

2.6.1 Existing / Design Configuration

As a result of the lane reconfiguration at the existing southbound bus stop location (approx. CH. 6860), a temporary relocation is required. The existing bus stop will be relocated to the southern / departure side of the Fremar Street intersection (approx. CH. 7000) until such time that the next stage of the corridor upgrade is implemented – likely after a period of between eight and twelve months.

Due to the high number of property accesses along the eastern verge, this temporary location was selected in order to provide the minimum length required in accordance with the Translink "Regular Bus Stop (Minimum Works)". However due to the relatively narrow verge width available, the minimum concrete boarding slab width requirement of 2.07 m could not been achieved. Refer to **Table 6** for a summary of the boarding slab widths for both the existing and design configuration.

Table 6 Bus Stop Requirements

Element	Reference Document	Requirement	Existing	Design
Bus stop boarding slab width	Public Transport Infrastructure Manual	2.07 m	0.6 m	0.6 m

2.6.2 Design Exceptions

Although this is a temporary bus stop, the reduced width of the boarding slab is still considered to be a design exception and requires approval.

2.6.3 Design Development and Mitigation Treatments

Although the standard boarding slab width requirements could not be achieved, the width at the temporary stop location will match that of the existing. Given that this is a temporary location, a reduced boarding slab width of 0.6 m has been deemed appropriate by the Region and Translink. The design of the next stage of the corridor upgrade will include a compliant arrangement in accordance with the Translink requirements.

2.7 Drainage Design

2.7.1 Existing / Design Configuration

The existing drainage network through this section of the corridor has a capacity equivalent to a 2 year ARI event. Due to budgetary limitations, the Region advised that the scope of the drainage works would only involve improvement to the flooded width on Southport-Burleigh Road where possible.

Under the proposed design, the flooded width on Fremar Street and Andrew Avenue will remain the same as the existing situation. The flooded width on Southport-Burleigh Road has decreased from the existing condition which is highlighted in **Table 7**.

Table 7 Flooded Width

Element	Reference Document	Requirement	Existing	Design
Flooded width (10 year ARI)	Cl. 11.2.2.1 of TMR Road Drainage Manual	< 1.0 m flooded width from kerb face	5.3 m flooded width from kerb face	3.5 m flooded width from kerb face

Upgrading the existing drainage network to meet the requirements in the TMR Road Drainage Manual (2010) would have involved an upgrade to the entire network extending over 200 m west along Fremar Street which the Region confirmed would not be feasible given the budgetary limitations.

2.7.2 Design Exceptions

Although the flooded width on Southport-Burleigh Road is improved, the drainage upgrade does not meet the requirements outlined in Figure 11.2.2.1 (a) in the TMR Road Drainage Manual (July 2010) and therefore a design exception is required.

2.7.3 Design Development and Mitigation Treatments

The primary focus for the drainage design was to improve the flooded width. The flooded width on Southport-Burleigh Road has decreased from the existing condition such that two full lanes remain free from water on both the northbound and southbound carriageways during a 10 year ARI event. This is a significant improvement from the existing configuration where only one full lane in both directions remains free from water.

2.8 Pavement Design

2.8.1 Existing / Design Configuration

The initial pavement design recommendation involved the utilisation of a full depth asphalt treatment for the areas of the existing pavement showing signs of failure, and the use of a full depth granular pavement with a cement modified working platform in areas of pavement widening. These treatments were developed in accordance with Part 2 of the Department of Transport and Main Roads Pavement Design Supplement (Nov 2013).

Due to budgetary limitations and the high likelihood of a pavement rehabilitation program on this section of road in the near future, the Region directed the following short-term pavement treatments be adopted in lieu of the initially recommended treatments:

- 50 mm asphalt mill and re-surface – where the existing pavement appeared to be in satisfactory condition
- 100 mm asphalt inlay for areas showing signs of failure (cracking, potholing, rutting and significant asphalt patching)
- full depth granular pavement to match the existing adjacent pavement profile, without the use of a cement modified working platform

The theoretical design life for these short-term pavement treatments was assessed and is provided in **Table 8**.

Table 8 Pavement Design Life

Element	Reference Document	Requirement	Existing	Design
Pavement design life	Cl. 7.4.2 of Pavement Design Supplement	20 years design life	Not applicable	1 year

The risks associated with the use of these short-term pavement treatments are discussed in detail within the Pavement Design Report and are summarised below:

- 100 mm thick layers applied on existing granular materials for the prevailing traffic loading conditions are prone to fatigue cracking, since they are not thin enough (< 50mm) nor sufficiently thick (> 150mm). The theoretical structural capacity resulting from implementing this treatment was assessed to be insufficient even for a year after opening, as the asphalt binder course theoretically fails in fatigue before reaching the first year.
- The condition of the existing granular base after the existing asphalt wearing course has been removed may require the removal and replacement of the unsuitable granular material, or the increase in asphalt thickness through the use of a corrector course to reinstate the volume of unsuitable material removed.

2.8.2 Design Exceptions

Given that the proposed pavement design does not meet the minimum criteria in the Pavement Design Supplement, a design exception is required for the adoption of the short-term treatments.

2.8.3 Design Development and Mitigation Treatments

Due to the selection of the short-term pavement treatments, an allowance for the removal and replacement of unsuitable pavement material has been included to repair isolated pavement failures.

It is also recommended that ongoing maintenance in the form of crack sealing and pothole patching is undertaken to maximise the performance of the rehabilitated / re-surfaced pavements until such time that TMR proceed with the planned pavement rehabilitation program.

2.9 Private Property Access

2.9.1 Existing / Design Configuration

Within this section of the corridor there are 33 private properties which access Southport-Burleigh Road directly via individual concrete driveways. Out of the 33 properties accesses, 23 are located on the eastern verge (southbound carriageway) and 10 are located on the western verge (northbound carriageway). During the design development, a detailed assessment was undertaken to determine the impact to each of these private property access points and the scope of work required to ensure that safe access / egress could be maintained under the new lane configuration. The initial desktop assessment identified four aspects of each existing driveway layout that had the potential to affect the safety of those utilising the accesses. The four aspects identified are listed and discussed in more detail below:

1) Entry manoeuvre
2) Vehicle storage space (between property fence / gate and the lane edge)
3) Exit direction and associated sight distance implications
4) Exit manoeuvre

2.9.1.1 Entry manoeuvre

The existing lane configuration allows for vehicles making a turn into the driveways to make the manoeuvre from the kerbside lane positioned approximately 2.5 m offset from the existing kerb line. Vehicle turn path analysis was used to confirm that each of the existing driveways was sufficiently wide to accommodate the turning movement for vehicles entering. A 5.2 m long passenger vehicle was adopted as the design vehicle. The analysis indicated that under the constraints of the existing configuration, the average theoretical speed of the vehicles entering existing driveways is 10 km/hr.

