ROUNDABOUTS

Improving Safety and Efficiency

SR83 & Smithville Western Rd.

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WHAT IS A ROUNDABOUT?

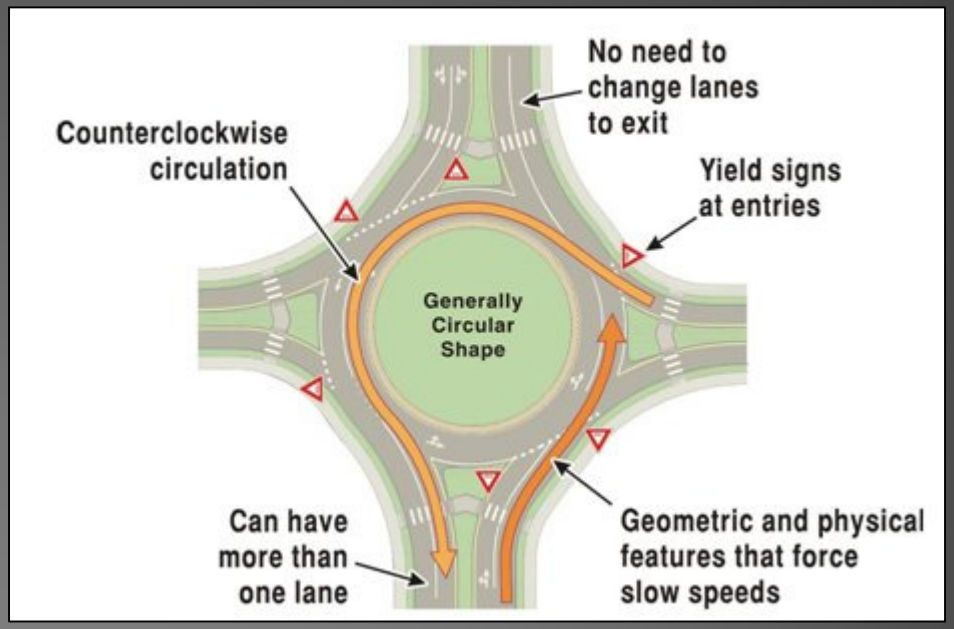
- A roundabout is a circular intersection in which traffic flows counterclockwise around a center island. There are no traffic signals or stop signs in a roundabout.

WHERE ARE ROUNDABOUTS APPROPRIATE?

- High Crash Rate Locations
- Intersection with Large Traffic Delays
- Complex Geometry (i.e. more than four approaches)
- High Left Turn Volumes

