



NZ TRANSPORT AGENCY  
WAKA KOTAHI

# Improving Road Safety by Better Utilisation of Warning Signs:

Safety Retrofit Project for Out of Context Curves

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# What is an “Out of Context Curve”?



- Horizontal curve combines with vertical curve at the end of a straight section of highway
- No visual clue for the motorists



# What is an “Out of Context Curve”?



PW-67 to provide guidance for road users  
Prefer 3 PW-67 as per MOTSAM Part 1

# Treatment Solutions

From cheapest to most expensive

- Edge marker post
- Edge line marking
- Edge line marking with RRPM
- Audio Tactile Pavement marking (ATP)
- Curve advisory signage
- With single chevron sign
- Or with chevron board with speed
- Active warning signs
- Increase lane and shoulder width on outside curve
- Realignment

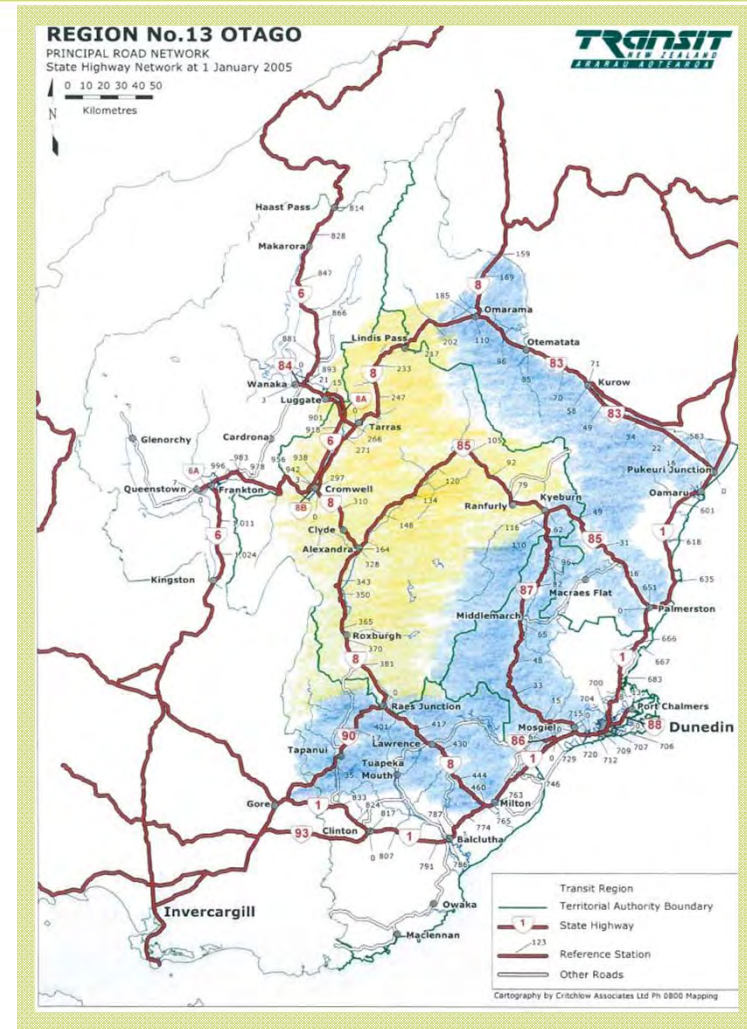




# Safety Retrofit Project

## Safety Retrofit Project

- Project budget: 200K dollars
- Original scope for Coastal Otago Area (blue area)
- Been extended to cover part of Central Otago (yellow area)



# Analysis Process

Analyse existing curve data

Lifting speed threshold from 15km/hr to 32km/hr

Compare with CAS crash data

Network drive over (field inspection)