This speed was used as a basis for the analysis of the new configuration to determine whether driveway widening is required to accommodate the entry movement from the new kerbside lane which is position directly adjacent to the existing kerb. Under the new lane configuration, a total of 11 driveways and 3 fences have been identified for widening, to accommodate the entry manoeuvre, with this work to be undertaken under the main construction contract. Drawings indicating the extent and scope of widening works are provided as part of the Design Development Report and Contract Documentation.

2.9.1.2 Vehicle storage space

The existing lane configuration allows vehicles to enter and exit the private properties by utilising the width provided in both the verge and the parking lane. This width varies between 5.2 m and 5.5 m and would be deemed sufficient to store a vehicle safely between the existing property fence / gate and the edge of kerbside lane. Under the new lane configuration the distance between the existing property fence / gate and the edge of the kerbside lane varies between 3.0 m and 3.3 m. The safety issue associated with this reduction in storage space is partially mitigated due to 31 of the 33 properties in this section of the corridor being fitted with an electric gate / roller door. The assessment of the driveway accesses identified only 2 properties with manually opening gates and the Region have committed to replacing these gates with electric gates under the main construction contract, to further mitigate the risk of vehicles unsafely overhanging the new through lanes for an extended period of time.

It should be noted that the risk still remains in the extenuating circumstance where there could be excessive delays in the electric gates opening, and when the gate's mechanism fails to activate. This would result in queuing traffic in the kerbside lane and carries the risk of rear-end collisions due to suddenly stopping vehicles.

2.9.1.3 Exiting direction

The direction in which vehicles exit these properties has a significant bearing on the sight distance and consequently the safety of the road users utilising the driveway access and on the main carriageway. Due to the location and type of the existing property boundary fences, the sight distance can vary dramatically depending on if the vehicle exits in a forward or reversing direction. Intuitively, it is safer for a vehicle exiting these driveways in a forward direction compared to a vehicle reversing, as the driver's eye position results in less of the vehicle encroaching onto the verge when trying to maximise sight distance.

As such, the Region is currently in consultation with each property owner to determine if there is opportunity for vehicles to turn around within the property prior to exiting, thus reducing the risk of sight distance issues. For

those properties without a turnaround facility, the Region will investigate the option to undertake accommodation works to assist in the turnaround movement. In the circumstances where there it is physically impossible for the vehicles to turn around with the property, exiting will continue to occur in a reversing direction as it does in the current arrangement.

The assessment of each property has determined that of the 33 properties in the section of the corridor, 10 do not currently have the facility or physical space to turn around within the property. This assessment was based upon a desktop analysis and an inspection of the properties from the exterior / road corridor.

For these 10 accesses, an additional assessment is currently being undertaken through the community consultation process with inspections occurring from the interior of the properties. The Region is working closely with each property owner to determine if further accommodation works would facilitate the turnaround movement.

An assessment of the sight distance implications on these 10 properties has also been undertaken based on the boundary fence arrangement, the available verge width and any other physical barriers impeding sight lines. The boundary fences are typically 1.8 m to 2.0 m high and constructed out of either timber or brick with the openings in the fences generally only just wide enough to accommodate a passenger vehicle entering / exiting at very low speeds. These two attributes mean that the eye position adopted when undertaking sight distance analysis must be entirely beyond the line of the boundary fence.

It is worth noting that in practice, sight distance may in fact be improved under the new lane configuration due to the removal of the parking lane and therefore the presence of parked vehicles, which currently act as physical barriers to sight lines between exiting vehicles and the through traffic.

The sight distances analysis undertaken investigated the compliance in relation to Safe Intersection Sight Distance (SISD) and Minimum Gap Sight Distance (MGSD) for each movement. A design speed of 70 km/hr was adopted and due to the relatively flat vertical geometry, no grade correction was required.

On this basis, in order to meet the NDD requirements:

- a SISD of 141 m is required for cars assuming a Reaction Time of 1.5 seconds for an urban environment
- a SISD of 168 m is required for trucks assuming a Reaction Time of 1.5 seconds for an urban environment
- a MGSD of 97 m is required for vehicles exiting the driveway in a forward direction assuming a t_a of 5 seconds
- a MGSD of 175 m is required for vehicles exiting the driveway in a reverse direction assuming a t_a of 9 seconds

Under the EDD requirements:

- a SISD of 72 m is required assuming a d=0.46 and an Observation Time of 1.0 seconds (reduced by 0.5 seconds) in accordance with Appendix A.3. These values were adopted due to the low speed, highly urban environment and the reduced Observation Time associated with a simple left in / left out arrangement at the driveway accesses.

In some circumstances, a more practical approach has been adopted in determining the achievable sight distance at each access. By using the vehicle turn path analysis software, an actual driver eye position (2.2 m from the front of the car) has been determined based upon the most likely exiting direction / manoeuvre, rather than applying the 3.0 m offset requirement specified in Section 3.3.2 and 3.4 of the AGRD04A. **Table 9** details those locations where this alternative approach has been adopted.

2.9.1.4 Exit Manoeuvre

A similar vehicle turn path analysis was undertaken for vehicle exiting each of the driveway accesses. There is a total of 24 properties with the facility to turnaround within the property resulting in vehicles having the ability to exit in a forward direction. Of these 24 properties, 12 require widening on the departure side of the driveway to improve egress safety, with this work to be undertaken under the main construction contract. Drawings indicating the extent and scope of widening works are provided as part of the Design Development Report and Contract Documentation.

2.9.2 Design Development and Mitigation Treatments

A summary of each of the driveways assessed is provided in **Table 9**, with details regarding the extent and type of accommodation works that are required to improve the safety of residents entering and exiting their properties as much as feasibly possible.

The summary also indicates the sight distances achieved at each access and the approach adopted in determining these distances.

Table 9 Driveway Access Assessment

House No.	Driveway Widening Required (Approach) [Yes / No]	Accom. Works required to turn around	Exiting Direction [Forward / Reverse]	Driveway Widening Required (Departure) [Yes / No]	MGSD Achieved	SISD Achieved	Consultation with property owner required?
not relevant							
45	Yes	No	F	Yes	NDD[#]	NDD[#]	No
43	No	No	R	No	DE[Ψ] (42 m)	DE[Ψ] (42 m)	Yes
41	No	No	F	No	NDD*	NDD*	No
not relevant							

House No.	Driveway Widening Required (Approach) [Yes / No]	Accom. Works required to turn around	Exiting Direction [Forward / Reverse]	Driveway Widening Required (Departure) [Yes / No]	MGSD Achieved	SISD Achieved	Consultation with property owner required?
not relevant							

* MGSD and SISD have been assessed based on the minimum sight line setback requirement of 3.0 m measured from the lane edge line in accordance with Figure 3.2 of the AGRD04A.

MGSD and SISD have been assessed based on a reduced sight line setback of 2.2 m based on the alternative approach described above and the assumption that the vehicle is propped in line with the back of the kerb.

