Presentation to 6th NZ Cycling Conference
Napier, Friday 2 November 2007

Cycle route network planning using GIS

Andrew G. Macbeth, BE, MEng, CPEng, FIPENZ (civil)
ViaStrada Ltd, Christchurch
andrew@viastrada.co.nz
www.viastrada.co.nz

Co-authors: Tricia Allen (formerly ARTA)
and Tony Barton (VicRoads, Melbourne)

VIASTRADA
TRAFFIC ENGINEERING AND PLANNING

Tricia Allen and Tony Barton

VIASTRADA

Auckland

VIASTRADA

Melbourne

VIASTRADA

Useful data for cycle planning in GIS

- General **topographical features** such as rivers, coastlines, railways and town or activity centres;
- Centrelines of **roads and cycle route networks** (both on-road and off-road);
- **Municipal boundaries**;
- **Zone boundaries** for conventional transport planning computer models;
- **Census population and employment data**, aggregated into transport planning zones;
- **School rolls**, aggregated to zone level; and
- Cycle **crash locations** for the last five years

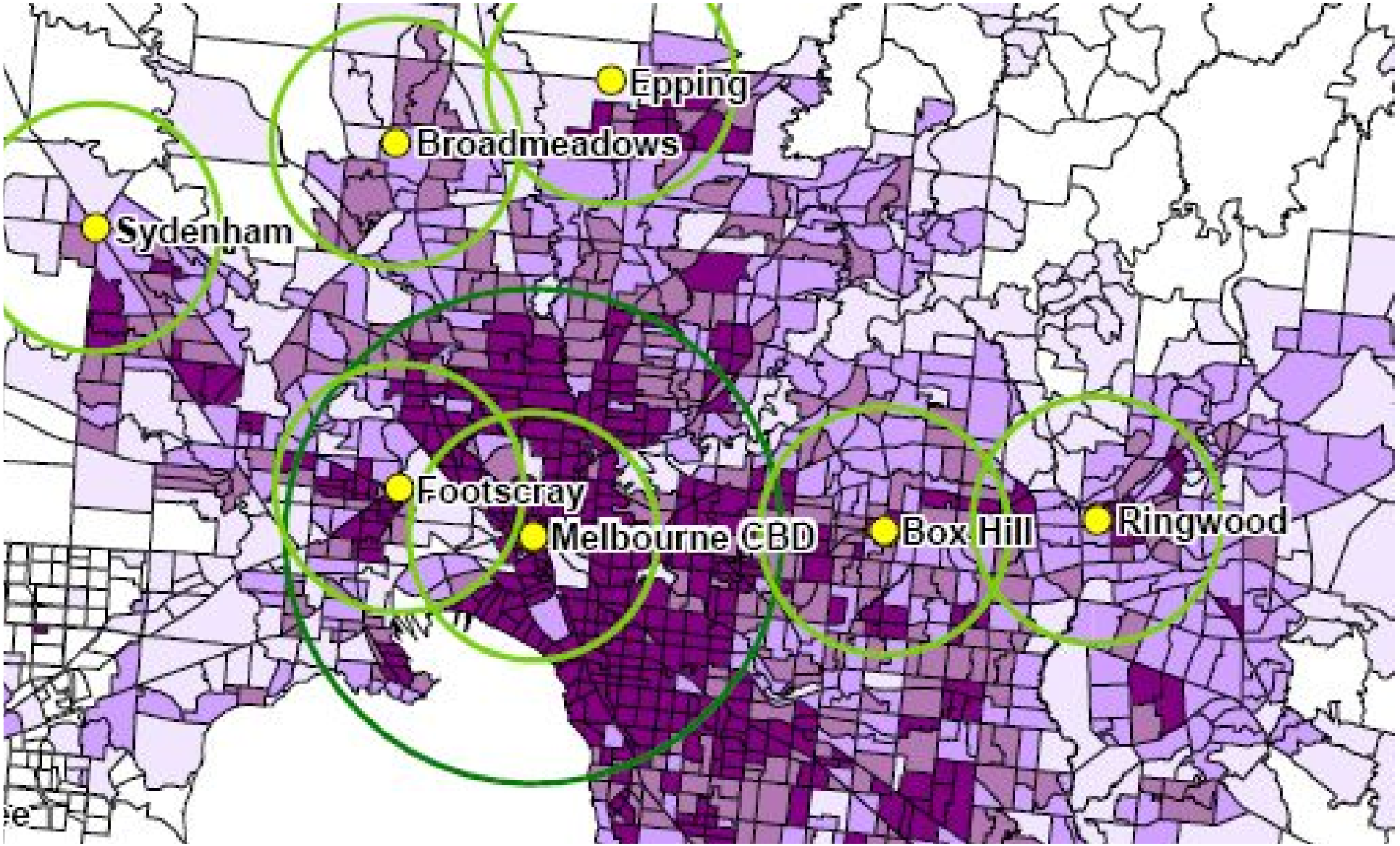
VIASTRADA

Demographic density

- Residential, employment and education totals from Census and school data
- Combine within transport planning model zones
- Display as persons per hectare using GIS
- Cycle network should service highest density areas first

