

Strategic Highway Safety Planning – Lessons Learned

**Midwest Transportation Consortium
Spring Transportation Seminar**

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Iowa State University
Ames, Iowa

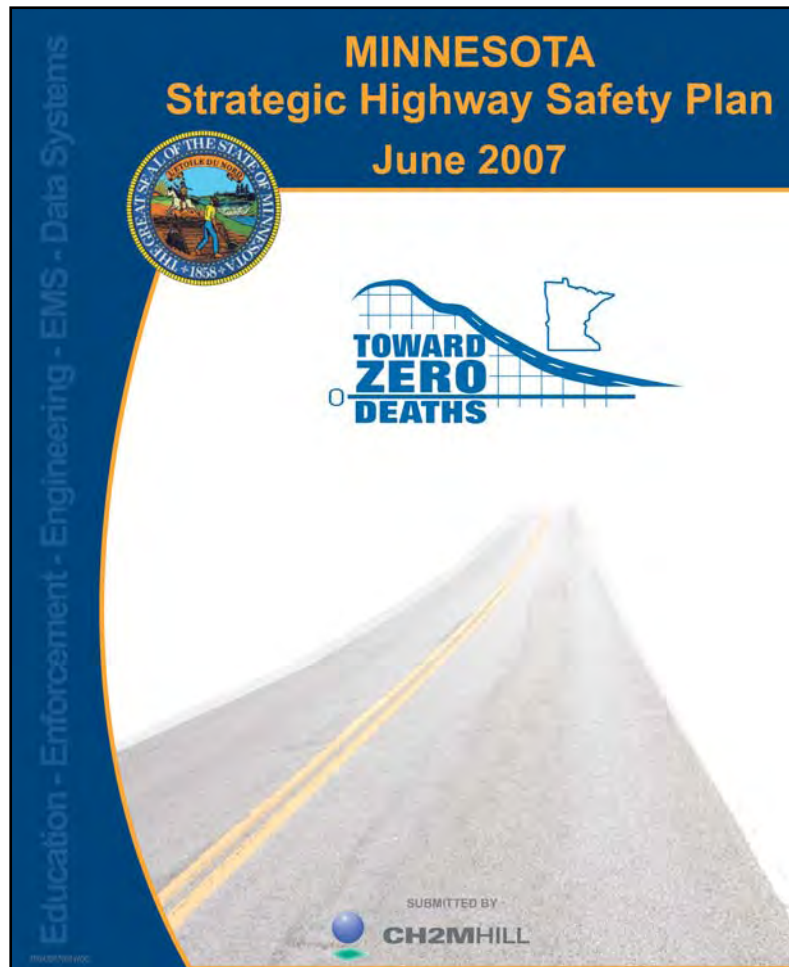
Howard Preston, PE

March 28, 2008

Agenda

- Background
- Minnesota's Safety Emphasis Areas
- Analytical Process
- Results
 - State System
 - Local System
- Safety Strategies
- Conclusions
- Questions

Minnesota Strategic Highway Safety Plan (SHSP)



- Data Driven
- Comprehensive: addressed Four Safety Es
- Systematic: considered all roads
- Identified a new safety performance measure: fatal and life-changing injury crashes
- Identified a new safety goal: 400 or fewer fatalities by 2010
- Identified a need to focus safety investments in Rural areas and on Local systems in order to achieve the goal
- Identified the Critical Emphasis Areas (CEAs) and Critical Strategies
- Proactive vs. Reactive

SHSP Development Process

■ Safety Partners

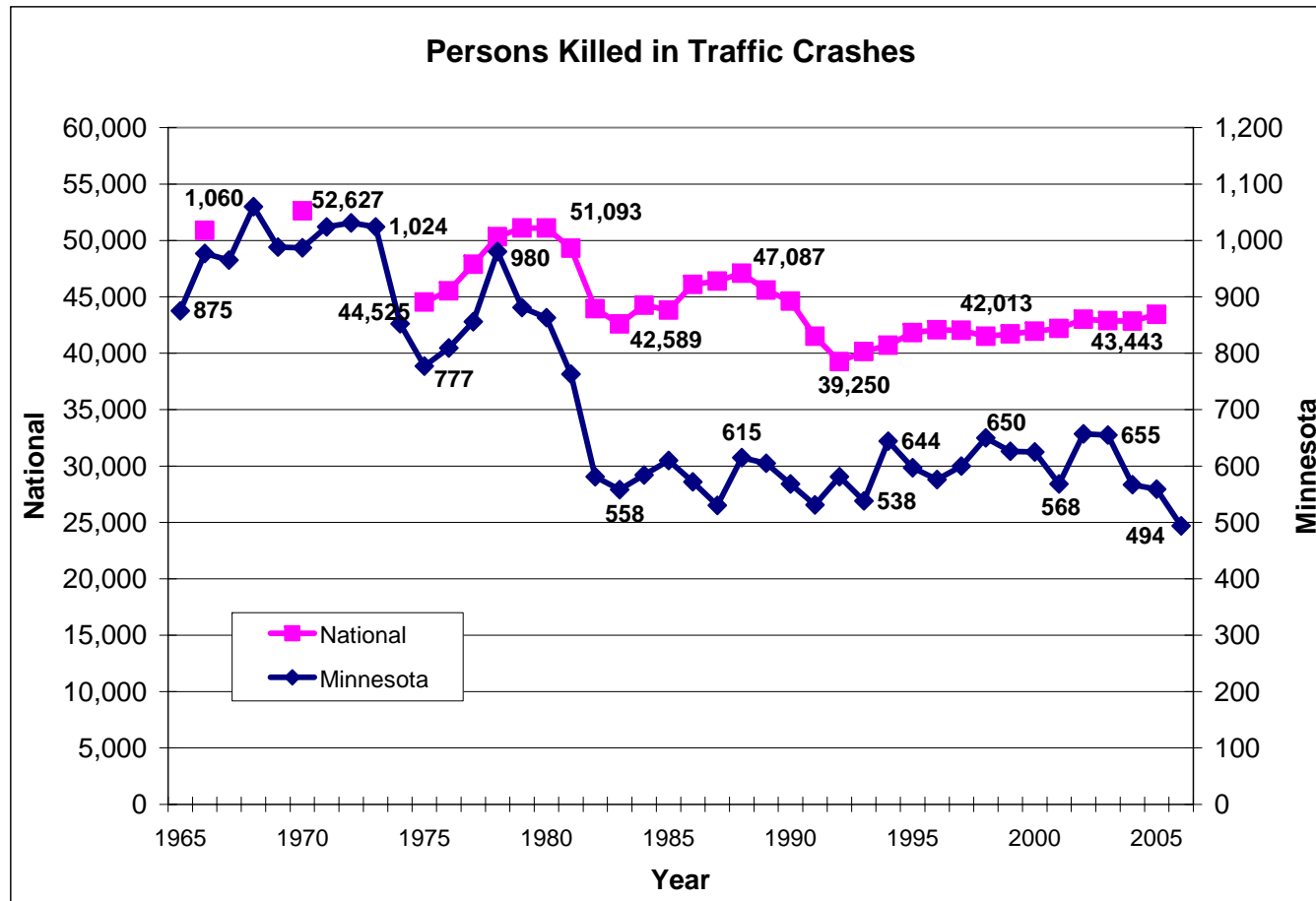
- ☐ Mn. Dept of Transportation
- ☐ Mn. Dept of Public Safety
- ☐ Mn. Dept of Health
- ☐ Federal Highway Admin.
- ☐ County Highway Agencies