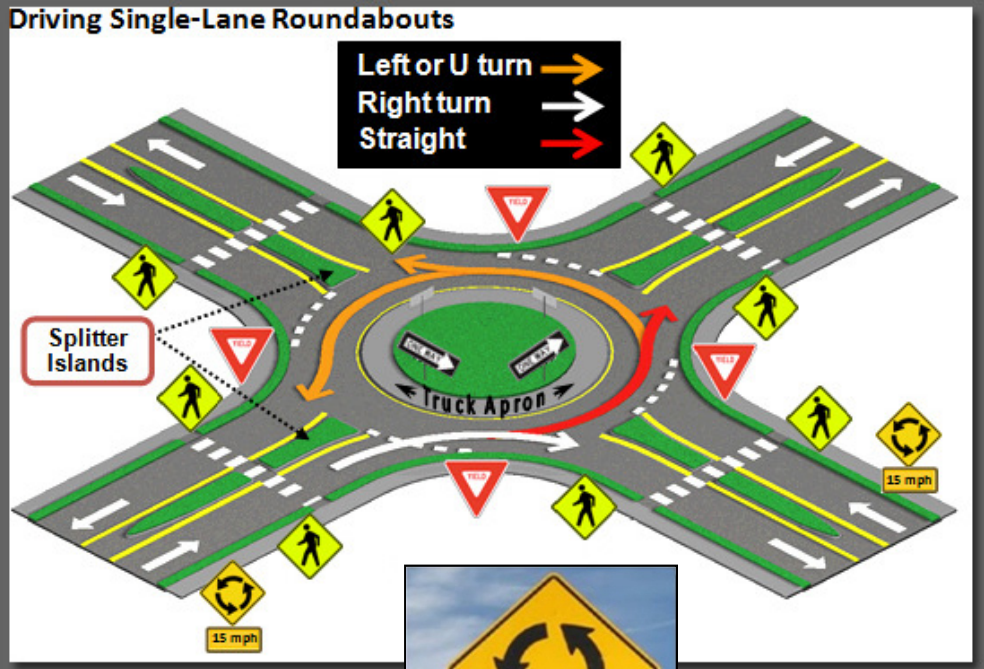
KEY ROUNDABOUT CHARACTERISTICS

- Circular in Shape
- Channelized Approach (i.e. splitter island)
- Counterclockwise Traffic Flow
- Yield Control on Entry
- Geometric Curvature Creates a Low Speed Environment
- Right Turn in / Right Turn out



HOW TO NAVIGATE A SINGLE LANE ROUNDABOUT

- Slow Down!
  - 20 mph or less is a safe entering speed.
- Yield!
  - All entering vehicles must yield to circulating traffic in the roundabout.



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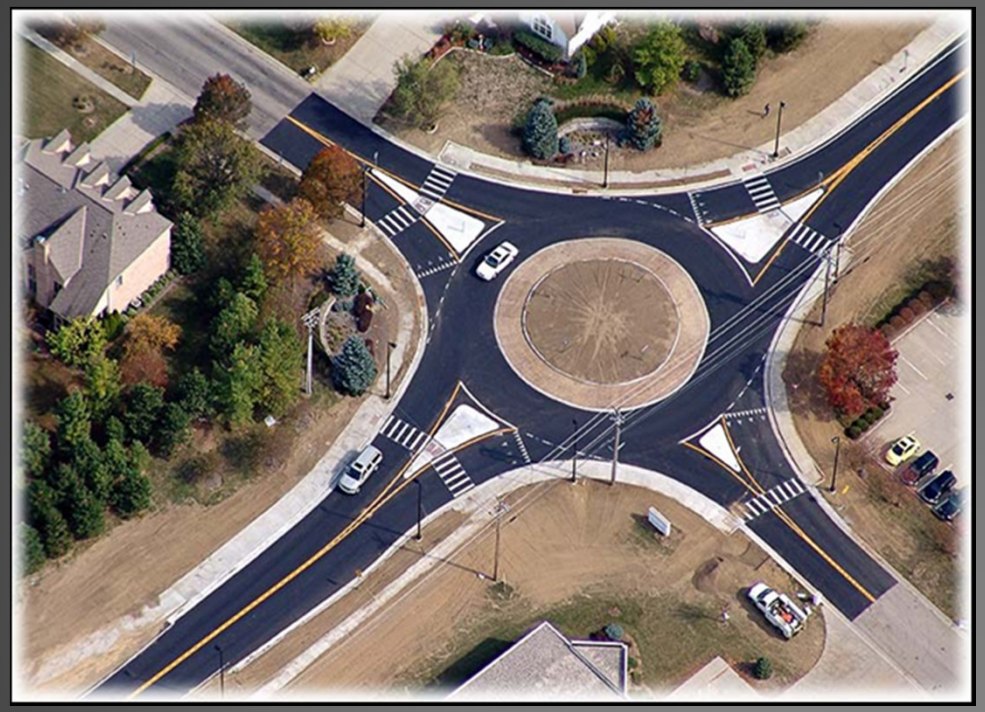
SINGLE LANE ROUNDABOUTS



Design Element	Single Lane Roundabout
Maximum Entry Design Speed	20 to 25 mph
Maximum Number of Entering Lanes per Approach	1
Typical Inscribed Circle Diameter	90 to 180 ft.
Center Island	Raised
Daily Service Volume	Up to 25,000 vehicles/day