VIASTRADA

Demographic density

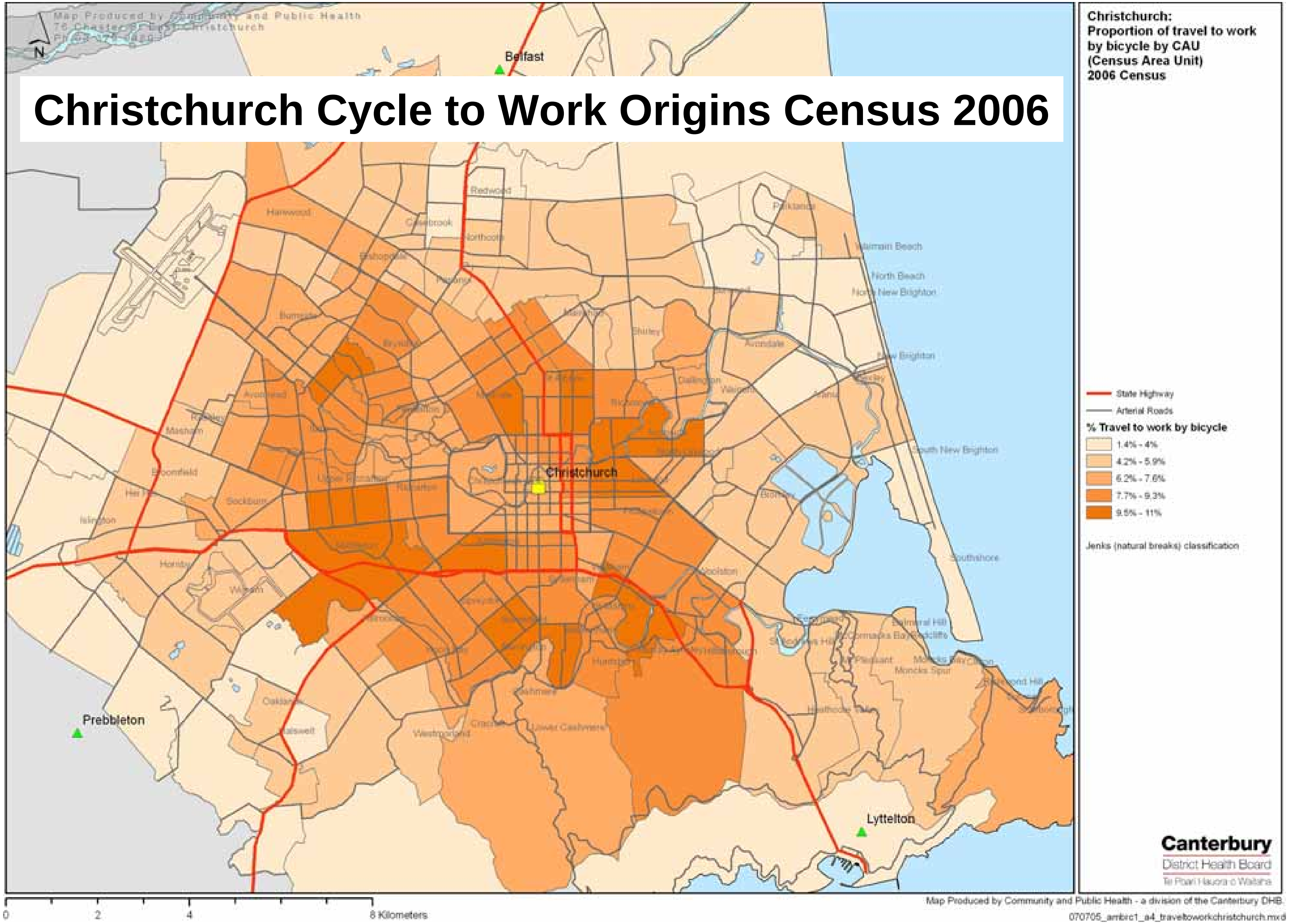


Chch cycle to work Census data 2006

- Another useful spatial data set for planning cycle networks
- Density of trips (persons per ha) can be calculated at meshblock level and plotted
- Can help understanding of existing cycle use for journey to work in any city or district
- Chch data analysed by Canterbury DHB – not just TLAs who are interested in this

