

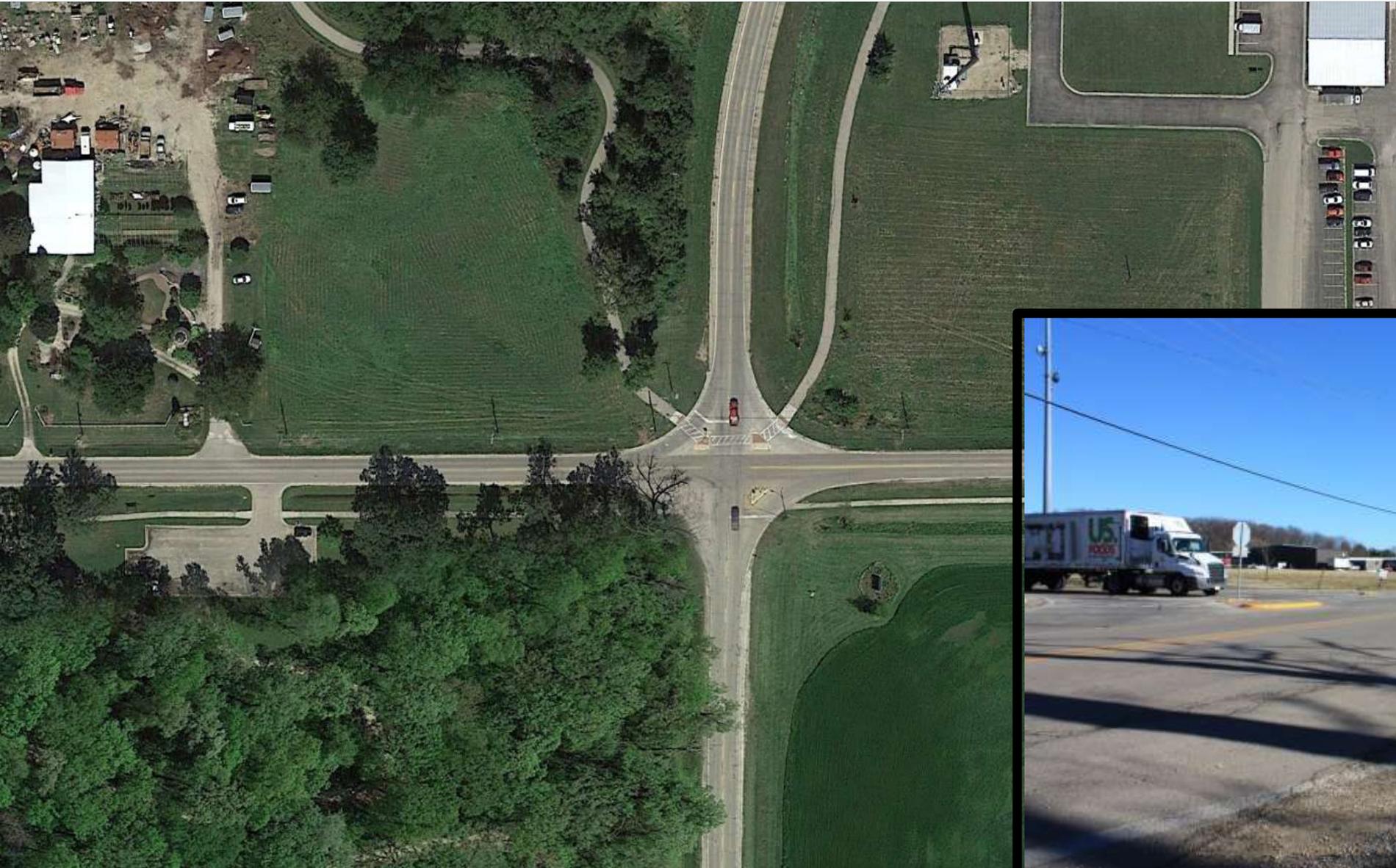


Lynn Boulevard /
LeFevre Road Roundabout

Public Informational Meeting

January 7, 2019

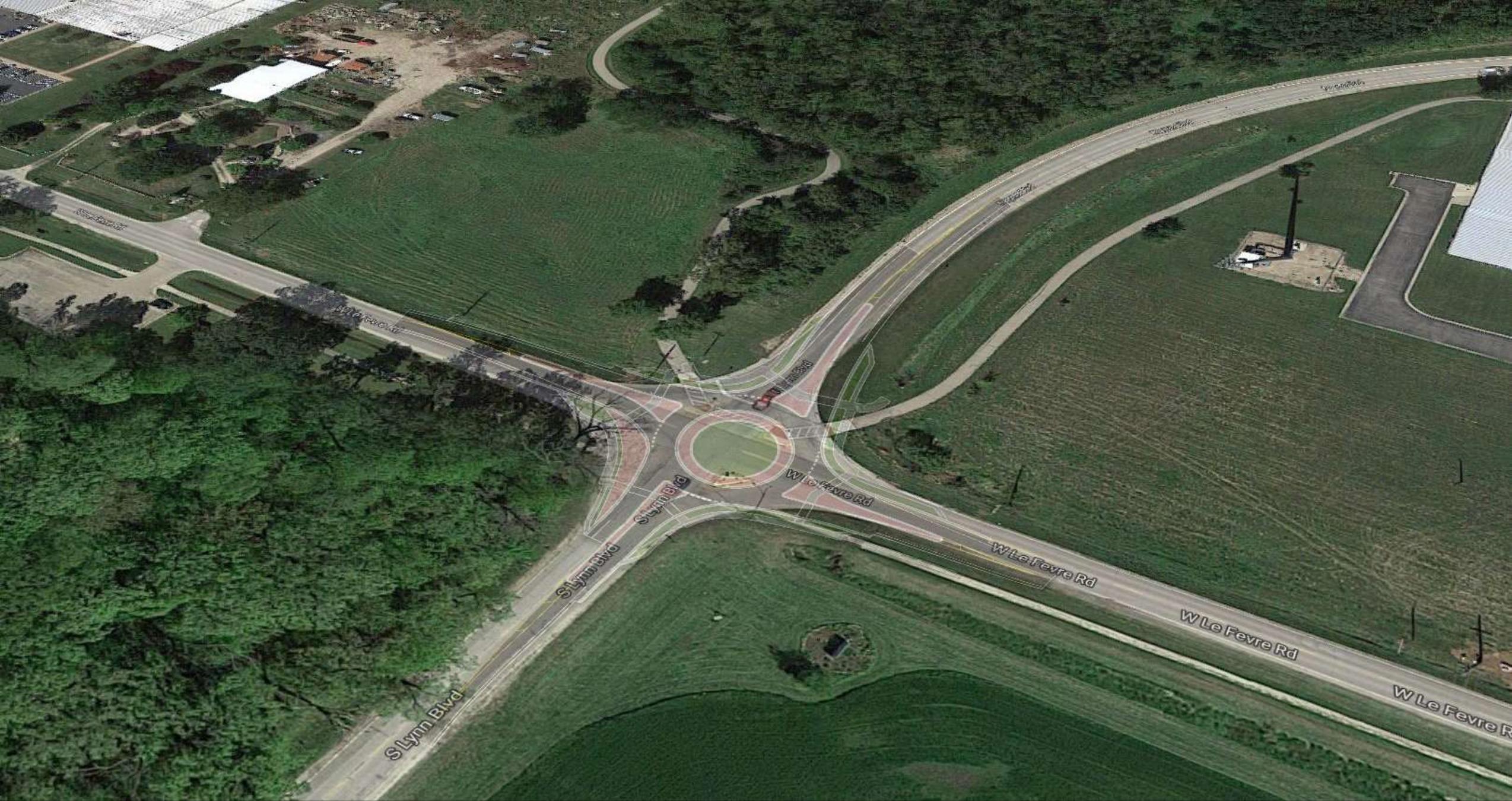
LeFevre Road and Lynn Boulevard



Project History

- April 2017 - Traffic Study
- January 2018 – City Council Approval of Roundabout
- September 2018 – Preliminary Design
- Summer 2019 - Construction