'!' MGSD and SISD have been assessed based on a vehicle reversing onto Southport-Burleigh Road and propped in the verge such that rear of the vehicle is in line with the back of the kerb.

To satisfy the MGSD and SISD at House no. not relevant

not relevant

The details of the Design Exception are outlined in **Table 10**.

2.9.3 Extended Design Domain (EDD) / Design Exceptions

Under the assumptions described above and the theoretical analysis undertaken in relation to the position of the driver's eye and the maximum safe distance between the rear of the exiting vehicle and the edge of the through lane, the following property accesses will require Design Exceptions for both SISD and MGSD:

- not relevant
- House no. 43 (Lot 141 RP117192)
- not relevant

If the assumption in relation the vehicle's reversed position was such that the rear of the vehicle was in line with the lip of the kerb rather than the back of the kerb, the number of properties requiring a Design Exception for sight distance would be reduced to two.

The affected properties would be:

- not relevant

The theoretical analysis has indicated that for the sight distances at these properties to adequately satisfy the NDD requirements for MGSD or the NDD/EDD requirements for SISD, the front boundary fence would need to be reconstructed in a location such that the sight line is not interrupted. This length of reconstruction will vary for each property and would range between 5 m to 10 m in length.

In order to more accurately validate the outcomes of the theoretical analysis, the design team recommends that a practical evaluation of each of the eight properties identified above be undertaken to determine the actual sight distances achieved, and to determine if further accommodation works would allow for the vehicles to turn around within the property thus removing the sight distance issues. The extent and type of accommodation works will be assessed on a case by case basis as a result of the Region's community consultation process.

3.0 Design Exception Summary

Table 10 below summarises the Design Exceptions for this project.

The design items which would require a Design Exception under the existing corridor arrangement and still require a Design Exception under the proposed arrangement have been shaded in **purple**.

The design items which require a Design Exception as a result of the proposed arrangement, or which have been worsened as a result of the proposed design arrangement are shaded in **grey**.

The design items which require a Design Exception however have improved on the existing arrangement are shaded in **green**.

Table 10 Design Exceptions Summary

Design Aspect	Reference Document / Clause	Design Standard	Existing Achieved	Design Achieved
Lane width	AGRD03 / Appendix A	3.3 m (EDD for trucks)	3.3 m	3.1 m
Median	Chapter 7 of RPDM (1st edition) / Table 7.1	0.9 m	0.9 m	0.3 m
Power poles within clear zone	Part 6 of RPDM (2nd edition) / Cl. 4.2.2	6.0 m (clear zone)	2.7 to 3.0 m (clearance to power pole)	0.7 to 1.0 m (clearance to power pole)
Fremar Street slip lane pedestrian crossing	ARGD04A / Cl. 3.3	120 m (CSD) / 64 m (ASD)	40 m (CSD & ASD)	40 m to 50 m (CSD & ASD) *Depending on the extent of vegetation trimming
Albert Park Lagoon footpath	Part 6A of RPDM (2nd edition) / Cl. 7.5.3	2.5 m wide	1.8 m (Albert Park) 1.2 m (Eastern Verge)	1.8 m (Albert Park) 1.2 m (Eastern Verge)
Bus stop boarding slab width	Public Transport Infrastructure Manual / Appendix B	2.07 m	0.6 m	0.6 m
Flooded width (10 year ARI)	Road Drainage Manual / Cl. 11.2.2.1	<1.0 m flooded width from kerb face	5.3 m flooded width from kerb face	3.5 m flooded width from kerb face
Pavement design life	Pavement Design Supplement / Cl. 7.4.2	20 years design life	n/a	1 year

Design Aspect	Reference Document / Clause	Design Standard	Existing Achieved	Design Achieved
Driveway access sight distance	AGRD04A	SISD (cars) = 141 m SISD (trucks) = 168 m MGSD (forward) = 97 m MGSD (reverse) = 175 m	Varies depending on the presences of vehicles parked in the existing parking lane	8 properties do not achieve SISD nor MGSD for those vehicles exiting in reverse
New driveway and associated footpath grade	CGC Standard Drawing No. 05-02-302	Vertical grades typically ranging between 4% and 2.5% on the verge, with an allowable slope of 1 in 8 within the property.	n/a	Driveway grade = 1 in 4 (from the back of footpath to the new carport) Footpath grade = 3%

4.0 Approval

The table below confirms TMR's approval / acceptance of the Design Exceptions outlined in this report and incorporated into the final design documents.

Title	Name	Signature	Date
AECOM Project Director	not relevant	not relevant	11/01/16.
AECOM Project Manager	not relevant	not relevant	11/1/16
TMR Project Manager	Ross Poidevin	not relevant	12 JAN 16
District Director (South Coast)	David Selth	not relevant	12.1.16

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Southport-Burleigh Road (Fremar St to Andrew Avenue)
Department of Transport and Main Roads
11-Dec-2017
Doc No. 60334601-GEN-RP-014

Design Exception Report

Southport-Burleigh Road (Fremar Street to Andrew Avenue)

Design Exception Report

Southport-Burleigh Road (Fremar Street to Andrew Avenue)

Client: Department of Transport and Main Roads

ABN: 39 407 690 291

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Quality Information

Document Design Exception Report

Ref 60334601

Date 11-Dec-2017

Prepared by Michael Kavourakis (RPEQ: 13364)

Reviewed by Stephen Kearns (RPEQ: 10732)

Revision History

Rev	Revision Date	Details	Authorised	
			Name/Position	Signature
A	27-Aug-2015	Draft for TMR Review	not relevant Project Manager	Original Signed
B	16-Sep-2015	Updated for Integration with Package 4	not relevant Project Manager	Original Signed
C	18-Sep-2015	For District Director Approval	not relevant Project Manager	Original Signed
D	21-Sep-2015	For District Director Approval	not relevant Project Manager	Original Signed
E	16-Dec-2015	Interim Issue With Driveway Updates	not relevant Project Manager	Original Signed
F	11-Jan-2016	New Driveway Grade Issue Included	not relevant Project Manager	Original Signed
G	11-Dec-2017	Updated to capture outcomes of completed Accommodation Works	not relevant Project Manager	not relevant

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1.0 Project Overview

1.1 Background

In February 2014, AECOM and SMEC were commissioned by the Department of Transport and Main Roads (TMR) to prepare a Business Case for the upgrade of Southport - Burleigh Road between North Street and Nerang-Broadbeach Road, with AECOM taking responsibility for the section between Vespa Crescent and Monaco Street.

In November 2014, AECOM was subsequently commissioned to undertake the Preliminary and Detailed Design of the same section of corridor, with the inclusion of the following additional scope items:

- extension of the original six lane configuration over the Nerang River and Monaco Street bridges
- continuation of the six lane configuration south of Andrew Avenue.