VIASTRADA

Christchurch Cycle to Work Origins Census 2006



Crash data and cycle network

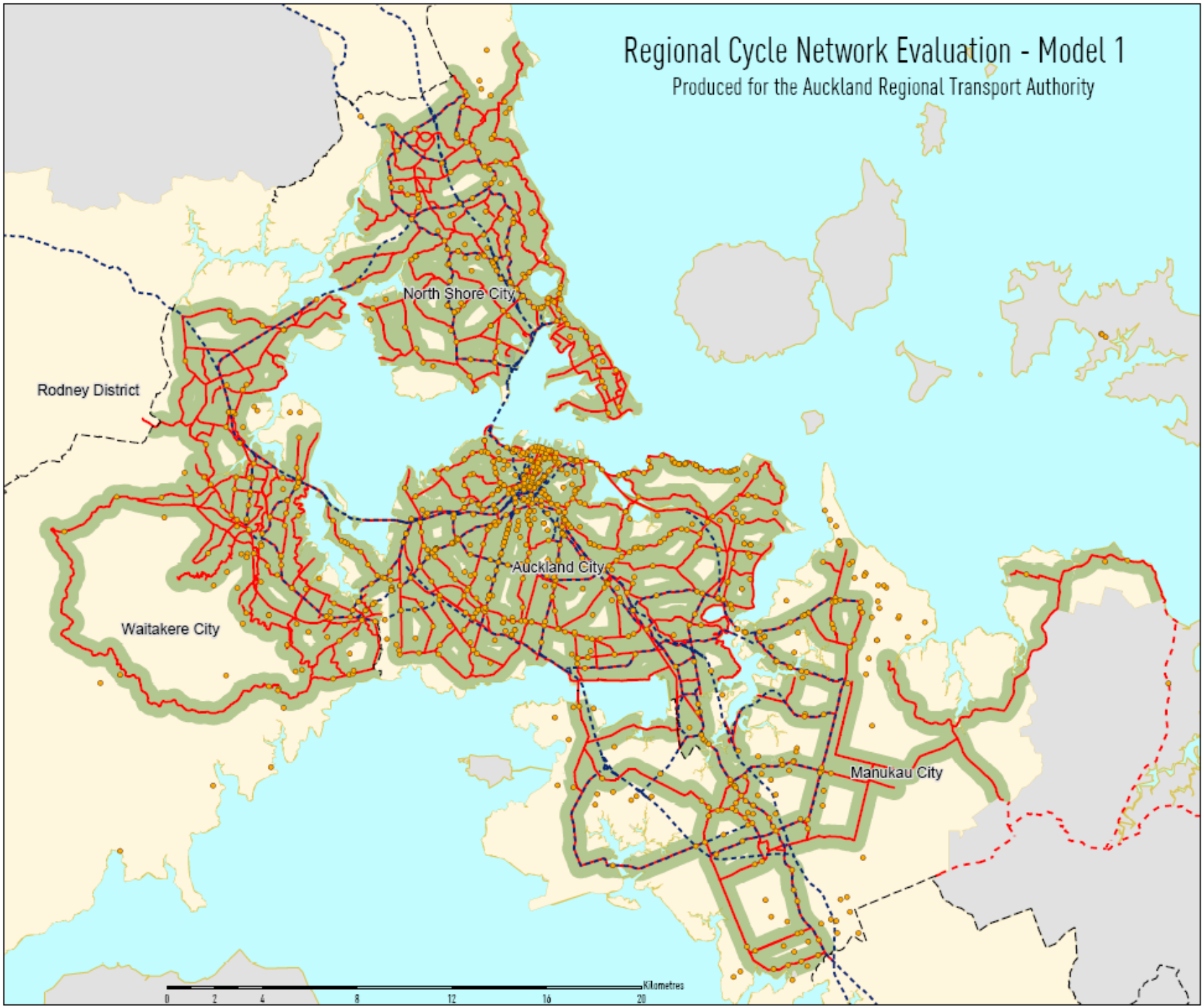
- Crash data and cycle network can be mapped
- Often cycle crash data align with proposed cycle routes
- Intention is to render cycle routes safe so that crashes diminish