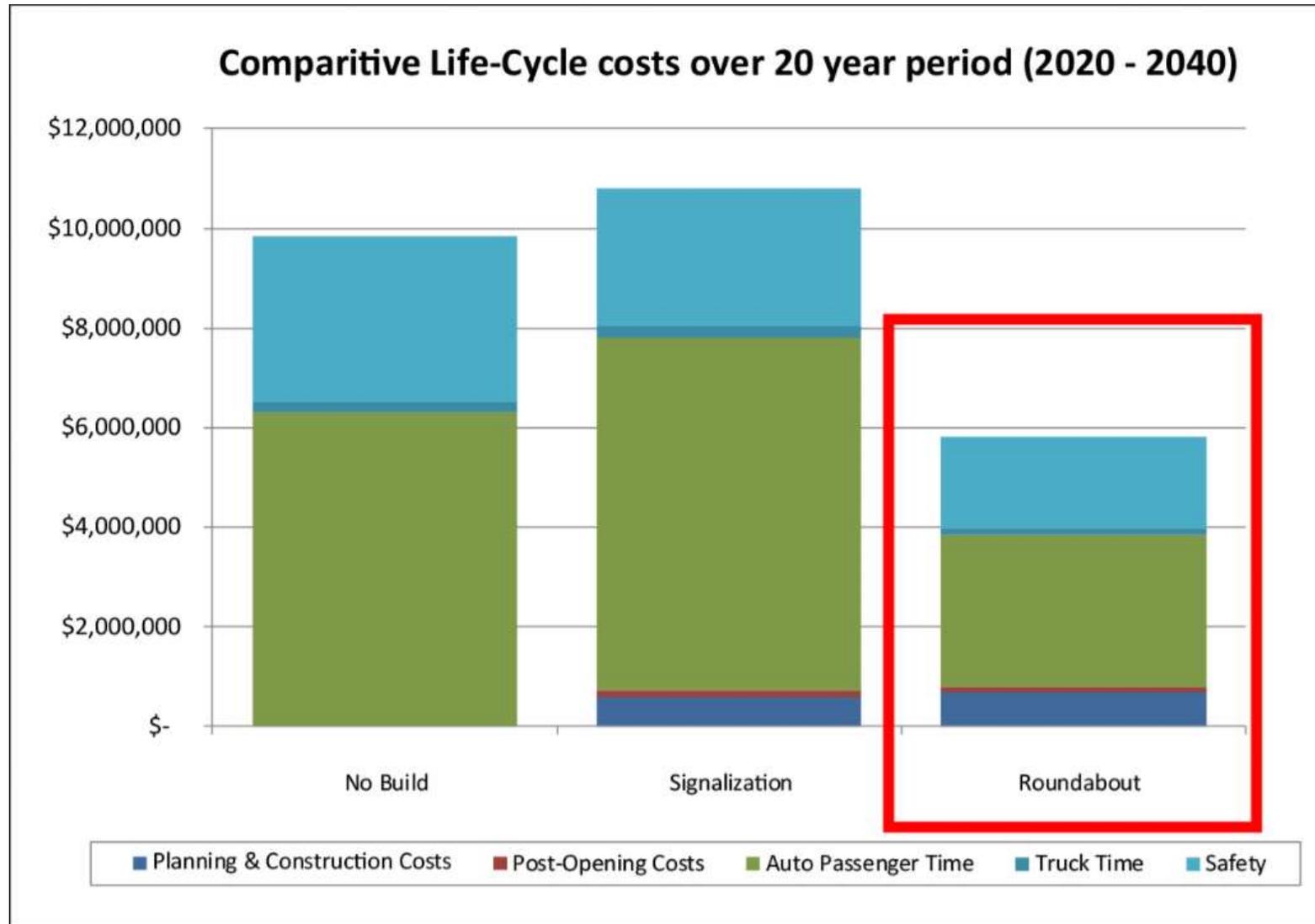
Why a Roundabout?

Intersection Design Study – Lynn Boulevard / West LeFevre Road

	No Build	Signalization	Roundabout
2040 Level of Service / Delay	3+ minutes	13.4 seconds	8.4 seconds
Safety (% Crash Reduction)	0%	17%	56%
Capital Cost	\$0	\$595,960	\$703,200
Maintenance Costs (20 years)	\$65,000	\$168,000	\$126,000
Impacts - Acquisition Acreage	0 acre	+/- 0.1 acre	+/- 0.2 acre

- Vehicle Operations
- Truck Accommodation
- Safety
- Construction Cost
- Maintenance

Why a Roundabout?



A Modern Roundabout is:

- Simple for Drivers
- Simple for Pedestrians
- Low Maintenance
- Safest treatment for high-speed intersections



Yield Control



**Vehicles yield upon entry
in a modern roundabout.**

Central Island

Central island deflects vehicles from a straight-line path.



Increase in Traffic at Lynn Boulevard/LeFevre Road

- Base Year Traffic Counts (March 2017)
- Traffic Increase projected to year 2040
- Warehouse and Office trips added for growth of surrounding area
- 2040 Traffic volumes expected to be 65% greater than 2017 counts

LeFevre Road and Lynn Boulevard – Traffic Operations

- Traffic Signal
 - Eight-hour and four-hour warrants are not met
 - Only meets traffic signal warrants for peak hour
- All-Way Stop
 - Meets safety criteria for AWSC – (> 5 crashes/yr)

Control	LOS in 2040
Existing 2 way Stop	F
All-Way Stop	F
Signal	B
Roundabout	A

LeFevre Road and Lynn Boulevard - Crash History

Table 1: Crash History for Lynn Boulevard at West LeFevre Road 10/1/2013 – 10/1/2018

	Total	2013*	2014	2015	2016	2017	2018*
Total Crashes	24	2	2	5	5	3	7
Injury Crashes	6	1	1	2	1	1	0
Fatal Crashes	0	0	0	0	0	0	0
Rear End	9	0	1	2	2	0	4
Angle	14	2	1	3	3	2	3
Sideswipe	0	0	0	0	0	0	0
Head-on	0	0	0	0	0	0	0
Other	1	0	0	0	0	1	0

**partial calendar year*

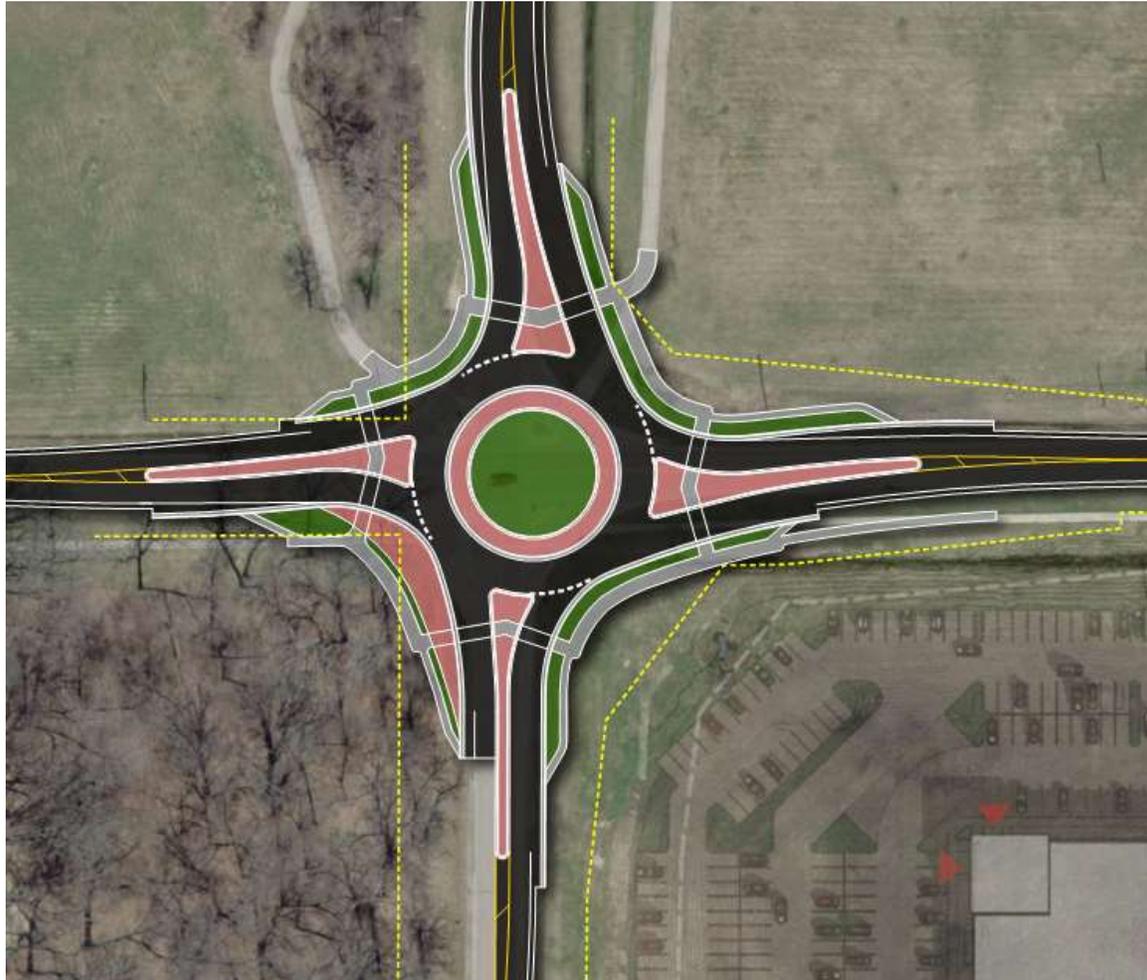
Safety Performance of Intersections Converted to Roundabouts

Reduction in All Crashes	Reduction in Injury Crashes
35%	76%

- Single lane roundabouts saw a larger decrease in total crashes than multi-lane roundabouts.
- Fatal crashes are extremely rare at roundabouts.