■ Data Driven

■ All Roads

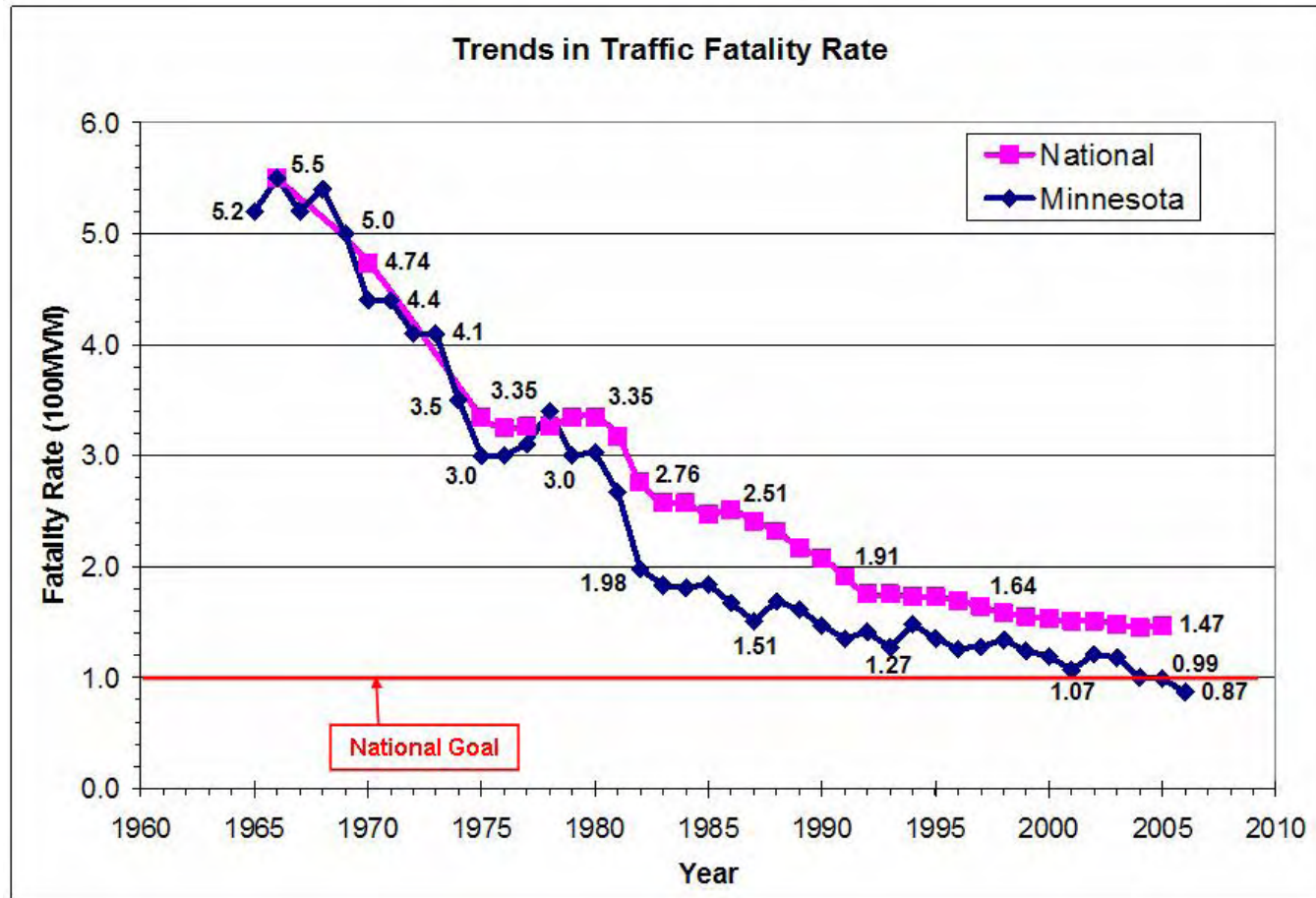
■ 4 E's

Trends in Traffic Fatalities



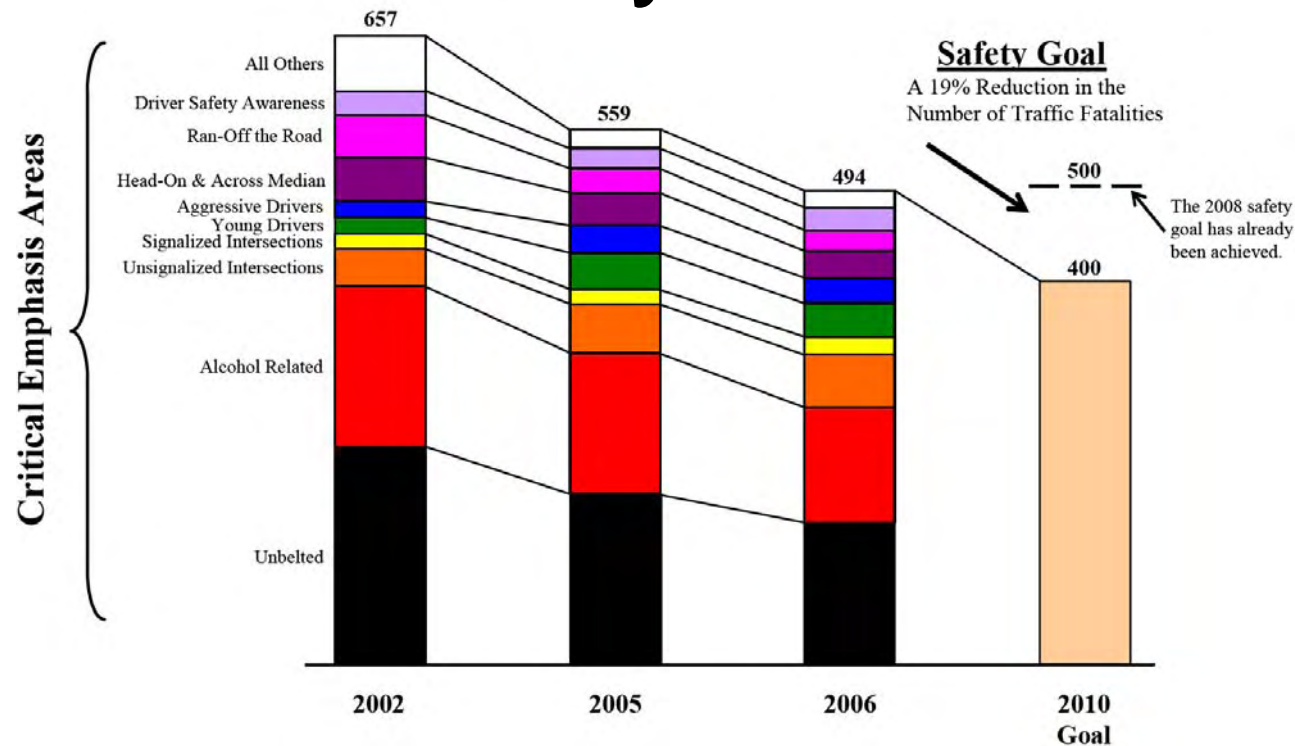
- The 494 traffic fatalities in 2006 is the lowest number in more than 50 years.

Trends in Traffic Fatalities



- The 0.87 fatality rate is the lowest in Minnesota history and is one of the lowest in the country.

Minnesota Safety Goal



- Goal established in 2004 CHSP
 - Fewer than 500 fatalities by 2008
 - Goal was met in 2006 – 494 fatalities
- Adopted new goal
 - Fewer than 400 fatalities by 2010
- Fatal Crash Trends
 - Single vehicle and lane departure crashes are increasing
 - Multiple vehicle crashes are decreasing

Critical Emphasis Areas

CEAs in the Minn. CHSP	Top 10 Emphasis Areas (Based on 2001-2005 Minnesota Data)	1998-2002			2001-2005		
		Related Fatal Crashes		Previous Rank	Related Fatalities		Current Rank
✓	Increasing Seat Belt Usage and Improving Airbag Effectiveness	1,351 fatalities	53%	1	1,271 fatalities	52%	1
✓	Reducing Impaired Driving	1,020 fatal crashes	36%	2	1,068 fatalities	36%	2
✓	Improving the Design and Operation of Highway Intersections	1,013 fatal crashes	36%	3	1,004 fatalities	33%	3
✓	Keeping Vehicles on the Roadway (combined with Minimizing the Consequences of Leaving the Road)	959 fatal crashes	34%	4	965 fatalities	32%	4
✓	Curbing Aggressive Driving	675 fatal crashes	24%	7	850 fatalities	28%	5
✓	Instituting Graduated Licensing for Young Drivers	705 fatal crashes	25%	5	718 fatalities	24%	6
✓	Reducing Head-On and Across-Median Crashes	505 fatal crashes	18%	9	611 fatalities	20%	7
	Keeping Drivers Alert	681 fatal crashes	24%	6	568 fatalities	19%	8
	Sustaining Proficiency in Older Drivers	594 fatal crashes	21%	8	533 fatalities	18%	9
	Making Truck Travel Safer	379 fatal crashes	14%	10	447 fatalities	15%	10
✓	Increasing Driver Safety Awareness						
✓	Improving Information and Decision Support Systems						

1998-2002: 2,797 fatal crashes; 3,126 fatalities; 2,572 vehicle occupant fatalities

2001-2005: 2,701 fatal crashes; 3,008 fatalities; 2,429 vehicle occupant fatalities

Statewide Fatalities (2001-2005)

Total Fatalities 3,008

Total Vehicle Occupant Fatalities 2,429

Driver Behavior Based Emphasis Areas

Unbelted (Based on Veh. Occ. Fatalities)	1,271	(52%)	1
Alcohol-Related	1,068	(36%)	2
Speeding-Related	850	(28%)	5
Involved Drivers Under 21	718	(24%)	6

Infrastructure Based Emphasis Areas

Single Vehicle ROR	965	(32%)	4
Intersection	1,004	(33%)	3
Head-On and Sideswipe	611	(20%)	7

Emphasis
Area
Fatality
Rank



CH2MHILL

Out State ATPs (2001-2005 Fatalities)

		Driver Behavior Based Emphasis Areas				Infrastructure Based Emphasis Areas		
	Total Fatalities	Unbelted	Alcohol- Related	Speeding -Related	Young Driver Involved	Single Vehicle ROR	Inter- section	Head-on & Sideswipe
Statewide	3,008	1,271 (52%)	1,068 (36%)	850 (28%)	718 (24%)	965 (32%)	1,004 (33%)	611 (20%)
ATP Total	2,063	968 (55%)	744 (36%)	546 (26%)	487 (24%)	741 (36%)	658 (32%)	424 (21%)
State Trunk Highway	1,089 (53%)	476 (49%)	284 (26%)	262 (24%)	224 (21%)	282 (26%)	360 (33%)	295 (27%)
Local Roads	974 (47%)	492 (63%)	460 (47%)	284 (29%)	263 (27%)	459 (47%)	298 (31%)	129 (13%)

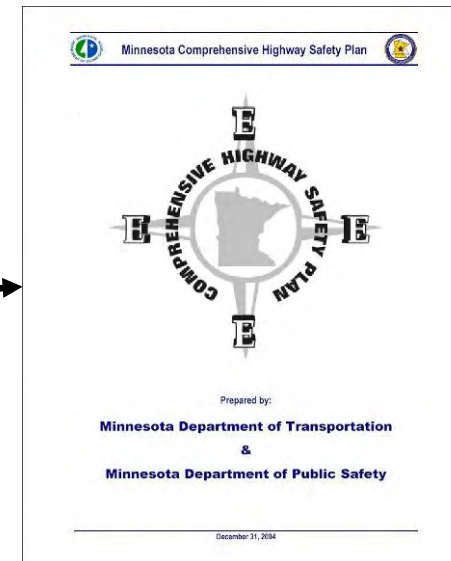
Metro ATP (2001-2005 Fatalities)

		Driver Behavior Based Emphasis Areas				Infrastructure Based Emphasis Areas		
	Total Fatalities	Unbelted	Alcohol- Related	Speeding -Related	Young Driver Involved	Single Vehicle ROR	Inter- section	Head-on & Sideswipe
Statewide	3,008	1,271 (52%)	1,068 (36%)	850 (28%)	718 (24%)	965 (32%)	1,004 (33%)	611 (20%)
ATP Metro Total	945	303 (45%)	324 (34%)	304 (32%)	231 (24%)	224 (24%)	347 (37%)	188 (20%)
State Trunk Highway	465	162 (45%)	167 (36%)	145 (31%)	103 (22%)	108 (23%)	126 (27%)	112 (24%)
Local Roads	480	141 (45%)	157 (33%)	159 (33%)	128 (27%)	116 (24%)	221 (46%)	76 (16%)

Detailed Model Process (1 of 2)

**Universes of
Possible Safety
Strategies**

Strategic Planning Process
- Data & Partner
- Driven Prioritization



Minnesota's 15 Critical Strategies

Enforcement

- Provide adequate law enforcement resources
- Primary seat belt law
- Implement automated enforcement
- Stronger graduated driver licensing system
- Support the enforcement of traffic safety laws
- Targeted enforcement

Education

- Communication and marketing task force
- High-level traffic safety panel and legislature action committee
- Enhance driver education

Engineering

- Cost effective lane departure improvements
- Cost effective intersection improvements
- Roadway maintenance
- Road Safety Audits

