

Introduction to Roundabouts

Presentation to:
El Dorado County Board of Supervisors
March 19, 2019



Today's Agenda: What? Why? How?

1. **What** are “Modern” Roundabouts?
2. **Why** consider Roundabouts?
3. **How** do Roundabouts work?



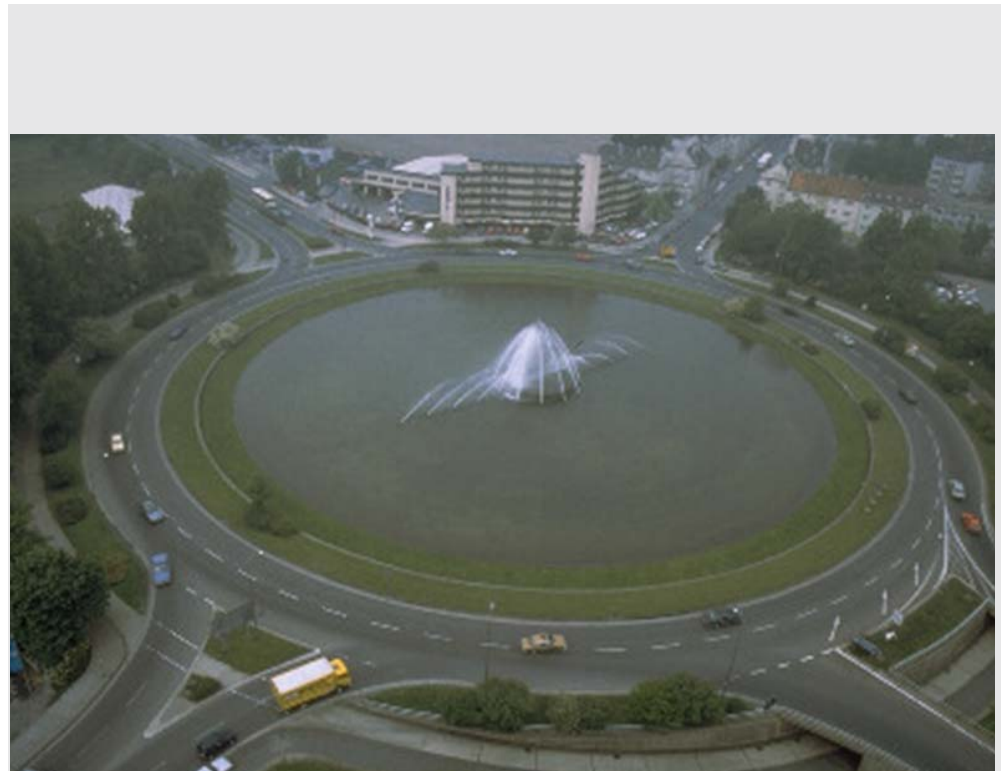
These are NOT Modern Roundabouts ...



Rotary

Traffic Circle

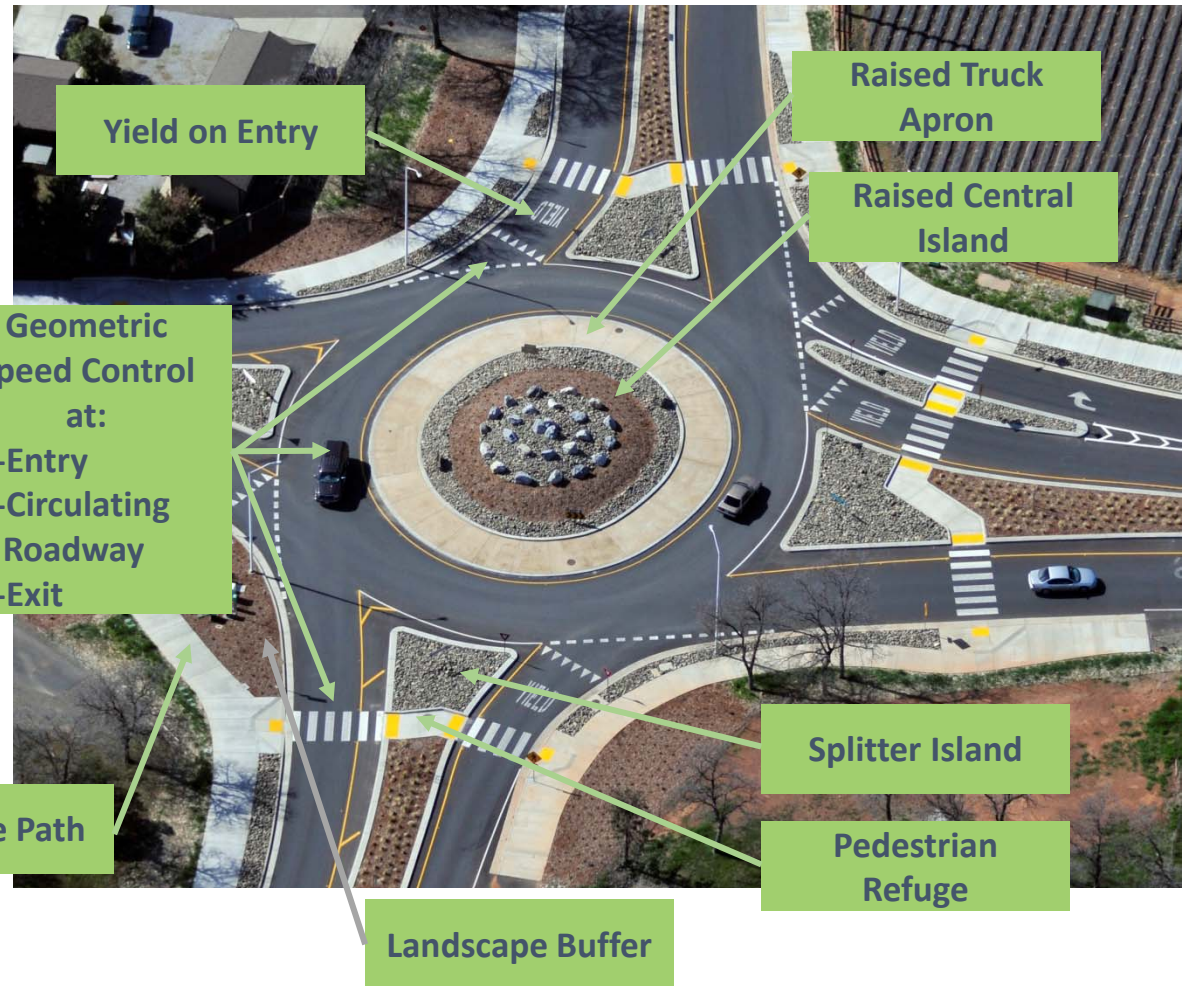
Neighborhood Calming



What are Modern Roundabouts?