To accommodate TMR's priorities and delivery timeframes, the Preliminary and Detailed Design of the extended scope was divided into three smaller sections detailed below:

- Package 3: Vespa Crescent to Monaco Street (original scope with the addition of the bridge widenings).
- Package 10a: Monaco Street to Fremar Street.
- Package 10b: Fremar Street to Andrew Avenue.

This report outlines the design exceptions for the Package 10b works which is located between CH. 6800 and CH. 7300 and includes the signalised intersection at Fremar Street, as shown in **Figure 1.**

Figure 1 Package 10b Extents

1.2 Purpose

The purpose of this report is to document the departures from the design standards, the process of mitigating the associated risks and the specific Extended Design Domain (EDD) and Design Exceptions required for the project, with a view to gaining Regional Director approval. **Section 2.0** of this report outlines each design departure in detail.

1.3 Design Standards and References

Unless stated otherwise in this report, the design for this project was carried in accordance with the design brief and the relevant engineering standards listed in the **Design Development Report**.

2.0 Design Exceptions

2.1 Scope of Works

Within the project brief and throughout the design development phase of the project, the Region defined the scope of works along Southport-Burleigh Road as being limited to the extent of the existing carriageway width, typically from kerb to kerb, with exception to localised driveway and fence widening.

By restricting the scope of work to the existing carriageway / corridor extents, there are a number of design issues that have not been be addressed in their entirety as part of this project. This is primarily due to the constrained nature of the site, the high number of private properties directly adjacent to the corridor, the presence of multiple services within the existing verges and budgetary limitations. The aspects of the design where design departures apply are as follows:

- Cross section
- Roadside hazards (clear zone)
- Pedestrian facilities
- Cycle facilities
- Public transport facilities
- Drainage
- Pavement structural life
- Private property access

Whilst full improvements were not able to be undertaken, measures such as reducing the speed limit, and provisions such as additional signage, pavement marking delineation, reduction to the speed limit, additional stormwater gullies and accommodation works were included in the design to minimise the risk of the safety issues associated with retaining these existing features.

2.2 Cross Section

2.2.1 Existing and Design Configuration

A summary of the existing and proposed cross section configurations for Southport-Burleigh Road is provided in **Table 1.**

Table 1 Cross Section

Element	Existing	Design
Number of Lanes	4 (2 lanes in each direction)	6 (3 lanes in each direction)
Median	0.9 m – 5.5 m	0.3 m – 5.5 m
Lane Width	3.3 m + 3.3 m	3.5 # m + 3.1 m + 3.1# m
Parking Lane*	2.0 m	Removed
Verge Width#	2.5 m – 3.5 m	2.5 m – 3.5 m
Footpath	1.2 m – 1.5 m	1.2 m – 1.5 m

*measured to lip of channel

#measured to kerb face

2.2.2 Extended Design Domain (EDD) / Design Exceptions

A comparison of the design criteria in relation to the cross section of Southport-Burleigh Road has been undertaken based on a design speed of 70 km/h and a 19.0 m long prime mover / semi-trailer design vehicle. A summary of the minimum design criteria and the design exceptions are provided in **Table 2**.

Table 2 Design Exceptions

Element	Reference Document	NDD Limit	EDD Limit	Existing	Design
Lane Width	Appendix A of AGRD03	3.3 m (cars) 3.5 m (trucks / buses)	3.0 m (cars) 3.3 m (trucks / buses)	3.3 m	3.1 m
Median	Table 7.1 of Chapter 7 of RPDM (1st edition)	0.9 m	n/a	0.9 m – 5.5 m	0.3 m – 5.5 m
Verge Width#	n/a	5.2 m *	n/a	2.5 m – 3.5 m	2.5 m – 3.5 m
Footpath	Section 6 of AGRD06A	1.2 m	n/a	1.2 m – 1.5 m	1.2 m – 1.5 m

#measured to kerb face

*Assumed requirement to accommodate the storage of a passenger vehicle during access and egress movements from private properties

In order to minimise impacts to private property, services and the adjacent footpaths, the upgrade of Southport-Burleigh Road to six lanes involved the reconfiguration of the carriageway by converting the existing parking lanes to through traffic lanes and narrowing the existing inner lanes from 3.3 m to 3.1 m. The proposed lane width as indicated in the table above meets the minimum EDD requirements for cars however does not achieve the width requirement for trucks / buses. A design exception is therefore required as the minimum lane width requirement for trucks cannot be provided.

The nominal 0.3 m median is below the 0.9 m absolute minimum width stipulated in Table 7.1 of Chapter 7 of RPDM (1st edition) which constitutes a design exception.

2.2.3 Design Development and Mitigation Treatments

The provision of a cross section (27.8 m) which meets each of the Normal Design Domain (NDD) requirements shown in **Table 2**, would result in partial property resumptions (up to 6.0 m) for approximately 38 properties fronting Southport-Burleigh Road. Furthermore, there would be significant cost impacts in adopting the NDD widths with major relocations required for the various existing services currently located within the existing verges. Due to budgetary constraints, the difficulties associated with partial resumptions and the community impact associated with service relocations, the Region agreed to adopt the 3.1 m lanes and a reduced median width of 0.3 m with a view to limiting the extent and scope of the works to within the confines of the existing carriageway.

The reduced median consists of a specially designed semi-mountable kerb that is 0.2 m wide x 0.125 m. The dimensions of the kerb profile were agreed with the Region and TMR's E&T branch. Since there are no transverse signs, traffic signals, turn bays or traffic barriers proposed along this section of median, the narrower width was deemed acceptable. The decision was also supported for the following reasons:

- Consultation with E&T arrived at the consensus that there have been few reported safety related issues associated with use of narrower medians particular on roads with straight horizontal geometry and that it has been adopted elsewhere on multi-lane roads in Brisbane, Gold Coast, Sydney and some local Council roads with great success.
- The physical median is considered safer as it provides better separation of opposing traffic when compared to double barrier lines, especially when combined with narrow lane widths.
- The median kerb was adopted in lieu of a double barrier line to provide a physical deterrent for vehicles attempting to illegally make a right turn into private properties or side roads on the opposite side of the carriageway.
- The median kerb will be painted yellow to provide additional delineation between the two carriageways.
- Provision for an ITS conduit in the median was proposed by the Region which required some form of physical protection from vehicle loads, resulting in a median being required.
- The narrow median will also provide benefits from a pedestrian safety perspective by discouraging mid-block crossings and preventing the median being used as a refuse for a two-stage crossing.

2.3 Roadside Hazards

2.3.1 Existing / Design Configuration

There are a large number of existing roadside hazards currently located within the clear zone under the existing lane configuration – the closest being a series of power poles in the verges, with the next closest the property boundary fences along the full length of this section of the corridor. As a result of the reconfiguration of the kerbside parking lanes into through traffic lanes, the risk of an errant vehicle impacting these hazards has increased. The clear zone criteria for the existing and design configuration is summarised in **Table 3**.