EMS

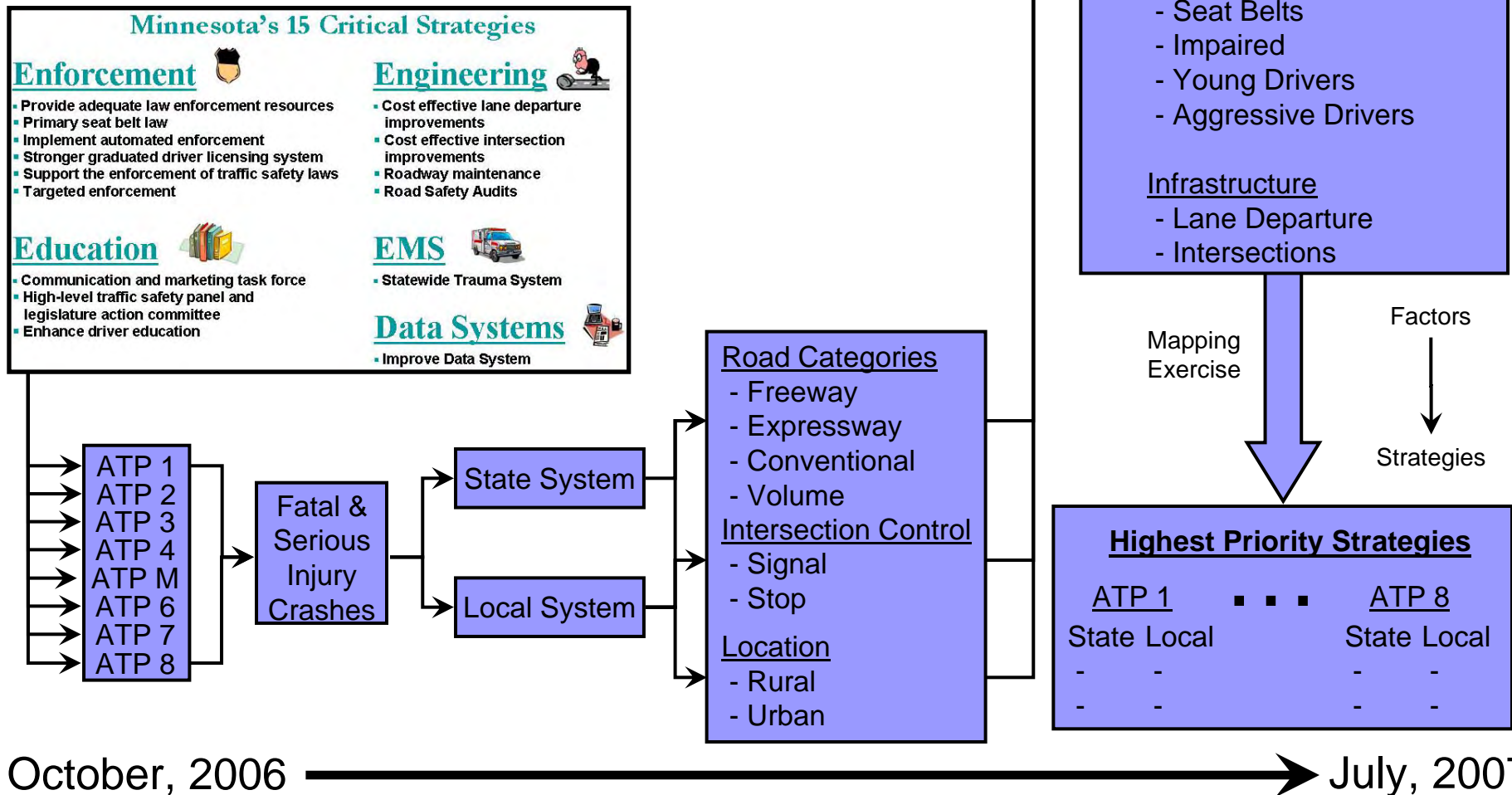
- Statewide Trauma System

Data Systems

- Improve Data System

December 31, 2004

Detailed Model Process (2 of 2)



Model Prioritization Process – Priority Strategies

To Address	Fatalities		Minnesota CHSP: Critical Emphasis Area	Critical Strategy	Countermeasure	Priorities	
	Outstate	Metro				STH	Local
Driver Behavior	744	324	Reducing Impaired Driving	→ Mapping Exercise			
	968	303	Increasing Seat Belt Use				
	487	231	Addressing Young Drivers Over Involvement				
	546	304	Curbing Aggressive Driving				
	658	347	Improving the Design and Operation of Highway Intersections				
	1165	412	Reducing Head-On and Across-median Crashes; Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road				
Infrastructure Improvement	744	324	Reducing Impaired Driving				
	968	303	Increasing Seat Belt Use				
	487	231	Addressing Young Drivers Over Involvement				
	546	304	Curbing Aggressive Driving				
	658	347	Improving the Design and Operation of Highway Intersections				
	424	188	Reducing Head-On and Across-median Crashes				
	741	224	Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road				



Prioritization for the State TH System

➤ Facility Types

Crash Summary by Facility Types – Out State Districts

Facility Type		Miles	Crashes		Crash Rate	Severity Rate	Fatal Rate	Crash Density	Priority
			Fatal	Serious Injury					
Rural	Freeway	702	54	77	0.6	0.8	0.6	3.7	✓
	4-lane Expressway	712	49	94	0.8	1.2	0.8	3.5	✓
	4-Lane Undivided	27	0	4	0.9	1.4	0.0	2.5	
	4-Lane Divided Conventional (Non expressway)	123	11	24	1.2	1.9	1.2	4.4	
	2-Lane ADT < 1,500	3,774	48	74	0.8	1.4	1.9	0.3	✓
	2-Lane 1,500 < ADT < 5,000	3,916	110	185	0.7	1.2	1.4	0.7	✓
	2-Lane 5,000 < ADT < 8,000	583	45	52	0.9	1.4	1.7	2.0	✓
	2-Lane ADT > 8,000	198	24	35	0.9	1.4	1.5	3.5	✓
Sub Total		10,034	341	545					
Urban	Freeway	21	2	7	1.4	1.9	0.3	21.3	
	4-lane Expressway	41	4	19	2.4	3.5	0.9	12.6	
	4-Lane Undivided	43	1	20	3.9	5.6	0.3	16.9	
	4-Lane Divided Conventional (Non expressway)	66	8	45	3.3	5.1	1.2	17.6	
	Three-Lane	30	0	10	2.8	3.8	0.0	10.1	
	Five-Lane	12	2	4	2.8	3.9	1.6	13.7	
	2-Lane ADT < 1,500	81	1	4	1.9	3.0	1.8	0.7	
	2-Lane 1,500 < ADT < 5,000	238	0	22	2.1	3.0	0.0	2.4	
	2-Lane 5,000 < ADT < 8,000	111	10	19	2.0	2.8	1.9	4.6	
	2-Lane ADT > 8,000	75	5	19	2.6	3.7	0.8	10.5	
Sub Total		718	33	169					

Source: Mn/DOT crash records, 2004-2005

- **91%** of fatal crashes and 76% of serious injury crashes were rural.
- **All** priority facility types are rural.

Priority Facility Types for the State System – Out State Districts

Facility Type		Crash Data Filter	Priority Types		
			Number	Rate	Density
Rural	Freeway	<div> <div>Number of Severed Classes</div> <div>Severed Rates</div> <div>Severed Density</div> <div>Severed Type</div> </div>	✓		✓
	4-Lane Expressway		✓		✓
	4-Lane Undivided				
	4-Lane Divided (Conventional)				
	2-Lane ADT < 1,500		✓	✓	
	1,500 ≤ ADT < 5,000		✓	✓	
	5,000 ≤ ADT < 8,000		✓	✓	
	ADT ≥ 8,000		✓	✓	✓
Urban	Freeway				
	4-Lane Expressway				
	4-Lane Undivided				
	4-Lane Divided (Conventional)				
	3-Lane				
	5-Lane				
	2-Lane ADT < 1,500				
	1,500 ≤ ADT < 5,000				
	5,000 ≤ ADT < 8,000				
	ADT ≥ 8,000				

Crash Summary by Facility Types – Metro District

Facility Type		Miles	Crashes		Crash Rate	Severity Rate	Fatal Rate	Crash Density	Priority
			Fatal	Serious Injury					
Rural	Freeway	122	22	24	0.6	0.9	0.5	11.1	✓
	4-lane Expressway	111	17	65	1.0	1.5	0.7	10.3	✓
	4-Lane Undivided	0	0	0	2.5	3.1	0.0	14.8	
	4-Lane Divided Conventional (Non expressway)	1	0	0	1.3	2.0	0.0	9.2	
	2-Lane	ADT < 1,500	13	0	2	0.0	0.0	0.0	
		1,500 < ADT < 5,000	89	5	8	1.0	1.5	2.0	
		5,000 < ADT < 8,000	98	8	18	1.2	2.0	1.8	✓
		ADT > 8,000	137	17	33	1.3	2.0	1.2	✓
	Sub Total		571	69	150				
Urban	Freeway	267	43	128	1.2	1.6	0.2	41.7	✓
	4-lane Expressway	124	17	81	1.9	2.7	0.5	23.9	✓
	4-Lane Undivided	20	2	25	5.8	7.8	0.7	41.3	✓
	4-Lane Divided Conventional (Non expressway)	21	3	19	5.0	6.8	0.9	38.6	✓
	Three-Lane	9	0	2	3.1	4.3	0.0	16.8	
	Five-Lane	2	0	3	5.6	8.8	0.0	52.4	
	2-Lane	ADT < 1,500	1	0	0	4.0	6.3	0.0	2.1
		1,500 < ADT < 5,000	9	0	0	2.8	3.9	0.0	3.7
		5,000 < ADT < 8,000	26	2	2	2.3	3.3	1.6	5.5
		ADT > 8,000	54	6	20	3.0	4.2	1.1	15.6
	Sub Total		533	73	280				

Source: Mn/DOT crash records, 2004-2005

- 49% of fatal crashes and 35% of serious injury crashes were rural.
- Priority facility types are almost equally split between rural and urban roadways.

Priority Facility Types for the State System – Metro District

Facility Type		Crash Data Filter	Priority Types		
			Number	Rate	Density
Rural	Freeway	<div> <div>Number of Severe Crashes</div> <div>Severe Crashes</div> <div>Crash Density</div> <div>Crash Type</div> </div>	✓		✓
	4-Lane Expressway		✓		✓
	4-Lane Undivided				
	4-Lane Divided (Conventional)				
	2-Lane ADT < 1,500				
	1,500 ≤ ADT < 5,000				
Urban	5,000 ≤ ADT < 8,000		✓		
	ADT ≥ 8,000		✓		
	Freeway		✓		✓
	4-Lane Expressway		✓		✓
	4-Lane Undivided		✓	✓	✓
	4-Lane Divided (Conventional)		✓	✓	✓
	3-Lane				
	5-Lane				
	2-Lane ADT < 1,500				
	1,500 ≤ ADT < 5,000				
	5,000 ≤ ADT < 8,000				
	ADT ≥ 8,000		✓	✓	✓



Crash Summary by Facility Types - Statewide

Facility Type		Miles	Crashes		Crash Rate	Severity Rate	Fatal Rate	Crash Density	Priority	
			Fatal	Serious Injury						
Rural	Freeway	824	76	101	0.6	0.8	0.6	4.8	✓	
	4-lane Expressway	823	66	159	0.9	1.3	0.8	4.4	✓	
	4-Lane Undivided	27	0	4	0.9	1.4	0.0	2.7		
	4-Lane Divided Conventional (Non expressway)	124	11	24	1.2	1.9	1.2	4.4		
	2-Lane	ADT < 1,500	3,787	48	76	0.8	1.4	1.9	0.3	✓
		1,500 ≤ ADT < 5,000	4,005	115	193	0.7	1.2	1.4	0.8	✓
		5,000 ≤ ADT < 8,000	681	53	70	0.9	1.5	1.7	2.1	✓
		ADT ≥ 8,000	334	41	68	1.1	1.7	1.4	4.9	✓
	Sub Total		10,606	410	695					
Urban	Freeway	288	45	135	1.2	1.6	0.2	40.2	✓	
	4-lane Expressway	165	21	100	1.9	2.8	0.6	21.1	✓	
	4-Lane Undivided	62	3	45	4.7	6.5	0.5	24.6		
	4-Lane Divided Conventional (Non expressway)	87	11	64	3.9	5.7	1.1	22.7	✓	
	Three-Lane	39	0	12	2.9	4.0	0.0	11.6		
	Five-Lane	14	2	7	3.4	5.0	1.3	18.9		
	2-Lane	ADT < 1,500	82	1	4	2.0	3.1	1.7	0.7	
		1,500 ≤ ADT < 5,000	246	0	22	2.1	3.1	0.0	2.4	
		5,000 ≤ ADT < 8,000	138	12	21	2.0	2.9	1.8	4.8	
		ADT ≥ 8,000	129	11	39	2.7	3.9	0.9	12.6	
	Sub Total		1,251	106	449					

