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 SUBJECT: Before/After Crash Data for Roundabouts on the State System

Before/after crash data was compiled for roundabouts on the state system. Table 1 summarizes the crash data and more detailed info is on the next pages.

Table 1 - Before/After Crash Data for Roundabouts on the State System										
Location	Year Round-about Installed	BEFORE Roundabout				AFTER Roundabout				
		# Yrs Crash Data	Average Crash Rate Per MEV	Total Crashes Per Yr	K+A Crashes Per Yr	# Yrs Crash Data	Average Crash Rate Per MEV	Total Crashes Per Yr	K+A Crashes Per Yr	
Killdeer ND 22 & ND 200	2012	4	1.68	3.50	0.25	10.5	0.35 79% ↓	1.05 70% ↓	0.00 ↓	
ND 200 & NW Bypass (west of Killdeer)**	2015	5	0.47*	0.60	0.00	7.5	0.34* 28% ↓	0.40 33% ↓	0.13 ↑	
ND 22 & NW Bypass (north of Killdeer)	2015	No intersection before.				7.5	3.17*	2.67	0.00	
ND 58 & ND 200 (east of Fairview MT)	2015	5	1.54	4.20	0.20	7.5	1.63 6% ↑	2.67 37% ↓	0.40 ↑	
ND 23 & ND 73 (Johnsons Corner)	2015	5	1.56	3.80	0.20	7.5	1.29 17% ↓	2.53 33% ↓	0.00 ↓	
Carrington US 52 / US 281 / ND 200	2016	5	1.00	2.60	0.20	6.5	0.41 59% ↓	1.08 59% ↓	0.00 ↓	
Keene Corner (ND 23 RP 28.4)	2016	5	1.50	3.20	0.60	6.5	1.38 8% ↓	2.15 33% ↓	0.15 ↓	
Watford City 6th Ave SE & 12th St SE	2017	5	1.43	4.00	0.60	5.5	0.44 69% ↓	0.55 86% ↓	0.00 ↓	
Bismarck Washington St & ND 1804	2019	5	0.71	1.20	0.00	3.5	0.14 80% ↓	0.29 76% ↓	0.00 ↓	
Fargo Main Ave & 2nd St	2019	5	0.78	8.00	0.40	3.5	0.82 5% ↑	7.14 11% ↓	0.00 ↓	
Mandan Collins Ave & Old Red Trail	2021	5	0.39	1.60	0.00	1.5	0.81 108% ↑	2.67 67% ↑	0.67 ↑	
Beulah ND 49 & ND 200	2021	5	1.21	2.60	0.60	1.5	0.64 47% ↓	1.33 49% ↓	0.00 ↓	
Totals		Avg =	1.18	3.21	0.28	Avg =	0.79 33% ↓	2.04 36% ↓	0.11 59% ↓	

Notes:
 -Crash data was excluded for the entire calendar year that the roundabout was constructed.
 -MEV = 1,000,000 entering vehicles.
 -K+A Crashes = crashes with a severity of fatal or incapacitating injury.
 *Don't compare this crash rate to other intersections. Due to lack of volume data, the rate was calculated using only one leg of volume data. These crash rates were excluded from the AVERAGE calculation towards the bottom of the table.
 **The roundabout and the NW Bypass were constructed in the same year. Prior to the roundabout, the N/S road was a section line road (not a bypass).

When combining all locations; after roundabouts were installed:
 -the crash rate reduced by 33%
 -Total crashes per year reduced by 36%
 -K+A crashes per year reduced by 59% *K+A = fatal and incapacitating injury crashes

In 2023, PCN 23529 installed large green guide signs on approaches to state system roundabouts. Crash data was only pulled through 6/30/2023, so the new signs likely did not impact crash data results.

Mandan Collins Ave & Old Red Trail Roundabout Installed in 2021				Crash Severity									
Year	Start Date	End Date	K	A	B	C	O	Totals	Total Crashes Per Yr	Traffic Entering Intersection (veh/day)	Crash Rate per MEV	Avg Crash Rate Per MEV	
			Before RAB*	1	1/1/2016	12/31/2016					1	1.60	10,098
2	1/1/2017	12/31/2017					2	10,098	0.54				
3	1/1/2018	12/31/2018				1	1	2	11,233	0.49			
4	1/1/2019	12/31/2019					3	3	12,478	0.66			
5	1/1/2020	12/31/2020						0	12,478	0.00			
*All-Way Stop prior to being a roundabout.							1	7	8				
After RAB	1	1/1/2022	12/31/2022				2	2	2.67	10,250	0.53	0.81	
	2	1/1/2023	6/30/2023*	1			1	2		10,250	1.08		
				*partial year	1		3	4	67%			108%	

Mandan Collins Ave & Old Red Trail

The previous page showed large crash increases after installing a roundabout at Mandan Collins Ave & Old Red Trail. However, the intersection-specific table above shows that **both** the before and after time periods have a mode (most frequent value) of 2 crashes per year.

