Monitoring cycling:
you can't manage what you don't measure

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TRANSPORT PLANNING AND DESIGN

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2 WALK and CYCLE
moving toward healthy communities

Palmerston North 30 July – 1 August 2018

Presentation overview

1. Why monitor
2. Crash data, apps & manual counts
3. Automatic counts
4. Data analysis
5. Reporting and next steps

If we don’t count it, it doesn’t count

- Many variations on this theme…

  …what gets measured, gets managed
- Many uses for the data

www.bikede.org

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Why monitor?

Data uses
Funding
Facility design
Network planning
Health impact assessments
Safety analysis
Travel demand models

Social license to operate	The case for investment and helps address the common misperception that there are no cyclists out there

Do many people actually ride here?

Yes!

About 410 on a typical fine day

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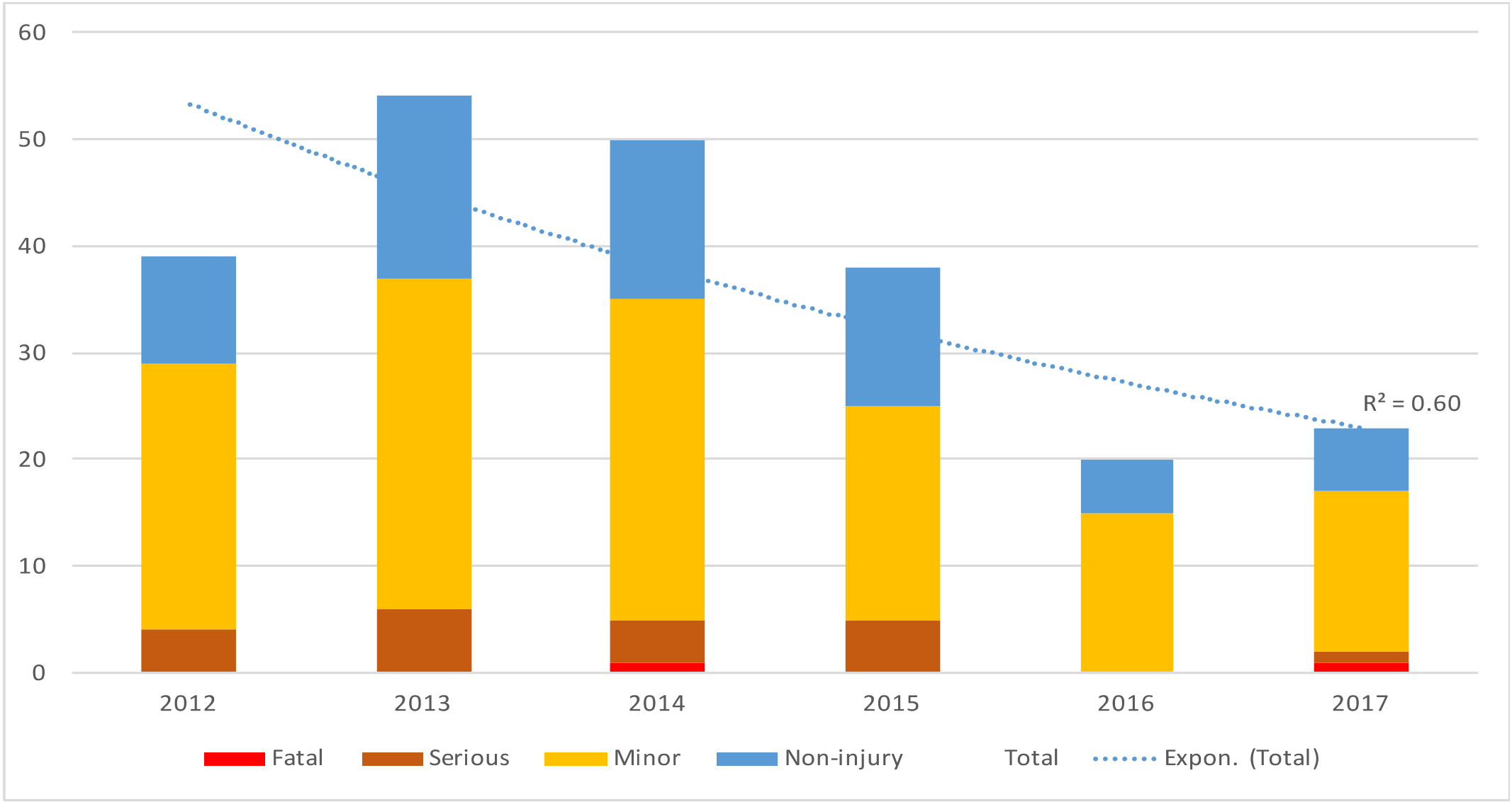
Safety analysis

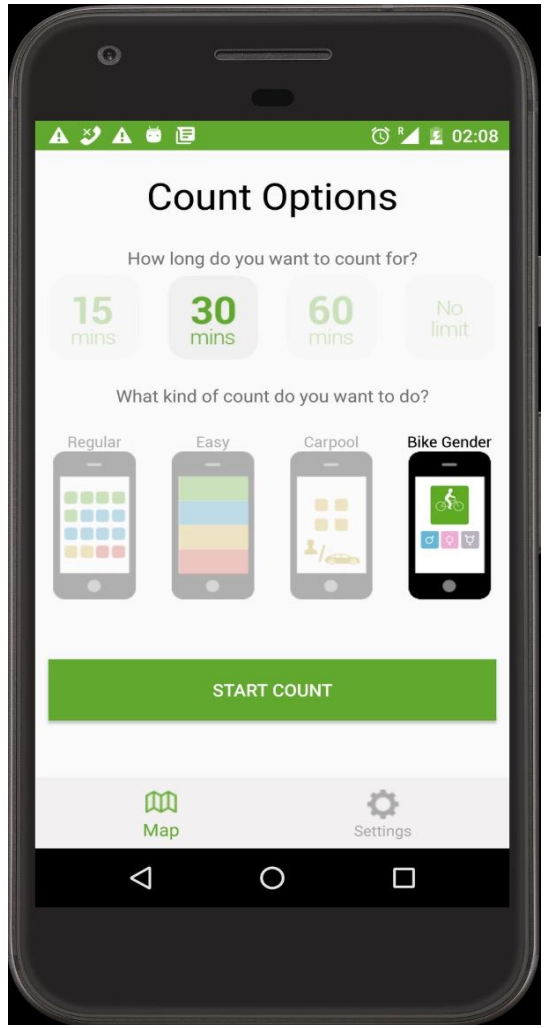


Crowdsourcing methods…

fitness apps

bikesharing data

counting apps



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Manual counts

Female	Adults	Footpath riding
17%	59%	8%

Urban Cycle Network Monitoring

*Town/City name	Palmerston North		
*Weather	Fine/Overcast	*Count date	21/03/2017

Cordon/screen line survey (7.00am - 9.00am)	
*Total Morning Peak Trips in to CBD	440
Total Morning Peak Trips out of CBD	85
Sub total	**525**
Additional count sites ?	
Morning peak count	
Morning peak count	
Morning peak count	
Total number of Morning Peak Trips recorded (raw data) (07:00-09:00)	**525**