Modern Roundabouts Are:

- Circular In Nature
- Utilize Specific Design Criteria
- Designed to Control Speed
- Multi-Modal
- More Efficient For Traffic Flow



What are Modern Roundabouts?

Modern Roundabouts Are:

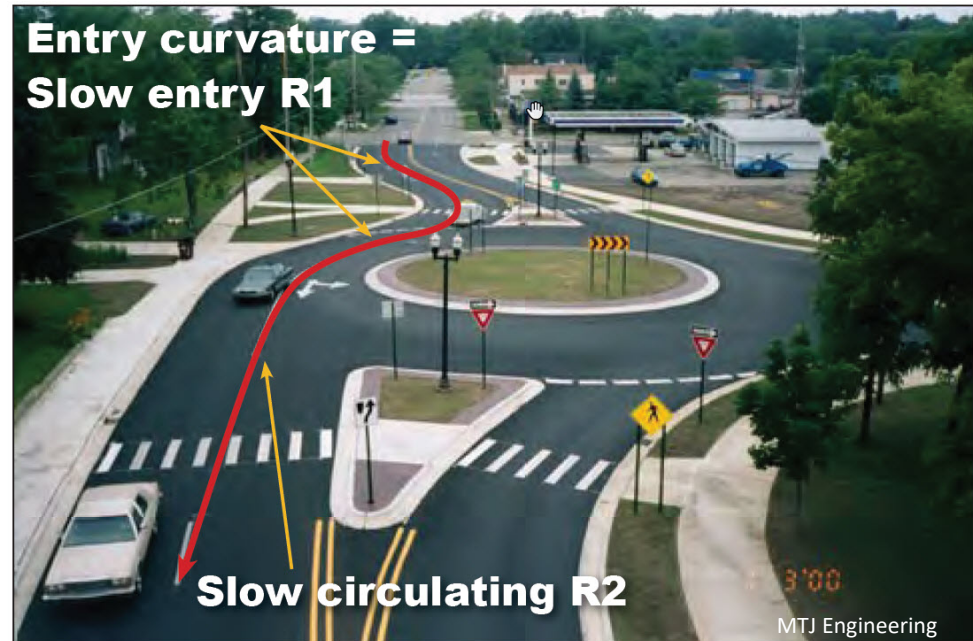
- Principles Based
- Guidelines not Standards
- Comprehensive design approach
- **Composition is important in meeting Driver Expectancy**



What are Modern Roundabouts?

Safety Design Principles – Speed Control:

- Deflection at Entry
- Fast Path Criteria
- View Angles and Phi
- Manage Sight Distances – landscaping
- Minimum diameter based on design vehicle



What are Modern Roundabouts?

Geometric Design Principles:

- Match capacity to demand
- Minimize number of lanes to reduce conflict points
- Minimize ped crossing distances to reduce exposure
- Simplify decision making



What are Modern Roundabouts?

Signing and Markings Principles:

- Clear and easily understood information
- Minimize detection, reading and processing time
- Advance lane choice
- **Meet Driver Expectancy**



What are Modern Roundabouts?

With a Roundabout the Environment is the Signal



Digital

Watch the Light



Analog

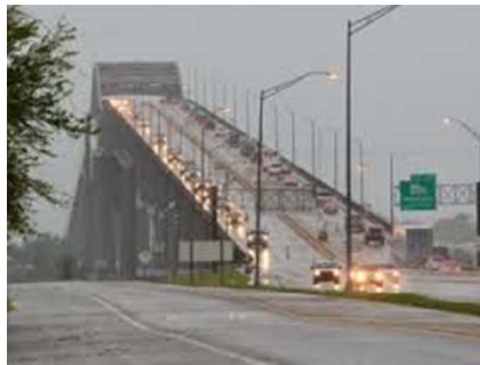
Yield on Entry

Where are Roundabout Applicable?

- Most Signalized Intersections
- Closely Spaced or Offset Intersections or Driveways
- Freeway Ramp Termini
- Constrained Roadways (over crossing or under crossing)
- Intersections With High Accident Rates

Where Roundabouts Are **Not** Applicable?

- Physical Constraints that make it politically or economically infeasible to construct a roundabout.
- Steep Grades
- Intersection with Highly Unbalanced Traffic Flow



Why Consider Roundabouts?

- Improve Overall Safety
- Relieve Congestion and Delay
- Improve Environment
- Cost Effective Solution

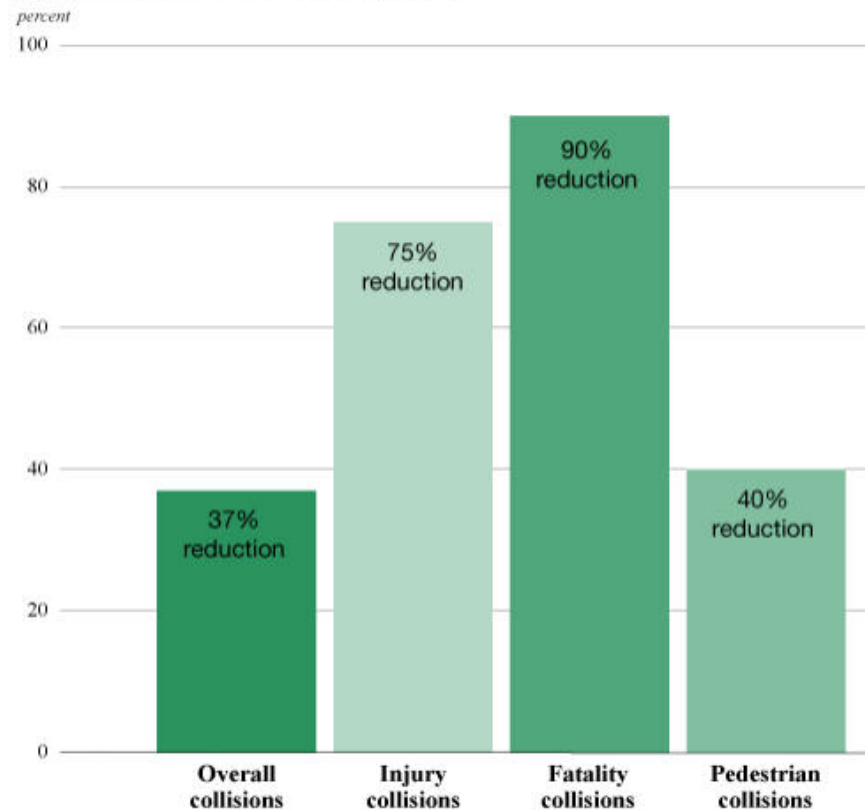


Consideration is required when improving any intersection on the State system

Why Consider Roundabouts?