Table 3 Clear Zone

Element	Reference Document	Requirement	Existing	Design
Clear Zone	Cl. 4.2.2 in Part 6 of RPDM (2nd edition)	6.0 m	2.7 m to 3.0 m (clearance to power pole)	0.7 m to 1.0 m (clearance to power pole)

2.3.2 Design Exceptions

The clear zone requirement in Section 4.2.2 of the RPDM (2nd edition) has not been achieved on Southport-Burleigh Road which constitutes a design exception.

2.3.3 Design Development and Mitigation Treatments

Relocation of the existing hazards to a location outside the clear zone was considered during the design development phase, however given the extremely constrained nature of the corridor, it was deemed infeasible to do so. The issues limiting the opportunity for relocation are as follows:

- Existing property boundary fence locations are fixed, with multiple resumptions required to relocate
- Multiple existing underground services including water, sewer and telecommunication are located within the verge, with no space to underground the overhead electrical cables associated with the power poles
- The footpath located in the verge is located centrally and is 1.2 m - 1.5 m wide, resulting in power poles needing to either be located adjacent to the kerb or the property boundary, such that the footpath width is maintained
- Energex have strict requirements regarding the offset of overhead wires to property boundaries resulting in resumptions being required to accommodate relocated power poles to the back of the verge

The combination of the extremely narrow existing verge and the presence of other underground services contributed to significant cost implications when investigating options to completely eliminate the existing power pole hazards.

The most effective means to reducing the safety risks associated with the proposed cross section and the roadside hazards was to reduce the posted speed limit from 70 km/hr to 60 km/hr on Southport-Burleigh Road.

In addition to the speed reduction, the focus during the development of the proposed cross section was to maximise the offset between the traffic lanes and the existing hazards located within the existing verge. This was achieved by minimising the median and lane widths, and aligning the carriageway as far to the west as possible.

To further minimise the risk of collision with the power poles, additional width has been allocated to the kerbside lanes, with an effective lane width of 3.5 m measured to the kerb face. This additional width will help reduce the risk of collisions in two ways.

1. The painted edge line is positioned 3.1 m from the adjacent lane essentially providing a shoulder that has an average width of 800 mm, delineating the lane and pushing vehicles away from the hazard.

2. The additional width will assist in accommodating larger vehicles (trucks and buses) that are most likely to use the kerbside lane, and that have the potential to lean toward the hazard as a result of the crossfall.

To delineate the hazard and increase driver awareness in relation to the hazard, the design also incorporates a series of hazard marker signs installed on each of the existing power poles. The use of these signs is in accordance with the MUTCD Part 2 Clause 4.6.7.

2.4 Pedestrian Facilities

2.4.1 Existing / Design Configuration

2.4.1.1 Footpath width and separation

The existing footpaths located in the existing eastern and western verges along Southport-Burleigh Road vary in width from 1.2 m to 1.5 m and therefore meet the minimum width requirement of 1.2 m outlined in Section 6 of the AGRD06A. The eastern footpath is positioned directly adjacent to the existing property fences and has a clearance ranging between 1.2 m to 1.6 m to the new kerbside lane edge. The existing western footpath is positioned directly adjacent to the existing kerb, with a steep turf / concrete batter (approximately 1:1 slope for 300 mm high) located between the flat concrete footpath and the property boundary fence, resulting in very limited separation between pedestrians and the new kerbside lane edge.

There is no change to the footpath layout under the design arrangement with all of the existing footpaths to remain in their current locations.

2.4.1.2 Kerb ramps

The existing kerb ramps located within the project site are not DDA compliant. These kerb ramps are located at the Fremar Street and Andrew Avenue intersections with Southport-Burleigh Road.

The Region has taken the decision to only install DDA compliant kerb ramps at all locations where the existing kerb ramps require reconstruction due to the reconfiguration of the Fremar Street intersection. Six existing kerb ramps have been upgraded.

Using this logic, the existing kerb ramps, located on the left slip lane into Fremar Street and those located at the Andrew Avenue intersection have not been upgraded to DDA compliant ramps as the existing kerbs in the areas adjacent are not impacted by the road design.

2.4.1.3 Pedestrian Crossings

Under the existing arrangement, there is a formal zebra pedestrian crossing on each of the left turn slip lanes of the Freamr Street intersection. As part of the design, the existing zebra crossings and associated signage on the have been removed to provide consistency throughout the intersection and the network. The Region confirmed that the formal zebra crossing points were removed on each leg of the Rudd Street intersection as part of the reconfiguration design and as such, this logic has also been applied to the Fremar Street intersection.

It should be noted that the crossing on the slip lane into Fremar Street does not meet the minimum sight distance requirements under the existing or the design arrangement due to the presences of large trees and other vegetation on the inside of the approach curve to the crossing point. A summary of the sight distance criteria for the pedestrian crossing is provided in **Table 4**.

Table 4 Pedestrian Crossing Sight Distance

Element	Reference Document	Requirement	Existing	Design
Pedestrian Crossing Sight Distance	Cl. 3.3 of AGRD04A	120 m (CSD) 64 m (ASD)	40 m (CSD & ASD)	40 m to 50 m (CSD & ASD) *Depending on the extent of vegetation trimming

2.4.2 Design Exceptions

2.4.2.1 Footpath width and separation

Not Applicable.

2.4.2.2 Kerb ramps

Two existing kerb ramps at the Fremar Street intersection and two existing kerb ramps at the Andrew Street intersection have not been upgraded. Approval is required for these four locations where the existing kerb ramps will remain non-compliant.

2.4.2.3 Pedestrian Crossings

The location of the existing crossing on the slip lane into Fremar Street does not meet the minimum ASD and CSD sight distance requirements stipulated in Section 3.3 of the AGRD04A. The maximum sight distance that can be achieved at the current crossing location is 40 m, as a result of the existing horizontal geometry and the presence of a number of large trees on the approach to the crossing, with significant improvements unachievable. As such, a design exception is required for the CSD and ASD requirements.

2.4.3 Design Development and Mitigation Treatments

2.4.3.1 Footpath width and separation

Along the western verge in particular, consideration was given to the option to widen the existing footpath in order to provide more separation between the new kerbside lane and pedestrians. Although the additional costs purely associated with the additional concrete widening would be relatively low, further investigation identified potentially significant impacts to the adjacent property boundary fences and the existing services located beneath the verge, if the widening was implemented. The investigation revealed that in order to widen the concrete footpath, the steep batter would need to be removed resulting in the undermining of at least eight front boundary fences (typically rendered brick), which would consequently require reconstruction. There would also be impact to the underlying water main and the water meter boxes at each property. The cost implications associated with addressing these two issues render the option to widen the footpath infeasible.

The investigation also indicated that regardless of the amount of footpath widening undertaken in the western verge, the effective width would be reduced locally at regular intervals due to the presence of power poles and road signage posts, forcing pedestrians to move closer to the kerbside lane.

The speed limit has been reduced from 70 km/hr to 60 km/hr on Southport-Burleigh Road to mitigate some of the safety risks associated with the lack of separation between traffic and pedestrians.

