

COUNTY ROADWAY
Safety Plan
 Toward **ZERO** Deaths

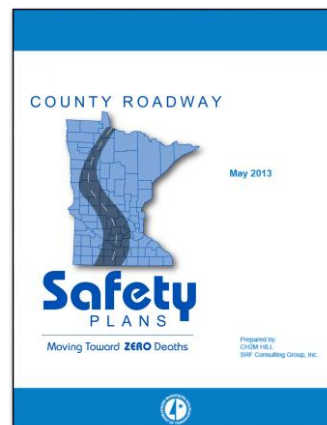
Where Did the Road Go? The Straight and Narrow about Curves

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 October 23, 2018

County Roadway Safety Plan Updates

What is a County Roadway Safety Plan or "CRSP?"

- CRSP Identifies priority location-specific safety concerns and suggested priority infrastructure improvements.
 - County segments, curves, & intersections
 - Locations that are most at risk
 - Proven safety strategies
- In 2014, initial CRSP plan created for all 87 MN counties in partnership with MnDOT and the Federal Highway Administration.
- The "CRSP Update" is an effort to continue to advance safety on county roadways.



Why the need for County Roadway Safety Plans?

- 60% of severe crashes (fatality or serious injury) occur on local roadways; **most severe are on county roads.**
- Local agencies are responsible for more than 90% of the state's roadway miles.
- The majority of roadway safety investments have been made on the state system.



What is the goal of County Road Safety Plans?

To support the statewide initiative of moving **Minnesota Toward Zero Deaths Program** through **continued reduction of fatalities and serious injuries** on county roadways.

- CRSP aligns with the Minnesota Strategic Highway Safety Plan (SHSP)
- Support TZD Goal of fewer than 300 fatalities and 850 serious injuries by 2020

CRSP Phase 1 Counties

- Beltrami
- Carlton
- Chisago
- Crow Wing
- Freeborn
- Goodhue
- Hennepin
- McLeod
- Meeker
- Morrison
- Olmsted
- Otter Tail
- St. Louis
- Stearns
- Wright

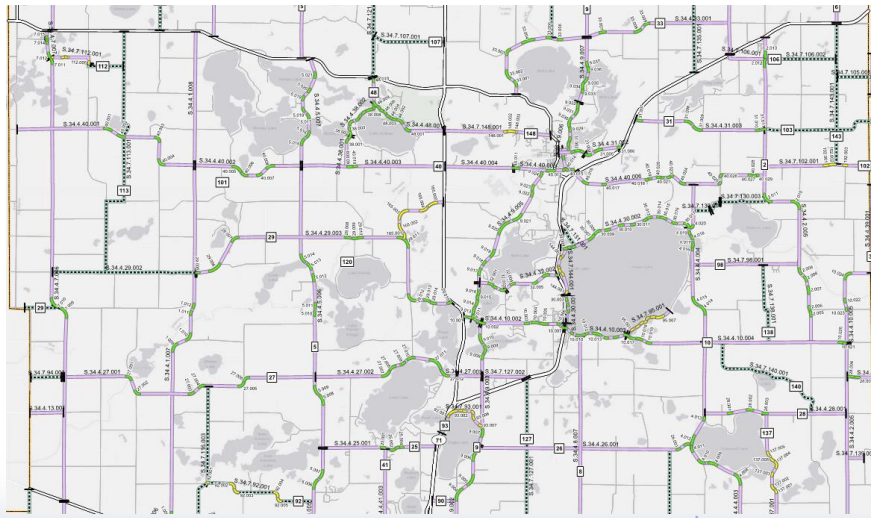


CRSP Phase 1 Curve System Inventory

County	Curves on System	Curves Analyzed
Beltrami	596	354
Carlton	438	232
Chisago	401	325
Crow Wing	821	788
Freeborn	339	199
Goodhue	639	483
Hennepin	1,156	473
McLeod	255	193
Meeker	204	179
Morrison	468	388
Olmsted	335	285
Otter Tail	840	782
St. Louis	4,278	1,538
Stearns	921	707
Wright	583	533
Total	12,274	7,459

- Did not analyze curves on gravel roads or in urban environments
- 61% of curves analyzed account for 76% of severe crashes

Example County Curve Map



COUNTY ROADWAY
Safety Plan
Toward 2020 Goals

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Horizontal Curves Frequency of Severe Crashes