They Improve Overall Safety

Reduction in collisions

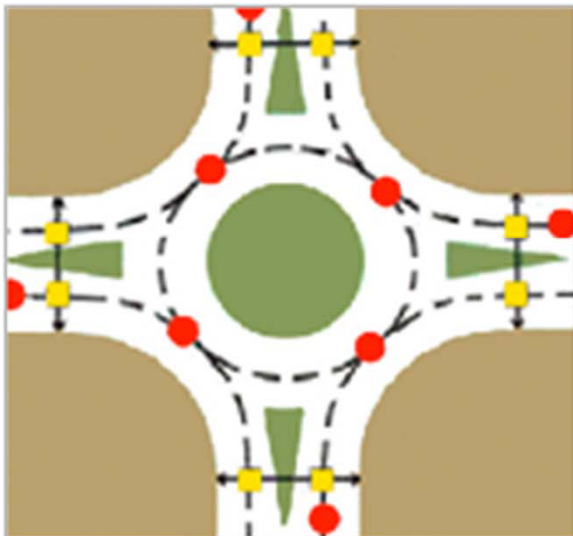


Source: Federal Highway Administration and Insurance Institute for Highway Safety (FHWA and IHS)

Why Consider Roundabouts?

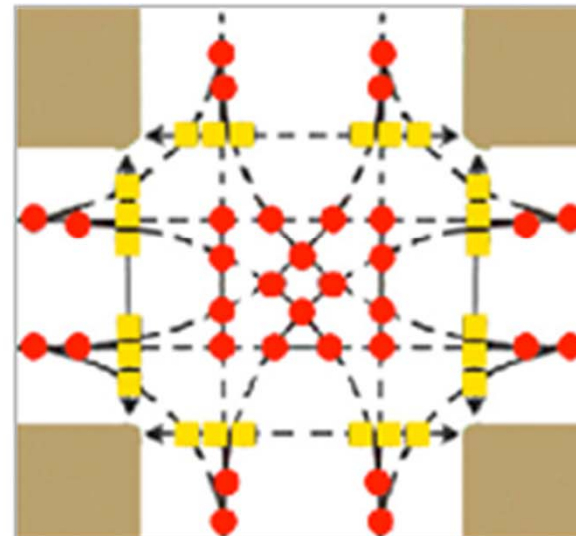
Conflict points on a regular 4-way intersection compared to a modern roundabout intersection

Roundabout



**Vehicles - 8 Conflict Points
Peds - 8 Conflict Points**

Intersection



**Vehicles -32 Conflict Points
Peds – 16 Conflict Points**

3/19/2019

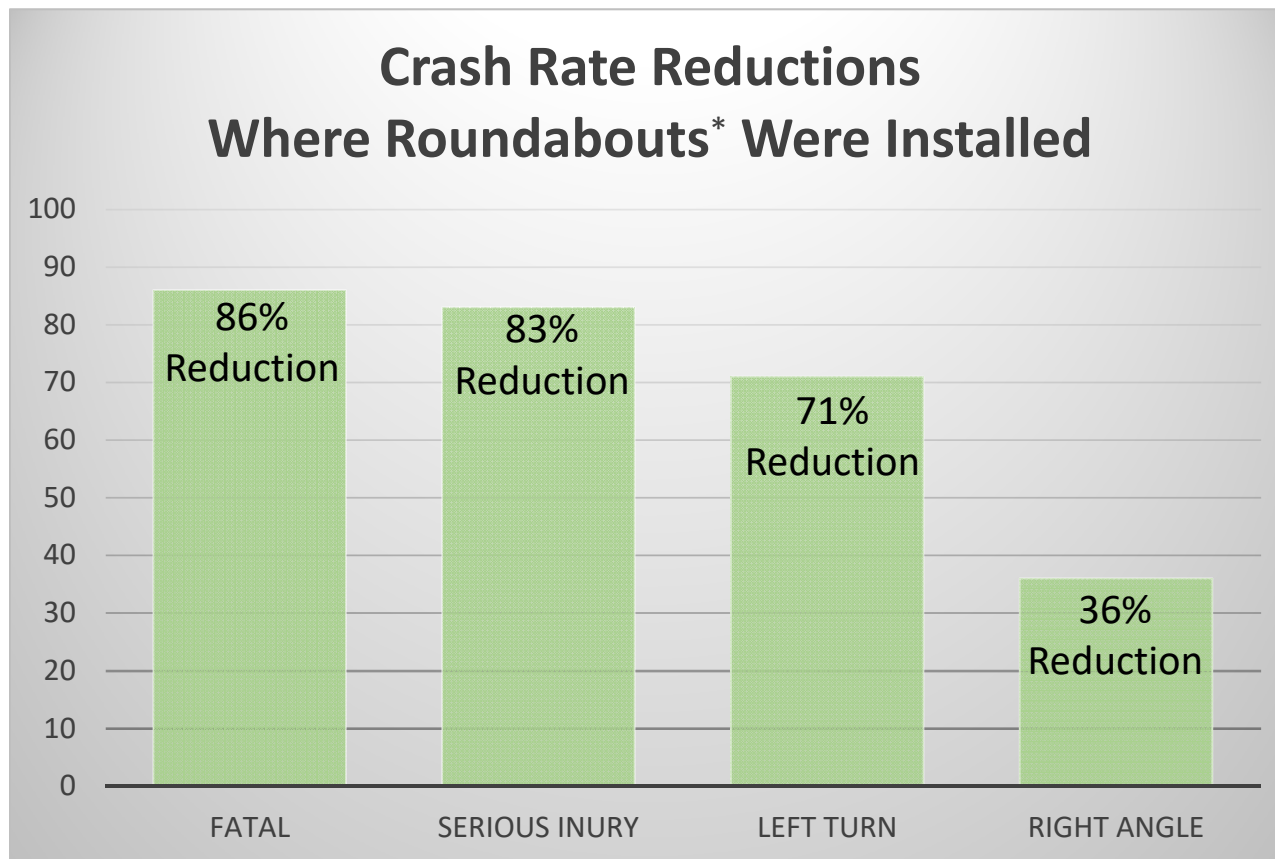
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Source: FHWA, Roundabouts An Informational Guide

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A Better Solution For Vehicle Safety

A Look at a Study on Vehicle Crash Rates



*Single, hybrid and multilane roundabouts

Source: A Study of the Traffic Safety at Roundabouts in Minnesota
Dated 10-30-17 | Amended 8-2-18