Gender Split %	M 93.0	F 7.0
Comments		
Upload file		

1. Why monitor
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3. Automatic counts and data analysis
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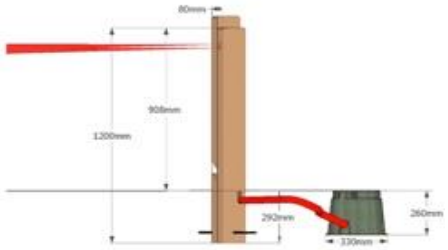
Inductive Loops	Active Infrared	Pneumatic Tubes
Shared-use path Cycle lanes Mixed traffic	Footpath Shared-use path	Shared-use path Cycle lanes Mixed traffic (EcoCounter)
Detects bikes through a break in magnetic field	*Detects people through a break in infrared beam*	*Detects bikes through a change in tube air pressure*
		
Short term ‘rotating’ (30 – 60 days) or permanent (365 days) 		
	Short term mobile (7 – 60 days) 	

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Siting is harder than it would seem

Optimising the programme

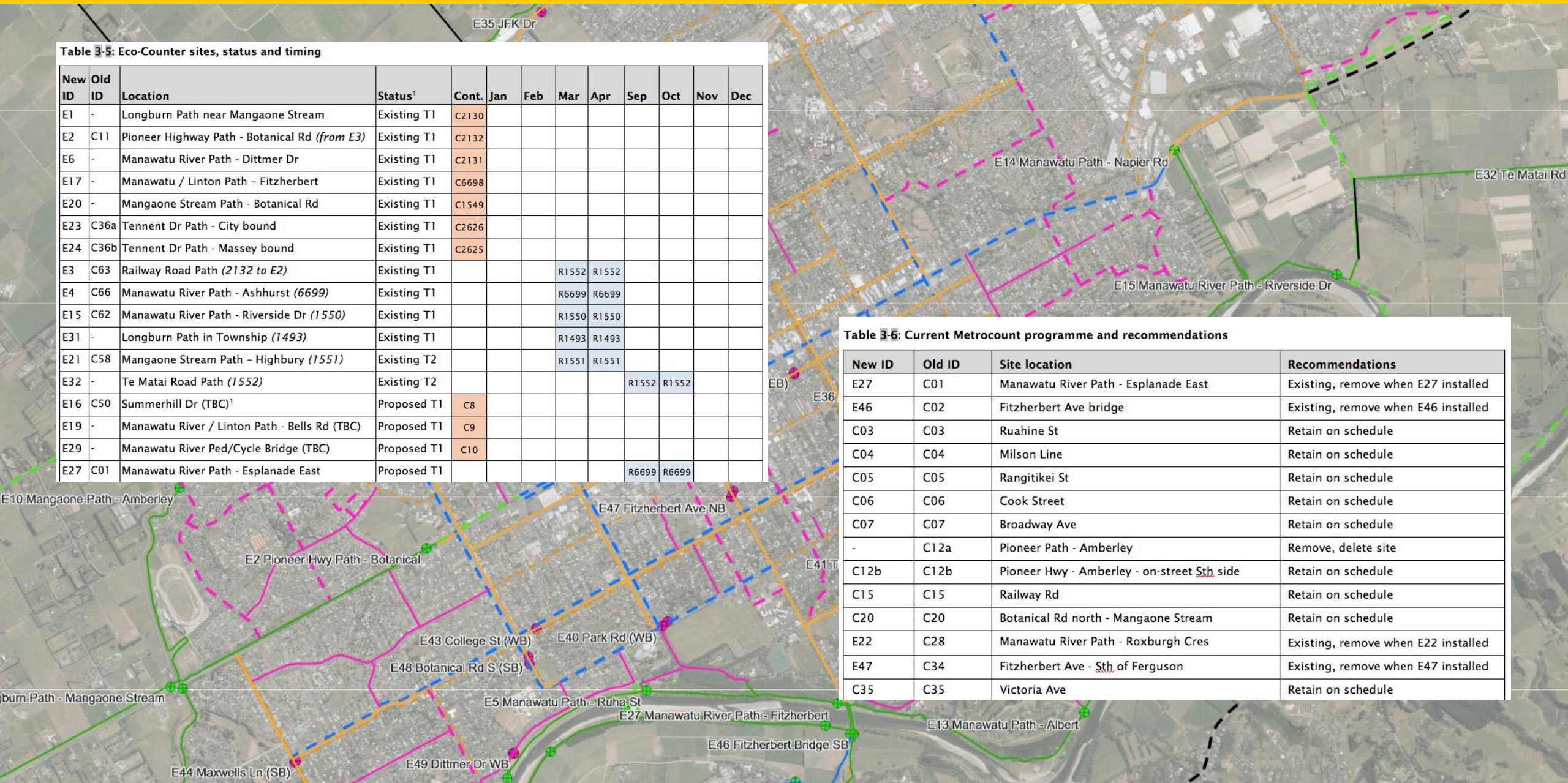

Table 3-5: Eco-Counter sites, status and timing

New ID	Old ID	Location	Status[1]	Cont.	Jan	Feb	Mar	Apr	Sep	Oct	Nov	Dec
E1	-	Longburn Path near Mangaone Stream	Existing T1	C2130								
E2	C11	Pioneer Highway Path - Botanical Rd *(from E3)*	Existing T1	C2132								
E6	-	Manawatu River Path - Dittmer Dr	Existing T1	C2131								
E17	-	Manawatu / Linton Path – Fitzherbert	Existing T1	C6698								
E20	-	Mangaone Stream Path - Botanical Rd	Existing T1	C1549								
E23	C36a	Tennent Dr Path - City bound	Existing T1	C2626								
E24	C36b	Tennent Dr Path - Massey bound	Existing T1	C2625								
E3	C63	Railway Road Path *(2132 to E2)*	Existing T1				R1552	R1552				
E4	C66	Manawatu River Path - Ashhurst *(6699)*	Existing T1				R6699	R6699				
E15	C62	Manawatu River Path - Riverside Dr *(1550)*	Existing T1				R1550	R1550				
E31	-	Longburn Path in Township *(1493)*	Existing T1				R1493	R1493				
E21	C58	Mangaone Stream Path – Highbury *(1551)*	Existing T2				R1551	R1551				
E32	-	Te Matai Road Path *(1552)*	Existing T2						R1552	R1552		
E16	C50	Summerhill Dr (TBC)[3]	Proposed T1	C8								
E19	-	Manawatu River / Linton Path - Bells Rd (TBC)	Proposed T1	C9								
E29	-	Manawatu River Ped/Cycle Bridge (TBC)	Proposed T1	C10								
E27	C01	Manawatu River Path - Esplanade East	Proposed T1						R6699	R6699		

Table 3-6: Current Metrocount programme and recommendations

New ID	Old ID	Site location	Recommendations
E27	C01	Manawatu River Path - Esplanade East	Existing, remove when E27 installed
E46	C02	Fitzherbert Ave bridge	Existing, remove when E46 installed
C03	C03	Ruahine St	Retain on schedule
C04	C04	Milson Line	Retain on schedule
C05	C05	Rangitikei St	Retain on schedule
C06	C06	Cook Street	Retain on schedule
C07	C07	Broadway Ave	Retain on schedule
-	C12a	Pioneer Path - Amberley	Remove, delete site
C12b	C12b	Pioneer Hwy - Amberley - on-street Sth side	Retain on schedule
C15	C15	Railway Rd	Retain on schedule
C20	C20	Botanical Rd north - Mangaone Stream	Retain on schedule
E22	C28	Manawatu River Path - Roxburgh Cres	Existing, remove when E22 installed
E47	C34	Fitzherbert Ave - Sth of Ferguson	Existing, remove when E47 installed
C35	C35	Victoria Ave	Retain on schedule

Document everything…

Photos & locations (EcoVisio)

Photos & locations (everything else)