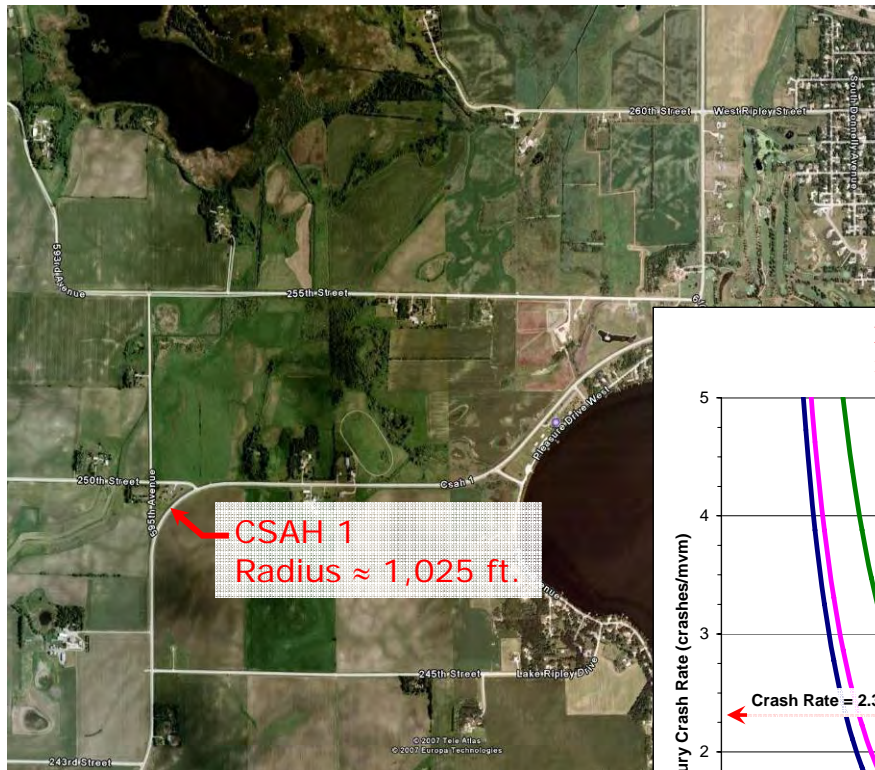
Source: Mn/DOT crash records, 2004-2005

- 79% of fatal crashes and 61% of serious injury crashes were rural.
- Most priority facility type are rural roadways.

Priority Strategies by Facility Type for the State System – Out State Districts

Minnesota CHSP: Critical Emphasis Area	Countermeasure
Reducing Impaired Driving	Conduct highly publicized sobriety saturation to deter impaired drivers.
Increasing Seat Belt Use	Conduct highly publicized targeted enforcement to increase seat belt use.
Addressing Young Drivers Over Involvement	Create a communications/marketing task force to raise awareness or establish a traffic safety panel to coordinate agencies.
Curbing Aggressive Driving	Conduct highly publicized targeted enforcement to deter aggressive driving.
Improving the Design and Operation of Highway Intersections	Utilize indirect left-turn treatments.
	Provide lighting to increase intersection visibility.
Reducing Head-On and Across-median Crashes	Construct median barriers for narrow-width medians on multilane roads.
	Utilize centerline rumble strips on undivided, two-way roads.
Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road	Utilize shoulder or mid-lane rumble strips (or edgeline rumble strips).
	Enhance warning of sharp curves.
	Utilize brighter or wider lane markings (see Enhance Pavement Markings).
	Pave shoulders.
	Eliminate shoulder drop-offs.
	Add safety wedge (45 degree beveled to edge of pavement).

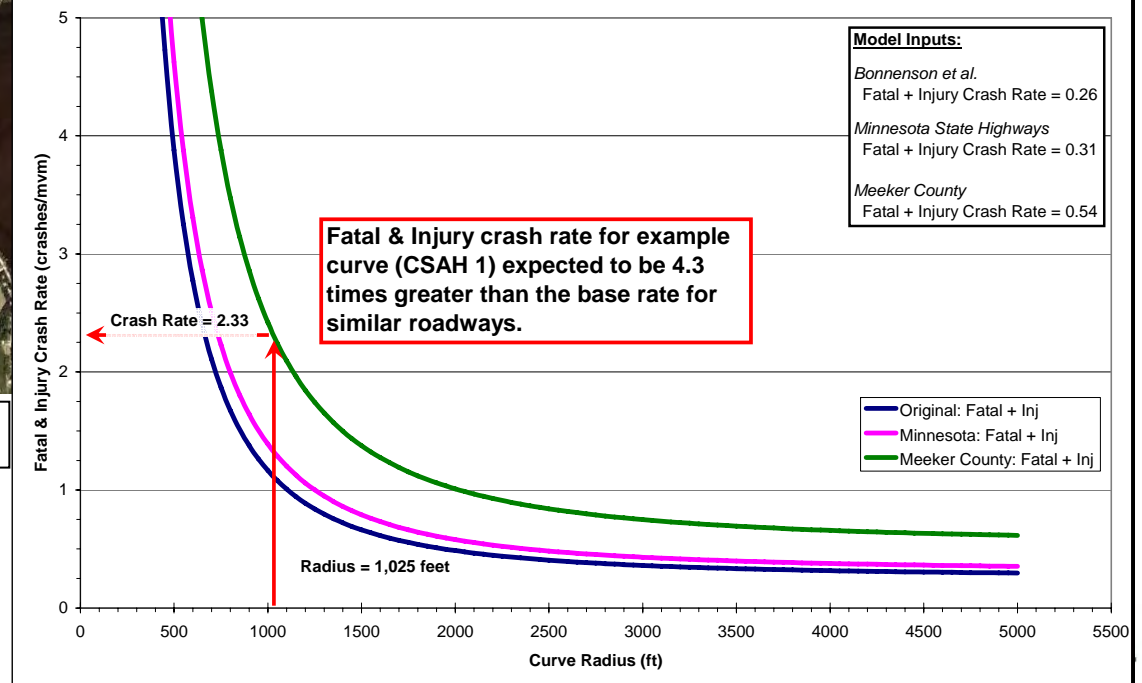
High Priority Rural Locations



This image has been modified from the original. The base map is from Google Earth Pro, but the data are from CH2M HILL.

- 40-50% of severe road departure crashes are in horizontal curves
- Continuation of local roads may create visual trap.
- Radius suggest possibility for higher fatal + injury crash rate.

DRAFT – Curve has yet to be validated for accuracy of Minnesota roadways. Carefully consider results.



Priority Strategies by Facility Type for the State System – Metro Districts

Minnesota CHSP: Critical Emphasis Area	Countermeasure
Reducing Impaired Driving	Conduct highly publicized sobriety saturation to deter impaired drivers.
Increasing Seat Belt Use	Conduct highly publicized targeted enforcement to increase seat belt use.
Addressing Young Drivers Over Involvement	Create a communications/marketing task force to raise awareness or establish a traffic safety panel to coordinate agencies.
Curbing Aggressive Driving	Conduct highly publicized targeted enforcement to deter aggressive driving.
Improving the Design and Operation of Highway Intersections	Install confirmation lights on the back side of mast arms to assist in traditional red-light running enforcement.
	Add turn lanes, offset turn lanes and/or longer turn lanes.
	Utilize indirect left-turn treatments.
	Provide or enhance lighting to increase intersection visibility.
	Implement driveway closures/relocations.
	Restrict or eliminate turning maneuvers by signing, providing channelization or closing median openings.
	Install larger regulatory and warning signs at intersections.
	Deploy mainline dynamic flashing beacons to warn drivers of entering traffic.
	Use freeway style guide signs along high-speed segments.
	Employ signal coordination.
	Improve operation of pedestrian and bicycle facilities at signalized intersections (i.e., countdown heads)
Reducing Head-On and Across-median Crashes	Construct median barriers for narrow-width medians on multilane roads.
	Utilize centerline rumble strips on undivided, two-way roads.
Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road	Utilize shoulder or mid-lane rumble strips (or edgeline rumble stripes).
	Enhance warning of sharp curves.
	Utilize brighter or wider lane markings (see Enhance Pavement Markings).
	Pave shoulders.
	Eliminate shoulder drop-offs.
	Add safety wedge (45 degree beveled to edge of pavement).

High Priority Urban Locations – Signalized Intersections

- Fatalities and Serious Injuries at Signalized Intersections.

Crash Type	Local	STH	Total
Rear End & Sideswipe (passing)	169 (14%)	96 (23%)	265 (16%)
Left-Turn	178 (14%)	59 (14%)	237 (14%)
Right-Turn	11 (1%)	1 (0%)	12 (1%)
Right Angle	602 (48%)	196 (46%)	798 (48%)
Ran Off Road	29 (2%)	11 (3%)	40 (2%)
Head-On and Sideswipe (opposite)	113 (9%)	31 (7%)	144 (9%)
Other & Unknown	142 (11%)	28 (7%)	170 (10%)
Total	1,244	422	1,666

- Fatalities and Serious Injuries at Thru-Stop and Yield Controlled Intersections.

Crash Type	Local	STH	Total
Rear End & Sideswipe (passing)	43 (5%)	10 (6%)	53 (5%)
Left-Turn	91 (11%)	8 (5%)	99 (10%)
Right-Turn	9 (1%)	1 (1%)	10 (1%)
Right Angle	477 (57%)	117 (72%)	594 (60%)
Ran Off Road	35 (4%)	3 (2%)	38 (4%)
Head-On and Sideswipe (opposite)	57 (7%)	9 (6%)	66 (7%)
Other & Unknown	119 (14%)	14 (9%)	133 (13%)
Total	831	162	993

- Majority of severe crashes are right-angle at signalized intersections stemming from running red light.





Prioritization for the Local Road System

Summary of Local Road System

	TOTALS			FATALITIES																				
	Total Fatalities #	Vehicle Occupant Fatalities #	Vehicle Miles Traveled	Under the Age of 21			Speeding-Related			Alcohol-Related			Unbelted Vehicle Occupant			Single Vehicle ROR			Intersection			Head-on and Sideswipe		
				#	%	Rate	#	%	Rate	#	%	Rate	#	%	Rate	#	%	Rate	#	%	Rate	#	%	Rate
Statewide Total	3008	2429	276,072,182,210	718	24%	0.3	850	28%	0.3	1068	36%	0.4	1271	52%	0.5	965	32%	0.3	1005	33%	0.4	612	20%	0.2
Local Road System Total	1454	1094	112,031,156,842	391	27%	0.3	443	30%	0.4	617	42%	0.6	633	52%	0.6	575	40%	0.5	519	33%	0.4	205	14%	0.2
ATP 1 Local Road System	134	104	8,595,781,788	36	27%		37	28%		64	48%		65	63%		64	48%		34	25%		16	12%	
ATP 2 Local Road System	96	76	4,635,600,464	15	16%		17	18%		47	49%		52	68%		49	51%		29	30%		5	5%	
ATP 3 Local Road System	301	247	14,219,887,352	85	28%		83	28%		145	48%		141	57%		120	40%		94	31%		56	19%	
ATP 4 Local Road System	100	78	6,160,005,522	24	24%		35	35%		55	55%		49	63%		60	60%		29	29%		12	12%	
ATP 6 Local Road System	151	119	9,991,158,034	49	32%		62	41%		70	46%		81	68%		74	49%		33	22%		28	19%	
ATP 7 Local Road System	93	72	7,439,374,162	26	28%		20	22%		33	35%		43	60%		42	45%		37	40%		6	6%	
ATP 8 Local Road System	99	86	5,648,880,732	28	28%		30	30%		46	46%		61	71%		50	51%		42	42%		6	6%	
ATP Metro Local Road System	480	312	55,340,468,788	128	27%		159	33%		157	33%		141	45%		116	24%		221	46%		76	16%	