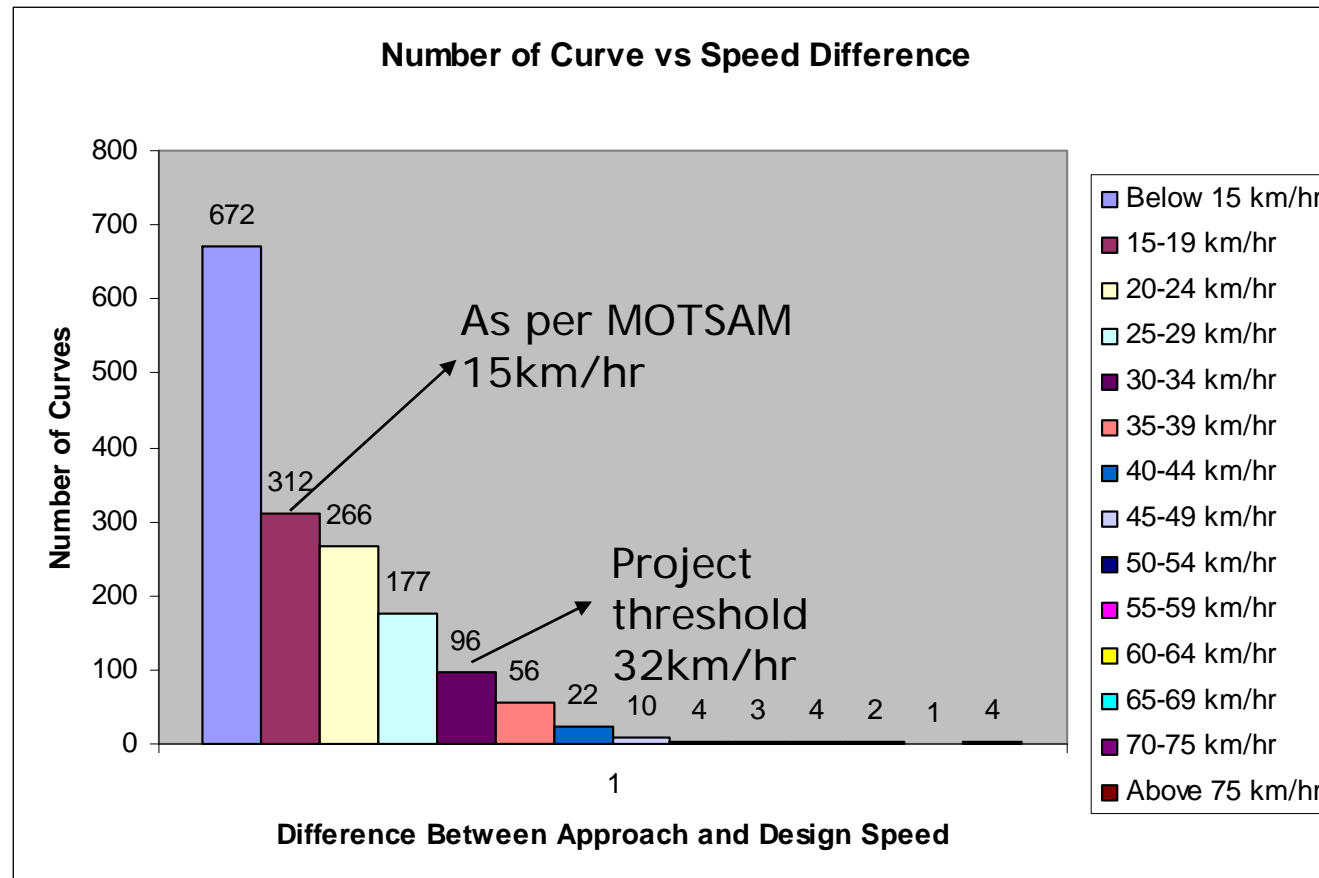




# Existing curve data

Risk	Region	SH/RS	Road ID	Inc/Dec	Start(m)	End(m)	Length	Direction	Adverse Xf	Approach Speed	Curve Speed	Curve Radi	ESC	MPD	est AAC
High	13	01S-0569	741	Increasing	13180	13220	40	Right Hand	OK	110	92	-424	0.41	1.51	7233
High	13	01S-0583	745	Decreasing	10920	11070	150	Right Hand	OK	104	86	-281	0.36	1.05	6110
High	13	01S-0583	745	Decreasing	11870	11960	90	Left Hand	OK	105	88	248	0.46	1.79	4758
High	13	01S-0583	745	Increasing	11880	11970	90	Right Hand	OK	109	81	-223	0.55	1.57	4758
High	13	01S-0583	745	Decreasing	12010	12060	50	Right Hand	OK	109	93	-358	0.47	1.76	4758
High	13	01S-0583	745	Decreasing	15690	15780	90	Right Hand	OK	106	85	-314	0.5	2.27	4313
High	13	01S-0601	747	Increasing	1780	1870	90	Left Hand	OK	110	95	321	0.46	1.86	4313
High	13	01S-0601	747	Increasing	3610	3740	130	Left Hand	OK	110	75	189	0.4	1.89	4494
High	13	01S-0601	747	Decreasing	3630	3760	130	Right Hand	OK	100	78	-197	0.36	1.36	4494
High	13	01S-0601	747	Decreasing	5470	5610	140	Right Hand	OK	98	77	-200	0.45	1.76	4673
High	13	01S-0601	747	Decreasing	5700	5810	110	Left Hand	OK	106	84	238	0.53	2.17	4786
High	13	01S-0601	747	Increasing	10700	10790	90	Right Hand	OK	110	94	-301	0.46	1.37	4010
High	13	01S-0601	747	Increasing	11690	11730	40	Left Hand	OK	110	94	374	0.51	1.92	4010
High	13	01S-0601	747	Decreasing	13420	13520	100	Left Hand	OK	106	87	243	0.47	1.4	4522
High	13	01S-0618	748	Increasing	3100	3170	70	Left Hand	OK	110	95	326	0.47	1.24	3950
High	13	01S-0618	748	Decreasing	4030	4090	60	Right Hand	OK	104	77	-279	0.43	1.68	3950
High	13	01S-0618	748	Decreasing	4190	4250	60	Left Hand	OK	104	85	272	0.55	1.77	3950
High	13	01S-0618	748	Decreasing	4560	4620	60	Left Hand	OK	105	87	302	0.46	1.5	3950
High	13	01S-0618	748	Increasing	4630	4690	60	Right Hand	OK	106	87	-311	0.44	1.53	3950
High	13	01S-0618	748	Decreasing	4650	4720	70	Left Hand	OK	107	84	279	0.45	1.84	3950
High	13	01S-0618	748	Increasing	4720	4790	70	Right Hand	OK	105	85	-307	0.45	1.87	3950
High	13	01S-0618	748	Decreasing	5190	5270	80	Left Hand	OK	99	84	267	0.41	1.87	3935