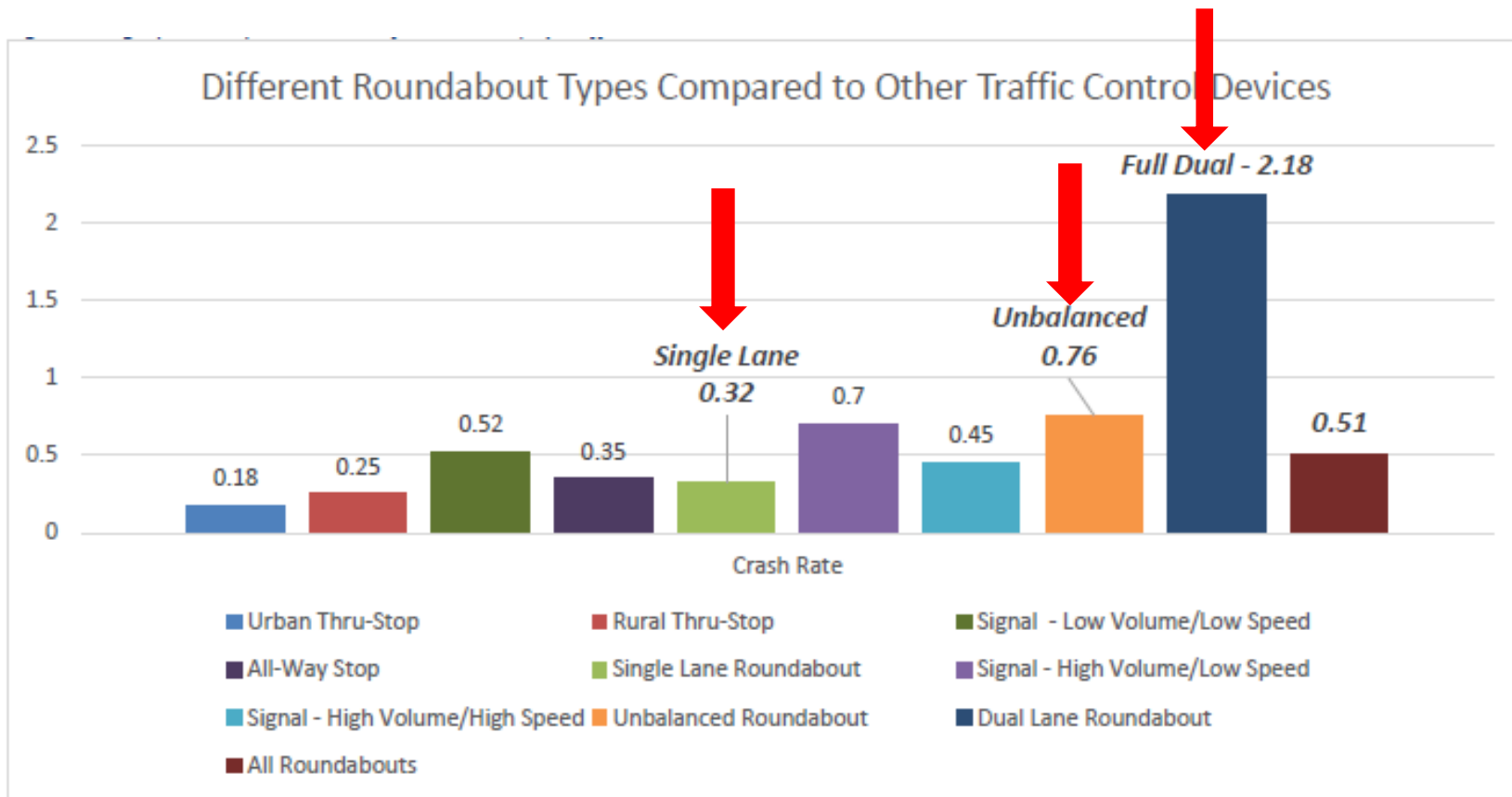
Despite the demonstrated safety benefits of roundabouts, some crashes still occur.

“A review of crashes at 39 roundabouts in the United States found that entering-circulating, exiting-circulating and rear-end collisions were the most common crash types. A large majority of crashes at the single-lane roundabouts were entering-circulating crashes. At multi-lane roundabouts, the majority of crashes were exiting-circulating”

“A review of fatal crashes at roundabouts in the United States and injury crashes at roundabouts in Washington and Wisconsin found that motorcycle crashes, fixed object crashes, and crashes involving impaired driving were overrepresented”

