



Appendix I

Design Advice



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Matthew Yu

From: Tim Wedmaier
Sent: Tuesday, 19 July 2016 3:44 p.m.
To: Kevin De Silva
Cc: Matthew Yu; Louise Strogon
Subject: FW: Northern Busway: bus demands
Attachments: Bus Reference Case_bus volumes.pdf

Hi Kevin

As discussed, If you could put together a memo that would be good.

The "known" (or anticipated) bus volumes are itemised out in my email to Louise below.

However you will need both AT and NZTA to confirm vehicles numbers and seek an overall approval/ acknowledgement from NZTA on this I think, as follows:

- AT – to confirm bus volumes are in line with those listed below (which are from their "Bus Reference Case" document anyway so should be no issued)
- AMA (or perhaps ATOC central) to confirm what the average number of emergency services and/ or maintenance vehicles on the busway per day or week – I assume its less than 100 a day
- NZTA (as road controlling authority) – to confirm that at this stage they have no plans to allow any additional vehicles (other than authorised buses, emergency and maintenance vehicles) to access and use the busway in the foreseeable future.
- Ultimately NZTA (as the asset owner, road controlling authority and the Requiring Authority under the RMA for busways) needs to recognise that if the stormwater assessment and consents being applied for are based on a particular set of assumption about vehicle eligibility and total vehicle volumes then they need to acknowledge in writing that if they subsequently change this decision, it will have possible retrospective infrastructure implications (eg additional stormwater infrastructure treatment **Matthew?**) as well as consenting implications (Matthew and Louise can assist with that wording better than I can)

Cheers
Tim

Tim Wedmaier
Associate, Aurecon

Tim.Wedmaier@aurecongroup.com

DISCLAIMER

From: Tim Wedmaier
Sent: Thursday, 30 June 2016 3:41 p.m.
To: Louise Strogon <Louise.Strogon@aurecongroup.com>
Subject: FW: Northern Busway: bus demands

Hi

Bus vols below for 2026 and 2036 below

Assume 4 peak hours a day (ie AM peak last 2 hours and PM peak lasts 2 hours) and 14 off peak hours a day – total of 20 hours a day operating (24 on weekends)

So for 2026 that's

- 78 each way during a peak hour (ie x 2 directions) x 4 hours = 624
- 26 each way (x 2 directions) x 16 hours = 832
- Friday and Saturday nights buses run every half hour though the night = 16 extra services outside of the above hours of operation
- **Total = 1472**

There are also a few coaches and school buses and the odd ambulance or police car on the busway but that should be nowhere near 5,000 vehicles per day.

Tim Wedmaier

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Please consider your environment before printing this e-mail.

From: Tim Wedmaier

Sent: Thursday, 23 June 2016 2:58 p.m.

To: 'Ian Clark' <ian@flownz.com>

Cc: Steve Dudley <Steve.Dudley@aurecongroup.com>; Louise Strogen <Louise.Strogen@aurecongroup.com>

Subject: RE: Northern Busway: bus demands

Yes apologies Ian

An extract from AT's Bus Reference Case (the planned bus frequency "bible") is attached which summarises all services from the North Shore to the City Centre.

The relevant services between Constellation and Albany are highlighted in the red box in the attached and in the table below.

Bus services per hour, per direction	2026 peak	2026 off peak	2036 peak	2036 off peak
NX1 (HC/ Albany to Britomart)	30	10	30	10
NX2 (Albany to Mid town/ University)	30	10	30	10
NX3 (Albany to Newmarket via Ponsonby)	8	6	10	8
Hibiscus Coast (Silverdale) to Midtown via busway (peak hours peak direction only)	10	0	12	0
TOTAL	78	26	82	28

As discussed while the in service bus volumes in the contra peak direction are much lower (refer to the attachment) many more out of service buses will be travelling contra peak to re-commence a new peak direction service.