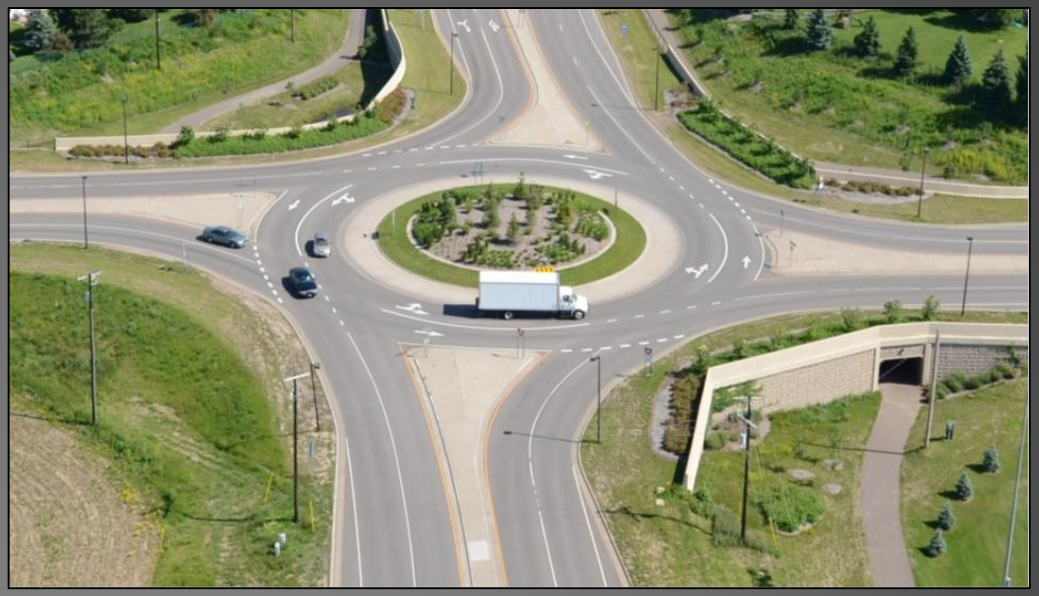
MULTI-LANE ROUNDABOUTS

Multi-lane roundabouts are intended to accommodate higher volumes of traffic

Design Element	Single Lane Roundabout
Maximum Entry Design Speed	25 to 30 mph
Maximum Number of Entering Lanes per Approach	2+
Typical Inscribed Circle Diameter	150 to 300 ft.
Center Island	Raised
Daily Service Volume	Up to 45,000 vehicles/day

BENEFITS OF ROUNDABOUTS

- Increased Traffic Safety
- Increased Pedestrian Safety
- Traffic Calming
- Operational Performance
- Ongoing Operations and Maintenance
- Approach Roadway Width
- Environmental Factors
- Aesthetics
- Land Use



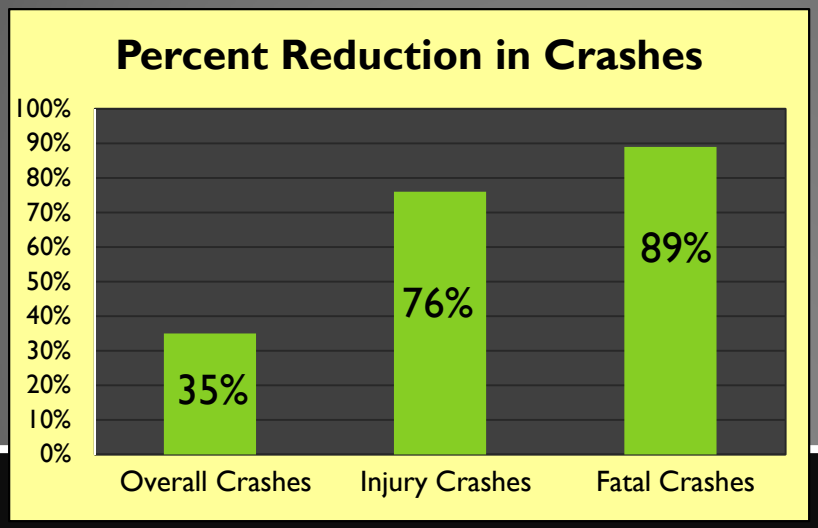
TRAFFIC SAFETY BENEFITS

TYPICAL INTERSECTION VS. ROUNDABOUTS

THE FACTS

- 89% Reduction in Fatalities
- 76% Reduction in Injuries
- 35% Reduction in Overall Crashes

Key Message – Roundabouts are SAFER!