Roundabouts Vs. Other Intersections

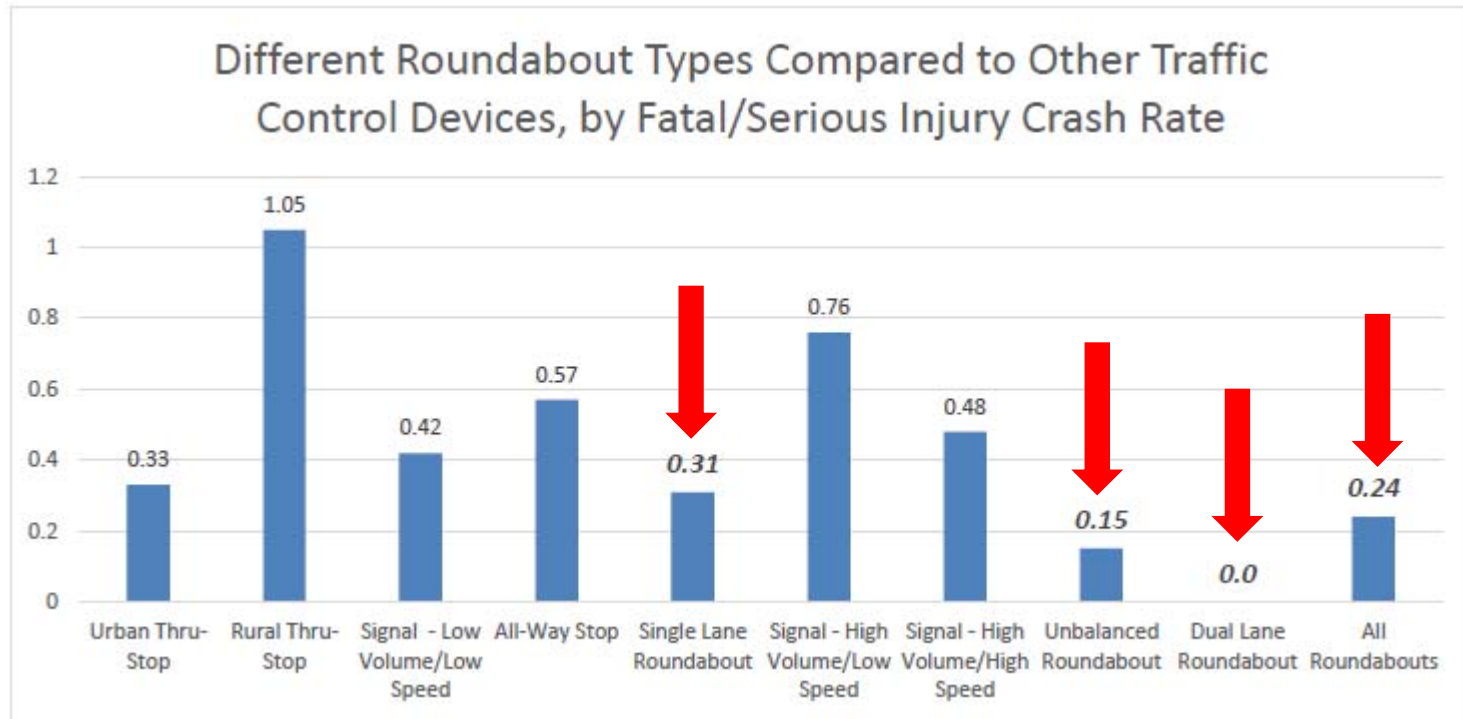
Crash Rates by Traffic Control Device



Source: A Study of the Traffic Safety at Roundabouts in Minnesota
Dated 10-30-17 | Amended 8-2-18

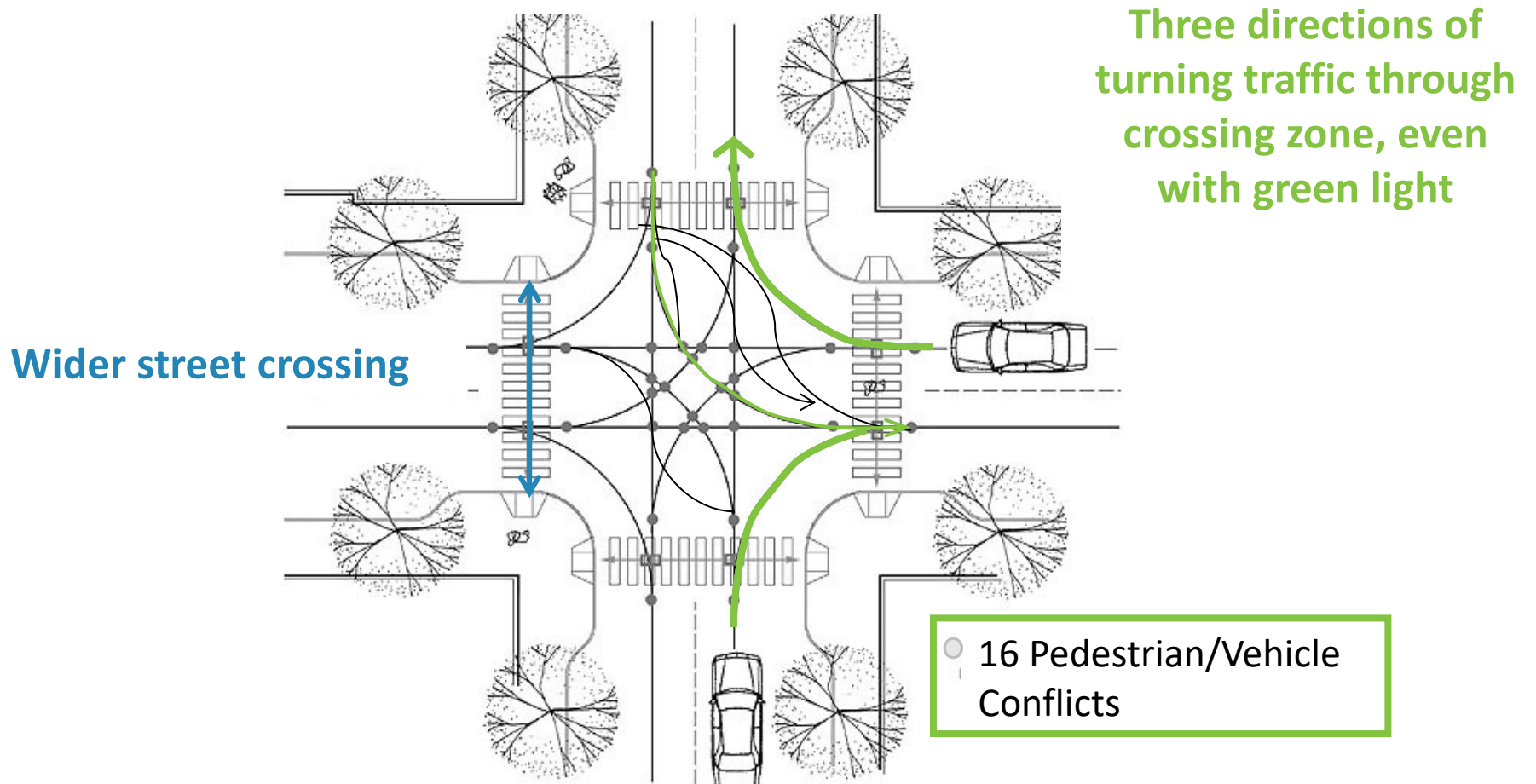
Roundabouts Vs. Other Intersections

Fatal/Serious Injury Crash Rates by Traffic Control Device



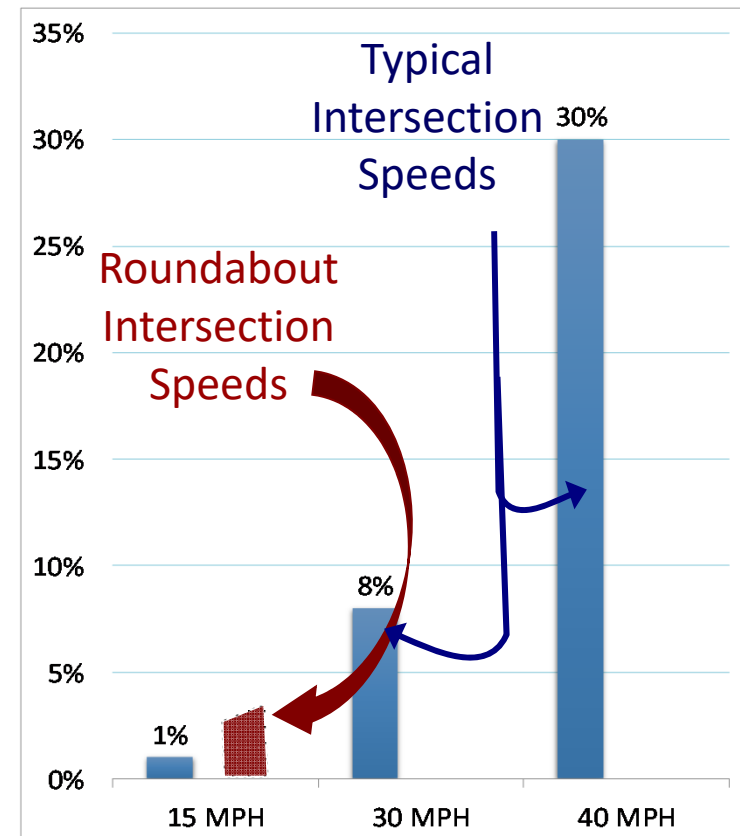
Source: A Study of the Traffic Safety at Roundabouts in Minnesota
3/19/2019 Dated 10-30-17 | Amended 8-2-18