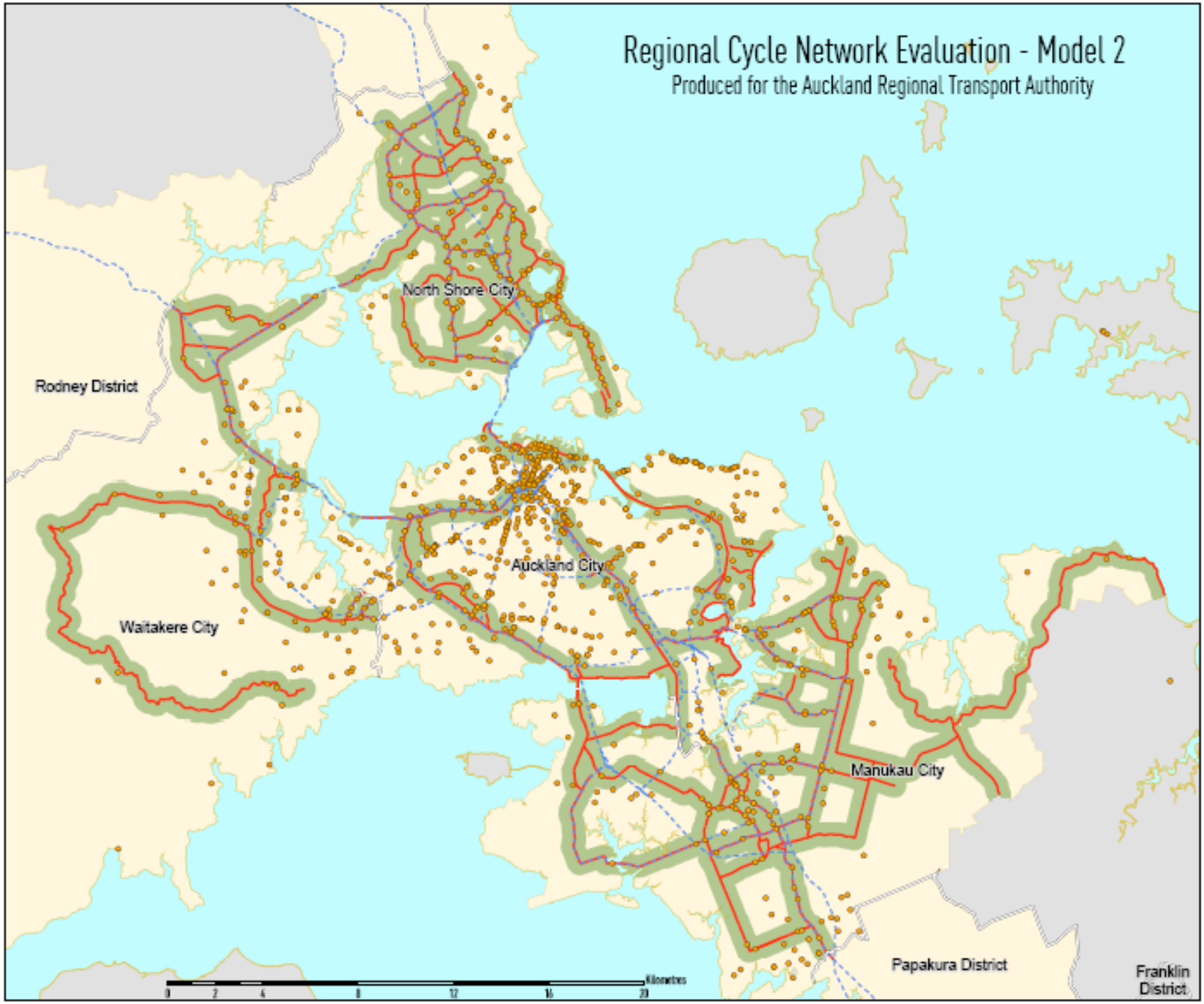
VIASTRADA

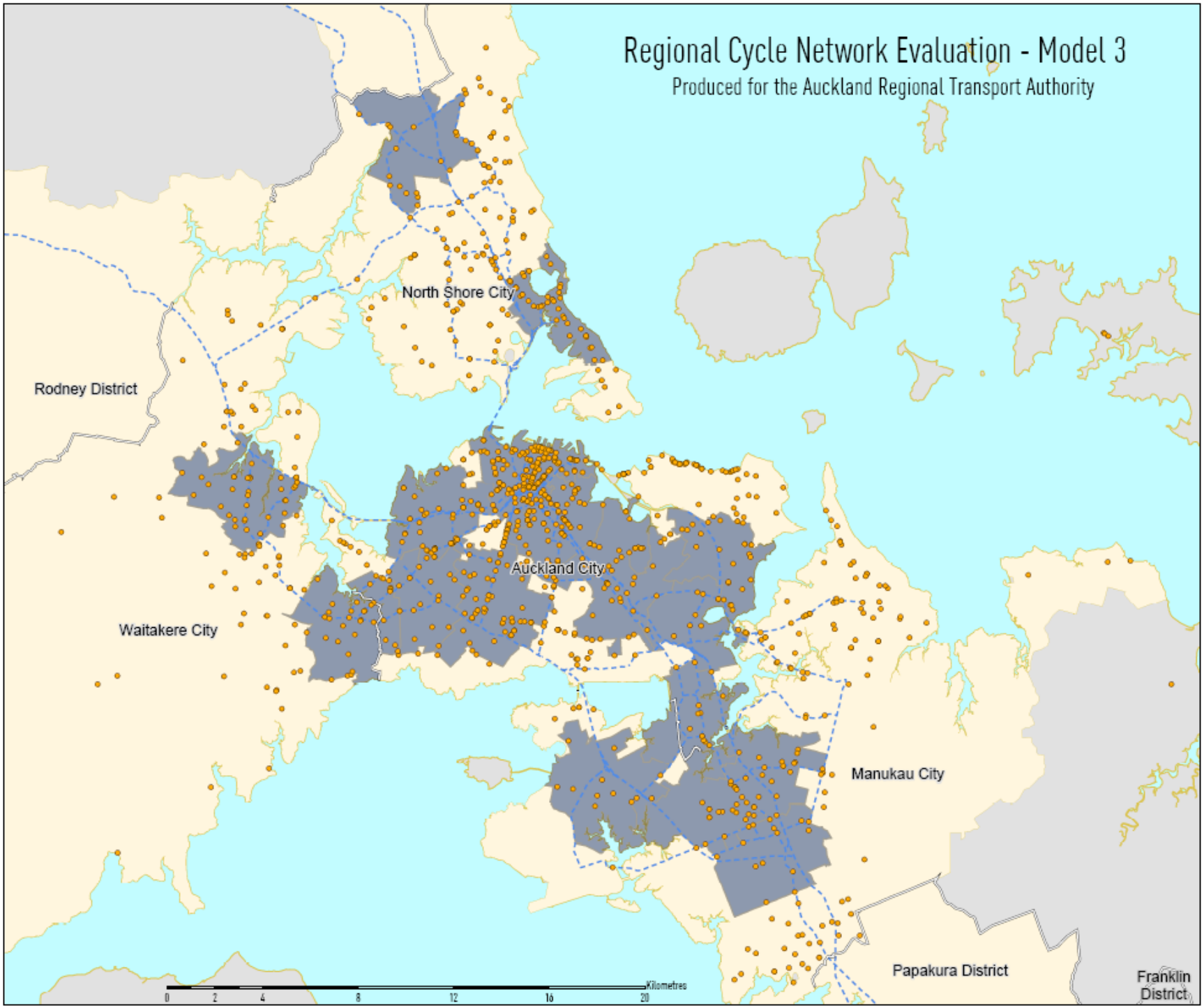
Auckland cycle network and crash data

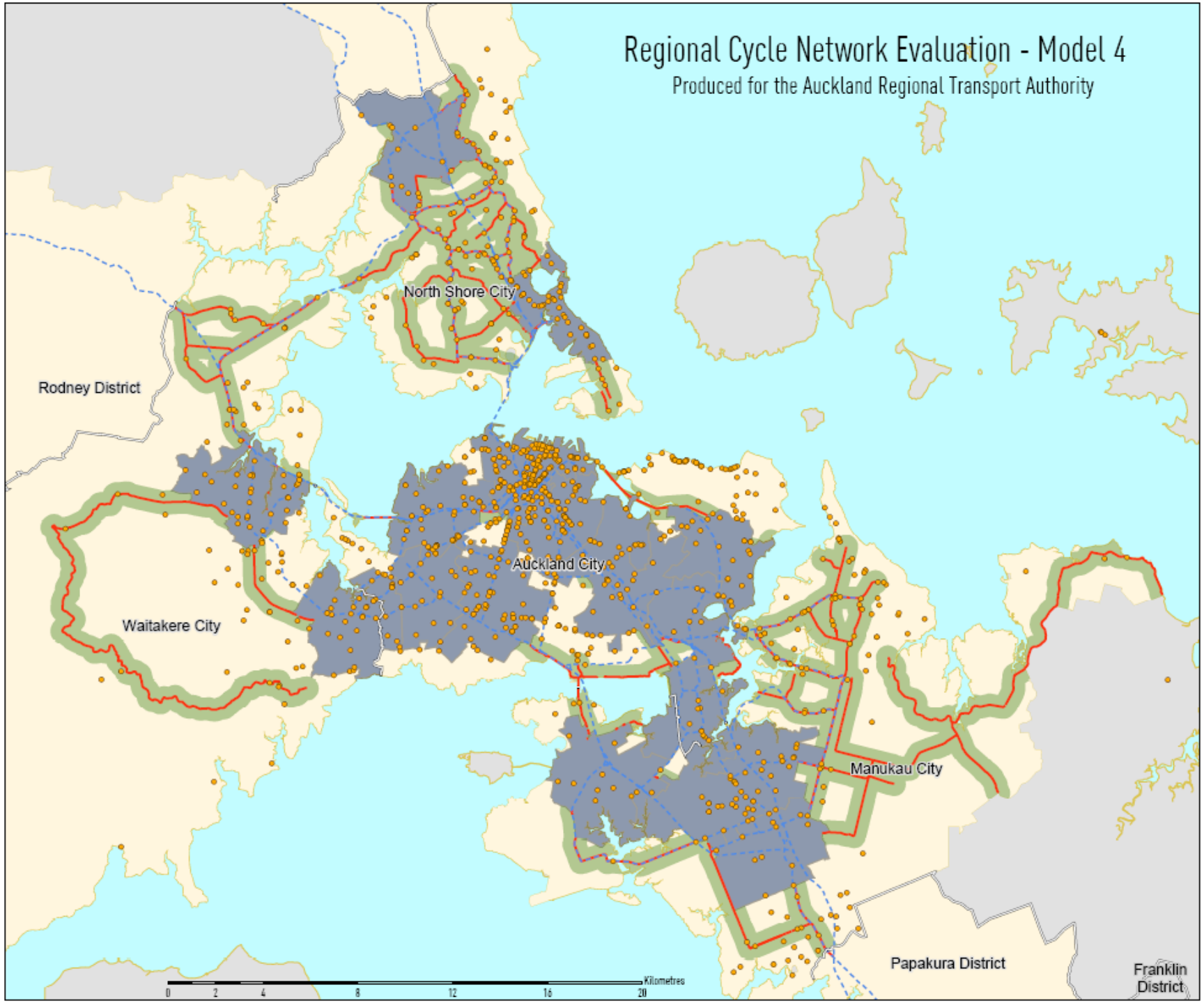
Auckland network models

- Model 1: The sum of the parts
- Model 2: Regionally strategic parts of Model 1
- Model 3: Town centres
- Model 4: Town centres with regional links


Regional Cycle Network Evaluation - Model 1
Produced for the Auckland Regional Transport Authority
North Shore City
Rodney District
Auckland City
Waitakere City
Manukau City
0
2
4
8
12
16
20
Kilometres


Regional Cycle Network Evaluation - Model 2
Produced for the Auckland Regional Transport Authority
North Shore City
Rodney District
Auckland City
Waitakere City
Manukau City
Papakura District
Franklin District
Kilometres
0
2