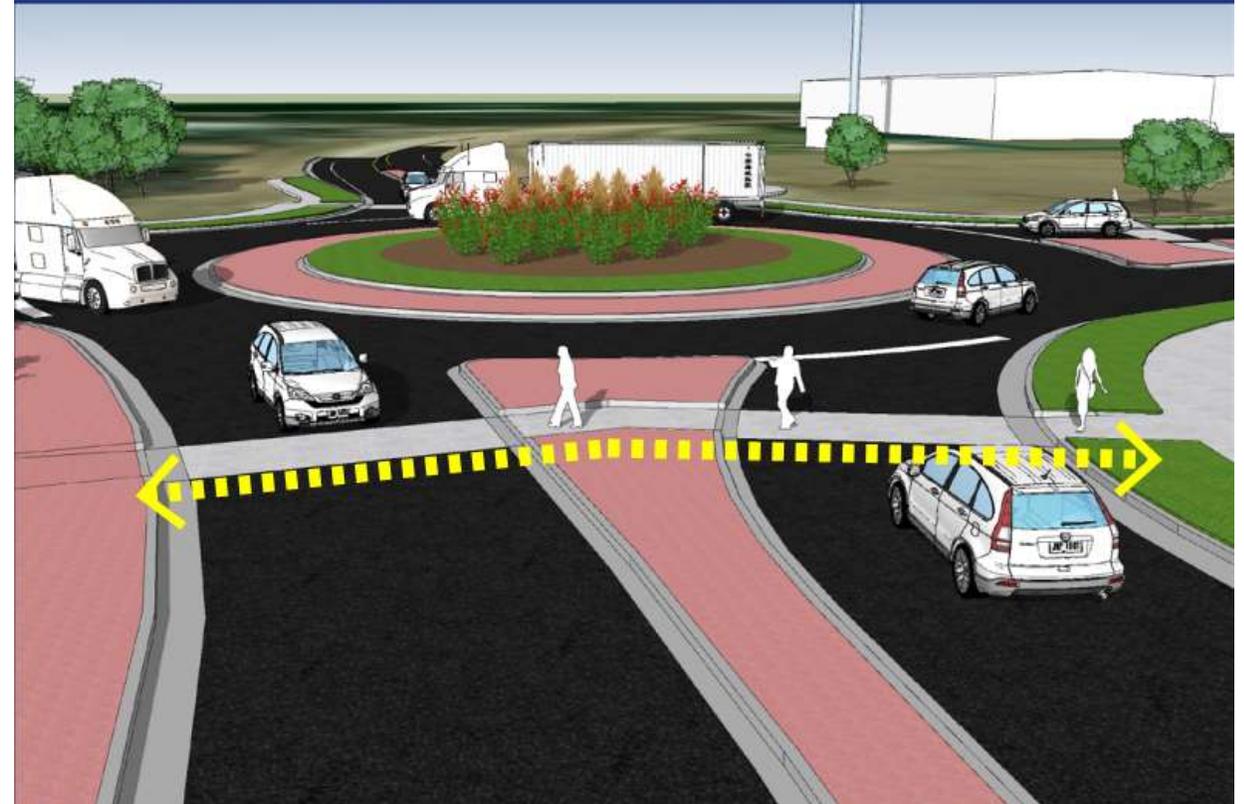
Source: National Cooperative Highway Research Program Report 572

Pedestrian Accommodations

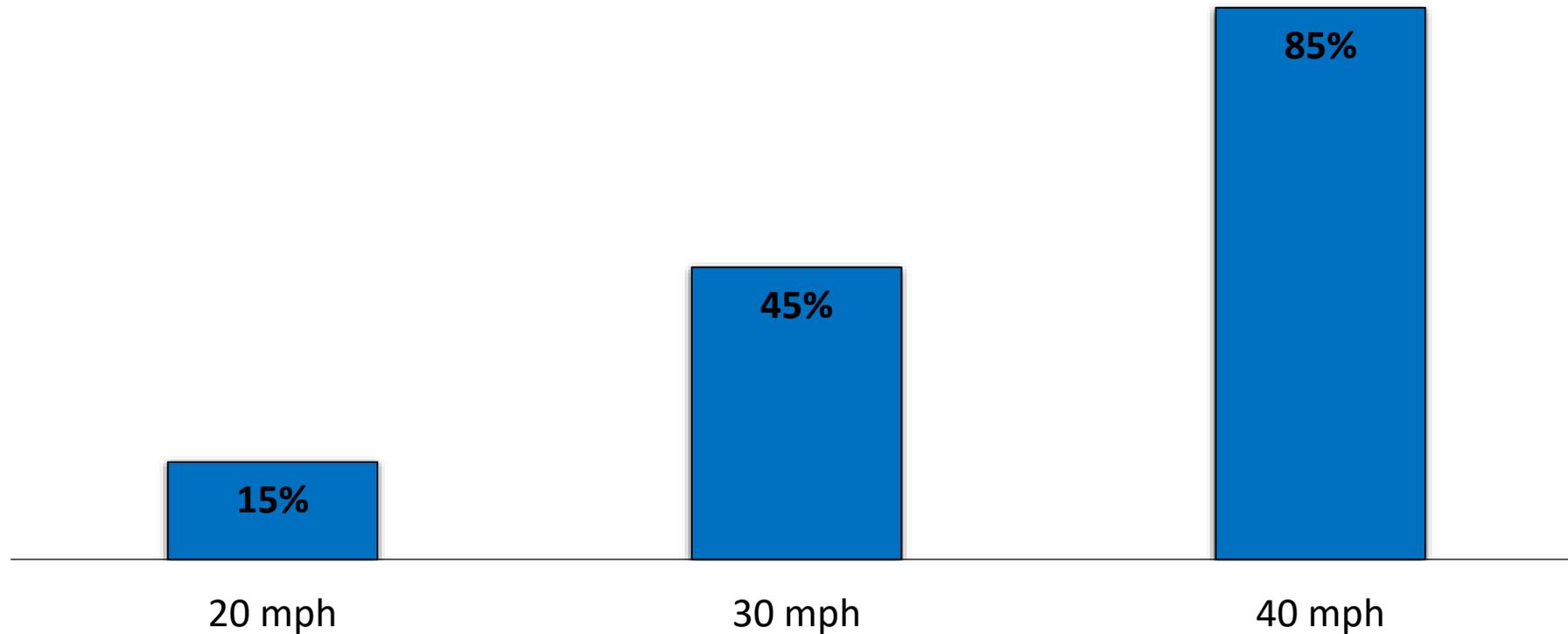


PEDESTRIAN SAFETY BENEFITS

The splitter-island refuge allows a pedestrian to cross entering and existing traffic flows separately, thus making the task of crossing the roadway simpler and safer. The pedestrian also has fewer conflict points compared to a traditional intersection.



Pedestrian Injury Probability



Pedestrian's chances of death if hit by a motor vehicle

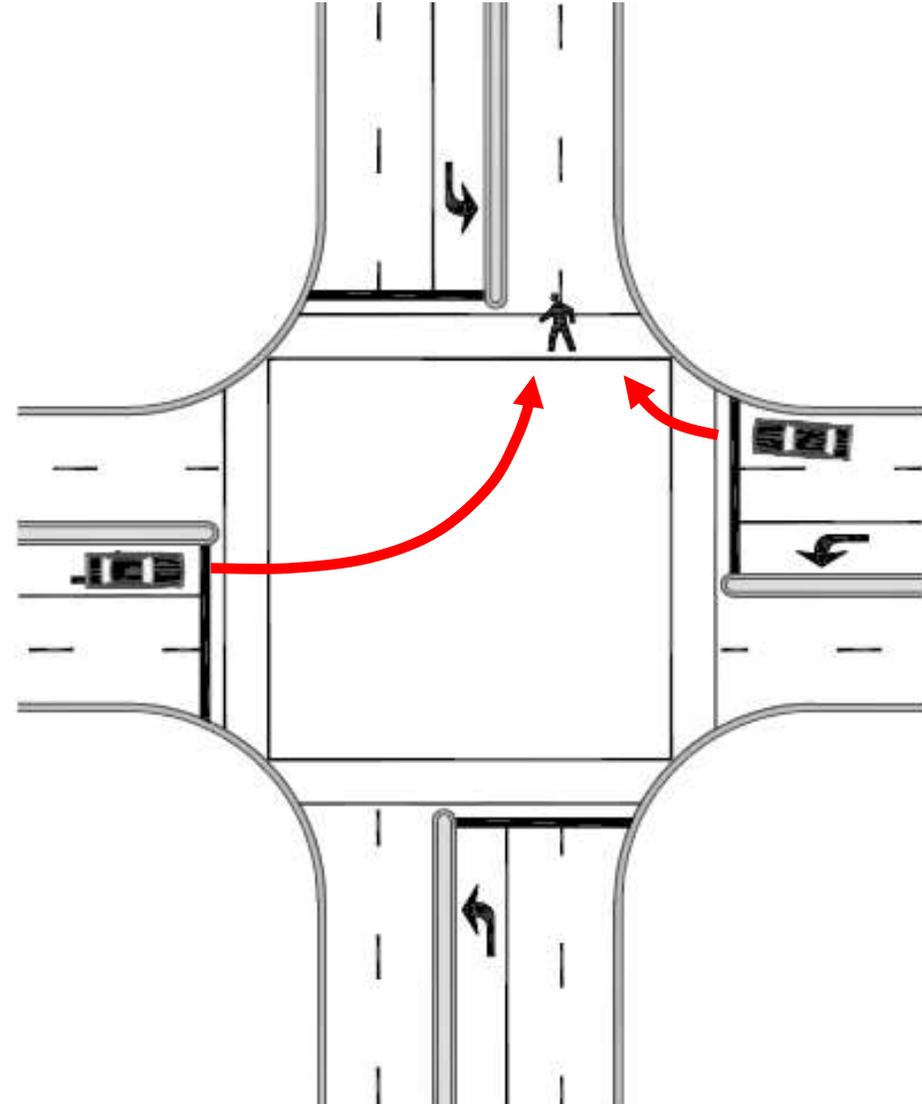
Source: Oregon Department of Transportation and Department of Transport (United Kingdom)