Dublin Rd shared-use path near Twin Rivers Dr		
Broad St & Warren Ave		

Rotating programme info

	Rotation 1 - Installed by: Jane Doe						
Serial	Location	Install Date	Install Notes	Install Time	Removal Date	Removal Time	Removal Notes
TUBE 5969							
TUBE 5970							
TUBE 5971							
TUBE 5972							

This format repeats for subsequent rotations

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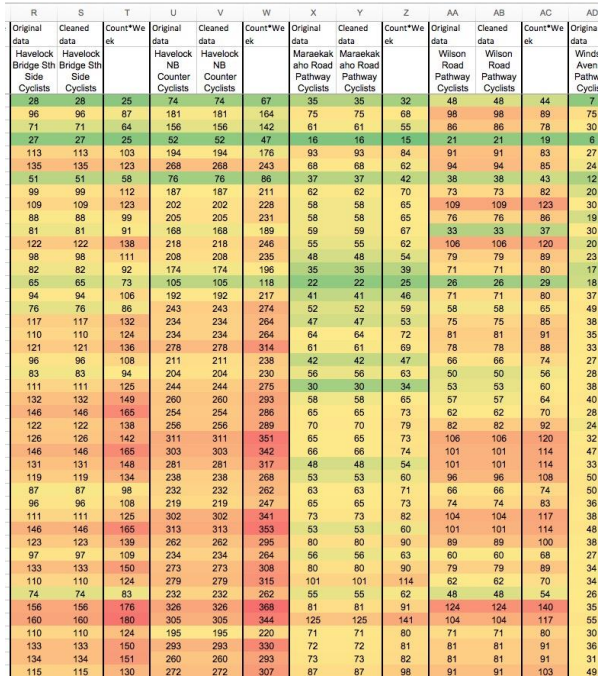
Data cleaning

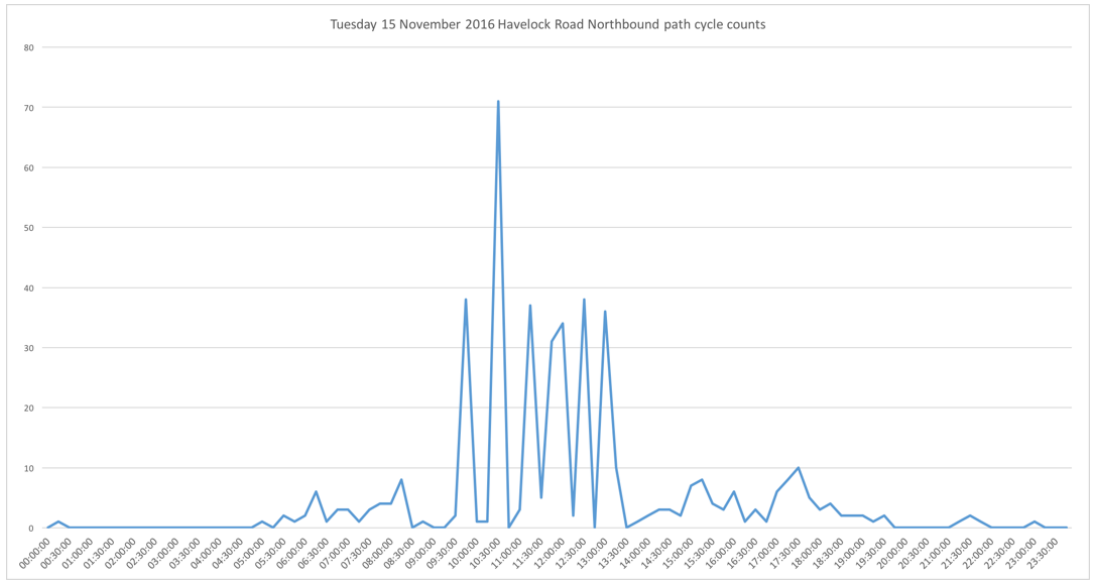
1. Conditional formatting of table or view graphs to identify anomalies
2. Determine if outlier is a machine error
3. Impute from surrounding data

– *See NCHRP Guidebook.*

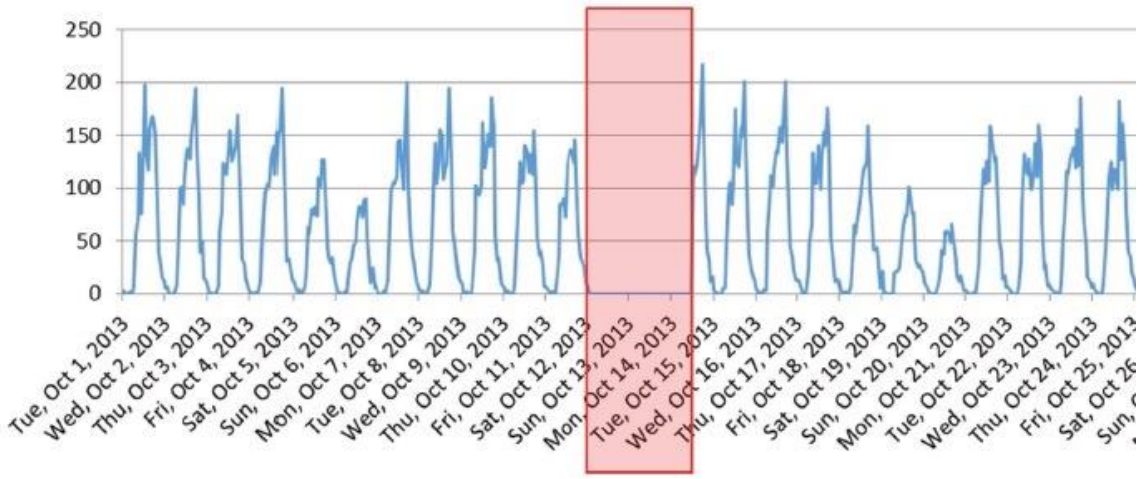


R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD
Original data	Cleaned data	Count*Week	Original data	Cleaned data	Count*Week	Original data	Cleaned data	Count*Week	Original data	Cleaned data	Count*Week	Original data
Havelock Bridge Sth Side Cyclists	Havelock Bridge Sth Side Cyclists		Havelock NB Counter Cyclists	Havelock NB Counter Cyclists		Maraekakaho Road Pathway Cyclists	Maraekakaho Road Pathway Cyclists		Wilson Road Pathway Cyclists	Wilson Road Pathway Cyclists		Windsor Avenue Pathway Cyclists
28	28	25	74	74	67	35	35	32	48	48	44	7
96	96	87	181	181	164	75	75	68	98	98	89	75
71	71	64	156	156	142	61	61	55	86	86	78	30
27	27	25	52	52	47	16	16	15	21	21	19	6
113	113	103	194	194	176	93	93	84	91	91	83	27
135	135	123	268	268	243	68	68	62	94	94	85	24
51	51	58	76	76	86	37	37	42	38	38	43	12
99	99	112	187	187	211	62	62	70	73	73	82	20
109	109	123	202	202	228	58	58	65	109	109	123	30
88	88	99	205	205	231	58	58	65	76	76	86	19
81	81	91	168	168	189	59	59	67	33	33	37	30
122	122	138	218	218	246	55	55	62	106	106	120	20
98	98	111	208	208	235	48	48	54	79	79	89	23
82	82	92	174	174	196	35	35	39	71	71	80	17
65	65	73	105	105	118	22	22	25	26	26	29	18
94	94	106	192	192	217	41	41	46	71	71	80	37
76	76	86	243	243	274	52	52	59	58	58	65	49
117	117	132	234	234	264	47	47	53	75	75	85	38
110	110	124	234	234	264	64	64	72	81	81	91	35
121	121	136	278	278	314	61	61	69	78	78	88	33
96	96	108	211	211	238	42	42	47	66	66	74	27
83	83	94	204	204	230	56	56	63	50	50	56	28
111	111	125	244	244	275	30	30	34	53	53	60	38
132	132	149	260	260	293	58	58	65	57	57	64	40
146	146	165	254	254	286	65	65	73	62	62	70	28
122	122	138	256	256	289	70	70	79	82	82	92	24
126	126	142	311	311	351	65	65	73	106	106	120	32
146	146	165	303	303	342	66	66	74	101	101	114	47
131	131	148	281	281	317	48	48	54	101	101	114	33
119	119	134	238	238	268	53	53	60	96	96	108	50
87	87	98	232	232	262	63	63	71	66	66	74	50
96	96	108	219	219	247	65	65	73	74	74	83	36
111	111	125	302	302	341	73	73	82	104	104	117	38
146	146	165	313	313	353	53	53	60	101	101	114	48
123	123	139	262	262	295	80	80	90	89	89	100	38
97	97	109	234	234	264	56	56	63	60	60	68	27
133	133	150	273	273	308	80	80	90	79	79	89	34
110	110	124	279	279	315	101	101	114	62	62	70	34
74	74	83	232	232	262	55	55	62	48	48	54	26
156	156	176	326	326	368	81	81	91	124	124	140	35
160	160	180	305	305	344	125	125	141	104	104	117	55
110	110	124	195	195	220	71	71	80	71	71	80	30
133	133	150	293	293	330	72	72	81	81	81	91	36
134	134	151	260	260	293	73	73	82	81	81	91	31
115	115	130	272	272	307	87	87	98	91	91	103	49