County	Curves Exhibiting # of Severe Crashes							
	0		1		2		3	
Beltrami	348	5%	5	0%	1	0%	0	0%
Carlton	231	3%	1	0%	0	0%	0	0%
Chisago	317	4%	6	0%	2	0%	0	0%
Crow Wing	777	10%	10	0%	0	0%	1	0%
Freeborn	192	3%	7	0%	0	0%	0	0%
Goodhue	468	6%	15	0%	0	0%	0	0%
Hennepin	455	6%	16	0%	2	0%	0	0%
McLeod	188	3%	5	0%	0	0%	0	0%
Meeker	173	2%	6	0%	0	0%	0	0%
Morrison	380	5%	8	0%	0	0%	0	0%
Olmsted	275	4%	10	0%	0	0%	0	0%
Otter Tail	769	10%	12	0%	1	0%	0	0%
St. Louis	1524	20%	14	0%	0	0%	0	0%
Stearns	691	9%	14	0%	1	0%	1	0%
Wright	514	7%	18	0%	1	0%	0	0%
Total	7302	98%	147	2%	8	0%	2	0%

- 7,459 curves analyzed – 7,302 (98%) had **NO** severe crashes
- 147 curves (2%) had **ONE** severe crash
- 8 curves (.1%) had **TWO** severe crashes
- 2 curves (.03%) had **THREE** severe crashes

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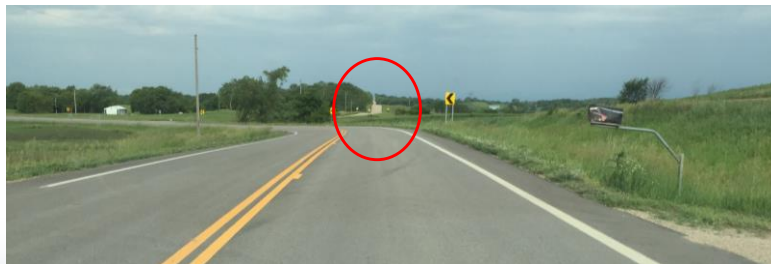
What is a Systemic Risk Analysis?

- **Analytical approach** identifies and prioritizes safety deficiencies on roads based on risk of crash
- **Identifies risk factors** based on roadway and traffic characteristics
- **Prioritizes the road system for safety investment** by documenting the number of risk factors present at each location.

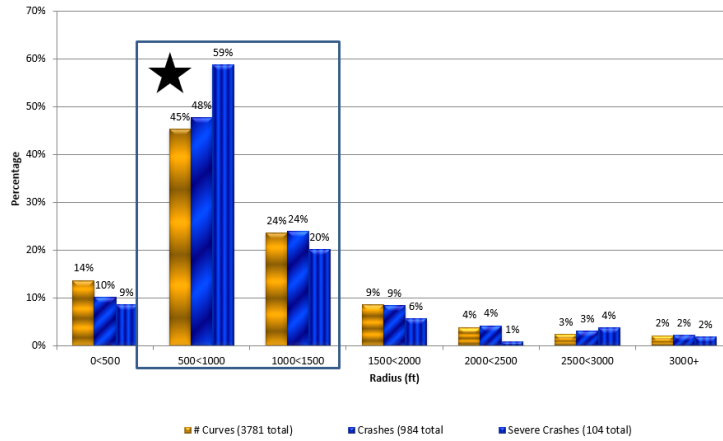
Risk Factor Identification

Curves:

- ADT Range
- Radius Range
- Severe Crash on Curve
- Intersection on Curve
- Visual Trap on Curve

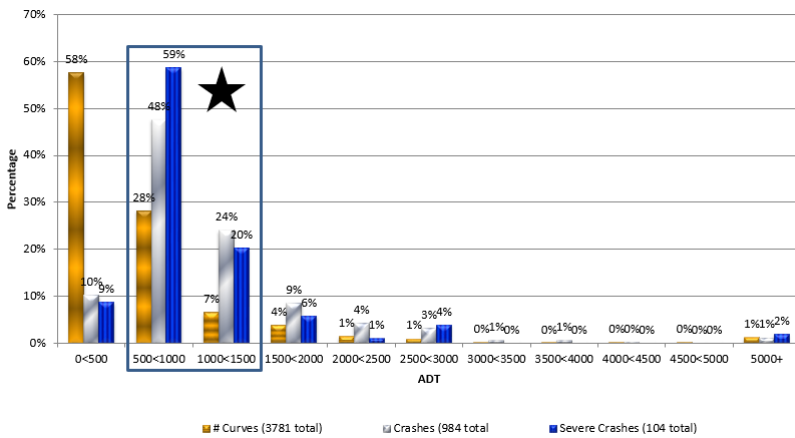


Example Risk Factor - Curve Radius



The majority of severe crashes occurred on curves with 500'-1,500' radii.