Existing Pedestrian Crossings



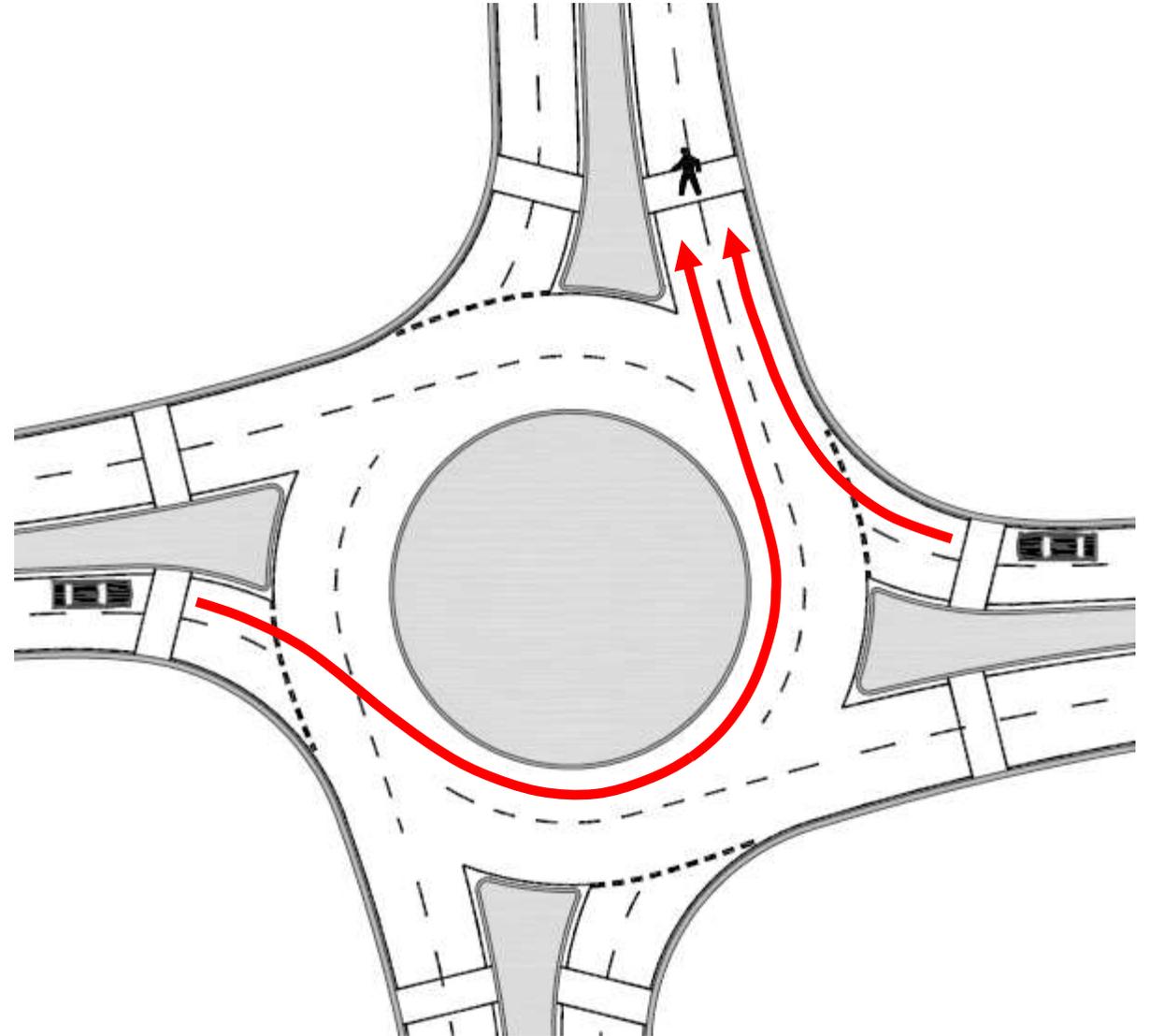
Safety vs. Security at Signalized Intersections

- Pedestrian experiences an exaggerated level of security because the signals tell them it's safe to cross
- Most crashes occur when drivers turn left or right across the crosswalk while the pedestrian has a Walk indication



Safety vs. Security at Roundabouts

- Pedestrian feeling of security more closely matches their actual level of safety



Trucks at Roundabouts

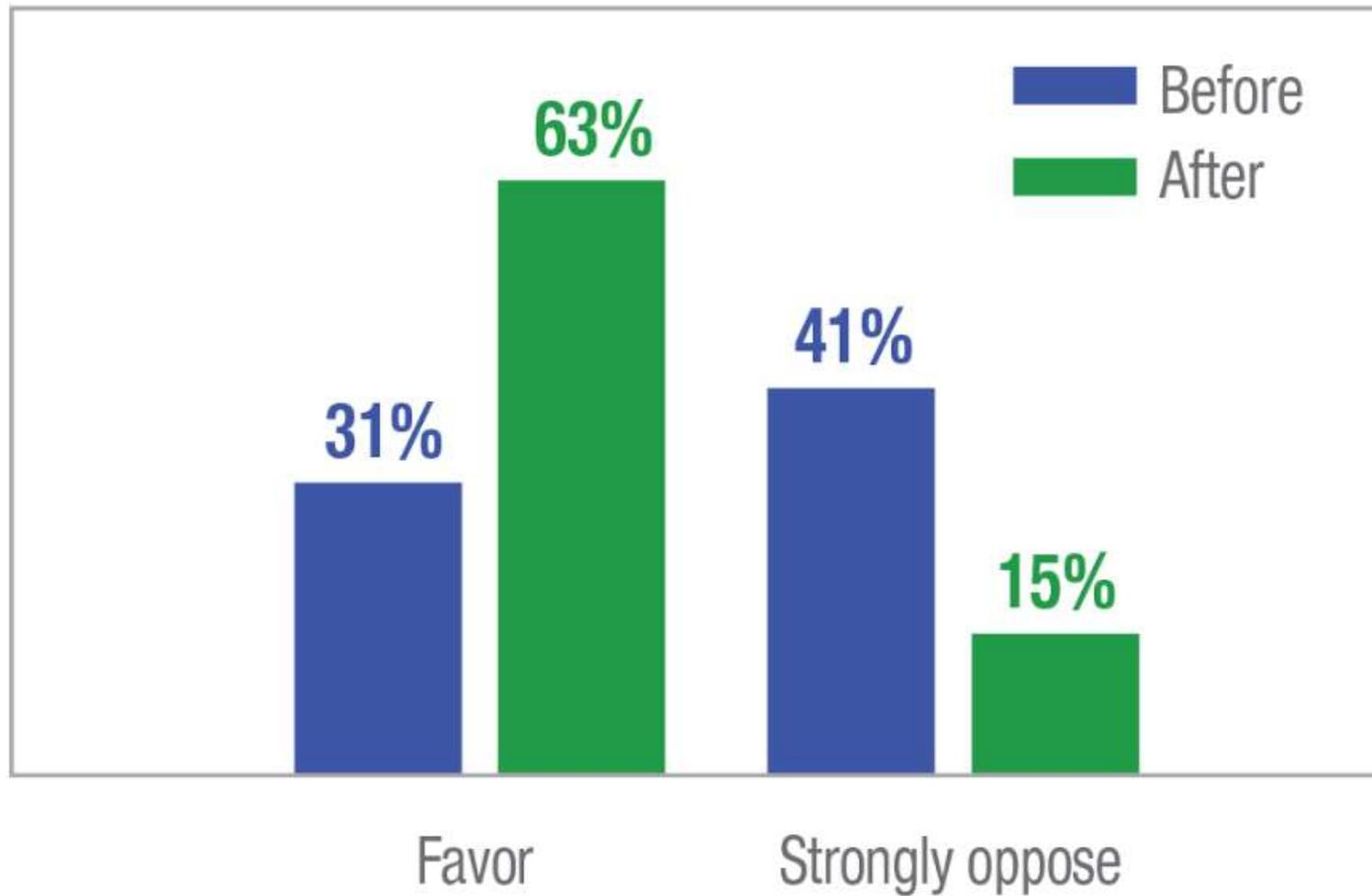


Truck Apron

Where trucks are common, a properly designed apron is necessary.