	TOTALS			FATALITIES + SERIOUS INJURIES (*A" Crashes Only)																				
	Total Fatalities #	Vehicle Occupant Fatalities #	Vehicle Miles Traveled	Under the Age of 21			Speeding-Related			Alcohol-Related			Unbelted Vehicle Occupant			Single Vehicle ROR			Intersection			Head-on and Sideswipe		
				#	%	Rate	#	%	Rate	#	%	Rate	#	%	Rate	#	%	Rate	#	%	Rate	#	%	Rate
Statewide Total	15166	11876	276,072,182,210	4342	29%	1.6	3509	23%	1.3	3570	24%	1.3	4345	37%	1.6	3708	24%	1.3	6895	45%	2.5	2217	15%	0.8
Local Road System Total	9972	7511	112,031,156,842	3041	30%	2.7	2312	23%	2.1	2390	24%	2.1	2748	37%	2.5	2531	25%	2.3	4775	48%	4.3	1276	13%	1.1
ATP 1 Local Road System	603	463	8,595,781,788	171	28%		170	28%		200	33%		212	46%		239	40%		167	28%		66	11%	
ATP 2 Local Road System	342	274	4,635,600,464	91	27%		87	25%		150	44%		146	53%		160	47%		94	27%		19	6%	
ATP 3 Local Road System	1412	1125	14,219,887,352	454	32%		373	26%		434	31%		494	44%		476	34%		568	40%		177	13%	
ATP 4 Local Road System	561	447	6,160,005,522	193	34%		150	27%		176	31%		212	47%		244	43%		190	34%		88	16%	
ATP 6 Local Road System	1068	828	9,991,158,034	366	34%		302	28%		239	22%		329	40%		366	34%		432	40%		133	12%	
ATP 7 Local Road System	535	420	7,439,374,162	181	34%		141	26%		156	29%		202	48%		193	36%		211	39%		46	9%	
ATP 8 Local Road System	544	455	5,648,880,732	188	35%		133	24%		153	28%		212	47%		202	37%		242	44%		54	10%	
ATP Metro Local Road System	4907	3499	55,340,468,788	1397	25%		956	25%		882	25%		941	31%		651	19%		2871	41%		693	15%	

= Between 5 and 10 percentage points above Statewide average
 = More than 10 percentage points above Statewide average

- Priorities of the Out State Local Roads
 - Single-Vehicle ROR
 - Alcohol-Related
 - Unbelted Vehicle Occupant

- Priorities of the Metro Local Roads
 - Intersections
 - Speeding-Related
 - Alcohol-Related

Ranking of the CEAs for the Local Road System within Each ATP

Emphasis Area	Statewide	ATP							
		1	2	3	4	6	7	8	Metro
Driver Behavior									
Unbelted Vehicle Occupant	1	1	1	2	3	1	1	1	4
Alcohol-Related	2	2 (tied)	3	1	2	3	4	3	3
Speeding Driver	5	4	5	6	4	4	6	5	2
Young Driver Involved	6	5	6	5	6	5	5	6	5
Infrastructure									
Single Vehicle ROR	4	2 (tied)	2	3	1	2	2	2	6
Intersection	3	6	4	4	5	6	3	4	1
Head-on	7	7	7	7		7	7	7	7

Summary of District/ATP Analysis

	Greater Minnesota Districts/ATPs				Metro District/ATP			
	Annual Fatal Crashes	Crash Density ⁺	Percent Lane Departure	Percent Intersection	Annual Fatal Crashes	Crash Density ⁺	Percent Lane Departure	Percent Intersection
Rural								
State	170	1	52%	34%	34	7	35%	24%
Local	143	0.3*	63%	31%	21	2*	50%	33%
Urban								
State	16	7	31%	44%	36	32	58%	33%
Local	16	4*	41%	53%	71	12*	36%	56%

Based on 2004-2005 fatal crash records.

⁺ Crash Density = Total Crashes ÷ Miles of Road ÷ Years of Crash Data

* Estimated crash densities for local roads.

Priority Strategies for the Local System – Out State Districts

Minnesota CHSP: Critical Emphasis Area	Countermeasure
Reducing Impaired Driving	Conduct highly publicized sobriety saturation to deter impaired drivers.
Increasing Seat Belt Use	Conduct highly publicized targeted enforcement to increase seat belt use.
Addressing Young Drivers Over Involvement	Create a communications/marketing task force to raise awareness or establish a traffic safety panel to coordinate agencies.
Curbing Aggressive Driving	Conduct highly publicized targeted enforcement to deter aggressive driving.
Improving the Design and Operation of Highway Intersections	Provide lighting to increase intersection visibility.
Reducing Head-On and Across-median Crashes	Utilize centerline rumble strips on undivided, two-way roads.
	Enhance pavement markings. Use durable epoxy pavement markings.
Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road	Utilize shoulder or mid-lane rumble strips (or edgeline rumble stripes).
	Enhance warning of sharp curves. Utilize brighter or wider lane markings (see Enhance Pavement Markings).
	Enhance pavement markings. Use durable epoxy pavement markings.
	Pave shoulders.
	Eliminate shoulder drop-offs. Add safety wedge (45 degree beveled to edge of pavement).
	Maintain pavement marking lines.

Example Priority Strategies for the ATP 6

Minnesota CHSP: Critical Emphasis Area	Countermeasure	Counties										
		Dodge	Fillemore	Freeborn	Goodhue	Houston	Mower	Olmsted	Rice	Steele	Wabasha	Winona
Reducing Impaired Driving	Conduct highly publicized sobriety saturation to deter impaired drivers.				✓	✓		✓✓	✓✓✓		✓	
Increasing Seat Belt Use	Conduct highly publicized targeted enforcement to increase seat belt use.	X		X	✓✓	✓✓		✓✓	✓✓✓		✓	✓
Addressing Young Drivers Over Involvement	Create a communications/marketing task force to raise awareness or establish a traffic safety panel to coordinate agencies.	X					X	✓✓✓	✓✓	✓		✓
Curbing Aggressive Driving	Conduct highly publicized targeted enforcement to deter aggressive driving.		X		✓✓	✓✓		✓✓✓	✓✓			
Improving the Design and Operation of Highway Intersections	Provide lighting to increase intersection visibility.			X			✓✓	✓✓✓	✓✓	✓✓		
Reducing Head-On and Across-median Crashes	Utilize centerline rumble strips on undivided, two-way roads.											
	Enhance pavement markings. Use durable epoxy pavement markings.				✓			✓✓✓		✓✓		✓✓
Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road	Utilize shoulder or mid-lane rumble strips (or edgeline rumble stripes).											
	Enhance warning of sharp curves. Utilize brighter or wider lane markings (see Enhance Pavement Markings).											
	Enhance pavement markings. Use durable epoxy pavement markings.	X	✓		✓✓	✓✓		✓✓✓	✓✓✓		✓	
	Eliminate shoulder drop-offs. Pave shoulders.											
	Add safety wedge (45 degree beveled to edge of pavement).											
	Maintain pavement marking lines.											

Priority Strategies by County for the Local System – ATP Metro

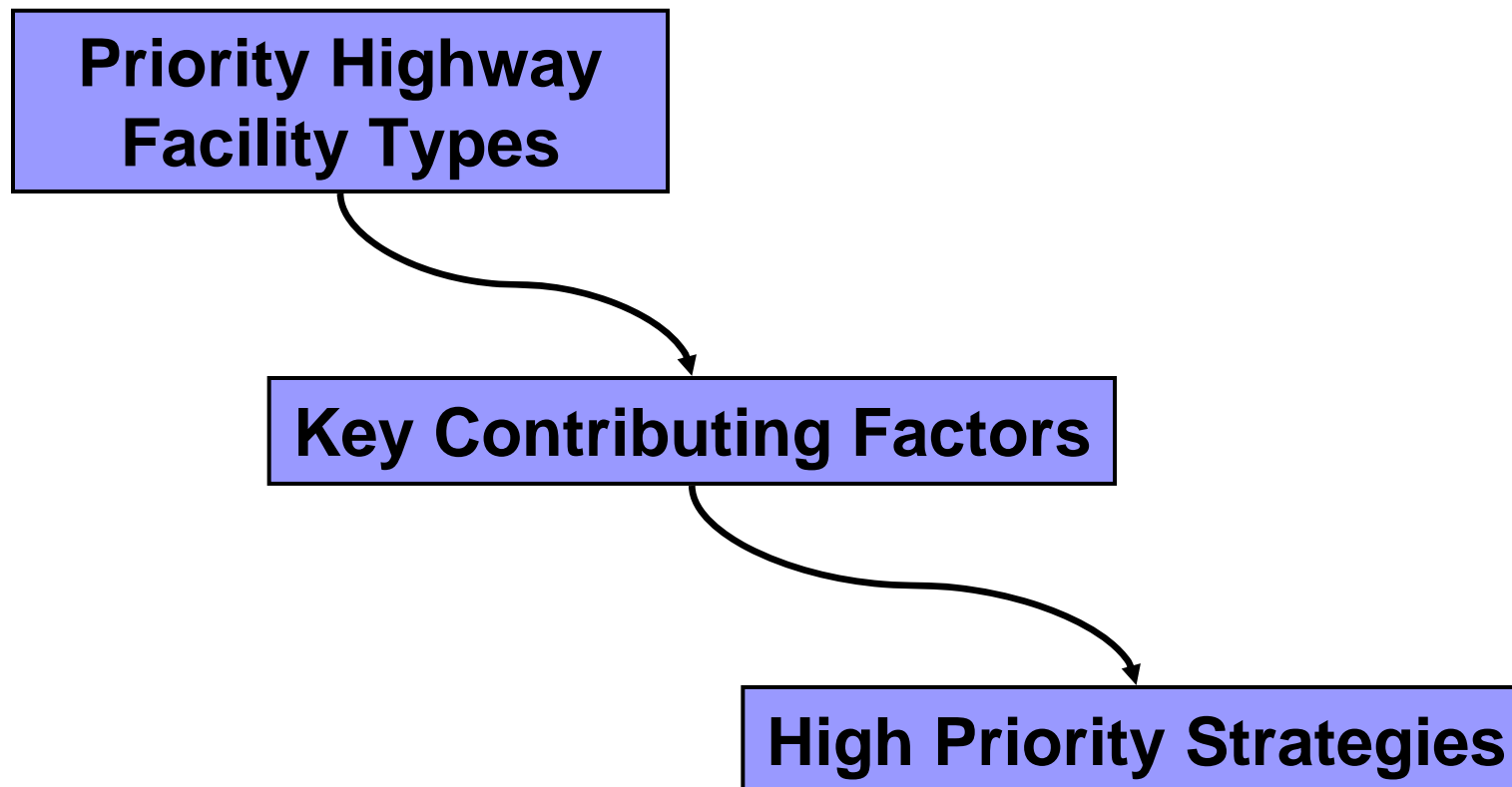
Minnesota CHSP: Critical Emphasis Area	Countermeasure
Reducing Impaired Driving	Conduct highly publicized sobriety saturation to deter impaired drivers.
Increasing Seat Belt Use	Conduct highly publicized targeted enforcement to increase seat belt use.
Addressing Young Drivers Over Involvement	Create a communications/marketing task force to raise awareness or establish a traffic safety panel to coordinate agencies.
Curbing Aggressive Driving	Conduct highly publicized targeted enforcement to deter aggressive driving.
Improving the Design and Operation of Highway Intersections	Implement automated enforcement to deter red-light running.
	Install confirmation lights on the back side of mast arms to assist in traditional red-light running enforcement.
	Add turn lanes, offset turn lanes and/or longer turn lanes.
	Eliminate parking near intersections that restricts sight distance.
	Provide or enhance lighting to increase intersection visibility.
	Implement driveway closures/relocations.
	Restrict or eliminate turning maneuvers by signing, providing channelization or closing median openings.
	Provide a stop bar (or wider stop bar) on minor-road approaches.
	Install larger regulatory and warning signs at intersections.
	Provide supplementary stop signs.
	Install red flashing beacons on stop signs at stop-controlled intersections.
	Employ multiphase signal operation.
	Optimize clearance intervals.
	Employ signal coordination.
	Improve operation of pedestrian and bicycle facilities at signalized intersections (i.e., countdown heads)
Reducing Head-On and Across-median Crashes	Utilize centerline rumble strips on undivided, two-way roads.
	Enhance pavement markings. Use durable epoxy pavement markings.
Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road	Utilize shoulder or mid-lane rumble strips (or edgeline rumble stripes).
	Enhance warning of sharp curves. Utilize brighter or wider lane markings (see Enhance Pavement Markings).
	Enhance pavement markings. Use durable epoxy pavement markings.
	Eliminate shoulder drop-offs. Pave shoulders.
	Add safety wedge (45 degree beveled to edge of pavement).
	Maintain pavement marking lines.