Worth noting is the pedestrian volumes that utilise the western verge. A traffic count was undertaken at the Fremar Street intersection in 2015, indicating extremely low pedestrian numbers using the footpaths in this area. The traffic count results show only 30 pedestrians per day making a north / south movement along the western verge.

As a result of the factors above, and due to the associated cost and operational implications of upgrading the footpath, the Region took the decision not to implement the widening.

2.4.3.2 Kerb ramps

New kerb ramps have been designed in accordance with TMR Standard Drawings 1446, 1447, KRG1 and KRG2 and Figure 24(c) of AS1428.1.

2.4.3.3 Pedestrian Crossings

Amendments to the location of this crossing were investigated however were deemed unlikely to be effective due to the pedestrian desire line through this leg of the intersection.

To maximise the sight distance and increase driver awareness as to the presence of this pedestrian crossing on the left slip lane into Fremar Street, the design includes some vegetation trimming and the installation of advance warning signage on the approach to the crossing.

2.5 Cycle Facilities

2.5.1 Existing / Design Configuration

There are no dedicated cycle facilities on Southport-Burleigh Road in the existing arrangement and the Region have indicated that due to the constrained cross section, inclusion of on-road facilities would not occur as part of this project.

To provide a consistent message to road users, the Region also directed the removal of the green painted cycle lane on the approach to the Fremar Street intersection. To accommodate cycle movements around the Fremar Street intersection, a concrete ramp and path has been provided in the design on the western approach to the intersection, such that cyclists can exit the roadway at a safe location.

The existing network of concrete paths within Albert Park will facilitate northbound cycle movements, with the traffic signals and footpaths within the existing eastern verge facilitating southbound movements toward Rudd Street.

An investigation into the path widths throughout the site was undertaken to determine whether the minimum shared path width requirement of 2.5 m could be achieved in accordance with Part 6A of the RPDM (2nd edition). The existing / design path widths are provided in **Table 5**.

Table 5 Shared Path Width Requirements

Element	Reference Document	Requirement	Existing	Design
Path width	Part 6A of the RPDM (2nd edition)	2.5 m (Shared path)	1.8 m (Albert Park) 1.2 m (eastern verge)	1.8 m (Albert Park) 1.2 m (eastern verge)

In order to achieve the required shared path width, significant costs would be required to widen the entire footpath network within the project site. Given the budgetary constraints, limited verge width and the location of existing power poles on Southport-Burleigh Road, widening the footpath to accommodate cyclists was not undertaken.

2.5.2 Design Exceptions

As a result of the constrained corridor, shared path width requirements have not been met and as such a design exception is required.

2.5.3 Design Development and Mitigation Treatments

Through the design development process, the Region identified Rio Vista Boulevard as the primary north / south cycle route and indicated that upgrades to that corridor would occur in the near future. This resulted in the Region eliminating the requirement for on-road cycle facilities on Southport-Burleigh Road. The primary east / west link will be via Darnay Street and Rudd Street, with cycle facilities provided at that intersection. Informal cycle movements between Fremar Street and Rudd Street (en route to Rio Vista Boulevard) may occur on the carriageway or via foot along the existing footpath network.

Due to cycles being diverted onto the existing footpath network, which is not sufficiently wide to safely accommodate both cyclists, signage requiring cyclist to dismount has been included as part of the design to minimise the risk of pedestrian and cyclist interactions.

2.6 Public Transport Facilities

2.6.1 Existing / Design Configuration

As a result of the lane reconfiguration at the existing southbound bus stop location (approx. CH. 6860), a temporary relocation is required. The existing bus stop will be relocated to the southern / departure side of the Fremar Street intersection (approx. CH. 7000) until such time that the next stage of the corridor upgrade is implemented – likely after a period of between eight and twelve months.

Due to the high number of property accesses along the eastern verge, this temporary location was selected in order to provide the minimum length required in accordance with the Translink "Regular Bus Stop (Minimum Works)". However due to the relatively narrow verge width available, the minimum concrete boarding slab width requirement of 2.07 m could not been achieved. Refer to **Table 6** for a summary of the boarding slab widths for both the existing and design configuration.

Table 6 Bus Stop Requirements

Element	Reference Document	Requirement	Existing	Design
Bus stop boarding slab width	Public Transport Infrastructure Manual	2.07 m	0.6 m	0.6 m

2.6.2 Design Exceptions

Although this is a temporary bus stop, the reduced width of the boarding slab is still considered to be a design exception and requires approval.

2.6.3 Design Development and Mitigation Treatments

Although the standard boarding slab width requirements could not be achieved, the width at the temporary stop location will match that of the existing. Given that this is a temporary location, a reduced boarding slab width of 0.6 m has been deemed appropriate by the Region and Translink. The design of the next stage of the corridor upgrade will include a compliant arrangement in accordance with the Translink requirements.

2.7 Drainage Design

2.7.1 Existing / Design Configuration

The existing drainage network through this section of the corridor has a capacity equivalent to a 2 year ARI event. Due to budgetary limitations, the Region advised that the scope of the drainage works would only involve improvement to the flooded width on Southport-Burleigh Road where possible.

Under the proposed design, the flooded width on Fremar Street and Andrew Avenue will remain the same as the existing situation. The flooded width on Southport-Burleigh Road has decreased from the existing condition which is highlighted in **Table 7**.

Table 7 Flooded Width

Element	Reference Document	Requirement	Existing	Design
Flooded width (10 year ARI)	Cl. 11.2.2.1 of TMR Road Drainage Manual	< 1.0 m flooded width from kerb face	5.3 m flooded width from kerb face	3.5 m flooded width from kerb face

Upgrading the existing drainage network to meet the requirements in the TMR Road Drainage Manual (2010) would have involved an upgrade to the entire network extending over 200 m west along Fremar Street which the Region confirmed would not be feasible given the budgetary limitations.

2.7.2 Design Exceptions

Although the flooded width on Southport-Burleigh Road is improved, the drainage upgrade does not meet the requirements outlined in Figure 11.2.2.1 (a) in the TMR Road Drainage Manual (July 2010) and therefore a design exception is required.

2.7.3 Design Development and Mitigation Treatments

The primary focus for the drainage design was to improve the flooded width. The flooded width on Southport-Burleigh Road has decreased from the existing condition such that two full lanes remain free from water on both the northbound and southbound carriageways during a 10 year ARI event. This is a significant improvement from the existing configuration where only one full lane in both directions remains free from water.

2.8 Pavement Design

2.8.1 Existing / Design Configuration

The initial pavement design recommendation involved the utilisation of a full depth asphalt treatment for the areas of the existing pavement showing signs of failure, and the use of a full depth granular pavement with a cement modified working platform in areas of pavement widening. These treatments were developed in accordance with Part 2 of the Department of Transport and Main Roads Pavement Design Supplement (Nov 2013).