Kind regards

Tim

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From: Ian Clark [<mailto:ian@flownz.com>]

Sent: Thursday, 23 June 2016 2:34 p.m.

To: Tim Wedmaier <Tim.Wedmaier@aurecongroup.com>

Cc: Steve Dudley <Steve.Dudley@arecongroup.com>; Louise Strogen <Louise.Strogen@arecongroup.com>
Subject: RE: Northern Busway: bus demands

Tim

Can I chase you up on the matter set out below – the NCI folk are expecting me to circulate new forecast flows tomorrow, and I'd like to use updated bus numbers.

Ian

Ian Clark

Director

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From: Ian Clark

Sent: Thursday, 16 June 2016 1:11 p.m.

To: 'Tim Wedmaier' <Tim.Wedmaier@arecongroup.com>

Cc: Terry Church <Terry@flownz.com>; 'kenny.see@nzta.govt.nz' <kenny.see@nzta.govt.nz>;

'Steve.Dudley@arecongroup.com' <Steve.Dudley@arecongroup.com>

Subject: Northern Busway: bus demands

Tim/Steve

Just following up on one of the actions of our meeting a couple of weeks ago. It makes sense to ensure that the NCI project and the North Shore rapid transit project are using similar assumptions regarding future bus numbers along the Northern Busway. Can you let me know what you are assuming for buses from Albany to Constellation, and south of Constellation, for each forecast year you are using.

For our (NCI) purposes, the more buses we have, the better, as this will lead to a more problematic Do Minimum scenario (without the Busway Extension). However, we probably need to focus on "reasonable" rather than aspirational bus numbers. Having said that, while our future models should focus on reasonable forecasts, we may also wish to refer to any aspirational forecasts as well, within our reports, just to give context.

And while I have your attention, can you let me know what can be said publicly about the future PT mode for the Busway, as a result of your RTN study. If the answer is "nothing at this stage", when is info likely to be forthcoming.

Ian

Ian Clark

Director

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Memorandum

To	Matthew Yu	From	Gregory Pinches
Copy	David Hughes, Gary Moore, Steve Temple	Reference	250310
Date	4 August 2016	Pages (including this page)	3
Subject	NCI – Potential for Soakage		

Matthew,

1 Review

I have undertaken a preliminary review of the ground and groundwater conditions at the sites of each of the stormwater ponds/wetlands proposed for the project (as shown on Rev. D of the GA drawings).

As a result of this review I have made a qualitative assessment of the potential for soakage at each site, which is summarised in Table 1, attached. The criteria I have used are:

- Soil – the type of soil present at a depth of around 2-4m below ground level.
- Groundwater level – the depth below ground of any groundwater observations, especially at the end of the wet season (Winter High, end of September).
- Potential for groundwater flow – how the groundwater level relates to the local topography, particularly if the groundwater surface can be expected to decline towards nearby streams.

Considering these factors together I have provided a judgement of the soakage potential at each site. There are sites which are clearly unsuitable but there are others where it may be possible to dispose of some stormwater into the ground by soakage, although this potential will need to be investigated.

2 Materials present and their permeability

The key aquifers of the Auckland Region, particularly the volcanic basalt, are not present across the area of the Northern Corridor Improvements. Nor are there other rocks or soils which would be expected to be well suited to soakage, such as clean sands or peat. The entire area of NCI is underlain by soils characterised by the presence of clay, predominantly residual soils derived from the East Coast Bays Formation (ER) and, in the Rosedale area, Pleistocene and Recent soils of the Tauranga Group (TG), including alluvium. Therefore there will be no areas which can be classified as providing medium or good soakage potential (according to Auckland Council's Technical Report on Stormwater Disposal by Soakage, TR2013/40). The best that we can hope for would be classified as with Poor Soakage potential.