Pedestrians at a Typical Intersection



A Better Solution For Pedestrian Safety

Pedestrian's Chance of Death if Hit by a Motor Vehicle



A Better Solution For Pedestrian Safety

A Look at a Study on Pedestrian Crash Rates

Study Result: 57.9% Fewer Pedestrian Crashes at Roundabouts



Comparison of Average Pedestrian Crash Rates for Roundabouts vs. Non-Roundabout/Comparable Sites

	Roundabout Intersections	Alternative Intersections
Average Crash Rate	0.002	0.0048

Why Consider Roundabouts?

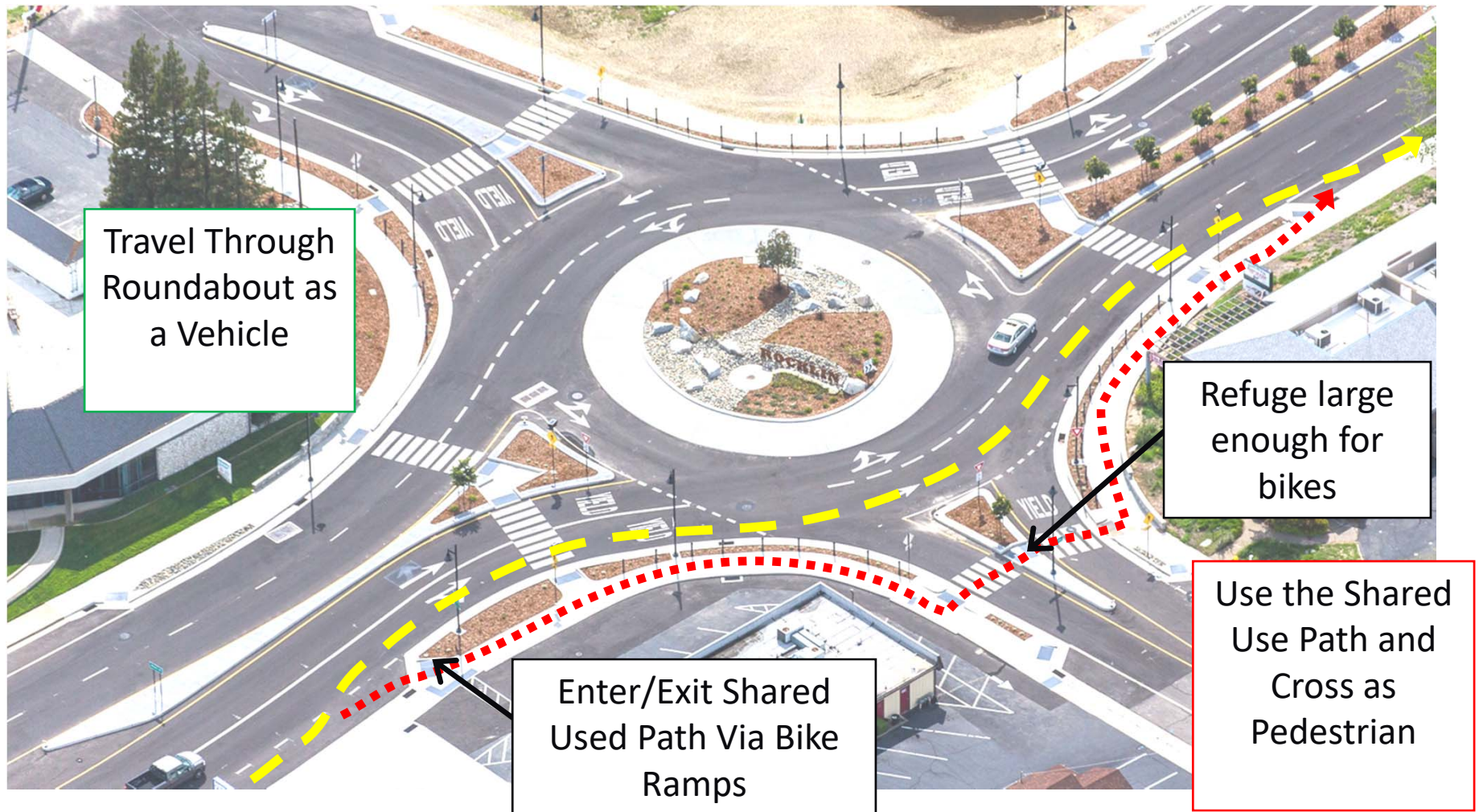
Bicycle Movements at a traffic signal



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A Better Solution For Bicycles



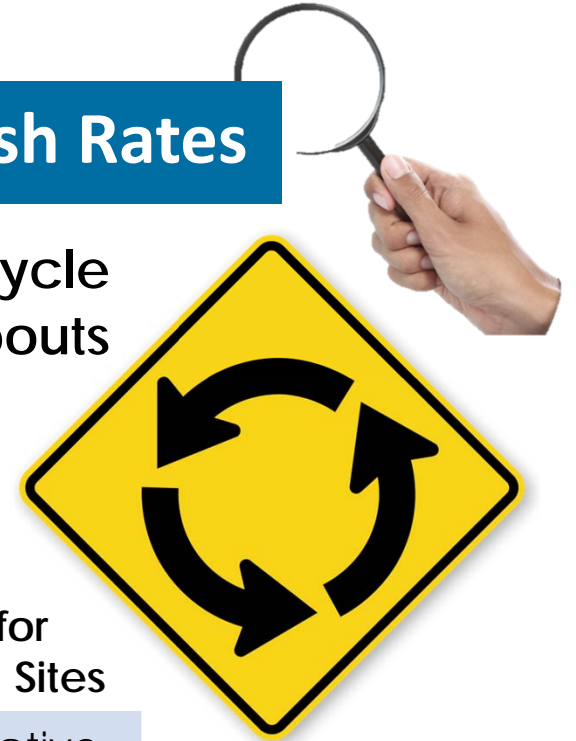
Bicycle Safety – Design Objectives

- Minimize transition and mixing zones = minimize exposure to conflicts
- Reduce speed at conflict points
- Communicate presence of cyclists and routing
- Simplify turning movements
- Continuity of routing of various experience levels
- Conform to existing with provisions for future planned facilities