Due to budgetary limitations and the high likelihood of a pavement rehabilitation program on this section of road in the near future, the Region directed the following short-term pavement treatments be adopted in lieu of the initially recommended treatments:

- 50 mm asphalt mill and re-surface – where the existing pavement appeared to be in satisfactory condition
- 100 mm asphalt inlay for areas showing signs of failure (cracking, potholing, rutting and significant asphalt patching)
- full depth granular pavement to match the existing adjacent pavement profile, without the use of a cement modified working platform

The theoretical design life for these short-term pavement treatments was assessed and is provided in **Table 8**.

Table 8 Pavement Design Life

Element	Reference Document	Requirement	Existing	Design
Pavement design life	Cl. 7.4.2 of Pavement Design Supplement	20 years design life	Not applicable	1 year

The risks associated with the use of these short-term pavement treatments are discussed in detail within the Pavement Design Report and are summarised below:

- 100 mm thick layers applied on existing granular materials for the prevailing traffic loading conditions are prone to fatigue cracking, since they are not thin enough (< 50mm) nor sufficiently thick (> 150mm). The theoretical structural capacity resulting from implementing this treatment was assessed to be insufficient even for a year after opening, as the asphalt binder course theoretically fails in fatigue before reaching the first year.
- The condition of the existing granular base after the existing asphalt wearing course has been removed may require the removal and replacement of the unsuitable granular material, or the increase in asphalt thickness through the use of a corrector course to reinstate the volume of unsuitable material removed.

2.8.2 Design Exceptions

Given that the proposed pavement design does not meet the minimum criteria in the Pavement Design Supplement, a design exception is required for the adoption of the short-term treatments.

2.8.3 Design Development and Mitigation Treatments

Due to the selection of the short-term pavement treatments, an allowance for the removal and replacement of unsuitable pavement material has been included to repair isolated pavement failures.

It is also recommended that ongoing maintenance in the form of crack sealing and pothole patching is undertaken to maximise the performance of the rehabilitated / re-surfaced pavements until such time that TMR proceed with the planned pavement rehabilitation program.

2.9 Private Property Access

2.9.1 Existing / Design Configuration

Within this section of the corridor there are 33 private properties which access Southport-Burleigh Road directly via individual concrete driveways. Out of the 32 properties accesses, 23 are located on the eastern verge (southbound carriageway) and 9 are located on the western verge (northbound carriageway). During the design development, a detailed assessment was undertaken to determine the impact to each of these private property access points and the scope of work required to ensure that safe access / egress could be maintained under the new lane configuration. The initial desktop assessment identified four aspects of each existing driveway layout that had the potential to affect the safety of those utilising the accesses. The four aspects identified are listed and discussed in more detail below:

1. Entry manoeuvre
2. Vehicle storage space (between property fence / gate and the lane edge)
3. Exit direction and associated sight distance implications
4. Exit manoeuvre

2.9.1.1 Entry manoeuvre

The existing lane configuration allows for vehicles making a turn into the driveways to make the manoeuvre from the kerbside lane positioned approximately 2.5 m offset from the existing kerb line. Vehicle turn path analysis was used to confirm that each of the existing driveways was sufficiently wide to accommodate the turning movement for vehicles entering. A 5.2 m long passenger vehicle was adopted as the design vehicle. The analysis indicated that under the constraints of the existing configuration, the average theoretical speed of the vehicles entering existing driveways is 10 km/hr.

This speed was used as a basis for the analysis of the new configuration to determine whether driveway widening is required to accommodate the entry movement from the new kerbside lane which is position directly adjacent to the existing kerb. Under the new lane configuration, a total of 22 driveways and 3 fences have been identified for widening, to accommodate the entry manoeuvre, with this work to be undertaken under the main construction contract. Drawings indicating the extent and scope of widening works are provided as part of the Design Development Report and Contract Documentation.

2.9.1.2 Vehicle storage space

The existing lane configuration allows vehicles to enter and exit the private properties by utilising the width provided in both the verge and the parking lane. This width varies between 5.2 m and 5.5 m and would be deemed sufficient to store a vehicle safely between the existing property fence / gate and the edge of kerbside lane. Under the new lane configuration the distance between the existing property fence / gate and the edge of the kerbside lane varies between 3.0 m and 3.3 m. The safety issue associated with this reduction in storage space is partially mitigated with all 32 properties in this section of the corridor being fitted with an electric gate / roller door as part of the accommodation works. The assessment during the design phase identified only 2 properties with manually opening gates and the Region replaced these gates with electric gates under the main construction contract, to further mitigate the risk of vehicles unsafely overhanging the new through lanes for an extended period of time.

It should be noted that the risk still remains in the extenuating circumstance where there could be excessive delays in the electric gates opening, and when the gate's mechanism fails to activate. This would result in queuing traffic in the kerbside lane and carries the risk of rear-end collisions due to suddenly stopping vehicles.

2.9.1.3 Exiting direction

The direction in which vehicles exit these properties has a significant bearing on the sight distance and consequently the safety of the road users utilising the driveway access and on the main carriageway. Due to the location and type of the existing property boundary fences, the sight distance can vary dramatically depending on if the vehicle exits in a forward or reversing direction. Intuitively, it is safer for a vehicle exiting these driveways in a forward direction compared to a vehicle reversing, as the

driver's eye position results in less of the vehicle encroaching onto the verge when trying to maximise sight distance.

Subsequent to the design phase, the Region undertook consultation with each property owner during the construction phase to determine if there is opportunity for vehicles to turn around within the property prior to exiting, thus reducing the risk of sight distance issues. For those properties without a turnaround facility, the Region investigated options to undertake accommodation works to assist in the turnaround movement. In the circumstances where there it is physically impossible for the vehicles to turn around with the property, exiting will continue to occur in a reversing direction as it does in the current arrangement.

The assessment of each property has determined that of the 33 properties in the section of the corridor, 10 were originally identified as not having the facility or physical space to turn around within the property. This assessment was based upon a desktop analysis and an inspection of the properties from the exterior / road corridor.

Through consultation with each of the property owners, solutions were developed on a case by case basis to improve the manoeuvrability within the properties with positive results for 8 out of the 10 properties, resulting in only 1 property remaining in which vehicles exit the property by reversing. Further sight distance analysis was then undertaken on this 1 property to determine whether further mitigation was possible via the reconfiguration of property boundary fencing arrangements. The approach adopted during the sight distance analysis was in accordance with AGRD04A, and is detailed further below.

The sight distances analysis undertaken investigated the compliance in relation to Safe Intersection Sight Distance (SISD) and Minimum Gap Sight Distance (MGSD) for each movement. A design speed of 70 km/hr was adopted and due to the relatively flat vertical geometry, no grade correction was required.