4
8
12
16
20


Regional Cycle Network Evaluation - Model 3
Produced for the Auckland Regional Transport Authority
North Shore City
Rodney District
Auckland City
Waitakere City
Manukau City
Papakura District
Franklin District
Kilometres
0
2
4
8
12
16
20


Regional Cycle Network Evaluation - Model 4
Produced for the Auckland Regional Transport Authority
North Shore City
Rodney District
Auckland City
Waitakere City
Manukau City
Papakura District
Franklin District
Kilometres
0
2
4
8
12
16
20

Network comparisons

	Model 1	Model 2	Model 3	Model 4
Demographic Coverage	82%	**47%**	55%	74%
Safety (crash coverage)	74%	**24%**	60%	80%
Raw Score (out of 200)	155	**71**	115	154
Cycle Network Length (km)	854	**375**	1,192	1,420
Final Score (normal-ised by length)	**0.18**	**0.19**	**0.10**	**0.11**

VIASTRADA

Model 2 network length, crashes

	Total Road Length	Model 2 Cycle Network Length		Total Cycle Crashes	Model 2 Cycle Crashes	
	km	km	% of road length	2001-05	No.	% of cycle crashes
Auckland City	1,354	75	**6%**	642	51	**8%**
Manukau City	1,300	143	**11%**	188	83	**44%**
North Shore City	804	91	**11%**	173	112	**65%**
Waitakere City	937	66	**7%**	135	26	**19%**
Total	**4,395**	**375**	**9%**	**1138**	**272**	**24%**

VIASTRADA

Model 2 (old & new) network length

	Total Road Length	Original Model 2		New Model 2	
	km	km	% of road length	km	% of road length
Auckland City	1,354	75	6%	247	18%
Manukau City	1,300	143	11%	169	13%
North Shore City	804	91	11%	119	15%
Waitakere City	937	66	7%	131	14%
Total	**4,395**	**375**	**9%**	**666**	**15%**