High	13	01S-0618	748	Increasing	5250	5340	90	Right Hand	OK	108	81	-271	0.41	1.93	3935
High	13	01S-0618	748	Decreasing	5520	5660	140	Right Hand	OK	102	79	-237	0.53	1.86	3935
High	13	01S-0618	748	Increasing	5600	5720	120	Left Hand	OK	103	80	229	0.54	2.02	3935
High	13	01S-0618	748	Increasing	6360	6410	50	Right Hand	OK	110	90	-381	0.55	2.27	3935
High	13	01S-0618	748	Increasing	13200	13230	30	Left Hand	OK	109	90	299	0.1	1.88	4048
High	13	01S-0618	748	Increasing	13260	13290	30	Left Hand	OK	108	90	316	0.1	2.22	4048
High	13	01S-0618	748	Increasing	16180	16220	40	Right Hand	OK	110	92	-391	0.49	2.02	3839
High	13	01S-0635	749	Decreasing	8060	8170	110	Left Hand	OK	98	81	236	0.58	2.11	3839
High	13	01S-0635	749	Decreasing	8310	8500	190	Right Hand	OK	103	87	-252	0.55	1.53	3839
High	13	01S-0635	749	Increasing	8340	8550	210	Left Hand	OK	105	85	242	0.59	2.12	3839
High	13	01S-0635	749	Increasing	9070	9150	80	Right Hand	OK	110	91	-328	0.57	1.88	3839
High	13	01S-0635	749	Increasing	10250	10610	360	Left Hand	OK	109	88	252	0.4	1.43	3839
High	13	01S-0651	750	Decreasing	1160	1300	140	Right Hand	OK	104	77	-194	0.42	1.39	4943
High	13	01S-0651	750	Decreasing	4180	4270	90	Left Hand	OK	106	86	276	0.44	1.79	4599
High	13	01S-0651	750	Increasing	4230	4320	90	Right Hand	OK	109	88	-307	0.38	1.65	4599
High	13	01S-0651	750	Increasing	7960	8040	80	Right Hand	OK	110	83	-243	0.5	1.78	4622
High	13	01S-0651	750	Decreasing	8290	8410	120	Left Hand	OK	102	78	200	0.51	1.37	4622
High	13	01S-0651	750	Increasing	8340	8470	130	Right Hand	OK	104	80	-212	0.46	1.35	4622
High	13	01S-0651	750	Decreasing	8460	8510	50	Right Hand	OK	109	93	-361	0.53	1.29	4622
High	13	01S-0651	1664	Increasing	9770	9850	80	Left Hand	OK	110	79	216	0.47	2.01	5796
High	13	01S-0651	1664	Increasing	9950	10050	100	Right Hand	OK	105	69	-153	0.41	1.48	5796
High	13	01S-0651	1664	Increasing	10090	10200	110	Left Hand	OK	98	50	63	0.35	1.27	5796
High	13	01S-0651	1664	Increasing	10280	10480	200	Right Hand	OK	87	65	-116	0.37	0.62	5796
High	13	01S-0651	1664	Decreasing	11240	11360	120	Left Hand	OK	105	81	211	0.42	2.17	5796