High Priority Locations on the Local System – Horizontal Curves

- No curves identified as “Black Spots”
- 48% of severe crashes in curves
- 17 of 72 (24%) curves identified as visual traps



Overview of Mapping Process to High Priority Strategies



Infrastructure-Based CEAs

District/County Transportation Plan

- NCHRP Report 500 Series

- 42 Lane Departure Strategies
- 63 Intersection Strategies
- 40 Pedestrian & Bike Strategies

145 Strategies

**Data Driven
Screening
Process**

- High Priority Strategies

- 11 Lane Departure Strategies
- 15 Intersection Strategies
- 10 Pedestrian Strategies

36 Strategies

Local
Input

X Critical Strategies selected to address the Engineering focused Critical Emphasis Areas.

HIGH PRIORITY LANE DEPARTURE STRATEGIES

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation
A—Assist drivers in maintaining their lane	A1—Use longitudinal rumble strips to warn drivers when leaving their lane. This includes centerline rumble strips for two-lane roads, shoulder rumble strips, and shoulder rumble stripes.	Low	Tried	Short (< 1 yr.)
	A2—Provide enhanced centerline and edgeline pavement markings for improved day/night/wet visibility. Treatments may include 6" or 8" wide markings instead of 4", durable pavement markings, and raised pavement markers.	Low	Tried	Short (< 1 yr.)
	A3—Provide advance warning of unexpected horizontal curves along with enhanced curve delineation (i.e., edgeline enhancements, chevrons, delineators).	Low	Proven/Tried/Experimental	Short (< 1 yr.)
B—Minimize the likelihood of crashing into an oncoming vehicle	B1—Use alternating passing lanes or four-lane sections at key locations.	Moderate to High	Tried	Medium (1-2 yrs.)
C—Keep vehicles from encroaching on the roadside	C1—Eliminate shoulder drop-offs by paving or widening shoulders.	Moderate to High	Proven/Tried	Medium (1-2 yrs.)
	C2—Construct a beveled edge (a.k.a. safety edge) to assist drivers getting back onto the travel lane if on the shoulder.	Low	Tried	Short (< 1 yr.)
D—Reduce the severity of run-off the road crashes	D1—Remove/relocate objects (such as trees, utility poles, light poles, extend culverts to move outside of clearzone, etc.) to provide adequate clear zones.	Low to Moderate	Proven	Short (< 1 yr.)
	D2—Design safer slopes and ditches to prevent rollovers, including transverse slope (i.e., flatten or use culvert safety grates).	Moderate to High	Proven	Medium (1-2 yrs.)
	D3—Shield motorists from steep slopes and roadside objects. Including updating of barriers and crash cushions that do not meet current standards.	Moderate to High	Proven/Tried	Medium (1-2 yrs.)

HIGH PRIORITY INTERSECTION STRATEGIES

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation
A—Improve access management	A1—Implement intersection or driveway closures, relocations, and turning restrictions using signing or by providing channelization.	Low to Moderate	Tried	Medium (1-2 yrs.)
B—Reduce the frequency and severity of intersection conflicts through geometric design improvements	B1—Provide left-turn lanes at intersections; provide sufficient length to accommodate deceleration and queuing; and use offset turn lanes to provide better visibility if needed.	Moderate to High	Proven	Medium (1-2 yrs.)
	B2—Provide bypass lanes on shoulders at T-intersections.	Low	Tried	Short (<1 yr.)
	B3—Provide right-turn lanes at intersections; provide sufficient length to accommodate deceleration and queuing; use offset turn lanes to provide better visibility if needed; and provide right-turn acceleration lanes.	Moderate to High	Proven	Medium (1-2 yrs.)
	B4—Realign intersection approaches to reduce or eliminate intersection skew.	High	Proven	Medium (1-2 yrs.)
C—Improve driver awareness of intersections as viewed from the intersection approach	C1—Improve visibility of intersections by providing enhanced signing. This may include installing larger regulatory, warning, and guide signing and supplementary stop signs.	Low	Tried	Short (<1 yr.)
	C2—Improve visibility of the intersection by providing lighting (install or enhance) or red flashing beacons mounted on stop signs.	Low to Moderate	Proven	Medium (1-2 yrs.)
	C3—Improve visibility of intersections by providing enhanced pavement markings, such as adding or widening stop bar on minor-road approaches, supplementary messages (i.e., STOP AHEAD).	Low	Tried	Short (<1 yr.)
	C4—Improve visibility of traffic signals using overhead mast arms and larger lenses.	Moderate	Tried	Short (<1 yr.)
	C5—Deploy mainline dynamic flashing beacons to warn drivers of entering traffic.	Low	Experimental	Short (<1 yr.)

HIGH PRIORITY INTERSECTION STRATEGIES

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation
D—Improve sight distance at intersections	D1—Clear sight triangles approaches to intersections; in addition to eliminating objects in the roadside, this may also include eliminating parking that restricts sight distance.	Low to Moderate	Tried	Short (<1 yr.)
E—Choose appropriate intersection traffic control to minimize crash frequency and severity	E1—Provide all-way stop control at appropriate intersections.	Low	Proven	Short (<1 yr.)
	E2—Provide roundabouts at appropriate locations.	High	Proven	Long (>2 yrs.)
F—Improve driver compliance with traffic control devices and traffic laws at intersections	F1—Enhance enforcement of red-light running violations using automated enforcement (cameras) or adding confirmation lights on the back of signals to assist traditional enforcement methods.	Moderate	Proven/Tried	Medium (1-2 yrs.)
G—Reduce frequency and severity of intersection conflicts through traffic signal control and operational improvements	G1—Employ multiphase signal operation, signal coordination, emergency vehicle preemption optimize clearance intervals; implement dilemma zone protection; on high speed roadways, install advance warning flashers to inform driver of need to stop; and retime adjacent signals to create gaps at stop-controlled intersections	Low to Moderate	Proven/Tried	Medium (1-2 yrs.)

HIGH PRIORITY PEDESTRIAN & BICYCLE STRATEGIES

Objectives	Strategies	Relative Cost to Implement and Operate	Effectiveness	Typical Timeframe for Implementation
A—Reduce pedestrian and bicycle exposure to vehicular traffic	A1—Provide sidewalks/walkways, bike lanes, bike paths, curb ramps, pedestrian refuge islands, curb extensions and raised medians.	Moderate to High	Proven	Long (> 2 yrs.)
	A2—Install or upgrade traffic and pedestrian signals (i.e., improved timing, count down timers, image displays, extended delay to accommodate elderly, advanced WALK display, etc.).	Moderate to High	Proven/Tried/Experimental	Medium (1-2 yrs.)
	A3—At intersections, improve bicycle signing, markings, timing and detection at intersections	Moderate	Tried	Medium (1-2 yrs.)
9.B—Improve sight distance and/or visibility between vehicles and pedestrians and bicyclists	B1—Provide crosswalk enhancements: wider crosswalks, raised crosswalks, crosswalk lighting or illumination, advance warning to alert motorists when pedestrians/bicyclists are crossing.	Low to Moderate	Proven/Tried	Medium (1-2 yrs.)
	B2—Eliminate screening by physical objects.	Moderate	Tried	Medium (1-2 yrs.)
	B3—Improve reflectorization/conspicuity of pedestrians (i.e., reflective clothing) and bicyclists and educate users on their benefits.	Low	Tried	Short (< 1 yr.)
C—Reduce vehicle speed	C1—Implement traffic calming or road narrowing measures at intersections and along road segments.	Moderate	Proven/Tried	Medium (1-2 yrs.)
	C2—Provide school route improvements.	Low	Tried	Short (< 1 yr.)
D—Improve pedestrian, bicyclists and motorist safety awareness and behavior	D1—Provide education, outreach, and training (i.e., meaning of WALK, flashing DON'T WALK and DON'T WALK phases; risks on high volume/speed roadways resulting from disabled vehicle, motorist assist, and crossing multi-lanes; safe riding practices; safety education programs in schools; Safe Routes to School).	Moderate	Proven	Medium (1-2 yrs.)
	D2—Implement enforcement campaigns for driver, pedestrian and bicycle laws; especially in high crash locations.	Moderate	Tried	Short (< 1 yr.)
	D3—Increase use of bicycle helmets.	Moderate	Proven	Medium (1-2 yrs.)
E—Implement a safety program targeting "high crash locations" in the major urbanized areas and select rural areas	E1— Develop a process to identify high crash locations.	Low	Experimental	Short (<1 yr.)

Implementation Guidance for Districts and ATPs



Roundabout

■ Cost

- \$800,000 to \$1,000,000

■ Safety Benefit

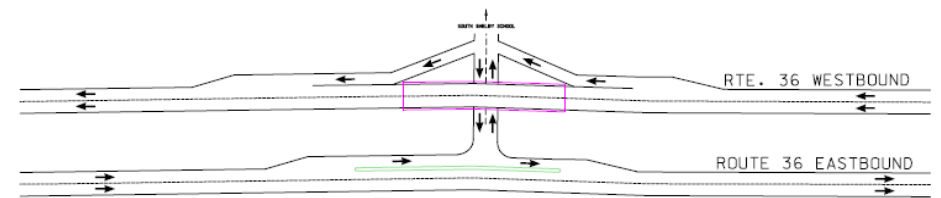
- Reduce all crashes by 38%
- Reduce injury crashes by 76%
- Reduce fatal and serious injury crashes by 90%