VIASTRADA

Network comparisons

	Model 1	Model 2	Model 3	Model 4	New Model 2
Demographic Coverage	82%	47%	55%	74%	82%
Safety (crash coverage)	74%	24%	60%	80%	92%
Raw Score (out of 200)	155	71	115	154	173
Cycle Network Length (km)	854	375	1,192	1,420	666
Final Score (normal-ised by length)	**0.18**	**0.19**	**0.10**	**0.11**	**0.26**

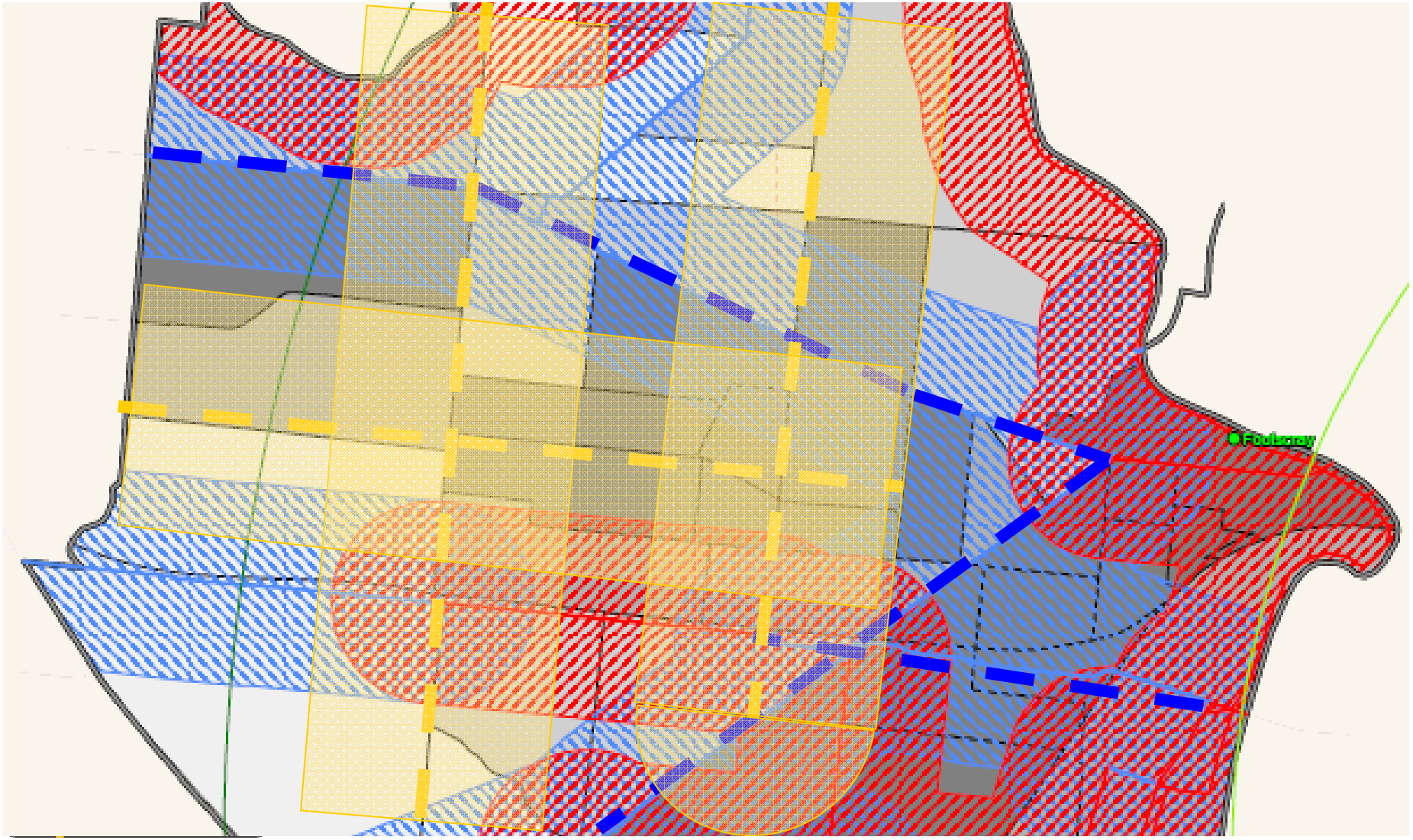
VIASTRADA

Existing and proposed routes

- Buffers around cycle network show demographic coverage
- Can be superimposed on demographic densities to identify missing key links
- Visual inspection provides useful clues
- Has been trialled in Melbourne
- Further work needed to develop a tool to optimise the technique