Whether from ER or TG, the majority of soils present are silty clays, which I would expect to have a low permeability coefficient (hydraulic conductivity), 10^{-7} to 10^{-9} m/sec. In places sandy silts and silty sands are present, whose permeability may increase to 10^{-6} m/sec (0.004 mm/hour). Where the East Coast Bays Formation (ECBF) rock occurs near surface its permeability will be similar to the derived soils; not unless there are systematic and persistent joint sets would we expect any increase in this value and, to date we have no evidence of this. In parts of the southern area (in and around the valley of the Rosedale ponds) soft wet organic clays occur and these will be effectively impermeable, 10^{-9} to 10^{-10} m/sec.

3 Groundwater

There are sites within the NCI project area where the groundwater surface is potentially deep enough to receive infiltrating water and we would expect a potential groundwater gradient falling towards streams at a lower elevation to take this water away from the potential soakage site.

Even the best of the site soils however is not going to yield an infiltration rates which satisfies Auckland Council's minimum percolation rate of 0.5 litres/m² per minute as specified in their Soakage Design Manual. Any proposal for soakage on this project therefore will be outside of the normal range that Council consider suitable and hence will require a specific assessment and application on individual merit.

4 Recommendations

For the Specimen Design I recommend your assumption is that there will be no soakage.

Should you wish to keep open the possibility of a design for in-ground soakage, perhaps as an item of added value to be offered by tenderers, I recommend undertaking local geotechnical investigations which include in situ soakage testing, laboratory classification testing and installation of piezometers to monitor the seasonal variation in groundwater levels.

Regards,



Gregory Pinches

Location	Chainage	Dimensions of Wetland/ Pond	Soil Type	Groundwater Depth	Date of GW measure	Groundwater Surface	Groundwater Gradient	Soil Permeability	Groundwater Head	Soakage Potential
Oteha East	12000 - 12070	70m x 30m	Fill to 1.5m, Silt (ER) to 2.5m, ER (sand) to 5.2m, ECBF below	No information		Probably shallow	Potentially falls to N	Low-Medium	Marginal - adequate	Very Poor
Oteha West	12030	40m x 30m	Fill to 2.5m, ECBF (MW rock) from 3.5m	2.0m	Oct-15	Shallow	Potentially falls to N	Low-Medium	Marginal - adequate	Very Poor
McClymonts	12700 - 12750	80m x 25m	Silt/clay (ER) to 4.5m	No information		deep G/w surface	Potentially falls to W	Low	Potentially good	Poor
Corinthian Drive	13650 - 13710	70m x 40m	clay/silt (ER)	No information			6m fall to nearby pond & declining to south	Low	Adequate	Very Poor
Greville Rd SB Offramp	13860 - 13930	80m x 20m	clay/silt to 5.5m, sand below				2-3m fall to Leachate pond, possibly 5m more to buried stream	Low	Potentially available	Very Poor
Greville Rd NB Offramp	14060 - 14160	90m x 20m	Embankment fill over clay/silt (TA) to 6m	No information			5m fall to Oteha stream	Low	Potentially good	Poor
Causeway North	15070 - 15140	80m x 60m	Potentially silt/clay (ER) over ECBF (MW rock)	No information		Below lake level		Low	Not available	Unsuitable
Causeway South	15280 - 15430	150m x 90m	Tunnel spoil (fill) 3m over soft wet clay (TA)					Very Low	Close to lake level	Unsuitable
Constellation Reserve East	SH18 Ch 680 - 770	80m x 25m	Silt of Residual ECBF	G/w seepage under saturated fill	Sep-15		8m fall to nearby stream	Low	Potentially good	Poor
Constellation Reserve West	SH18 Ch 870 - 1010	140m x 50m	Soft Silty Clay	At ground surface	Oct-15	Similar to lake level		Very Low	Not available	Unsuitable
Rook Reserve	SH18 Ch 1460-1530	70m x 30m	Silt/Clay to 6m (4m fill over TA)	3m begl	Oct-15		Declines to Alexandra Stream	Low	Adequate	Poor

Table 1 Northern Corridor Improvements Project Area – Qualitative Assessment of Soakage Potential