Example Risk Factor - Curve Radius



The majority of severe crashes occurred on curves with 500 -1,500 ADT

Systemic Contributing Factors Horizontal Curves

Factor	Rural	
	Min	Max
Radius [ft]	500	1500
Traffic Volume [vpd]	500	1500
Lane Width [ft]	11	
Shoulder Type	None, Curb, Composite	
Outside Shoulder Width [ft]	None	4
Total Cross Section Width [ft]	28	34
Adjacent Intersection	Intersection, Railroad	
Visual Trap	Present	
Lighting	None	
Outside Edge Risk	2S	3

Example Curve Prioritization

List No.	County Rank	Curve ID	Radius [ft]	Traffic Volume [vpd]	Lane Width [ft]	Shoulder Type	Total Cross Section Width [ft]	Adjacent Intersection	Visual Trap	Lighting	Outside Edge Risk	Star Total
595	1	C.18.7.112.001	*	*	*	*	*	*	*	*	*	*****
217	2	C.18.4.2.013	*	*	*	*	*	*	*	*	*	*****
546	3	C.18.7.107.005	*	*	*	*	*	*	*	*	*	*****
551	4	C.18.7.109.001	*	*	*	*	*	*	*	*	*	*****
552	5	C.18.7.109.002	*	*	*	*	*	*	*	*	*	*****
553	6	C.18.7.109.003	*	*	*	*	*	*	*	*	*	*****
555	7	C.18.7.109.005	*	*	*	*	*	*	*	*	*	*****
566	8	C.18.7.109.016	*	*	*	*	*	*	*	*	*	*****
572	9	C.18.7.111.001	*	*	*	*	*	*	*	*	*	*****
574	10	C.18.7.111.003	*	*	*	*	*	*	*	*	*	*****
575	11	C.18.7.111.004	*	*	*	*	*	*	*	*	*	*****
576	12	C.18.7.111.005	*	*	*	*	*	*	*	*	*	*****
577	13	C.18.7.111.006	*	*	*	*	*	*	*	*	*	*****
583	14	C.18.7.111.012	*	*	*	*	*	*	*	*	*	*****
585	15	C.18.7.111.014	*	*	*	*	*	*	*	*	*	*****
587	16	C.18.7.111.016	*	*	*	*	*	*	*	*	*	*****
589	17	C.18.7.111.018	*	*	*	*	*	*	*	*	*	*****
590	18	C.18.7.111.019	*	*	*	*	*	*	*	*	*	*****
593	19	C.18.7.111.022	*	*	*	*	*	*	*	*	*	*****
597	20	C.18.7.112.003	*	*	*	*	*	*	*	*	*	*****

Rural Curve Strategies



Chevrons

Crash Reduction Factor

- 20% to 30%

Typical Installation Costs

- \$3,960 per curve



Delineators

Crash Reduction Factor

- 18% to 34% non-intersection, head-on, run-off-road, sideswipe, nighttime crash types

Typical Installation Costs

- \$500 per curve



High Friction Surface Treatment

Crash Reduction Factor

- All crash types - 24%
- Wet road crash type – 52%

Typical Installation Costs

- \$25 to \$35 per square yard



Reconstruct (TT to a Single T Intersection)

Crash Reduction Factor

- Not Available

Typical Installation Costs

- \$150,000 to \$300,000 per curve



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Shoulder Paving (2', 4', 6')

Crash Reduction Factor

- 20% to 30% run-off-the-road crashes (with shoulder rumble) (2' only)

Typical Installation Costs

- \$54,000 per mile + \$5,850 per mile (for Edge Rumble)



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Clear Zone Maintenance/ Enhancements