The statistical percentages are likely distorted due to three reasons:

- an overall low number of crashes at the intersection
- a relatively short AFTER time period (only 1.5yrs)
- lower traffic volumes in the AFTER time period.

Location	BEFORE Roundabout							AFTER Roundabout						
	Manner of Collision							Manner of Collision						
	Angle	Rear End	Left Turn	Sideswipe Same Dir.	Ped/ Bike	Single Veh	Other	Angle	Rear End	Left Turn	Sideswipe Same Dir.	Ped/ Bike	Single Veh	Other
Killdeer ND 22 & ND 200	7	4	0	2	0	1	0	0	0	0	0	0	11	0
ND 200 & NW Bypass (west of Killdeer)	1	1	0	0	0	1	0	0	0	0	0	0	3	0
ND 22 & NW Bypass (north of Killdeer)	No intersection prior to the roundabout being installed.							1	1	0	1	0	16	1
ND 58 & ND 200 (east of Fairview MT)	5	12	3	0	0	0	1	1	3	0	0	0	16	0
ND 23 & ND 73 (Johnsons Corner)	10	4	1	2	0	2	0	1	4	0	4	0	10	0
Carrington US 52 / US 281 / ND 200	6	1	1	4	0	0	1	0	1	0	0	0	6	0
Keene Corner (ND 23 RP 28.4)	6	0	2	0	0	4	4	0	0	0	0	0	13	1
Watford City 6th Ave SE & 12th St SE	4	4	1	1	0	4	6	0	2	0	0	0	1	0
Bismarck Washington St & ND 1804	1	3	1	0	0	0	1	0	0	0	1	0	0	0
Fargo Main Ave & 2nd St	3	22	6	4	0	3	2	15	3	0	2	0	5	0
Mandan Collins Ave & Old Red Trail	2	5	0	0	0	0	1	3	0	0	0	1	0	0
Beulah ND 49 & ND 200	12	1	0	0	0	0	0	1	0	0	0	0	1	0
Totals	57	57	15	13	0	15	16	22	14	0	8	1	82	2
	33%	33%	9%	8%	0%	9%	9%	17%	11%	0%	6%	1%	64%	2%
Difference compared to the BEFORE time period =								16%	22%	9%	2%	1%	55%	7%
								↓	↓	↓	↓	↑	↑	↓

Comparing Manner of Collision

-The proportion of Rear End crashes reduced by 22% (33% before, 11% after).

-The proportion of Angle crashes reduced by 16% (33% before, 17% after).

*Prior to installing roundabouts, Angle crashes were more of a T-bone (right angle) crash. After installing roundabouts, Angle crashes are more of a *merging* crash between a vehicle entering the roundabout and a vehicle already circulating within the roundabout.

*After installing roundabouts, most Angle crashes occurred at Fargo Main Ave & 2nd St (15 Angle crashes). However, those have been decreasing each year (2020=7, 2021=5, 2022=3, 2023 thru 6/30 = zero crashes).

-The proportion of Single Vehicle crashes **increased** by 55% (9% before, 64% after).

After installing roundabouts, Single Vehicle crashes involved:

- *28% Overturning or Shifting Load when circulating within the roundabout.
- *21% Approaching the roundabout and going straight into the center island.
- *15% Losing control when approaching the roundabout and going into the near right corner (hitting a sign / light pole or going into the ditch).
- *12% Losing control while navigating the roundabout and going into the far right corner (hitting a sign / light pole or going into the ditch).
- *9% Approaching the roundabout and hitting the median splitter island curb.
- *15% Other miscellaneous events.