On this basis, in order to meet the NDD requirements:

- a SISD of 141 m is required for cars assuming a Reaction Time of 1.5 seconds for an urban environment
- a SISD of 168 m is required for trucks assuming a Reaction Time of 1.5 seconds for an urban environment
- a MGSD of 97 m is required for vehicles exiting the driveway in a forward direction assuming a t_a of 5 seconds
- a MGSD of 175 m is required for vehicles exiting the driveway in a reverse direction assuming a t_a of 9 seconds

Under the EDD requirements:

- a SISD of 72 m is required assuming a d=0.46 and an Observation Time of 1.0 seconds (reduced by 0.5 seconds) in accordance with Appendix A.3. These values were adopted due to the low speed, highly urban environment and the reduced Observation Time associated with a simple left in / left out arrangement at the driveway accesses.

In some circumstances, a more practical approach has been adopted in determining the achievable sight distance at each access. By using the vehicle turn path analysis software, an actual driver eye position (2.2 m from the front of the car) has been determined based upon the most likely exiting direction / manoeuvre, rather than applying the 3.0 m offset requirement specified in Section 3.3.2 and 3.4 of the AGRD04A. **Table 9** details those locations where this alternative approach has been adopted.

It is worth noting that in practice, sight distance may in fact be improved under the new lane configuration due to the removal of the parking lane and therefore the presence of parked vehicles, which currently act as physical barriers to sight lines between exiting vehicles and the through traffic.

2.9.1.4 Exit Manoeuvre

A similar vehicle turn path analysis was undertaken for vehicle exiting each of the driveway accesses. There is a total of 30 properties with the facility to turnaround within the property resulting in vehicles having the ability to exit in a forward direction. Of these 30 properties, 18 require widening on the departure side of the driveway to improve egress safety, with this work to be undertaken under the main construction contract. Drawings indicating the extent and scope of widening works are provided as part of the Design Development Report and Contract Documentation.

2.9.2 Design Development and Mitigation Treatments

A summary of each of the driveways assessed is provided in **Table 9**, with details regarding the extent and type of accommodation works that are required to improve the safety of residents entering and exiting their properties as much as feasibly possible.

The summary also indicates the sight distances achieved at each access and the approach adopted in determining these distances.

Table 9 Driveway Access Assessment

House No.	Driveway Widening Required (Approach)	Accom. Works required to turn	Exiting Direction [Forward /	Driveway Widening Required (Departure)	MGSD Achieved	SISD Achieved	Rectification works completed during
not relevant							
45	Yes	No	F	Yes	NDD#	NDD#	Yes
43	No	Yes	F	No	NDD#	NDD#	Yes
41	Yes	No	F	No	NDD*	NDD*	Yes
not relevant							

House No.	Driveway Widening Required (Approach) [Yes / No]	Accom. Works required to turn around	Exiting Direction [Forward / Reverse]	Driveway Widening Required (Departure) [Yes / No]	MGSD Achieved	SISD Achieved	Rectification works completed during construction.
not relevant							

* MGSD and SISD have been assessed based on the minimum sight line setback requirement of 3.0 m measured from the lane edge line in accordance with Figure 3.2 of the AGRD04A.

MGSD and SISD have been assessed based on a reduced sight line setback of 2.2 m based on the alternative approach described above and the assumption that the vehicle is propped in line with the back of the kerb.

Ψ MGSD and SISD have been assessed based on a vehicle reversing onto Southport-Burleigh Road and propped in the verge such that rear of the vehicle is in line with the back of the kerb.

2.9.3 Extended Design Domain (EDD) / Design Exceptions

At the completion of the Detailed Design phase, utilising the assumptions described above and the theoretical analysis undertaken in relation to the position of the driver's eye and the maximum safe distance between the rear of the exiting vehicle and the edge of the through lane, 7 properties were identified as having property accesses where a Design Exceptions for both SISD and MGSD applies. Through consultation with property owners and implementation of accommodation works within the properties to allow vehicles to exit in a forward-facing direction, the number of property accesses where a Design Exceptions for both SISD and MGSD applies has been reduced to 1.

not relevant

2.9.4 Design Development and Mitigation Treatments

Ongoing monitoring of each of these access locations will be undertaken via the use of CCTV footage with corrective actions to potentially include relation of front boundary fences through a 'partial resumption' process, or more significant reconfiguration works within each of the properties.

In addition to the mitigation strategies outlined above, in the form of accommodation works, additional signage (TC1201 "Concealed Driveways") has been provided on the main carriageways to alert through traffic to the potential for vehicles frequently exiting properties.

3.0 Design Exception Summary

Table 10 below summarises the Design Exceptions for this project.

The design items which would require a Design Exception under the existing corridor arrangement and still require a Design Exception under the proposed arrangement have been shaded in **purple**.

The design items which require a Design Exception as a result of the proposed arrangement, or which have been worsened as a result of the proposed design arrangement are shaded in **grey**.

The design items which require a Design Exception however have improved on the existing arrangement are shaded in **green**.

Table 10 Design Exceptions Summary

Design Aspect	Reference Document / Clause	Design Standard	Existing Achieved	Design Achieved
Lane width	AGRD03 / Appendix A	3.3 m (EDD for trucks)	3.3 m	3.1 m
Median	Chapter 7 of RPDM (1st edition) / Table 7.1	0.9 m	0.9 m	0.3 m
Power poles within clear zone	Part 6 of RPDM (2nd edition) / Cl. 4.2.2	6.0 m (clear zone)	2.7 to 3.0 m (clearance to power pole)	0.7 to 1.0 m (clearance to power pole)
Fremar Street slip lane pedestrian crossing	ARGD04A / Cl. 3.3	120 m (CSD) / 64 m (ASD)	40 m (CSD & ASD)	40 m to 50 m (CSD & ASD) *Depending on the extent of vegetation trimming
Albert Park Lagoon footpath	Part 6A of RPDM (2nd edition) / Cl. 7.5.3	2.5 m wide	1.8 m (Albert Park) 1.2 m (Eastern Verge)	1.8 m (Albert Park) 1.2 m (Eastern Verge)
Bus stop boarding slab width	Public Transport Infrastructure Manual / Appendix B	2.07 m	0.6 m	0.6 m
Flooded width (10 year ARI)	Road Drainage Manual / Cl. 11.2.2.1	<1.0 m flooded width from kerb face	5.3 m flooded width from kerb face	3.5 m flooded width from kerb face
Pavement design life	Pavement Design Supplement / Cl. 7.4.2	20 years design life	n/a	1 year
Driveway access sight distance	AGRD04A	SISD (cars) = 141 m SISD (trucks) = 168 m MGSD (forward) = 97 m MGSD (reverse) = 175 m	Varies depending on the presences of vehicles parked in the existing parking lane	1 property does not achieve SISD nor MGSD for those vehicles exiting in reverse

4.0 Approval

The table below confirms TMR's approval / acceptance of the Design Exceptions outlined in this report and incorporated into the final design documents.

Title	Name	Signature	Date
AECOM Project Manager	not relevant	not relevant	19/12/17
Delivery Manager	David Selth		
District Director (South Coast)	Warren McReight		