Perception of Roundabouts Before/After Construction



Insurance Institute for Highway Safety

<https://www.iihs.org/iihs/sr/statusreport/article/36/7/2>

Perception of Roundabouts Before/After Construction

Public Attitude Towards Roundabouts (Before and After Construction)

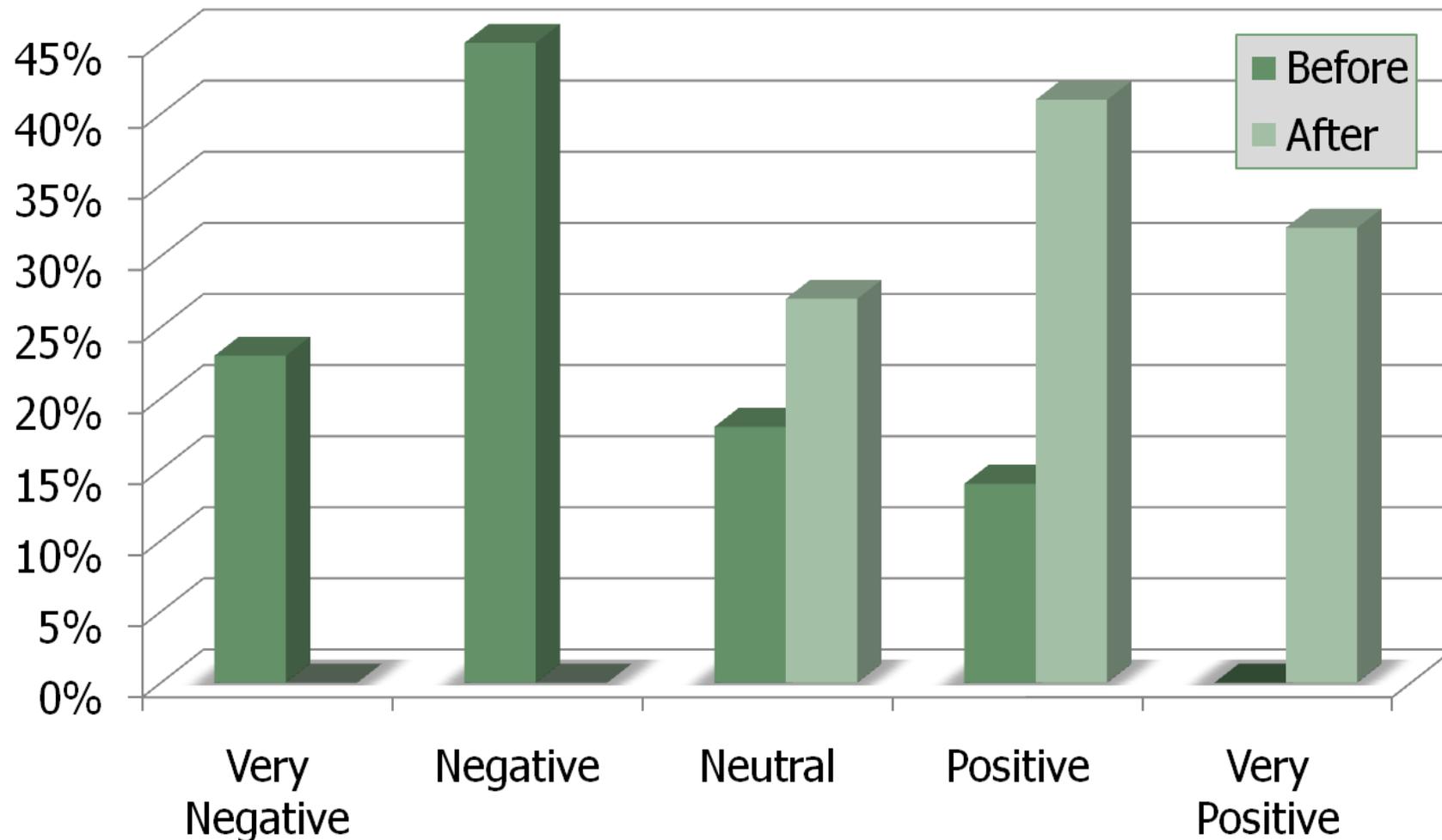


TABLE 7

PUBLIC ATTITUDE TOWARD ROUNDABOUT BEFORE AND AFTER CONSTRUCTION

Attitude	Percent	
	Before Construction	After Construction
Very negative	23	0
Negative	45	0
Neutral	18	27
Positive	14	41
Very positive	0	32

Source: NCHRP Synthesis 264

Public Opinion Improves After Roundabouts Are in Place

Roundabout success surprises residents

The newest intersection in Mount Horeb proves helpful in alleviating an old problem.

By Valeria Davis-Humphrey
Wisconsin State Journal

MOUNT HOREB — For a town generally skeptical that a roundabout would solve traffic problems, Mount Horeb residents are pretty pleased now that it's open.

With few hesitations, drivers were coping handily with the new road, which opened late Thursday.

Traffic flows one way—counterclockwise—around the 140-foot circular intersection where four major roads converge: highways 78, 92, ID and 18-151 leading into downtown Mount Horeb.

It replaces a cumbersome and outdated intersection that frequently lost its signal lights to semitrucks trying to negotiate turns.

"Most of the customers who have come in say it's not as bad as they thought it would be," said Lance Hook, owner of My Mechanic, one of the businesses pushed back to

make room for the roundabout.

"It used to be that you'd have to wait forever to get out of here, and I used to get to see the semis go through and take the stop lights down," Hook said.

But on Friday, drivers were adapting to the change and perhaps paying more attention to one another than in the past when negotiating the right-of-way.

While roundabouts are common in some urban areas, it's new enough in Mount Horeb to draw a temporary audience. Resident Richard Moore watched, eating

chips in his parked truck.

"I've seen a couple of close calls already," Moore said. "I guess it isn't clear who's supposed to yield to who."

Each entry to the roundabout has a yield sign to allow drivers to use their judgement, said state Department of Transportation Project Engineer Bill Strobel.

The traffic circle is designed for a speed of about 15 mph, he said, although the road's curve makes it appear that vehicles are moving

Please see **SUCCESS**, Page B2

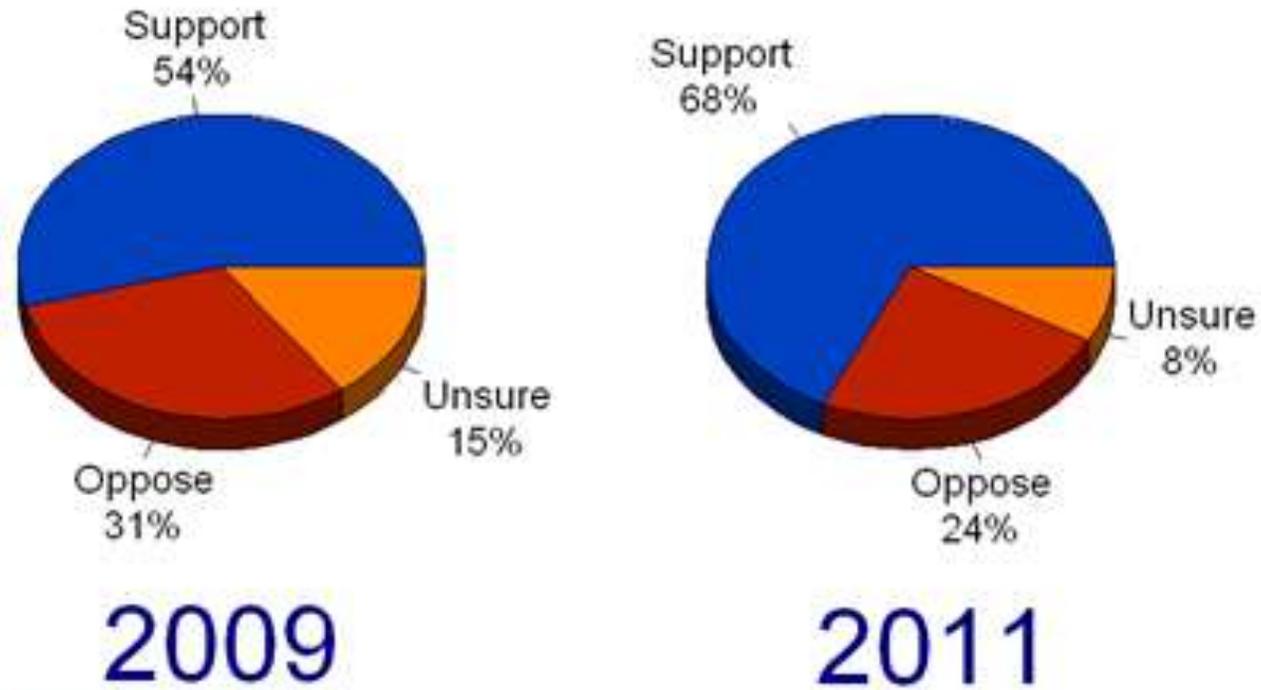
May 29, 2004

4 more roundabouts constructed in this community 2 years after the first

Public Opinion – A Typical Survey

Construction of More Roundabouts

2011 City of Woodbury



Decision Resources, Ltd.