Excessive values



Zero values



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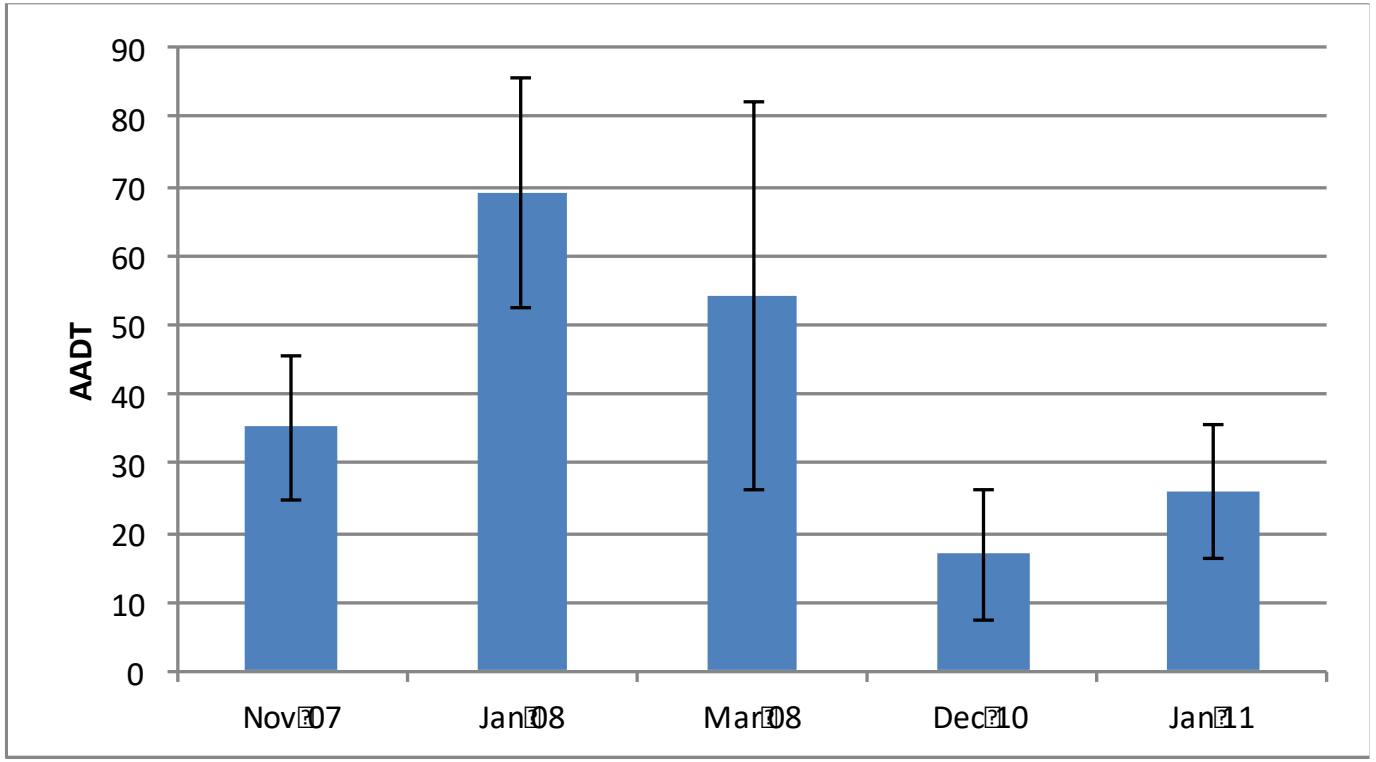
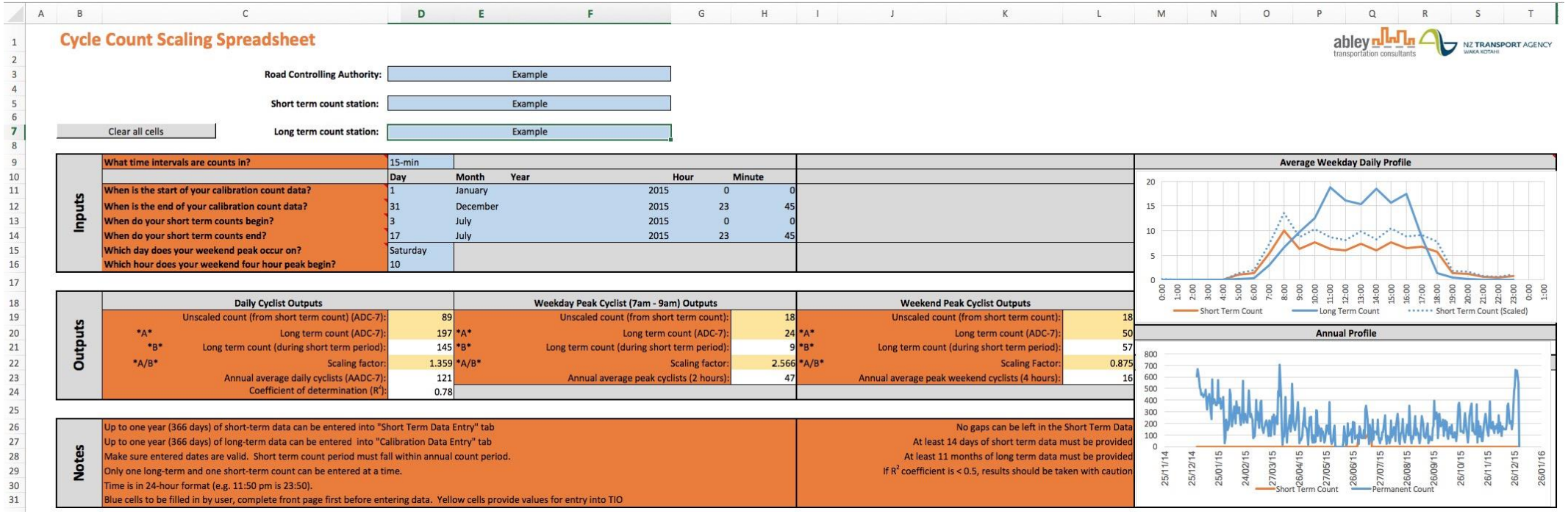
Statistics