VIASTRADA

Existing and proposed routes, buffers

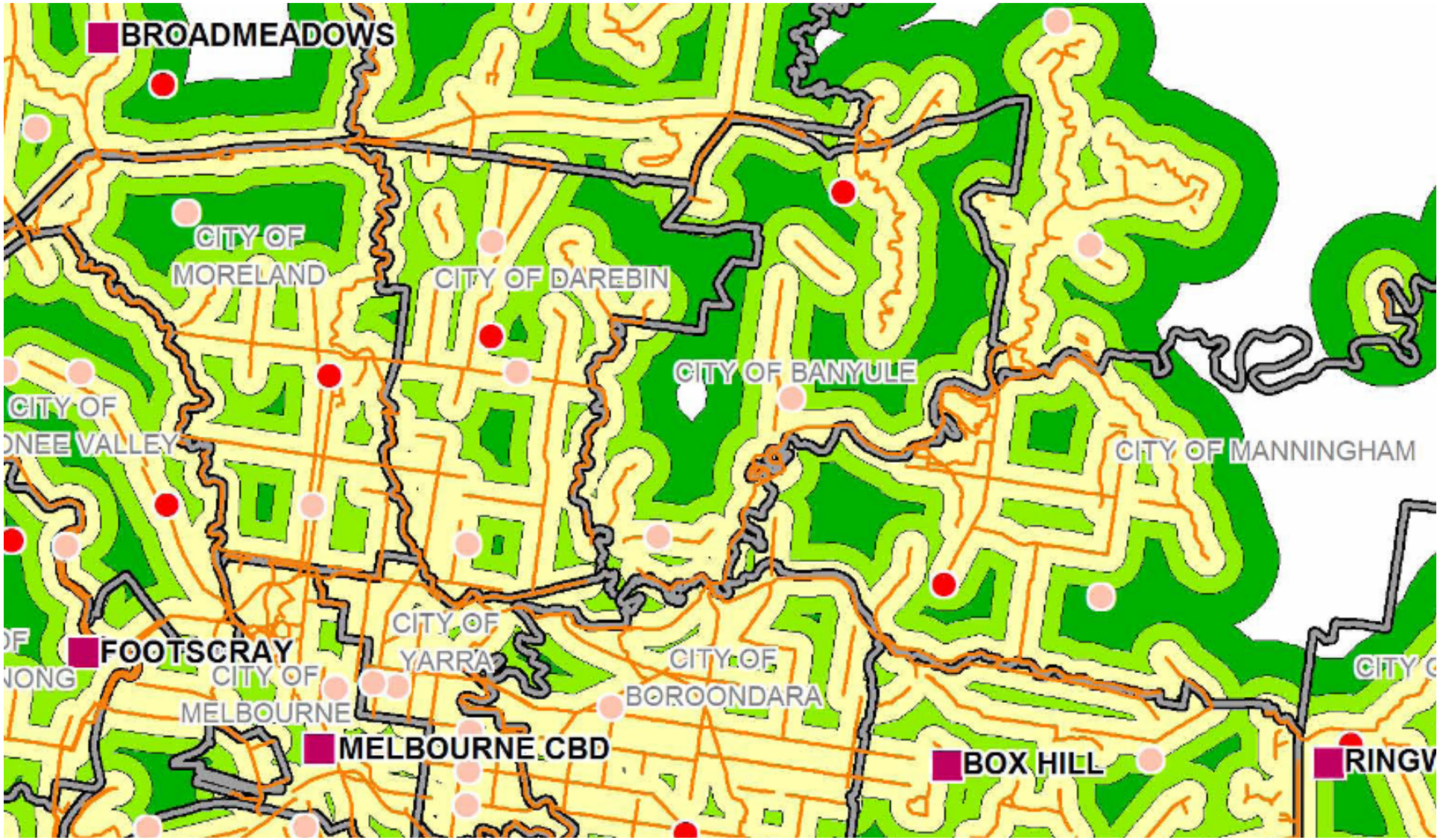


Coverage of different buffers

- Assume people living within 500 m of cycle network have access to it
- 500 m = 2 minutes at 15 km/h
- Average time to access network = 1 min.
- Can calculate demographic coverage for a network for any given buffer
- Can compare coverage of different networks or existing and proposed networks

VIASTRADA

Coverage of 400 m, 800 m & 1.6 km buffers



Conclusions

- GIS helps analyse and visualise complex spatial data
- Improves objectivity of cycle route network planning
- Helps rationalise spending for most effective cycle network projects

VIASTRADA