# Curve data analysis





# 5 Years of Crash Data

All crashes on curve in grey

Coastal Otago in white

Central Otago in yellow

SH	RS	Start(m)	End(m)	Length	Inc/Dec	Direction/Side Road	Speed diff/Crash ID	Video Spd/Crash Mov	Comment/Crash Veh
8	169	2320	1070	S		MCAUGHTRIES ROAD	2623587	BC	CN14
8	169	550	550	S		LAKE OHAU ROAD	2573135	EC	CN1
8	169	7520	7520	S		LAKE OHAU ROAD	2670424	KB	CN1T
8	169	7904	4100	N		QUAILBURN ROAD	2922808	DA	4N1
8	169	9941	150	N		WILLOWBURN STATION	2523241	DB	CS1
8	169	10004	2000	N		QUAILBURN ROAD	2970375	DB	CS1
8	169	10054	1950	N		QUAILBURN ROAD	2774786	DB	TS1
8	169	12894	890	S		QUAILBURN ROAD	2971806	DB	VN1
8	185	3527	2800	W		GOLF COURSE ROAD	2722963	DA	CW1
8	185	14051	500	W		KILLERMONT STATION	2774573	DA	CW1
8	185	14263	13170	W		BROKEN HUT ROAD	2721101	DA	VW1
8	185	15551	2000	W		KILLERMONT STATION	2822801	DB	4W1
8	202	3220	3300	80	Inc	Left Hand Curve	33	85	3 x PW-67
8	202	8880	8990	110	Inc	Left Hand Curve	33	75	3 x PW-67
8	202	9310	9650	340	Dec	Left Hand Curve	25		Check approach speed on both side, maybe PW-66
8	202	9360	9700	340	Inc	Right Hand Curve	40	65	Shoulder widen, old/smaller PW-67 on Inc direction
8	202	9465	500	S		MCLAYS CRK BR	2522180	BF	CS1C
8	202	10765	1800	S		MCLAYS CRK BR	2571669	DA	VN1
8	202	10765	1800	S		MCLAYS CRK BR	2571670	DA	CN1
8	202	10945	1980	S		MCLAYS CRK BR	2722520	DA	VS1
8	202	12022			A	LONGSLIP CRK BR NO3	2871641	DA	VN1
8	202	12022			A	LONGSLIP CRK BR NO3	2972784	DB	CS1
8	202	12222	200	S		LONGSLIP CRK BR NO3	2621132	DB	CN1
8	202	12322	300	S		LONGSLIP CRK BR NO3	2922419	DA	MS1
8	202	14200	14280	80	Inc	Left Hand Curve	40	45	2 x PW-67
8	202	14310	14450	140	Inc	Right Hand Curve	45	45	3 x PW-67
8	202	15160	220	230	Inc	Left Hand Curve	18		3 x PW-67 + PW-66
8	217	0	130	130	Inc	Right Hand Curve	50	55	PW-66 with 55k, shift Speed sign near #40 culvert
8	217	11	20	E		LINDIS PASS SUMMIT	2672486	DB	CE1
8	217	31			A	LINDIS PASS SUMMIT	2972308	DA	4W1
8	217	31			A	LINDIS PASS SUMMIT	2620013	BF	ME1T
8	217	51	20	W		LINDIS PASS SUMMIT	2871067	DA	CE1
8	217	81	30	W		LINDIS PASS SUMMIT	2874206	DA	CW1
8	217	160	290	130	Dec	Left Hand Curve	27		PW-66
8	217	331	300	W		LINDIS PASS SUMMIT	2770200	DA	CW1
8	217	390	460	70	Inc	Left Hand Curve	35	65	2 x PW-67 Low priority
8	217	431	400	W		LINDIS PASS SUMMIT	2971205	DA	4W1
8	217	431	400	W		LINDIS PASS SUMMIT	2621129	DA	MW1
8	217	520	640	120	Dec	Right Hand Curve	29		PW-67
8	217	590	700	110	Inc	Left Hand Curve	27		2 x PW-67
8	217	810	900	90	Inc	Right Hand Curve	22		2 x PW-67 Low priority
8	217	1531	1500	W		LINDIS PASS SUMMIT	2521261	DB	SW1
8	217	1540	1660	120	Inc	Left Hand Curve	25		PW-67
8	217	1600	13500	N		LINDIS (MORVEN) RIV BR	2621173	DA	CS1V
8	217	1738	3000	S		MT THOMAS STATION	2974596	DA	TS1
8	217	1788	2950	S		MT THOMAS STATION	2922331	DB	CW1
8	217	1788	2950	S		MT THOMAS STATION	2922330	DB	CW1

# Project Outcome

- A list of 154 sites
- 358 single chevron signs
- 23 chevron boards with speed advice
- Compare to KiwiRAP (safety rating of state highway)
- Achieve the goals (budget and safety improvement), but still require passive monitoring