- Calculate standard deviation, CoV, p-value
- Present confidence interval
- Round when reporting



Scaling

- Manual count scaling
  - Aggregate counts and scale together. Doesn't work if you need to apply different scaling factors
  - Don't try to compare values from a specific site year-on-year
- Automatic short term counts
  - The CNG has a scaling workbook for >14 day counts only



Cycle Count Scaling Spreadsheet

ableytransportation consultants · NZ TRANSPORT AGENCY WAKA KOTAHI

Road Controlling Authority: Example

Short term count station: Example

Clear all cells

Long term count station: Example

Inputs

	Day	Month	Year	Hour	Minute
What time intervals are counts in?	15-min				
When is the start of your calibration count data?	1	January	2015	0	0
When is the end of your calibration count data?	31	December	2015	23	45
When do your short term counts begin?	3	July	2015	0	0
When do your short term counts end?	17	July	2015	23	45
Which day does your weekend peak occur on?	Saturday				
Which hour does your weekend four hour peak begin?	10				

Outputs

Daily Cyclist Outputs			Weekday Peak Cyclist (7am - 9am) Outputs			Weekend Peak Cyclist Outputs		
	Unscaled count (from short term count) (ADC-7):	89		Unscaled count (from short term count):	18		Unscaled count (from short term count):	18
A	Long term count (ADC-7):	197	*A*	Long term count (ADC-7):	24	*A*	Long term count (ADC-7):	50
B	Long term count (during short term period):	145	*B*	Long term count (during short term period):	9	*B*	Long term count (during short term period):	57
A/B	Scaling factor:	1.359	*A/B*	Scaling factor:	2.566	*A/B*	Scaling Factor:	0.875
	Annual average daily cyclists (AADC-7):	121		Annual average peak cyclists (2 hours):	47		Annual average peak weekend cyclists (4 hours):	16
	Coefficient of determination (R^2):	0.78						

Notes

Up to one year (366 days) of short-term data can be entered into "Short Term Data Entry" tab
Up to one year (366 days) of long-term data can be entered into "Calibration Data Entry" tab
Make sure entered dates are valid. Short term count period must fall within annual count period.
Only one long-term and one short-term count can be entered at a time.
Time is in 24-hour format (e.g. 11:50 pm is 23:50).
Blue cells to be filled in by user, complete front page first before entering data. Yellow cells provide values for entry into TIO

No gaps can be left in the Short Term Data
At least 14 days of short term data must be provided
At least 11 months of long term data must be provided
If R^2 coefficient is < 0.5, results should be taken with caution

Average Weekday Daily Profile

Annual Profile

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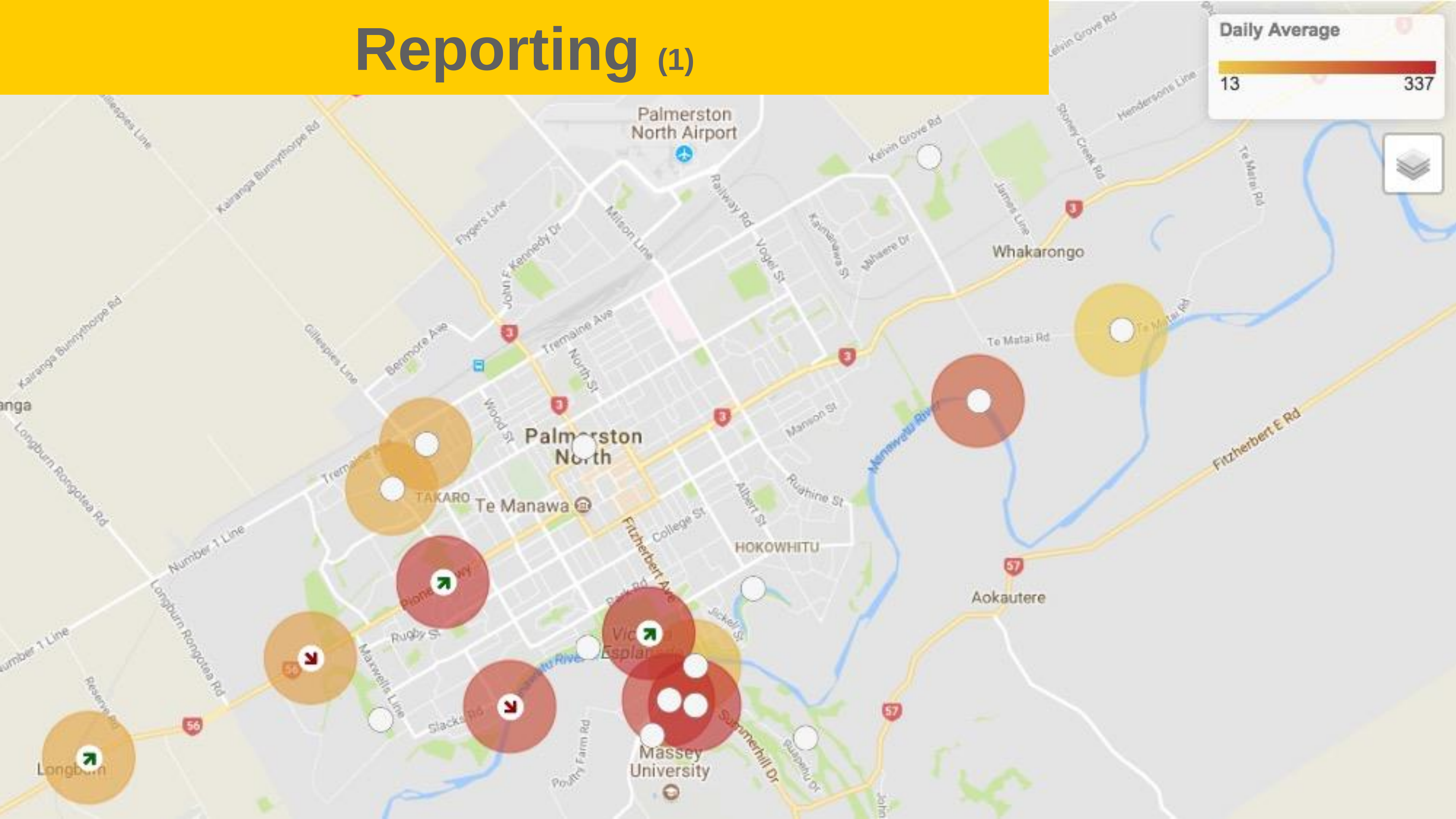
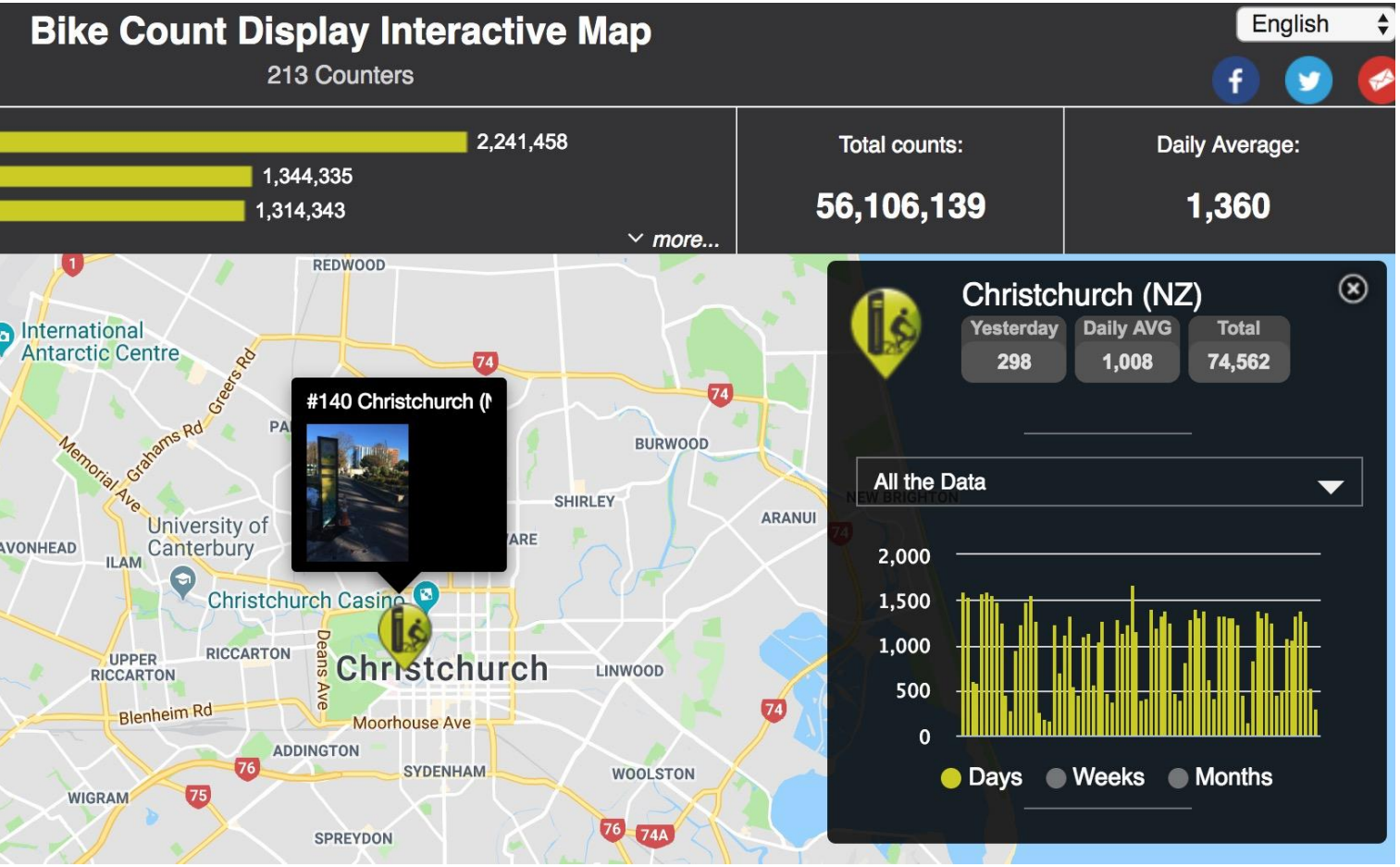
Reporting (1)