A Better Solution For Bicycle Safety

A Look at a Study on Bicycle Crash Rates

Study Result: 3.5% Fewer Bicycle Crashes at Roundabouts



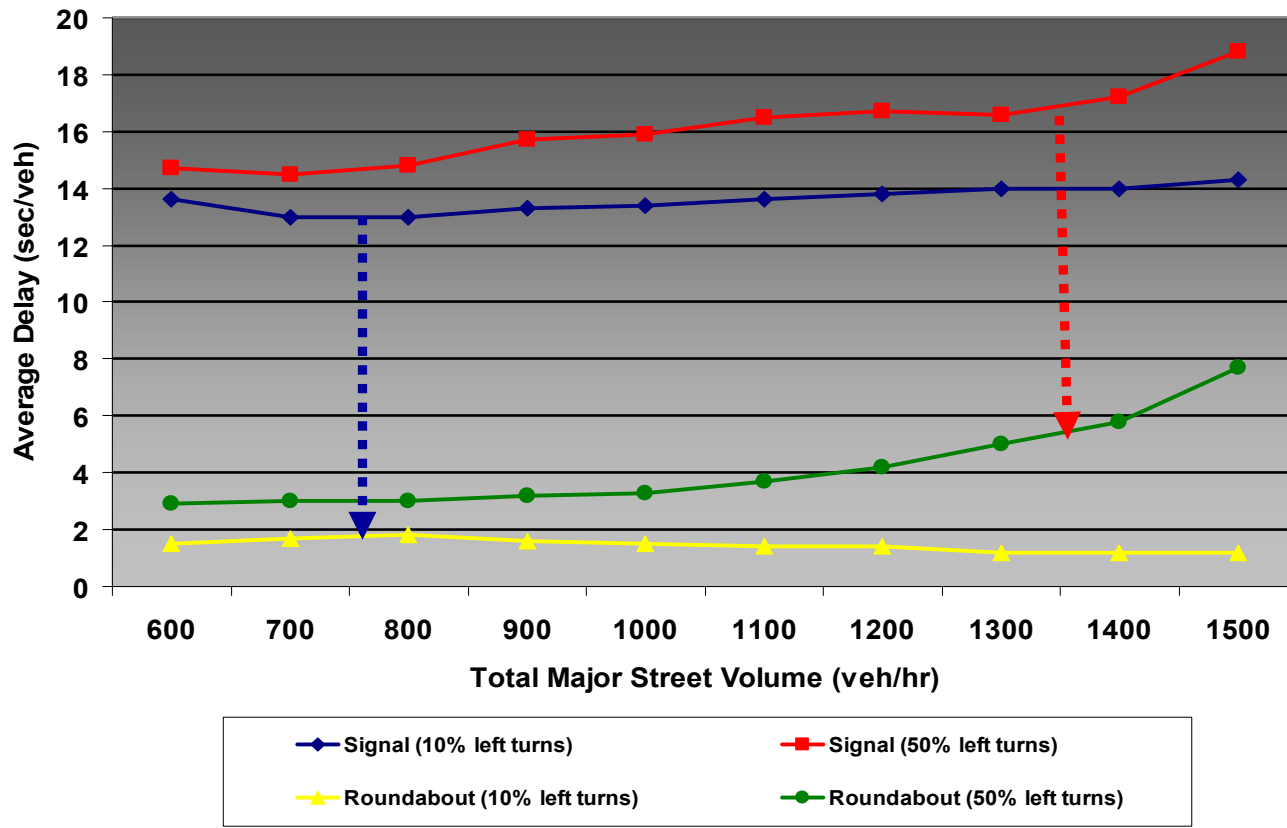
Comparison of Average Bicycle Crash Rates for Roundabouts vs. Non-Roundabout/Comparable Sites

	Roundabout Intersections	Alternative Intersections
Average Crash Rate	0.0057	0.0059

A Better Solution For Intersection Capacity

Increased Capacity & Reduced Delay

Average Delay per Vehicle at Traffic Signal as Compared to Roundabout



A Balanced Solution Accommodating All Users

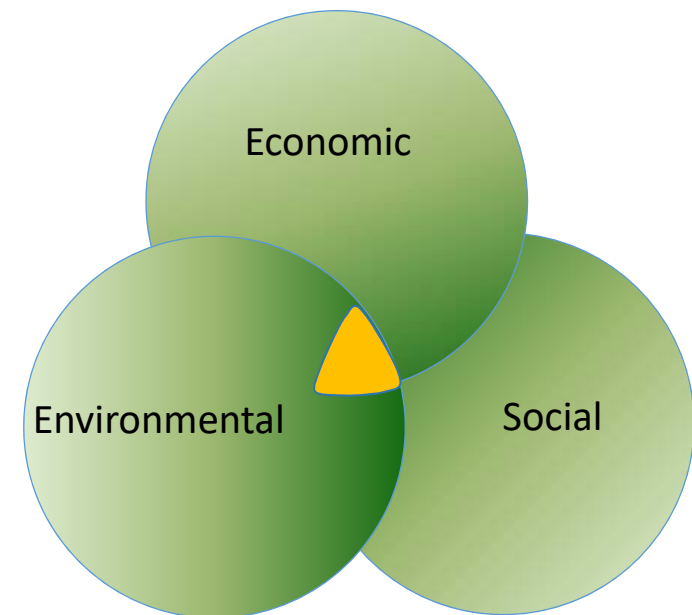


Roundabouts are Multi-Modal

Why Roundabouts Are A Better Solution?

Consideration of Environmental, Economic and Social Issues in the Design of a Project:

- Safety
- Delay
- Emissions
- Life Cycle Costs
- Water Quality
- Consideration of All Users