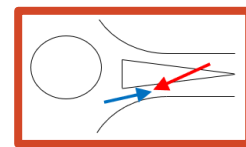
Location	BEFORE Roundabout					AFTER Roundabout				
	Crash Severity					Crash Severity				
	K	A	B	C	O	K	A	B	C	O
Killdeer ND 22 & ND 200	0	1	1	0	12	0	0	4	0	7
ND 200 & NW Bypass (west of Killdeer)	0	0	0	0	3	0	1	0	0	2
ND 22 & NW Bypass (north of Killdeer)	N/A					0	0	0	1	19
ND 58 & ND 200 (east of Fairview MT)	1	0	5	3	12	0	3	4	1	12
ND 23 & ND 73 (Johnsons Corner)	1	0	7	4	7	0	0	1	1	17
Carrington US 52 / US 281 / ND 200	0	1	0	2	10	0	0	1	0	6
Keene Corner (ND 23 RP 28.4)	2	1	1	3	9	1	0	3	1	9
Watford City 6th Ave SE & 12th St SE	0	3	2	2	13	0	0	0	0	3
Bismarck Washington St & ND 1804	0	0	2	1	3	0	0	0	0	1
Fargo Main Ave & 2nd St	0	2	1	10	27	0	0	3	4	18
Mandan Collins Ave & Old Red Trail	0	0	0	1	7	0	1	0	0	3
Beulah ND 49 & ND 200	1	2	1	4	5	0	0	0	0	2
Totals	5 3%	10 6%	20 12%	30 17%	108 62%	1 1%	5 4%	16 12%	8 6%	99 77%
Difference compared to the BEFORE time period =						2% ↓	2% ↓	0% ---	11% ↓	15% ↑

K=Fatal. A=Incapacitating Injury. B=Non-Incapacitating Injury. C=Possible Injury. O=Property Damage Only.

Crash Severity

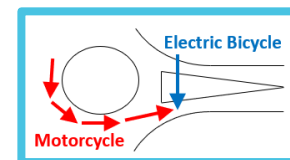
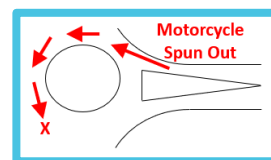
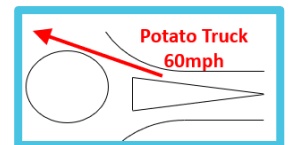
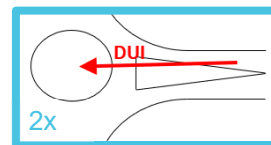
The proportion of property-damage-only crashes increased by 15% (62% before, 77% after). This is a good thing as property-damage-only is the least severe category.

There was 1 fatal crash reported at a roundabout. It involved a vehicle that was approaching a roundabout, crossed the median splitter island, and hit another vehicle head on.



There were 5 incapacitating injury crashes at roundabouts:

- Two involved DUI drivers who went straight into the center island.
- One involved a potato truck that entered at ~60mph and went into the far right corner.
- One involved a motorcycle that was about to exit a roundabout, accelerated rapidly, lost control, and spun out.
- One involved a motorcycle that hit an electric bicycle (in crosswalk).



Location	BEFORE Roundabout			AFTER Roundabout		
	Surface Condition			Surface Condition		
	Dry	Wet	Ice/Snow	Dry	Wet	Ice/Snow
Killdeer ND 22 & ND 200	9	2	3	7	0	4
ND 200 & NW Bypass (west of Killdeer)	2	0	1	2	0	1
ND 22 & NW Bypass (north of Killdeer)	N/A			12	2	6
ND 58 & ND 200 (east of Fairview MT)	17	1	3	9	1	10
ND 23 & ND 73 (Johnsons Corner)	15	0	4	13	0	6
Carrington US 52 / US 281 / ND 200	11	2	0	5	1	1
Keene Corner (ND 23 RP 28.4)	11	0	5	13	0	1
Watford City 6th Ave SE & 12th St SE	16	0	4	1	1	1
Bismarck Washington St & ND 1804	4	0	2	1	0	0
Fargo Main Ave & 2nd St	19	2	19	17	4	4
Mandan Collins Ave & Old Red Trail	6	0	2	2	0	2
Beulah ND 49 & ND 200	11	1	1	2	0	0
Totals	121	8	44	84	9	36
	70%	5%	25%	65%	7%	28%
Difference compared to the BEFORE time period =				5%	2%	3%
				↓	↑	↑

Surface Conditions

There were no significant before/after differences related to surface conditions.