Indirect Turns & Partial T-Interchange

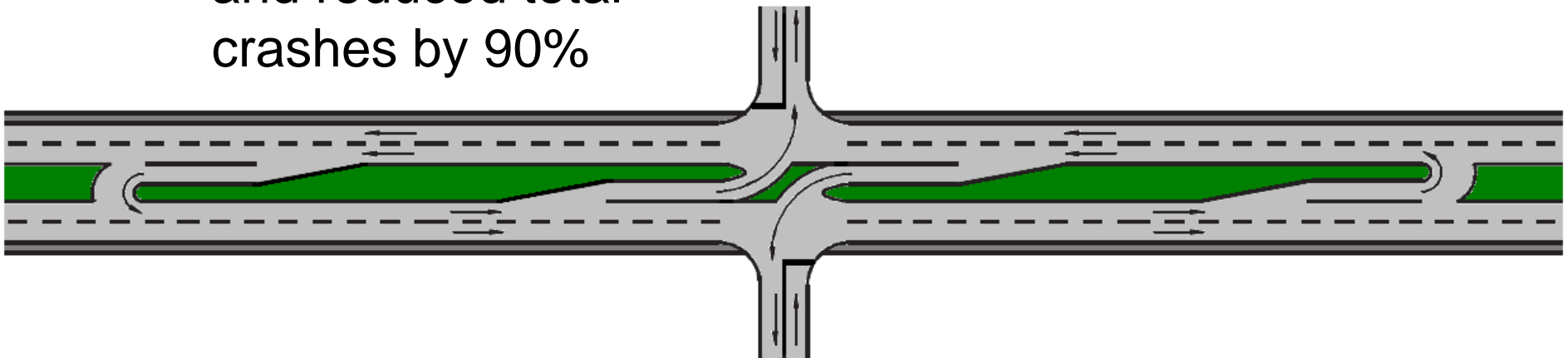
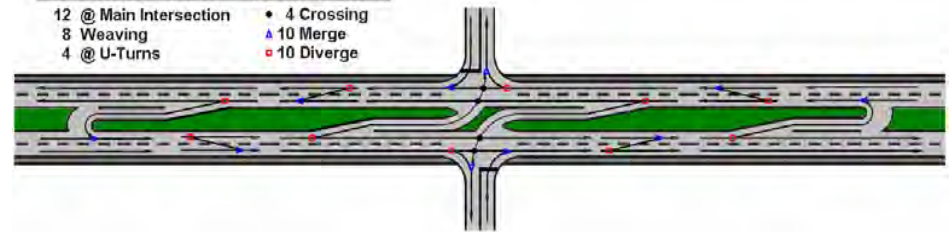
■ J-Turn or Superstreet

- Cost \approx \$500,000
- Safety Benefit: At a Maryland location, the J-Turn eliminated all crossing path crashes and reduced total crashes by 90%



24 Total J-Turn Conflict Points

- | | |
|------------------------|--------------|
| 12 @ Main Intersection | • 4 Crossing |
| 8 Weaving | ▲ 10 Merge |
| 4 @ U-Turns | ■ 10 Diverge |



Red Light Enforcement

- Red-Light Running Cameras
 - Cost \approx \$50,000 per intersection
 - Safety Benefit: Observed 40% reduction in violations; FHWA estimates a 15% reduction in crashes
- Confirmation Light
 - Need acceptance from the local traffic court to assure that the citations will be accepted
 - Safety Benefit: At a Florida intersection, three month evaluation found a 50% decrease in RLR violations and 11% crash decrease with 519 citations issued.



Street Lights

- Cost
 - Typically \$5,000 to \$30,000 per location
- Safety Benefit
 - Recent Minnesota Study of Rural Intersections
 - 27% reduction in nighttime collisions
 - 35% reduction in nighttime crash rates
 - 20% reduction in crash severity



Curb Extensions and Medians

■ Purpose

- Used to reduce vehicle speeds at pedestrian crossing locations or intersections.
- Reduce potential vehicle conflicts by reducing pedestrian crossing distance & time.
- Improves lines of sight.



Edge Treatments

■ Cost:

- From no cost (safety wedge) to several thousand dollars per mile for rumble strips/strips.

■ Safety Benefit:

- Shoulder rumble strips reduced single-vehicle run-off the road crashes by 20% - 50% on freeways.



Upgrade Roadside Hardware

■ General Cost Estimates:

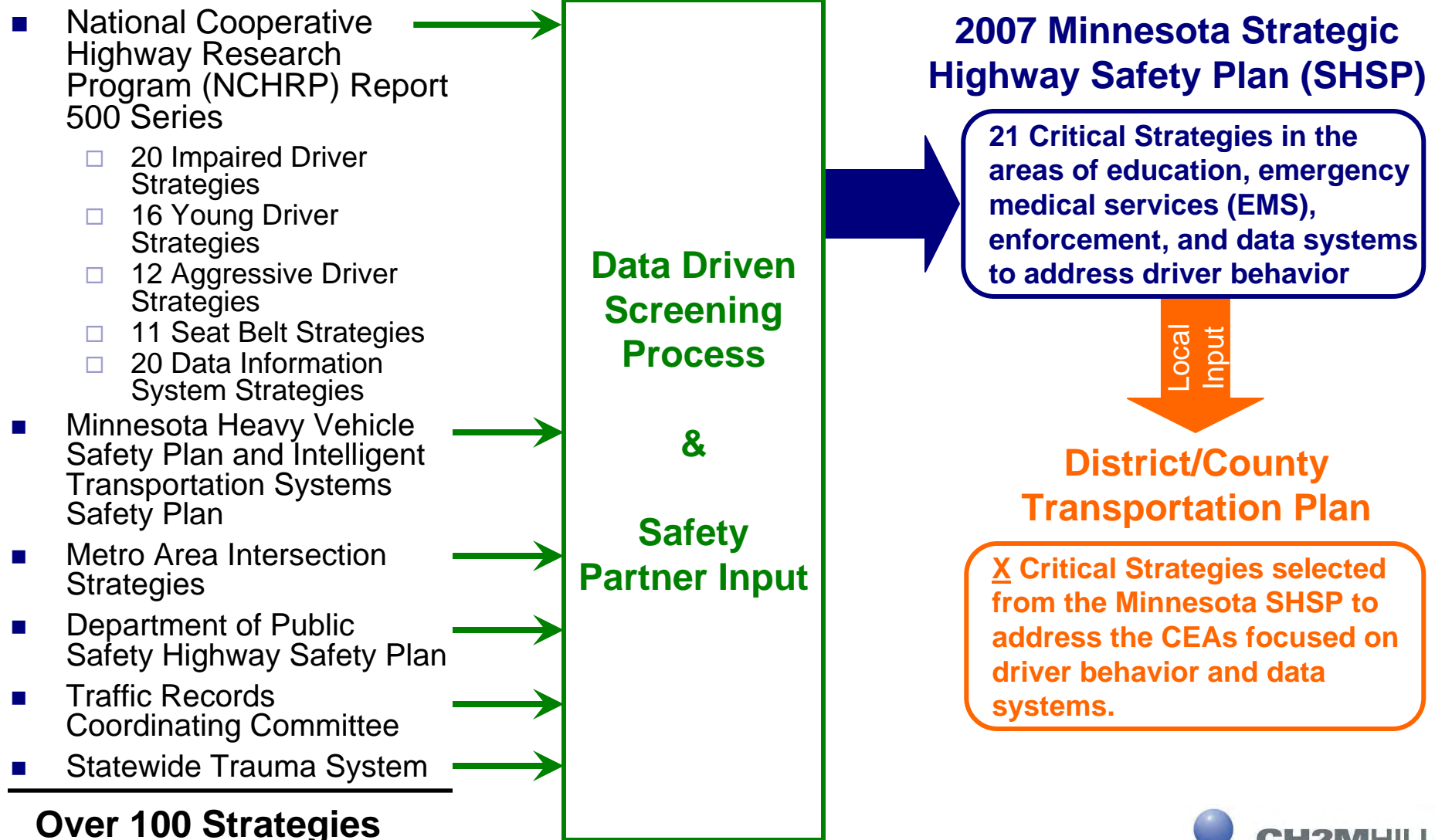
- Impact attenuator = \$20,000
- Guardrail terminal = \$1,500
- Guardrail transition = \$1,000
- W-Beam or Cable Guardrail = \$75,000 - \$100,000 per mile

■ Safety Benefit

- Using modern hardware can prevent a fatal or serious injury from occurring in collisions with guardrail.

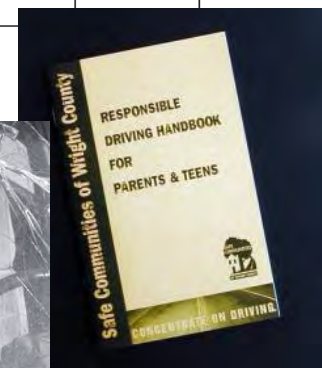


Driver Behavior and Data Systems Critical Emphasis Areas



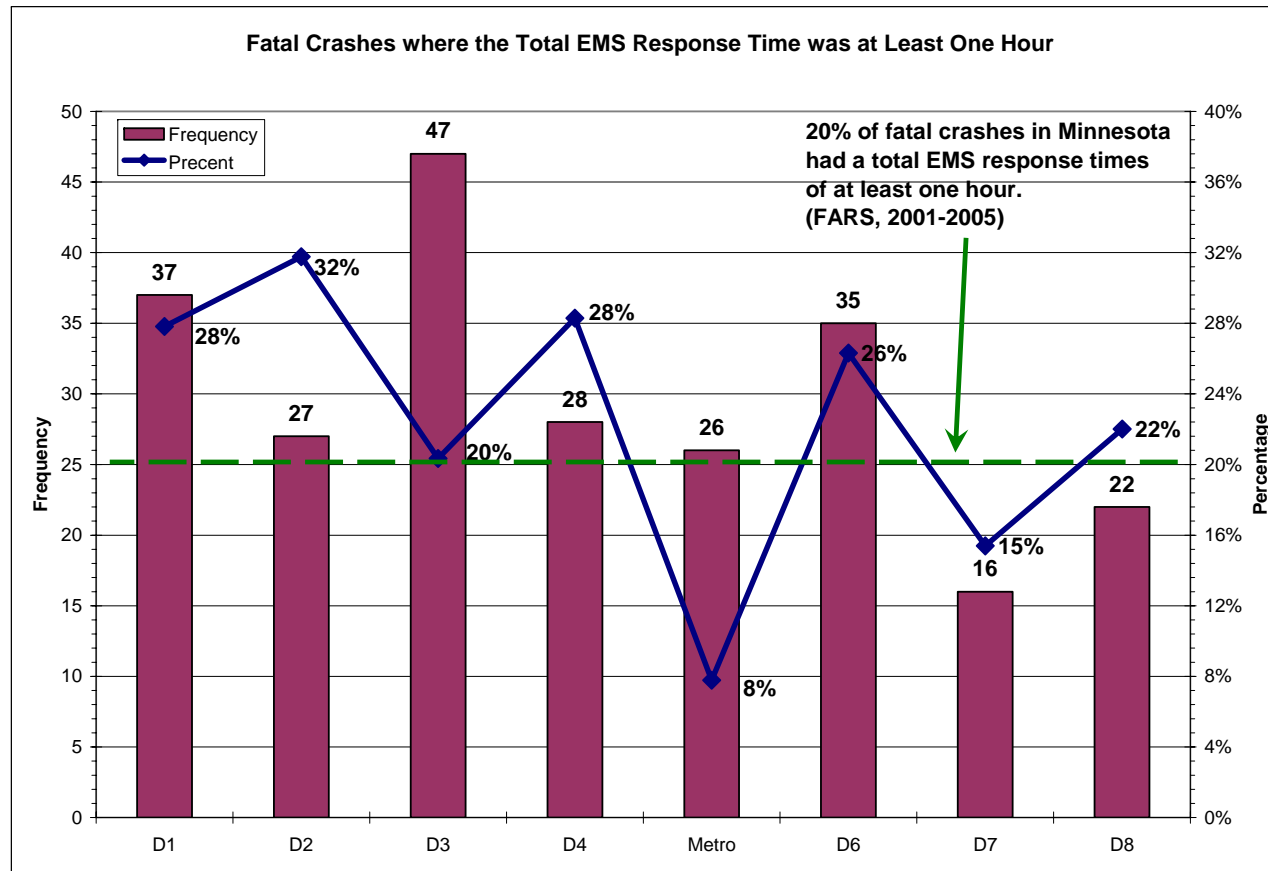
DRIVER BEHAVIOR AND DATA SYSTEMS CRITICAL EMPHASIS AREAS

Recommended High Priority Strategies	Data Systems and Driver Behavior Critical Emphasis Areas					
	Reducing Impaired Driving	Increasing Seat Belt Usage	Curbing Aggressive Driving	Addressing Young Driver Over Involvement	Keeping Drivers Alert	Utilizing Info. and Decision Support Systems
Education Strategies						
Encourage the enactment of a stronger graduated driver licensing system.				✓		
Utilize safe community coalitions to improve driver behavior, including impaired driving, crashes involving young drivers, using seat belts, aggressive drivers, and distracted drivers. <i>Note: Safe Communities of Wright County is an example safe community coalition that has been able to successfully address several of the leading contributing factors in fatal crashes.</i>	✓	✓	✓	✓	✓	
Enforcement Strategies						
Encourage the enactment of a statewide primary seat belt law that will permit standard enforcement and provide universal coverage to all vehicle occupants.		✓				
Participate in publicized saturations and targeted enforcement to deter impaired drivers and aggressive drivers, and increase seat belt use. Existing programs include (but are not limited to) Safe & Sober, NightCAP, and Highway Enforcement of Aggressive Traffic.	✓	✓	✓			
Data and Information System Strategies						
Lead the formation of a 4E Fatal Crash Review Committee that reviews each fatal crash to help identify patterns and contributing factors in fatal crashes so that cooperative and integrated solutions can be developed. <i>Note: New strategy, not in the Minnesota SHSP.</i>						✓