Construction

Tentative Construction Dates

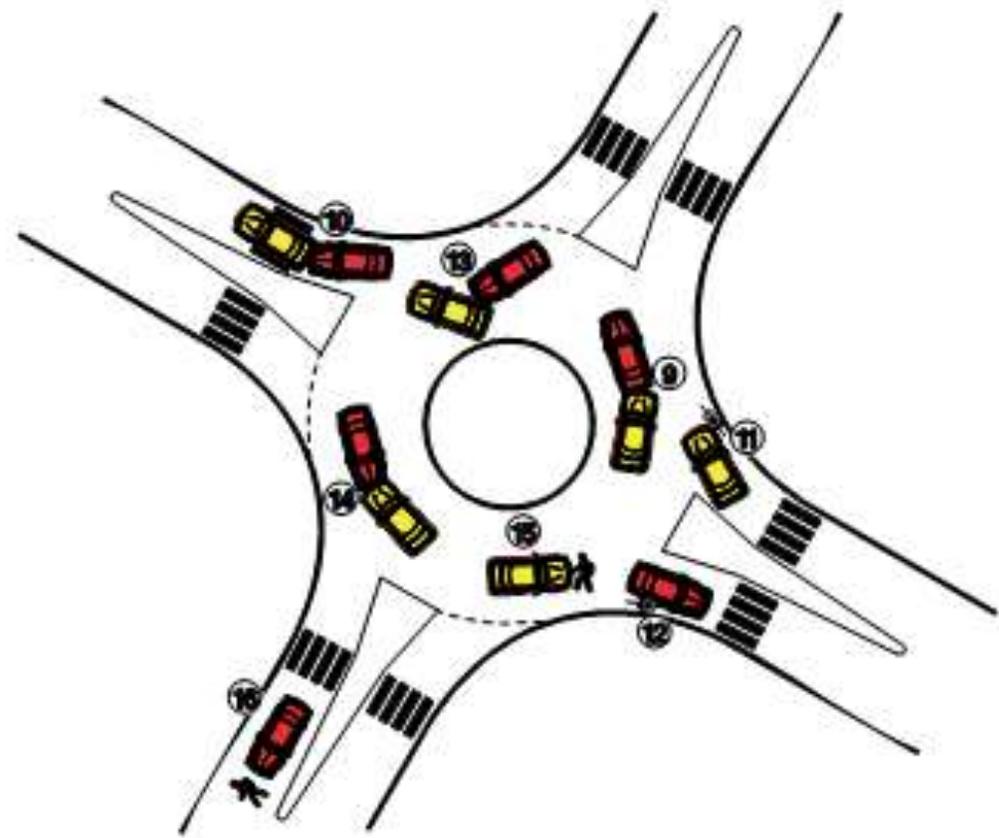
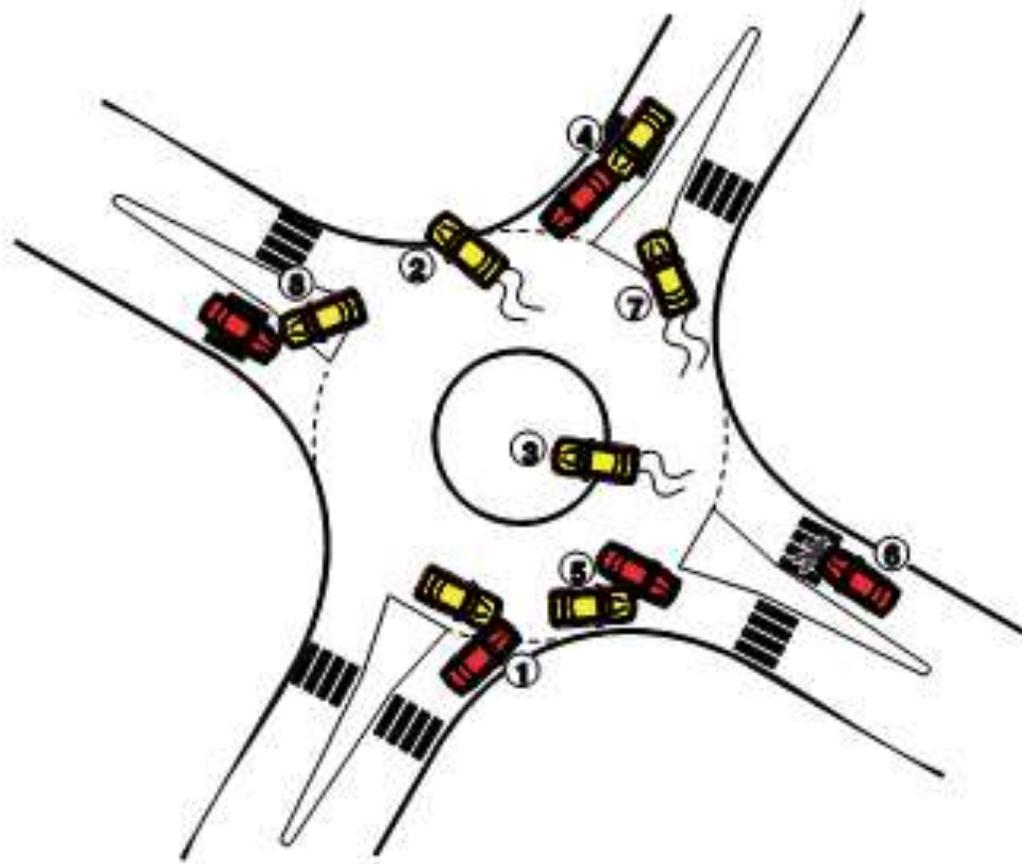
- Begin in April 2018
- Completion in September 2018



Thank you.

Safety

Crash Types at Roundabouts



NCHRP 672

Crash Types at Roundabouts

Crash type	France	Queensland, Australia	United Kingdom ¹	United States	
				Single- Lane	Double- Lane
1. Failure to yield at entry (entering-circulating)	36.6%	50.8%	71.1%	13%	17%
2. Single-vehicle run off the circulatory roadway	16.3%	10.4%	8.2% ²	50% ²	28% ²
3. Single vehicle loss of control at entry	11.4%	5.2%	2	2	2
4. Rear-end at entry	7.4%	16.9%	7.0% ³	34%	19%
5. Circulating-exiting	5.9%	6.5%			4%
6. Pedestrian on crosswalk	5.9%		3.5% ⁴		4% ⁵
7. Single vehicle loss of control at exit	2.5%	2.6%	2		
8. Exiting-entering	2.5%			1%	
9. Rear-end in circulatory roadway	0.5%	1.2%			
10. Rear-end at exit	1.0%	0.2%			
11. Passing a bicycle at entry	1.0%				
12. Passing a bicycle at exit	1.0%				
13. Weaving in circulatory roadway	2.5%	2.0%			
14. Wrong direction in circulatory roadway	1.0%				
15. Pedestrian on circulatory roadway	3.5%		4		
16. Pedestrian at approach outside crosswalk	1.0%		4		
Other collision types		2.4%	10.2%	2%	3%
Other sideswipe crashes		1.6%			24% ⁶

Notes:

1. Data are for "small" roundabouts [curbed central islands >13 ft (4 m) diameter, relatively large ratio of inscribed circle diameter to central island size]
2. Reported findings do not distinguish among single-vehicle crashes.
3. Reported findings do not distinguish among approaching crashes.
4. Reported findings do not distinguish among pedestrian crashes.
5. Reported findings combine pedestrian and bicycle crashes.
6. Reported findings do not distinguish among sideswipe crashes.

Sources: France (10), Australia (11), United Kingdom (1), United States (2)

Exhibit 5-12
Comparison of Crash Types
at Roundabouts

NCHRP 672

Crash Types at Roundabouts

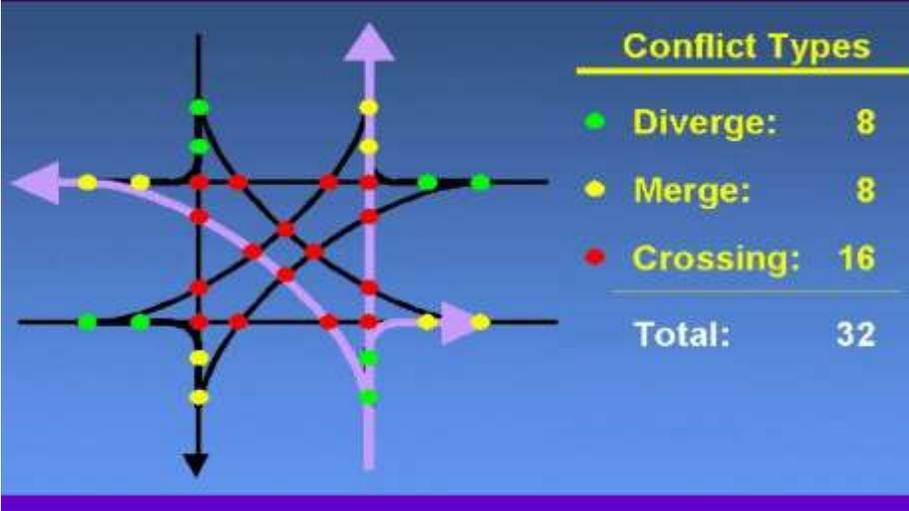
Control Before	Sites	Setting	Lanes	Estimate of the Percent Reduction in Crashes (and Standard Error)	
				All	Injury + Fatal
All Sites	55	All	All	35.4% (3.4)	75.8% (3.2)
	9	All	All	47.8% (4.9)	77.7% (6.0)
Signalized	4	Suburban	2	66.7% (4.4)	Sample too small to analyze
	5	Urban	All	Effects insignificant	60.1% (11.6)
All-way stop	10	All	All	Effects insignificant	Effects insignificant
	36	All	All	44.2% (3.8)	81.8% (3.2)
Two-way stop	9	Rural	1	71.5% (4.0)	87.3% (3.4)
	17	Urban	All	29.0% (9.0)	81.2% (7.9)
	12		1	39.8% (10.1)	80.3% (10.0)
	5		2	Sample too small to analyze	Sample too small to analyze
	10		All	31.8% (6.7)	71.0% (8.3)
	4	Suburban	1	78.2% (5.7)	77.6% (10.4)
6		2	19.3% (9.1)	68.0% (11.6)	
Two-way stop	27	Urban/	All	30.8% (5.5)	74.4% (6.0)
	16	Suburban	1	56.3% (6.0)	77.7% (7.4)
	11		2	17.9% (8.2)	71.8% (9.3)