Data from Federal Highway Administration's website

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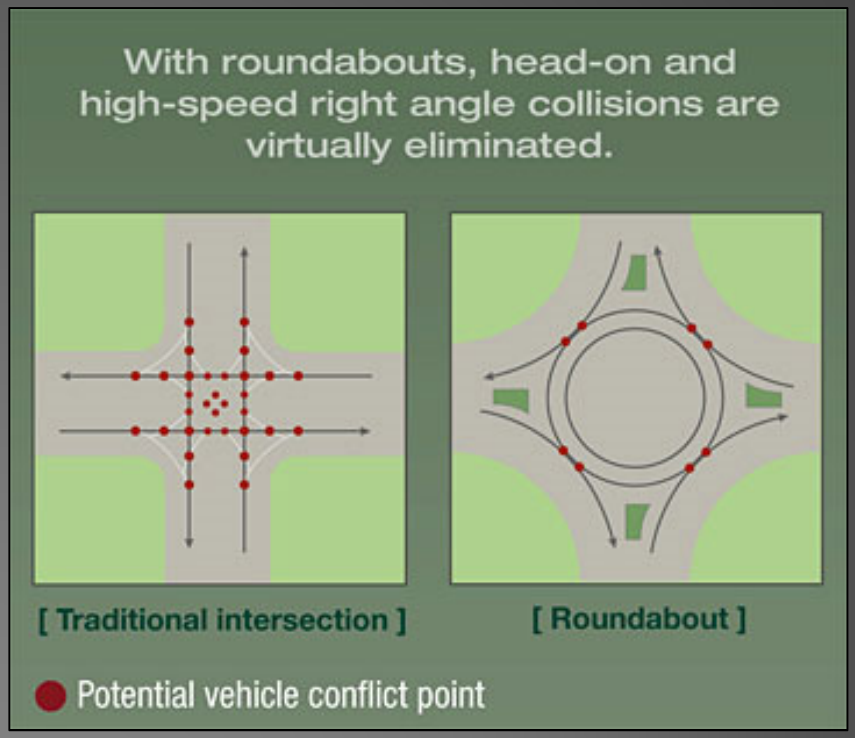
TRAFFIC SAFETY BENEFITS

TYPICAL INTERSECTION VS. ROUNDABOUTS

- A typical 4-leg intersection contains 32 conflict points.
- A roundabout contains only 8 conflict points.
- All vehicles travel in the same direction, never crossing paths which dramatically reduces head-on and high speed angle crashes.

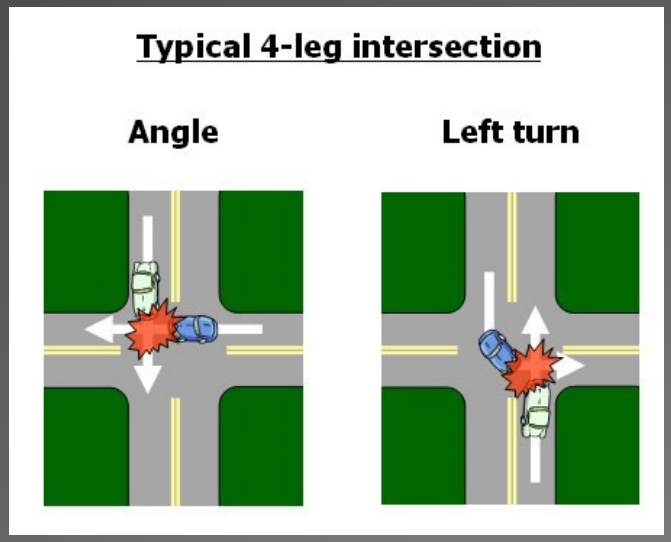


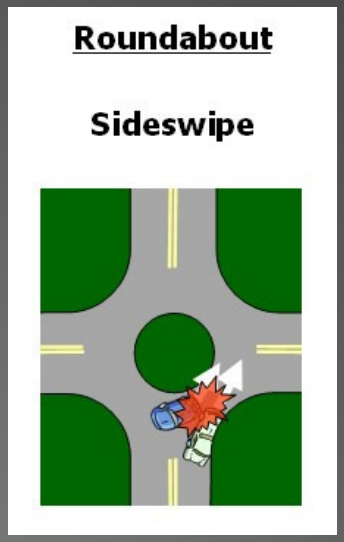
- Converging (8)
- Diverging (8)
- Crossing (16)