DRIVER BEHAVIOR AND DATA SYSTEMS CRITICAL EMPHASIS AREAS

Recommended High Priority Strategies	Data Systems and Driver Behavior Critical Emphasis Areas					
	Reducing Impaired Driving	Increasing Seat Belt Usage	Curbing Aggressive Driving	Addressing Young Driver Over Involvement	Keeping Drivers Alert	Utilizing Info. and Decision Support Systems
EMS Strategies						
Support the development of common location information and communication standards to assist emergency responders in quickly and efficiently locating crashes. <i>Note: For example, Mn/DOT's 511 system could be modified to add features that allow EMTs access to information and assistance on route selection to the crash scene and from the crash scene to the best hospital given the level of trauma.</i>	✓	✓	✓	✓	✓	✓
Equip all law enforcement vehicles with Automatic External Defibrillators.	✓	✓	✓	✓	✓	





Safety Investment Analysis



Effectiveness Spreadsheet

		Given Values				Input Values			Output Values						
CEA		Related Crashes		Effectiveness		Unit	Deployment	Interest Rate (R) = 3.6%	Service Life (Y)	Annual Crash Prevention		Initial Cost (11)	BC Ratio (12)	Champion	
		Fatal (1)	Serious Injury (2)	Fatal (3)	Serious Injury (4)					Fatalities (9)	Serious Injuries (10)				
Critical Strategy #1: Provide Adequate Law Enforcement Resources															
Increased Traffic Law Enforcement	1 & 3	381	1048	0.007	0.020	crash per 8-hour shift	0	8-hour shift	\$ 673	1	0.0	0.0	\$ -	0.0	DPS Anne Beers
Critical Strategy #2: Primary Seat Belt Law															
Enact Primary Seat Belt Law	1	275	642	17%	16%	of unbelted	0	law	\$ 50,000	20	0.0	0.0	\$ -	0.0	DPS Kathy Swanson
Critical Strategy #3: Implement Automated Enforcement															
Photo Speed Enforcement	3	148	406	0.1	0.3	crash per location	0	locations	\$ 50,000	5	0.0	0.0	\$ -	0.0	DPS Anne Beers
Red Light Running Cameras	3	32	362	15%	15%	of RLR crashes	0	intersections	\$ 50,000	5	0.0	0.0	\$ -	0.0	DPS Anne Beers
Critical Strategy #4: Stronger Graduated Licensing System															
Enact Stronger GDL	3	139	686	18%	30%	of related crashes	0	law	\$ 50,000	20	0.0	0.0	\$ -	0.0	DPS Pat McCormack
Critical Strategy #5: Cost Effective Lane Departure Improvement															
Install Centerline Rumble Strips	4	82	199	36%	36%	of Head-On	0	miles	\$ 1,000	10	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Install Edgeline Rumble Strips	4	231	523	20%	20%	of Run-Off Road	0	miles	\$ 2,000	10	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Enhance Pavement Markings by Using 6" Edgelines	4	231	523	10%	10%	mile	0	miles	\$ 150	1	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Enhance Delineation of Sharp Curves	4	83	190	0.009	0.011	crash per location	0	curves	\$ 1,000	1	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Install Median Barriers	4	17	23	90%	90%	of Across Median	0	miles	\$ 100,000	10	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Remove/locate Roadside Objects	4	119	246	25%	25%	of Run-Off Road & struck fixed object	0	miles	\$ 10,000	10	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Eliminate Shoulder Drop-Offs by Paving Shoulders	4	231	523	25%	25%	of Run-Off Road	0	miles	\$ 100,000	10	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Delineate Roadside Objects	4	119	246	1%	1%	of Run-Off Road & struck fixed object	0	miles	\$ 500	5	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Critical Strategy #6: Communications and Marketing Task Force															
Create a communications & marketing task force	5	590	2226	0.03%	0.03%	of related crashes	0	program	\$ 50,000	1	0.0	0.0	\$ -	0.0	DPS Kathy Swanson
Public Education and Advertisement Campaigns	5	590	2226	0.15%	0.15%	of related crashes	0	campaign	\$ 500,000	1	0.0	0.0	\$ -	0.0	DPS Kathy Swanson
Critical Strategy #7: High-level Traffic Safety Panel															
High-level Traffic Safety Panel	5	590	2226	0.03%	0.03%	of related crashes	0	committee	\$ 50,000	1	0.0	0.0	\$ -	0.0	DPS Kathy Swanson
Critical Strategy #8: Cost Effective Intersection Improvements															
Enhance Traffic Control Devices (larger or brighter signs, supplementary messages on approach, or double yellow lines on approaches / median openings)	2	101	463	15%	15%	of right angle crashes	0	intersections	\$ 5,000	15	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Clearing Sight Triangles (remove parking and roadside objects)	2	101	463	15%	15%	of right angle crashes	0	intersections	\$ 5,000	10	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Install Street Lighting	2	40	75	25%	25%	of intersection at night	0	intersections	\$ 5,000	10	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Acceleration Lanes	2	25	116	20%	20%	of right angle crashes	0	intersections	\$ 50,000	10	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Offset and Longer Turn Lanes	2	7	112	20%	20%	of rear end crashes	0	intersections	\$ 50,000	10	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Critical Strategy #9: Roadway Maintenance															
Winter Weather Maintenance	4	61	127	0.004	0.007	crash per 8-hour shift	0	8-hour shift	\$ 480	1	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Roadway and Shoulder Maintenance	4	231	523	15%	15%	of Run-Off Road	0	miles	\$ 5,000	5	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Improve Roadside Hardware	4	24	26	50%	50%	of Run-Off Road & struck guardrail	0	miles	\$ 25,000	10	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Critical Strategy #10: Support the Enforcement of Traffic Safety Laws															
Work with Courts to Prevent Reduced/Dismissed Traffic Law Charges	1 & 3	147	556	0.9	3.4	crash per district	0	court district	\$ 150,000	1	0.0	0.0	\$ -	0.0	DPS Kathy Swanson
Critical Strategy #11: Targeted Enforcement															
Targeted Impaired Driving Campaign	1	211	477	0.9	2.0	crash per campaign	0	campaign (50 saturation patrols)	\$ 200,000	1	0.0	0.0	\$ -	0.0	DPS Kathy Swanson
Statewide Seat Belt Campaign	1	275	642	3.7	8.6	crash per campaign	0	campaign	\$ 750,000	1	0.0	0.0	\$ -	0.0	DPS Kathy Swanson
Statewide Speed Enforcement Campaign	3	148	406	0.9	2.5	crash per campaign	0	campaign	\$ 750,000	1	0.0	0.0	\$ -	0.0	DPS Kathy Swanson
Critical Strategy #12: Enhance Driver Education															
Enhance Driver Education Instructors, Training Material, and Behind the Wheel Experience	3	139	686	0.03%	0.50%	of related crashes	0	program	\$ 1,500,000	20	0.0	0.0	\$ -	0.0	DPS Pat McCormack
Critical Strategy #13: Road Safety Audits															
Perform Network Road Safety Audits	2 & 4	590	2226	0.2	0.7	crash per RSA	0	RSA	\$ 25,000	1	0.0	0.0	\$ -	0.0	Mn/DOT Bernie Arseneau
Critical Strategy #14: Improve Data Systems															
Oversight Committee	5	590	2226	0.03%	0.03%	of crashes	0	committee	\$ 50,000	1	0.0	0.0	\$ -	0.0	DPS Pat McCormack & Kathy Swanson
Upgrade the Accident Records System	5	590	2226	0.03%	0.03%	of crashes	0	program	\$ 920,000	5	0.0	0.0	\$ -	0.0	DPS Pat McCormack & Kathy Swanson
Critical Strategy #15: Trauma System															
Implement a Statewide Trauma System	5	590	2226	9%	9%	of fatalities	0	trauma system	\$ 550,000	1	0.0	0.0	\$ -	0.0	Health Tim Held
										Total =	0	0	\$ -	0.0	
1=Impaired/Seat Belt 2=Intersections 3=Young/Aggressive 4=Lane Departure 5=Awareness/Data															

Best Practices – Safety Investment Strategies

- Dedicate a part of your Capital Improvement Plan to low-cost safety strategies.
- Focus your infrastructure-based safety investments on a limited number of strategies that are:
 - ☐ Proven
 - ☐ Relatively Inexpensive
 - ☐ Can be Widely Deployed
 - ☐ Proven Effective
 - ☐ Address High Frequency of Crashes
 - ☐ In Greater Minnesota – focus should be on Road Departure Crashes.
 - ☐ In Metro – focus should be on Intersections.

Best Practices – Safety Investment Strategies

- A comprehensive safety program includes a Reactive and a Proactive component – determine the right balance for your system.
 - In Greater Minnesota – focus should be on Proactive because of very low crash densities.
 - In Metro – focus should be on Reactive because of much higher crash densities.
- Find ways to build partnerships with law enforcement and safety education

Conclusions

■ Out State Districts

- Establish a goal to spend at least 70% of the safety investment on low-cost proactive strategies.
- Invest in rural roads (90% of the fatalities occur on roads classified as rural)
- Invest in two-lane facilities (67% of the fatalities).
- Invest in low-cost and proven strategies that can be widely deployed across the system.
- Develop a process to aid implementation of safety projects on the local road system.
- Focus investments in improving the edges of roadways (paved shoulders, safety wedge, rumble strips/stripes).
- Build partnerships with law enforcement to address alcohol-related, speeding-related and unbelted vehicle occupant fatalities and injuries.

■ Metro District

- Establish a goal to spend 70% of the safety investment on reactive strategies at identified high crash locations.
- Invest in freeway and multi-lane facilities (70% of the fatalities).
- Continue investing in safety projects on the local road system.
- Focus investments in road edges and median barriers on freeway facilities and intersection improvements on multi-lane arterials.
- Build partnerships with law enforcement to address serious crashes related to speeding and red-light running.