Daily Average
13
337
Palmerston North Airport
Whakarongo
Palmerston North
Te Manawa
TAKARO
HOKOWHITU
Aokautere
Massey University
Kelvin Grove Rd
Te Matai Rd
Fitzherbert E Rd
Tremaine Ave
Benmore Ave
Kairanga Bunnythorpe Rd
Gillespies Line
Number 1 Line
Longburn Rongotea Rd
Maxwells Line
Rugby St
College St
Albert St
Ruahine St
Railway Rd
Vogel St
Milson Line
John F Kennedy Dr
Flygers Line
Wood St
North St
Manson St
Stoney Creek Rd
James Line
Hendersons Line
Te Matai Rd
Fitzherbert Ave
Summerhill Dr
Ruapehu Dr
Poultry Farm Rd
Manawatu River
Kaimanawa St
Mihaere Dr

Reporting – real time displays



http://data.eco-counter.com/ParcPublic/?id=4586

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Report cards

Palmerston North City – Annual Cycle Report Card – 2017/18[1]

561	People cycling in the *central city* on an average *morning* (2h)[2]
667	People cycling along *Tennent Drive* on average *weekday*[3]
540 (-21%)	People cycling at nine *on-street* count stations *daily*[4]
129,480 (+3.1%)	People cycling at four *path* count stations *yearly*[5]
1.7 million	Estimated cycling *trips* per *year* in Palmerston North[6]
5%	Decline in reported cycle crashes from 2012 to 2017
Future metric	Palmerston North residents interested but concerned about riding to work or school
To be reported in 2018/19	Walk and cycle mode share at participating schools
70 km	Length of cycle lanes and shared paths in Palmerston North[7]