- Converging (4)
- Diverging (4)
- Crossing (0)

TRAFFIC SAFETY BENEFITS

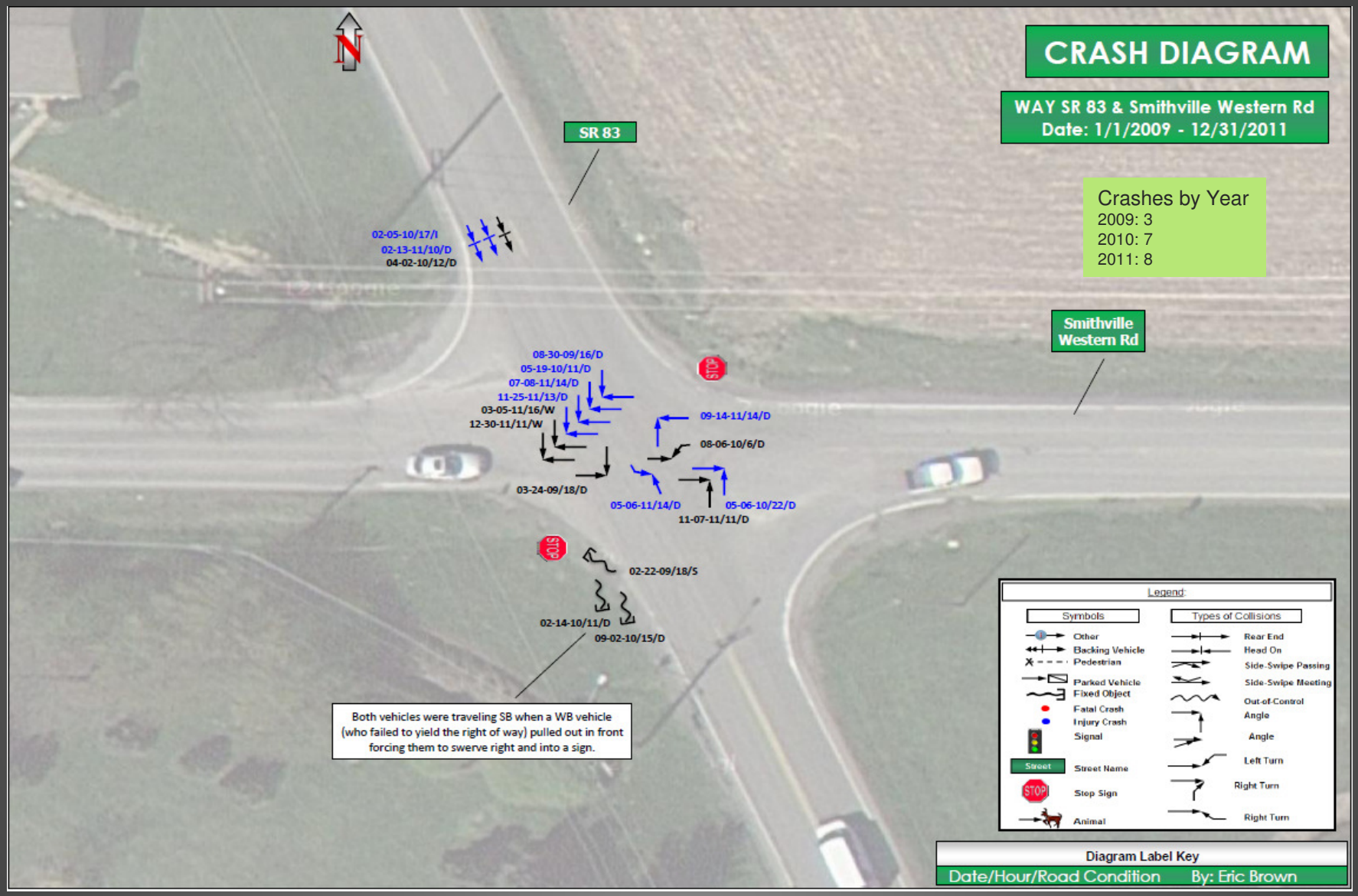
TYPICAL INTERSECTION VS. ROUNDABOUTS



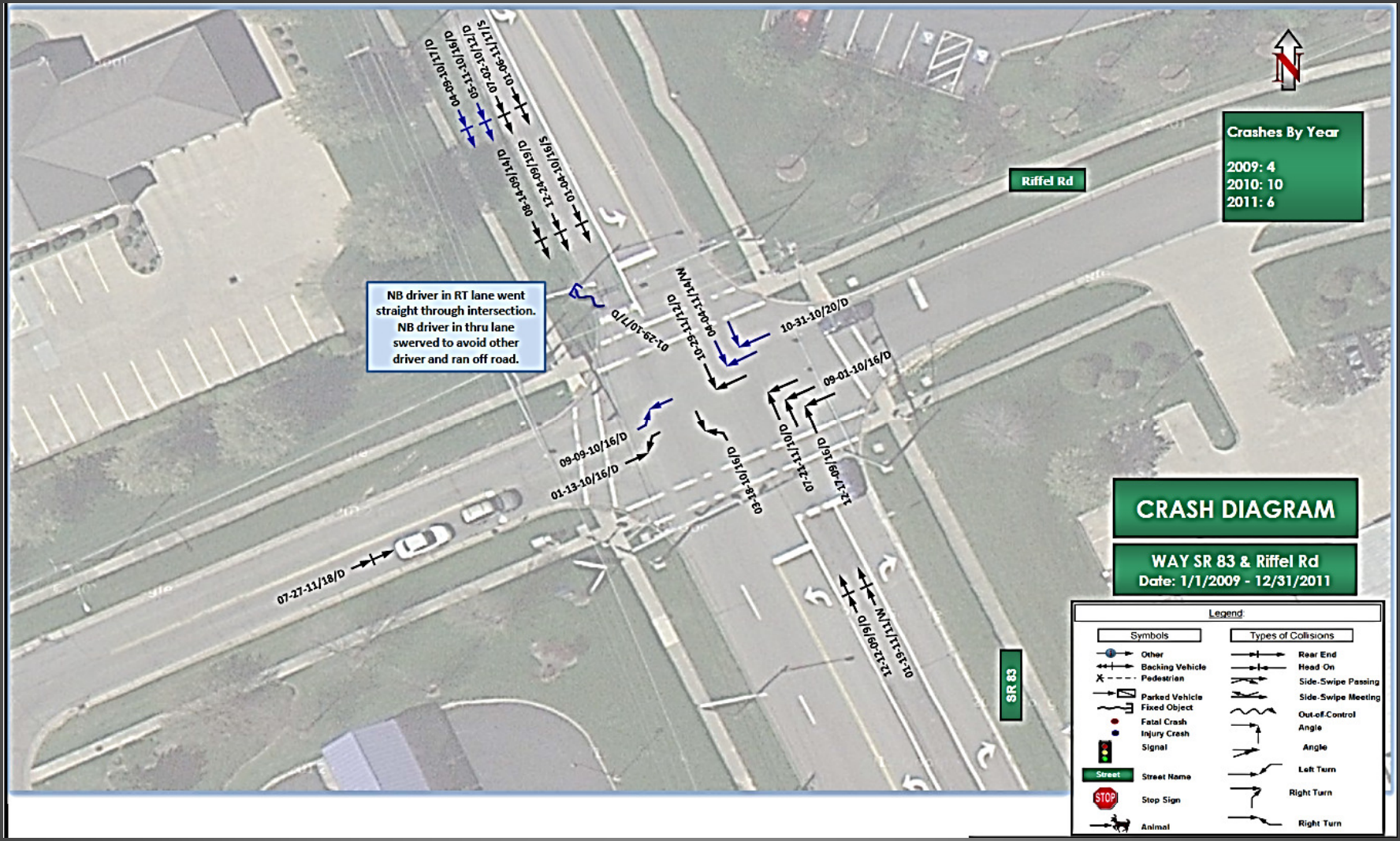


- Angle and left turn crashes account for 63% of fatal crashes.
- A roundabout eliminates angle and left turn crashes by forcing vehicles to make a right turn in and out.
- Crashes that do occur in a roundabout are sideswipe in nature and less severe due to low vehicle speeds.