Exhibit 5-9

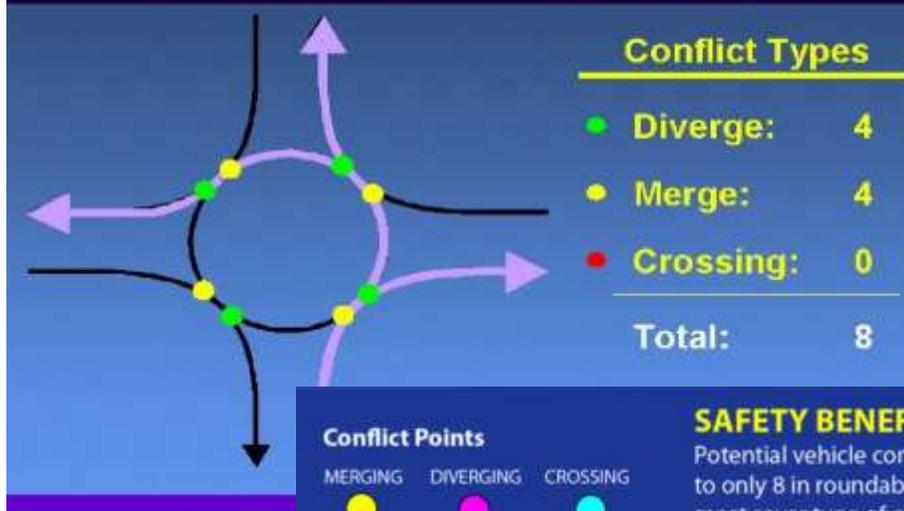
Comparisons to Previous Intersection Treatments in the United States

Safety Comparison - Signals vs. Roundabouts

Vehicle conflict points: Conventional intersection



Vehicle conflict points: Roundabout



- Crashes of this type are more severe

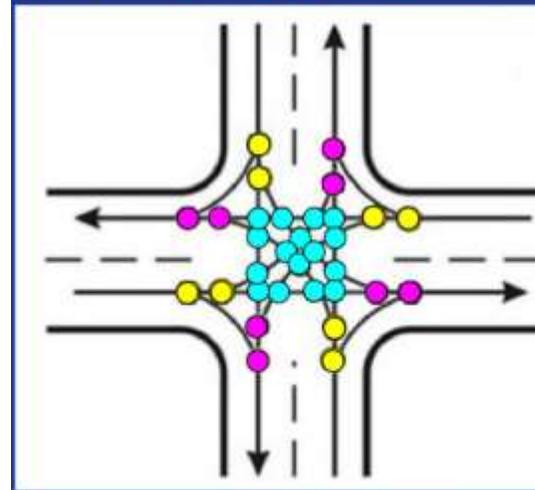
Conflict Points

MERGING DIVERGING CROSSING



SAFETY BENEFITS

Potential vehicle conflict points are reduced from 32 in a traditional intersection to only 8 in roundabout. Roundabout also have no crossing conflicts, often the most severe type of crash, such as a head-on or T-bone crash.



Human Capital Crash Costs

Crash Type	Capital Cost
K- Fatality	\$9,200,000
A – Severe Injury	\$440,125
B – Moderate Injury	\$120,167
C – Minor Injury	\$62,114
O – No Injury	\$6,734

Source: National Cooperative Highway Research Program Report 220 Estimating the Life-Cycle Cost of Intersection Designs

VIDEO FROM A
RED LIGHT CAMERA
IN ST. LOUIS, MO
2009-2010

T-Bone Collisions = Severe Injuries



Roundabout Crash



Roundabout Crash



Operations

Roundabout vs. Traffic Signal



Operations

	Traffic Signal	Roundabout
Capacity	↓	↑
Level of Service	↓	↑
Traffic Speed	Not limited by geometrics	Restrained to 25 mph by geometrics
Operational Benefits	More delay to all vehicles	Less delay

↑ Higher

↓ Lower

Myth Busters – Roundabout vs. Four Way Stop

<https://www.wimp.com/mythbusters-four-way-stop-vs-roundabout/>

Trucks



 Ourston
Roundabout
Engineering

What About Large Trucks?

- **Give extra space for large trucks!!!**
- Large trucks may need to occupy both lanes entering and circulating in the roundabout
- The central island truck apron is for large vehicles rear wheels

What About Emergency Vehicles?

- If you are in the roundabout when an emergency vehicle approaches, exit as normal and proceed beyond the splitter island before pulling over
- Do not stop inside the roundabout
- If you have not entered the roundabout yet, pull to the right if possible and wait until the emergency vehicle has passed

What About Emergency Vehicles?

What to do when an...
EMERGENCY VEHICLE
APPROACHES A ROUNDABOUT

KEY

- Stopped
- Yielding
- In Motion
- Ambulance

After you exit the roundabout, move to the right and stop so the emergency vehicle can safely pass.

If you are already in the roundabout, **do not stop** because the emergency vehicle may not be able to safely pass.

Do not enter a roundabout when an emergency vehicle is approaching from another direction.

Prior to entering the roundabout, move to the right so the emergency vehicle can safely pass.

EMERGENCY VEHICLES

Drivers are trained to pull over when an emergency vehicle is coming because it's the law. In the case of roundabouts, the Wisconsin Department of Transportation (WisDOT) states that motorists must clear a roundabout if they hear (or see) an emergency vehicle coming.

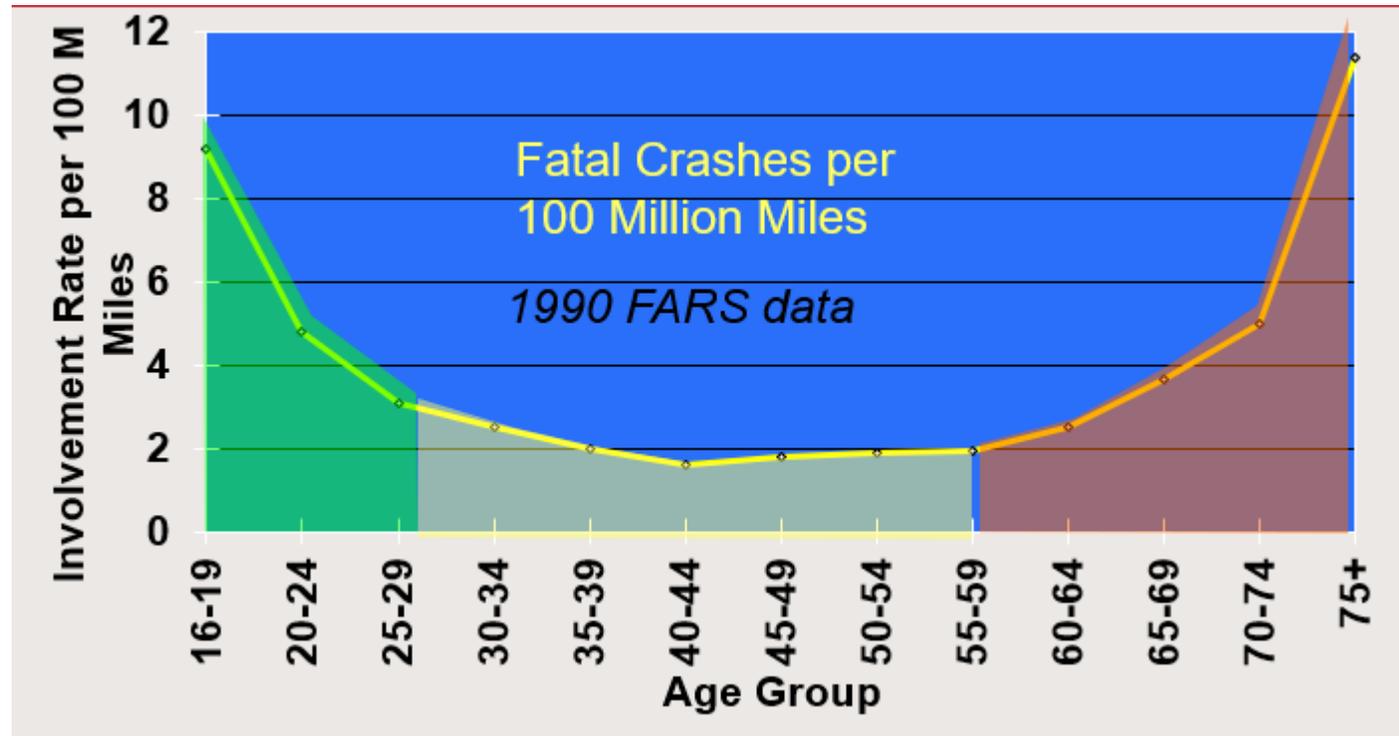
Motorists should immediately exit the roundabout at the next right.



Wisconsin Department of Transportation
Federal Highway Administration

Roundabouts and Older Drivers

Roadway users are at risk ...



And, older roadway users are at increasing risk ...

- Between 1991 and 2001 crashes involving at least one older driver **increased 20 percent**.
- And the number of Americans aged 70 and older killed in traffic crashes **increased by 27 percent**.

Senior drivers are becoming more numerous

- Population ages 65 and older grew nearly **twice as fast** as the total population between 1990 and 2000.
- The population of seniors is projected to **double** over the next 30 years.
- Americans age 85 and older are the **fastest growing** demographic.
- By 2020, **one in five** people will be 65 or older.