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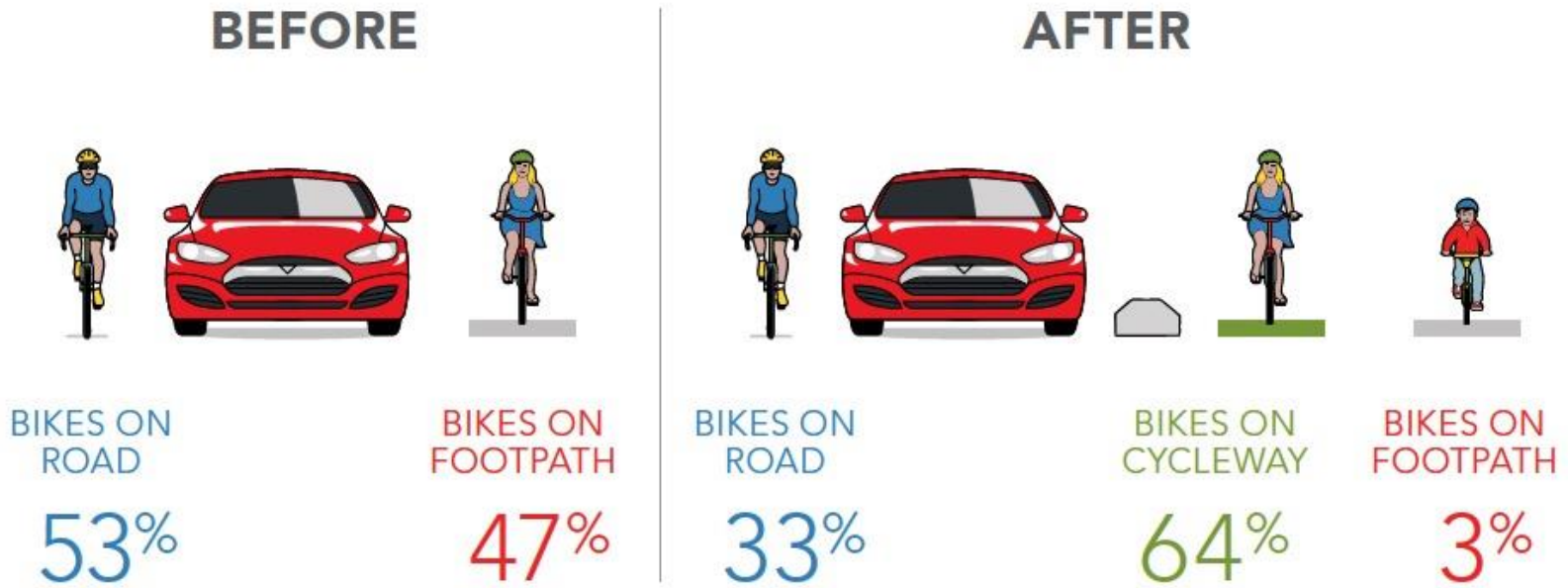
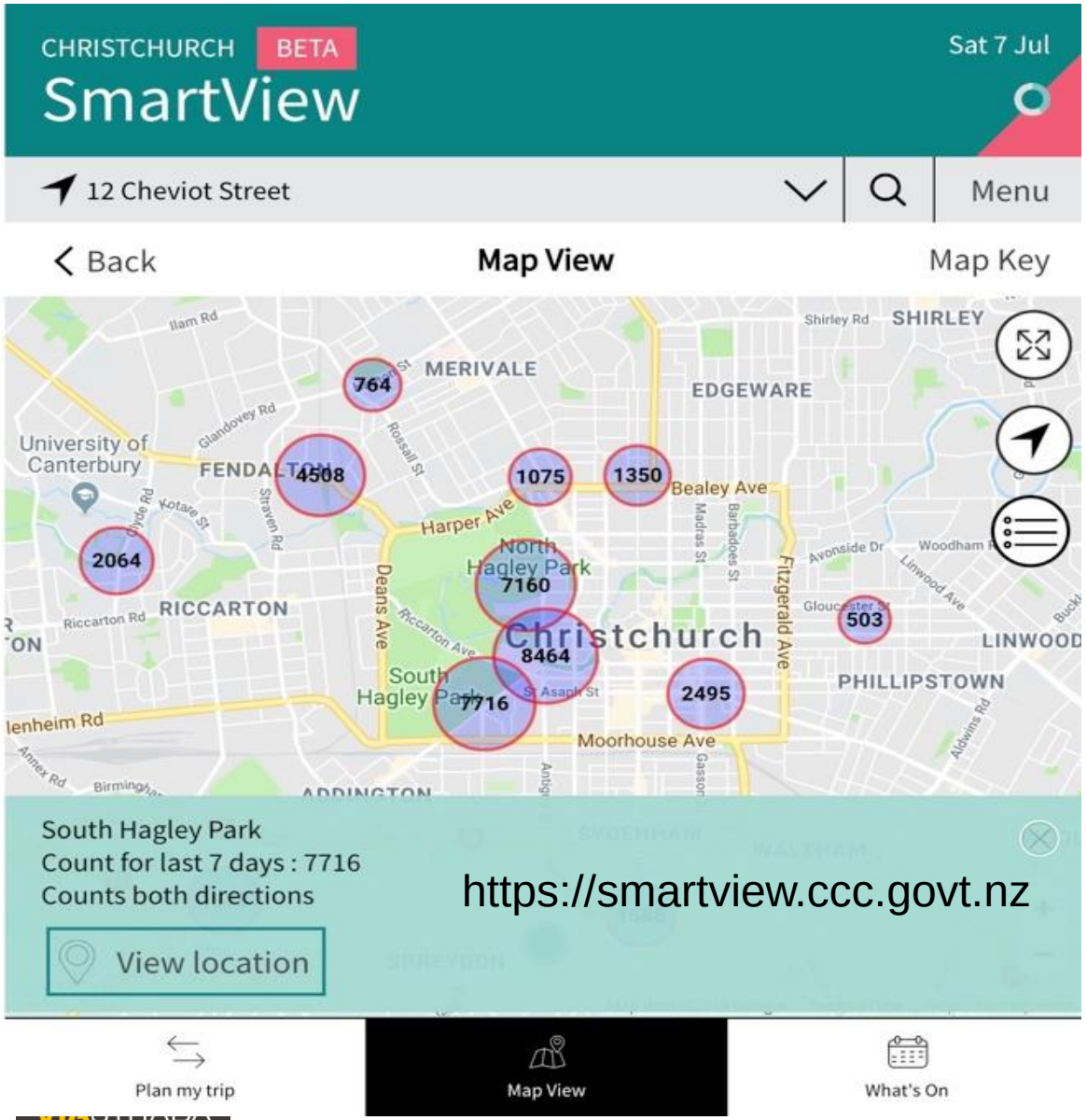
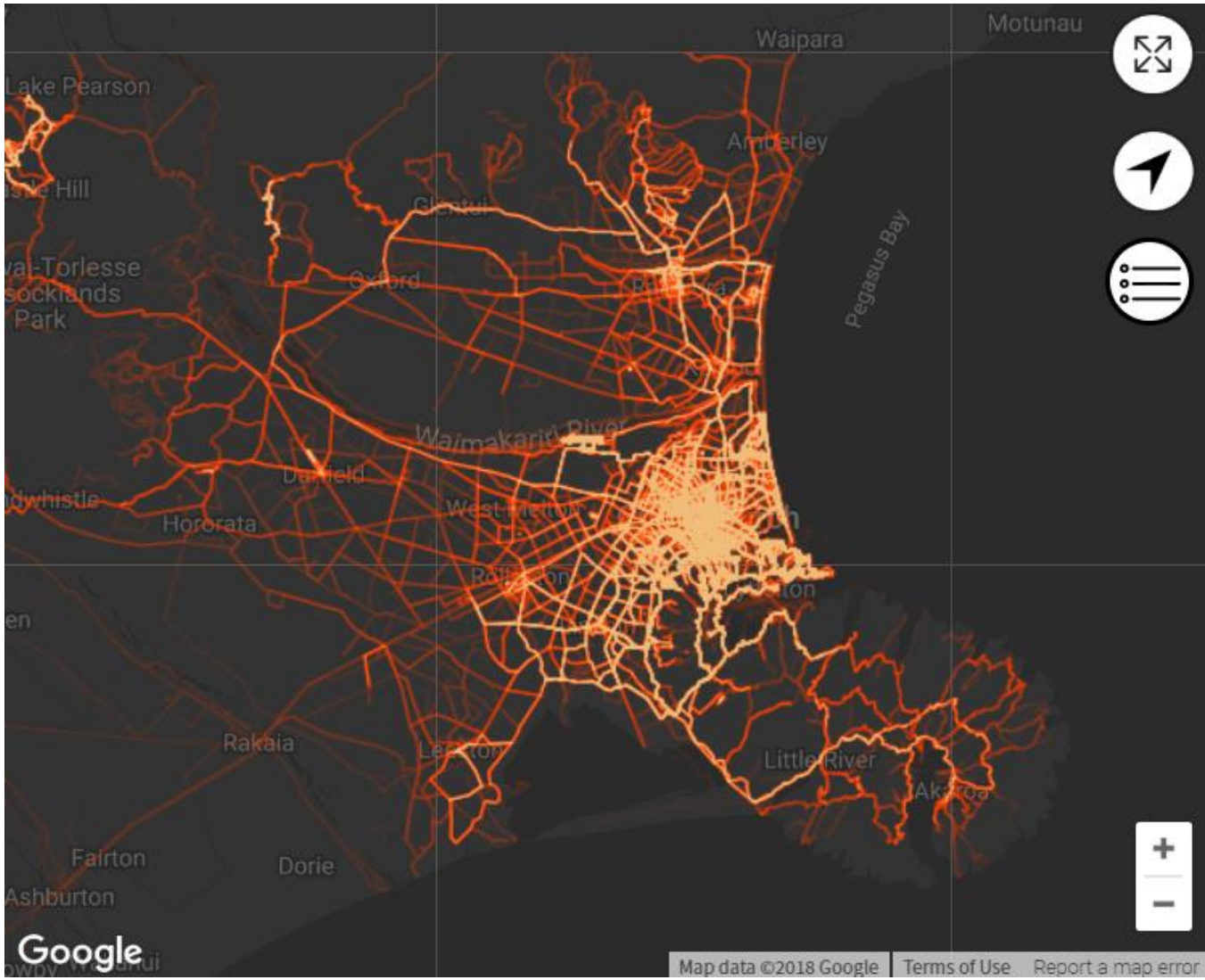
Reporting – report cards / accounts