SR 83 / SMITHVILLE WESTERN RD.



SR 83 / RIFFEL ROAD



BENEFITS CONTINUED

- Ongoing Operations and Maintenance
  - Lower operating and maintenance costs than a traffic signal due to the lack of technical hardware, signal timing equipment, and electricity needs.
  - Substantial cost savings to communities due to the reduction in crashes.
  - Overall life cycle costs less than that of a signalized intersection.

- Approach Roadway Width
  - No need for lengthy left or right turn lanes.

BENEFITS CONTINUED

- Environmental Factors
  - Reduce the number and duration of stops compared with signalized or all-way stop-controlled alternatives.
  - Reduction in noise and air quality impacts and fuel consumption by reducing the number of start/stops and the time spent idling.

- Aesthetics
  - Landscaping opportunities in the center island.
  - "Gateway" into communities

SR83 & SMITHVILLE WESTERN

- Safety & Crash Analysis:
  - Eighteen (18) total crashes occurred at the intersection during the three-year crash analysis time period.
  - Most collisions occurred during daylight hours and under dry conditions.
  - Crashes have been increasing each year since 2009, with the highest amount (eight) occurring in 2011.
    - -67% (12 0f 18 total crashes) were angle crashes
    - -22% (4 of 18 total crashes) were rear-end crashes
    - -11% (2 of 18 total crashes) were left turn crashes
  - All twelve (12) angle collisions involved motorists who stopped at the stop sign, then failed to yield the right of way before attempting to enter/cross SR 83. The majority of the angle crashes involved SB drivers on SR 83 and WB drivers on Smithville Western Road.

SR83 & SMITHVILLE WESTERN

- Two Proposed Alternatives
  - Common elements:
    - 150 foot diameter circle
    - 16 foot circular lane (12 foot travel lane w/ 8 foot shoulder)
    - 12 foot truck apron
  - Alternative No. 1 – Roundabout in NE Quadrant:
    - Allows intersection to align w/o skew
    - Avoids R/W complications
  - Alternative No. 2 – Roundabout in Center of ex. Intersection
    - Keeps existing skew
    - Increases R/W complications
    - Turning movement design challenges

ALTERNATIVE NO. 1

ALTERNATIVE NO. 2

ALTERNATIVE ANALYSIS

ALTERNATIVE 1: Roundabout with the center shifted to the north and east of the existing intersection.

- Advantages:
  - Removes existing skew of 68 degrees between intersections
  - Approach alignments of approximately 90 degrees generally provide for improved traffic operations and performance
  - Uniform entry approach distance and spacing provides better visibility and truck turning paths
  - Less Right of Way Impacts
  - Realignment provides more space for future walks/path and landscaping on northwest corner
  - Realignment facilitates future widening from a single to multi-lane roundabout
  - Realignment provides for better positive drainage and higher profile due to distance from houses
  - Uniform entrance and exit radii
  - Fastest vehicular path analysis: most consistent speed through roundabout
- Disadvantages
  - Encroaches on northeast quadrant farmland (no buildings present)
  - Slightly extends roadway work limits approximately 200 feet on the north and east legs

ALTERNATIVE ANALYSIS

ALTERNATIVE 2: Roundabout with the center at existing intersection.