Senior users are especially at risk at intersections

- 38% of pedestrian deaths among people 65 and older in 1998 occurred at intersections
- Senior drivers are nearly **twice** as likely to be killed while driving through an intersection than younger drivers
- Drivers 85 and older are **more than 10 times as likely** as drivers 40-49 to have multi-vehicle intersection crashes

Safer intersections provide:

More time to:

Perceive and
evaluate situations

Make decisions

Take action

Less complicated
situations to interpret



Modern Roundabouts

A LIVABILITY FACT SHEET

Every day in the U.S. more than 20 people are killed at traffic intersections, and many more are seriously injured.¹

Roundabouts — circular intersections that move traffic counterclockwise around a central island — can help reduce these deaths and injuries. Modern roundabouts are calmer and safer than conventional intersections and have been deemed a “proven safety counter-measure” by the U.S. Department of Transportation.²

Roughly the size of a baseball diamond or infield, modern roundabouts differ from rotaries or traffic circles, which can be as big as the entire outfield. Roundabouts feature lower, safer vehicle speeds. They can be 80 feet across with single lanes carrying 25,000 vehicles a day or larger at 200 feet, with double lanes and 45,000 vehicles a day.³

Personal injuries and fatalities plummet as much as 90 percent in modern roundabouts when compared to conventional intersections.⁴ Roundabouts cause drivers to slow down, ideally to less than 20 mph, which reduces the risks to both pedestrians and drivers.

Because roundabouts can handle 30 to 50 percent more traffic than conventional intersections, they reduce travel delays.⁵ Since roundabouts can be designed to be aesthetically pleasing, they help create a sense of place.

By January 2014, roundabouts graced more than 1,000 intersections in the U.S., with more planned. To maximize their safety and placemaking benefits, roundabouts should be considered for many more of the 100,000 intersections in the U.S.



Modern roundabouts are calmer and safer than conventional intersections and have been deemed a “proven safety counter-measure” by the U.S. Department of Transportation.



Vehicle speeds on Grandview Drive in University Place, Wash., often reached or exceeded 50 mph. After the installation of modern roundabouts, vehicle crashes dropped from one every nine months to zero in 14 years.

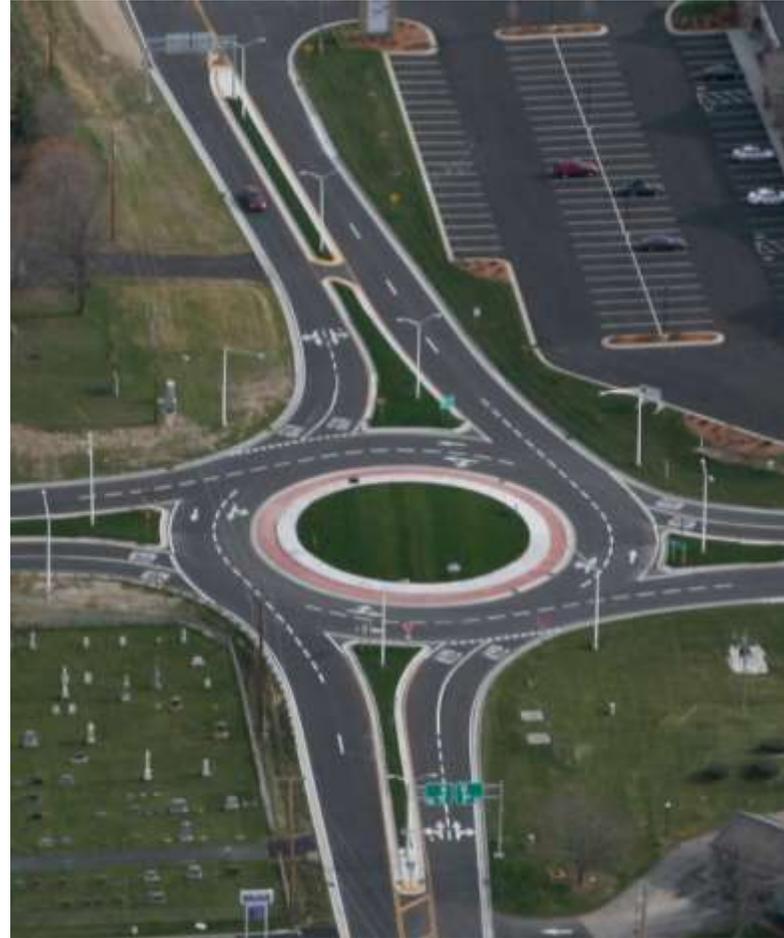
Roundabout vs. Conventional

Intersection Comparison

Signalized Intersection	Roundabout Intersection
<ul style="list-style-type: none">• High speeds	<ul style="list-style-type: none">• Low speeds
<ul style="list-style-type: none">• Wide visual scans	<ul style="list-style-type: none">• Narrow visual scans
<ul style="list-style-type: none">• Less response time	<ul style="list-style-type: none">• More response time
<ul style="list-style-type: none">• Harder to judge gaps	<ul style="list-style-type: none">• Easier to judge gaps
<ul style="list-style-type: none">• High severity crashes	<ul style="list-style-type: none">• Low severity crashes

Price of Implementation

- Require interaction with other drivers
 - Not just a red or green light
- Some are only willing to adapt if it equates to a benefit
- Initial construction cost may be more
- Effort is worth it!!



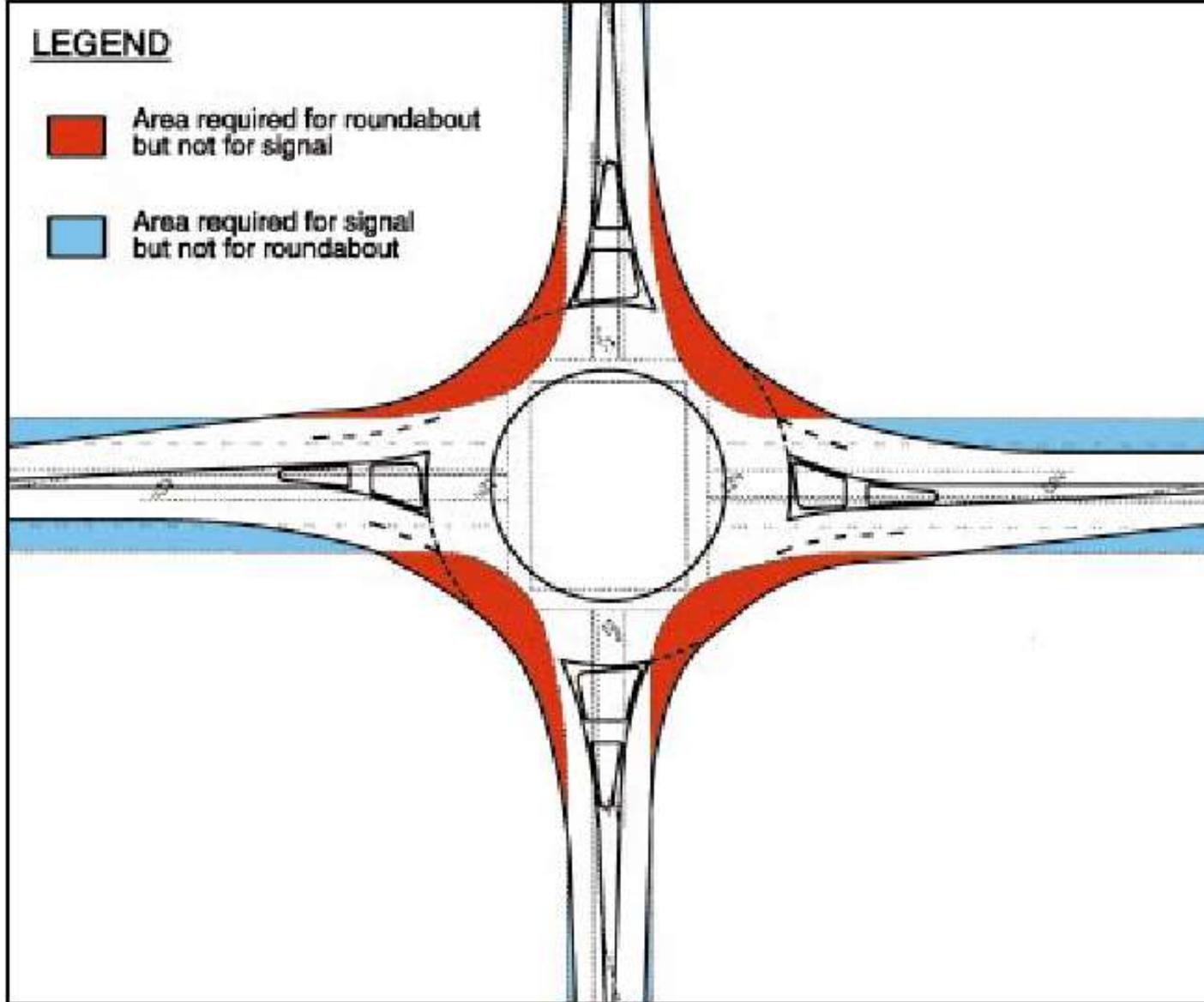
Long Term Cost of Maintenance

- Construction cost plus cost of property acquisition usually higher with a roundabout
- Maintenance costs usually higher for traffic signals (power, periodic bulb replacement, review of signal timings, etc.)
- Roundabouts function during power outages
- Roundabouts may need landscape maintenance and more illumination
- Consider societal costs of crashes?
- Consider societal cost of delay?

LEGEND

 Area required for roundabout but not for signal

 Area required for signal but not for roundabout



LeFevre Road and Lynn Boulevard

- High Speed Approaches (35 - 45 mph)
- Sight Distance Constraints
- Truck Route
- Pedestrian and Bicycle Path Crossings
- Developing Area