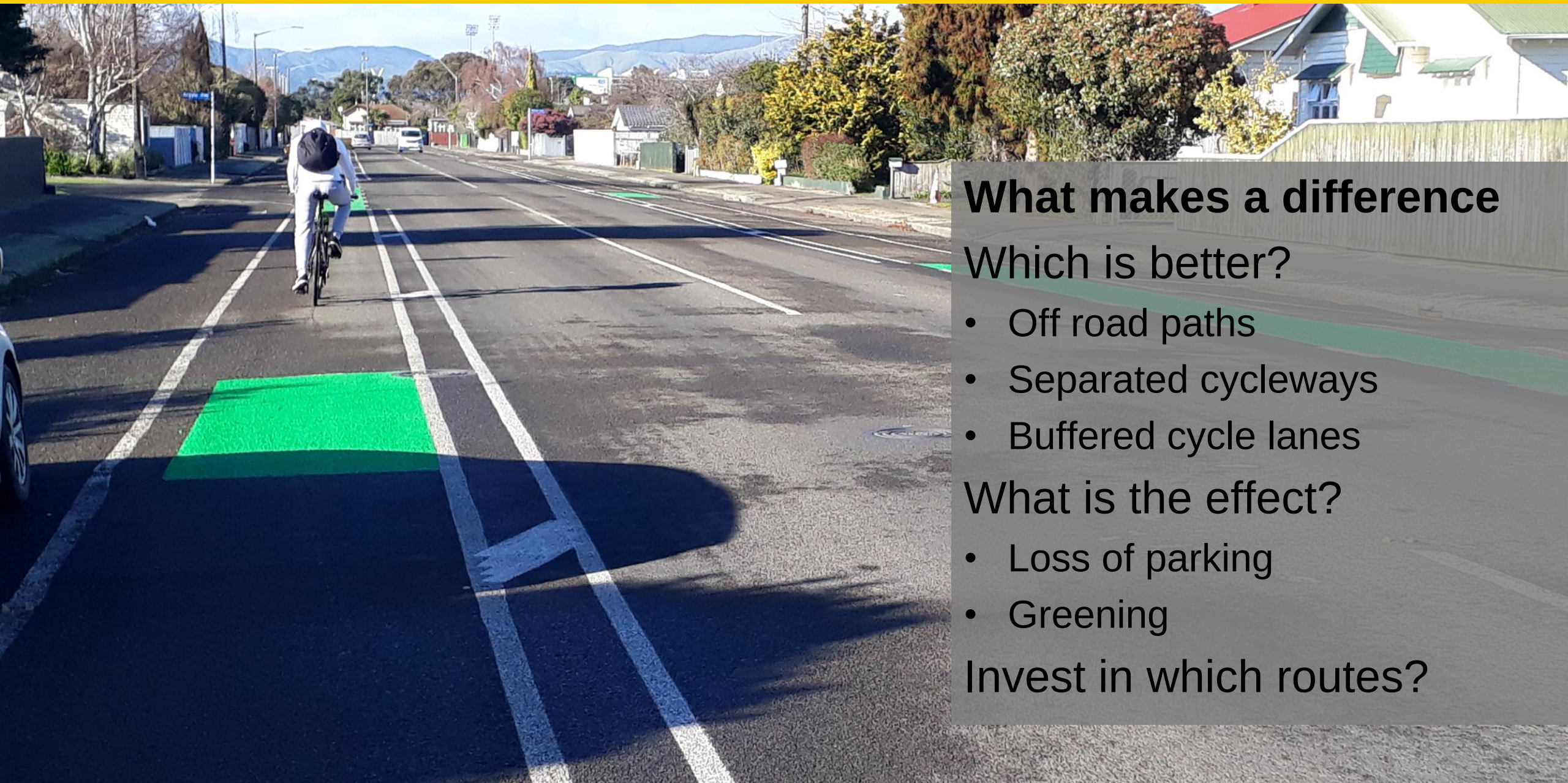


Reporting – web apps





Using the data



What makes a difference

Which is better?

- Off road paths
- Separated cycleways
- Buffered cycle lanes

What is the effect?

- Loss of parking
- Greening

Invest in which routes?

Budgeting

- Invested >$100K capital in permanent path counters
- Now budgeting $40K p.a.
  - Maintenance
  - Rotating on-street counters
  - Analysis & reporting
  - Real-time display

Description	Equip.	Install.	Existing	Tier 1	Tier 2	Exist + T1	T2
CAPEX							
Mobile multi with tubes and pyro	$ 7,350			1	1	$ 7,350	$ 14,700
Urban Zelt on-road 2 loops	$ 5,027	$ 3,500				$ -	$ -
Urban Zelt on-road 4 loops	$ 5,800	$ 3,800				$ -	$ -
Urban Zelt off-road 1 loop	$ 4,290	$ 2,300				$ -	$ -
Urban Zelt off-road 2 loop	$ 4,572	$ 2,600				$ -	$ -
Urban Zelt off-road 2 loops	$ 5,027	$ 2,650				$ -	$ -
Urban Zelt off-road 4 loops	$ 5,800	$ 3,000				$ -	$ -
Multi for path with loops & pyro (continuous sites)	$ 7,650	$ 3,000		3		$ 31,950	$ 31,950
Short term loggers (all five already owned)	$ 5,000					$ -	$ -
Short term sites - install loops & bollard	$ 1,337	$ 1,175		3	13	$ 7,536	$ 40,193
Bike count display only		$ 20,000				$ -	$ -
Bike count display with counter		$ 35,000			1	$ -	$ 35,000
					CAPEX TOTAL (rounded)	$ 46,900	$ 121,900
OPEX							
Eco-Count							
Eco-Visio license per counter per year		$ 510	12	4	2	$ 8,160	$ 9,180
Sensor battery (2 loop counter)		$ 90	4	1	1	$ 450	$ 540
Sensor battery (4 loop counter)		$ 180	8	3	1	$ 1,980	$ 2,160
Continous sites - bi-annual maintenance check		$ 180	7	3		$ 1,800	$ 1,800
Rotating 2mo loop sites - cycle count labour		$ 260		9	13	$ 2,340	$ 5,720
Rotating 14 day tube sites - cycle count labour		$ 260		10	5	$ 2,600	$ 3,900
Metrocount						$ -	
Routine maintenance		$ 120				$ -	$ -
Traffic control and signage		$ 300				$ -	$ -
Hardware charge		$ 100				$ -	$ -
Cycle count - 1 cycle lane (one side of the road)		$ 130				$ -	$ -
Cycle count – pair (both sides of a road)		$ 160	13			$ 2,080	$ 2,080
Cycle count - shared path		$ 130	1			$ 130	$ 130
Extra checks (i.e. one more if duration 2 weeks)		$ 75	14			$ 1,050	$ 1,050
Metrocount data analysis & reporting						$ -	$ -
Other						$ -	
Video 12 hour turning movement count all modes		$ 1,860	As required			$ -	
Manual count annual central city cordon		$ 88	17			$ 1,488	$ 1,488
Analysis, reporting							
Annual data collation, cleaning, report card		$ 170	60			$ 10,200	$ 10,200
Graphic design for public facing report documents		$ 110	24			$ 2,640	$ 2,640
Analysis and reporting for all indicators		$ 170	20			$ 3,400	$ 3,400
					OPEX TOTAL (rounded)	$ 38,400	$ 44,300

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Thank you

Questions & discussion

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