Crash Reduction Factor

- Fatal, serious, & minor injury crashes: increase of 28% to decrease of 18%

Typical Installation Costs

- \$10,000 to \$250,000 per curve



Lighting

Crash Reduction Factor

- 25% to 40% of nighttime crashes

Typical Installation Costs

- \$6,000 per light



Dynamic Curve Signing

Crash Reduction Factor

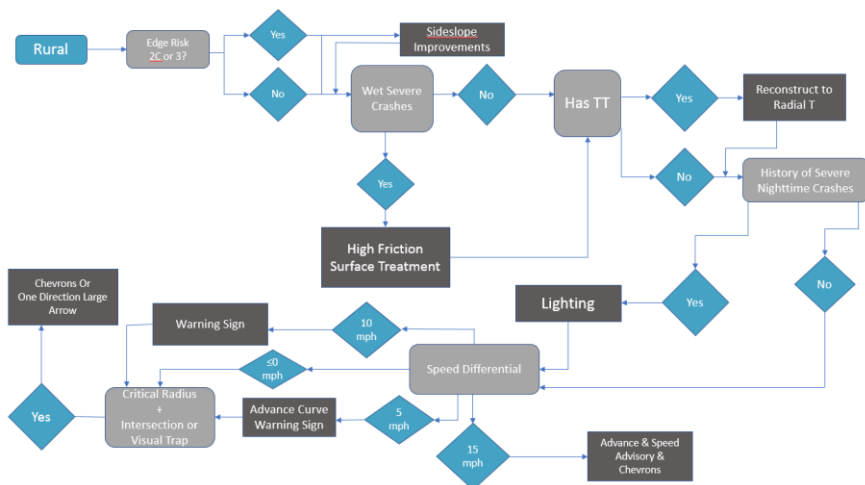
- Not Available

Typical Installation Costs

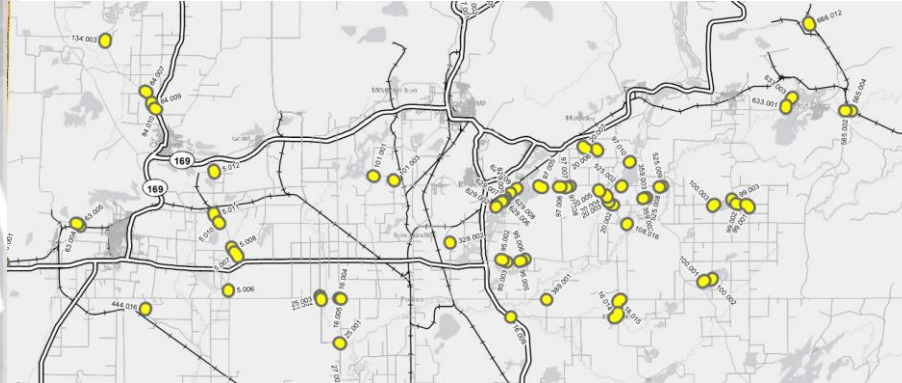
- \$50,000 per curve



Curve Project Decision Tree



Example Curve Project Map



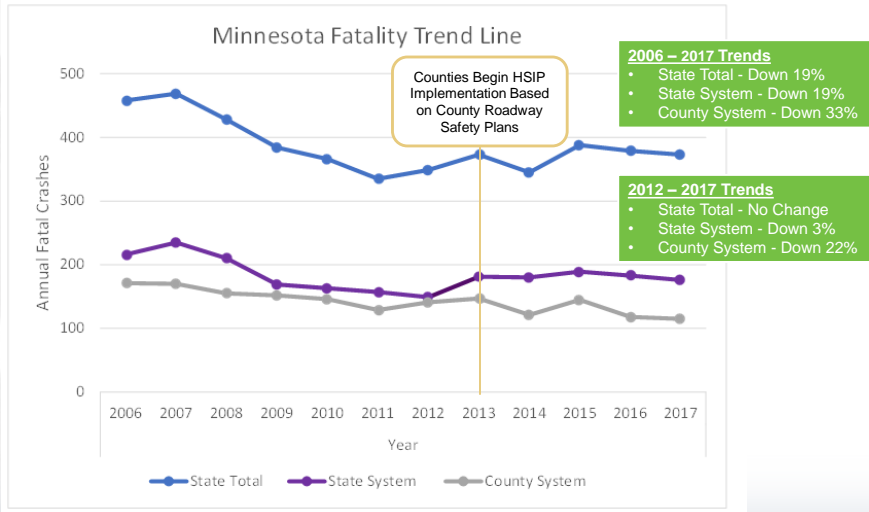
Suggested Curve Projects Summary

County	Number of Curve Locations with Treatment							Cost
	Clear Zone & Sideslope Improvement	High-Friction Surface Treatment	TT to Single T	Add Lighting	Warning Signs	Chevrons/ Arrow	Delineators	
Beltrami	14	0	0	1	3	9	1	\$329,350
Carlton	87	5	0	0	13	48	1	\$555,750
Chisago	37	11	0	1	2	20	2	\$235,150
Crow Wing	118	1	0	2	51	7	4	\$590,750
Freeborn	44	0	12	0	4	0	5	\$2,882,300
Goodhue	31	13	2	1	6	24	5	\$684,750
Hennepin	33	10	0	2	8	7	15	\$192,500
McLeod	104	7	13	1	4	17	1	\$3,416,450
Meekeer	17	0	1	1	1	0	2	\$75,150
Morrison	64	5	6	3	7	0	5	\$1,633,300
Olmsted	12	15	1	2	7	19	7	\$373,950
Otter Tail	12	0	15	0	6	0	6	\$3,432,400
St. Louis	268	13	7	2	40	64	12	\$2,969,400
Stearns	5	8	11	1	4	44	6	\$2,683,550
Wright	34	0	1	2	3	0	3	\$380,800

Version: April 20, 2018

Total cost: \$20,435,550

What are the initial results of county road safety improvements?



Questions?