- Advantages:
  - Less impact to northeast quadrant of farmland
  - Slightly less work limits, approximately 200 feet on the north and east legs, compared to Alternative 1.
- Disadvantages
  - Substandard skew of 68 degrees remains - Relatively sharp angles between entries
  - Poor entry approaches tend to deteriorate traffic operations and performance
  - Likelihood of truck overruns of the curb during turning movements
  - Possible Septic system disturbed
  - Drive access restricted to right only on NW corner parcel
  - Limited drainage improvement
  - Non-uniform entrance and exit radii
  - Vehicular path analysis: Speed consistency is not met

ALTERNATIVE ANALYSIS

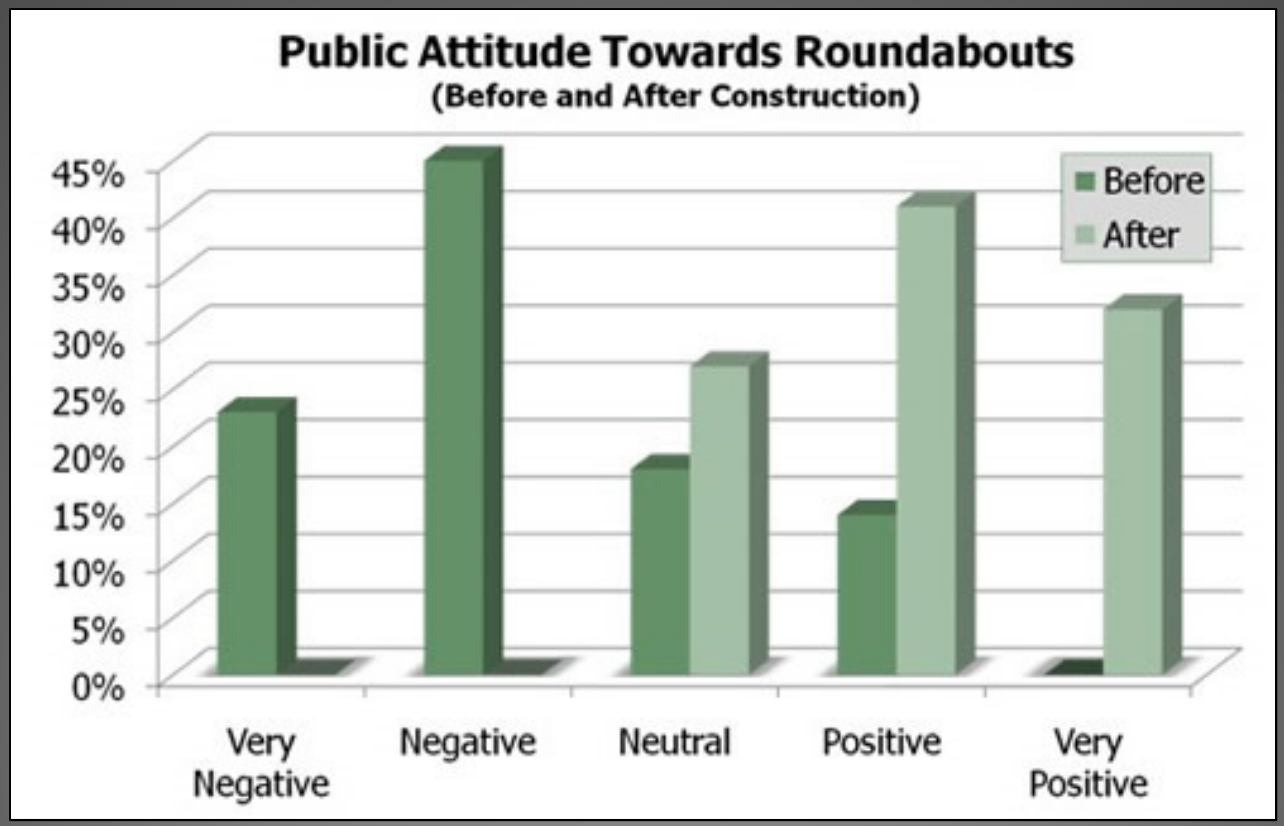
INITIAL RECOMMENDATIONS

Alternative 1 provides more desirable geometric features and provides for all the preferred criteria of designing a modern roundabout

- Approach entry angle/spacing
- Uniform exit radii
- Improved sight distance as a result of "squaring up" or realigning the intersection.
- Proposed realignment reduces Right of Way impacts
- Improved drainage measures.

PUBLIC PERCEPTION

BEFORE AND AFTER



NCHRP Synthesis 264

ANY QUESTIONS?

SOURCES

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