A Better Solution For The Environment

Roundabouts Provide a Significant Reduction of Greenhouse Gases

**20%-50% Emission
Reduction**
with Roundabouts
versus
Traffic Signals



A Better Solution For The Environment

Less Delay = Less Time Idling
= Less Emissions
= Less Fuel Consumption

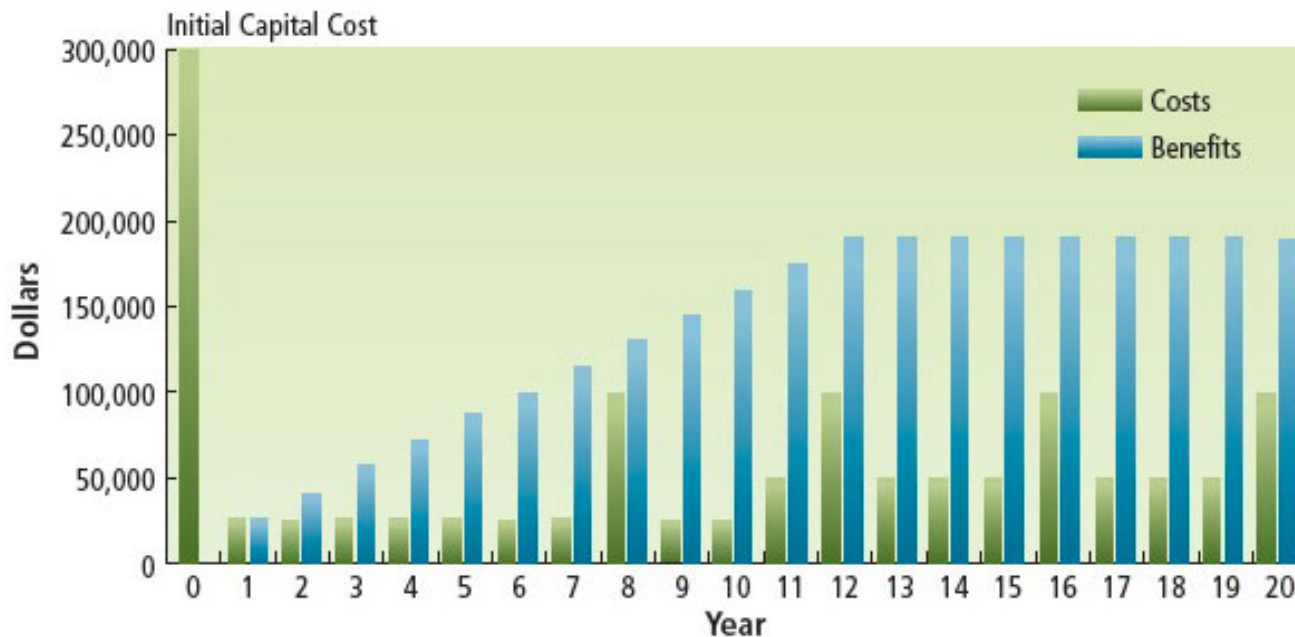
Per Kansas State University (*Environmental Impacts of Kansas Roundabouts, September 2003*):

38-45 percent decrease in **Carbon Monoxide emissions**,
55-61 percent decrease in **Carbon Dioxide emissions**,
44-51 percent decrease in **Nitrogen Oxides**, and
62-68 percent decrease in **Hydrocarbons**.

A Better Solution For Life Cycle Costs

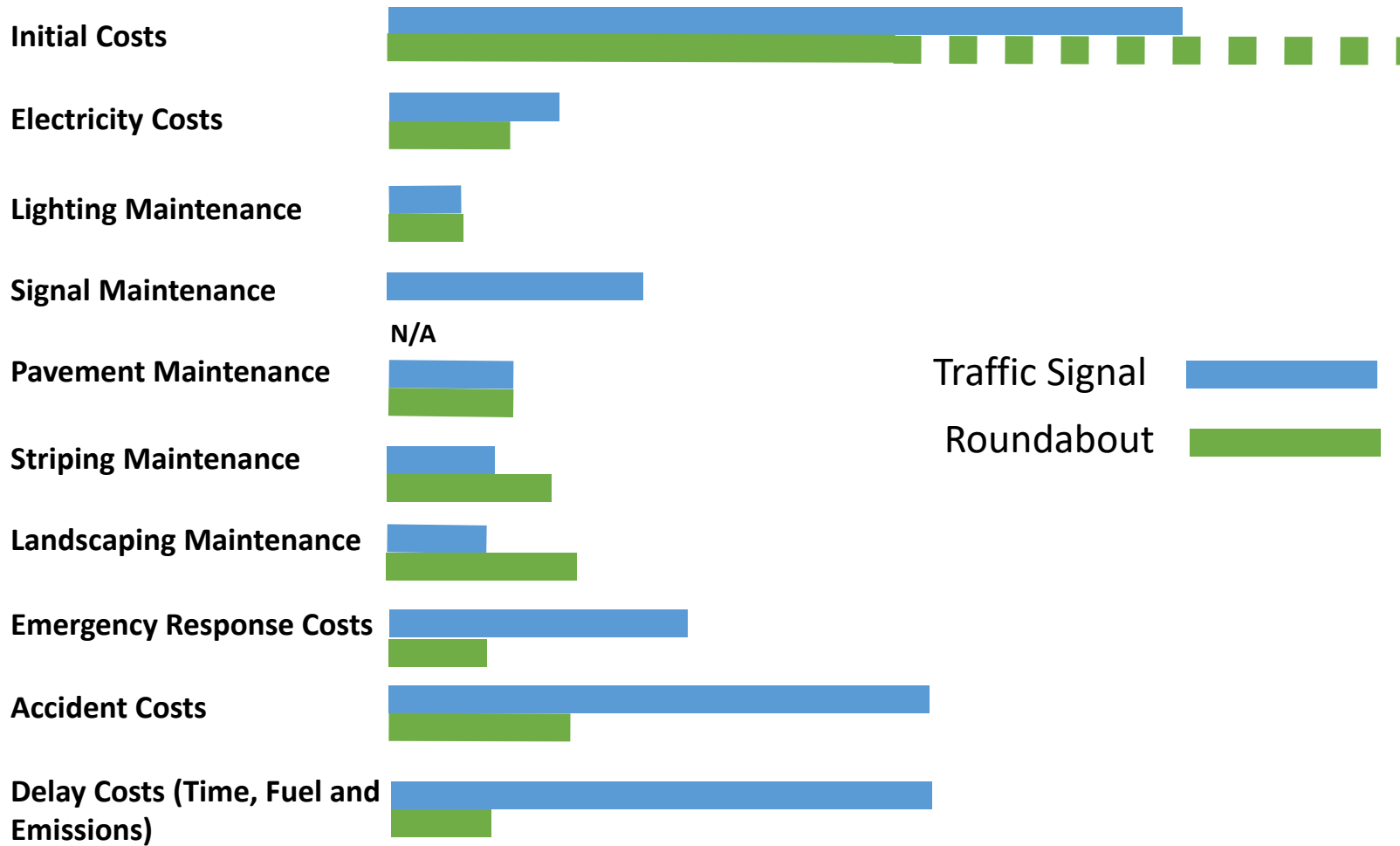
Definition: Sum of all recurring and one-time costs over the full life span of a system

Typical Project Life Cycle



Source: FHWA.

Life Cycle Costs – Relative Costs*



*Cost relationships are project dependent and can vary significantly from project to project

Intersection Control Evaluation

What is ICE?

- **Engineering Policy Directive & Type-Selection Tool**

Focused on the Intersection – the most critical component of a roadway network

- **Flexible Framework comprised of TWO STEPS:**

Step 1. SCREENING eliminates impractical solution alternatives

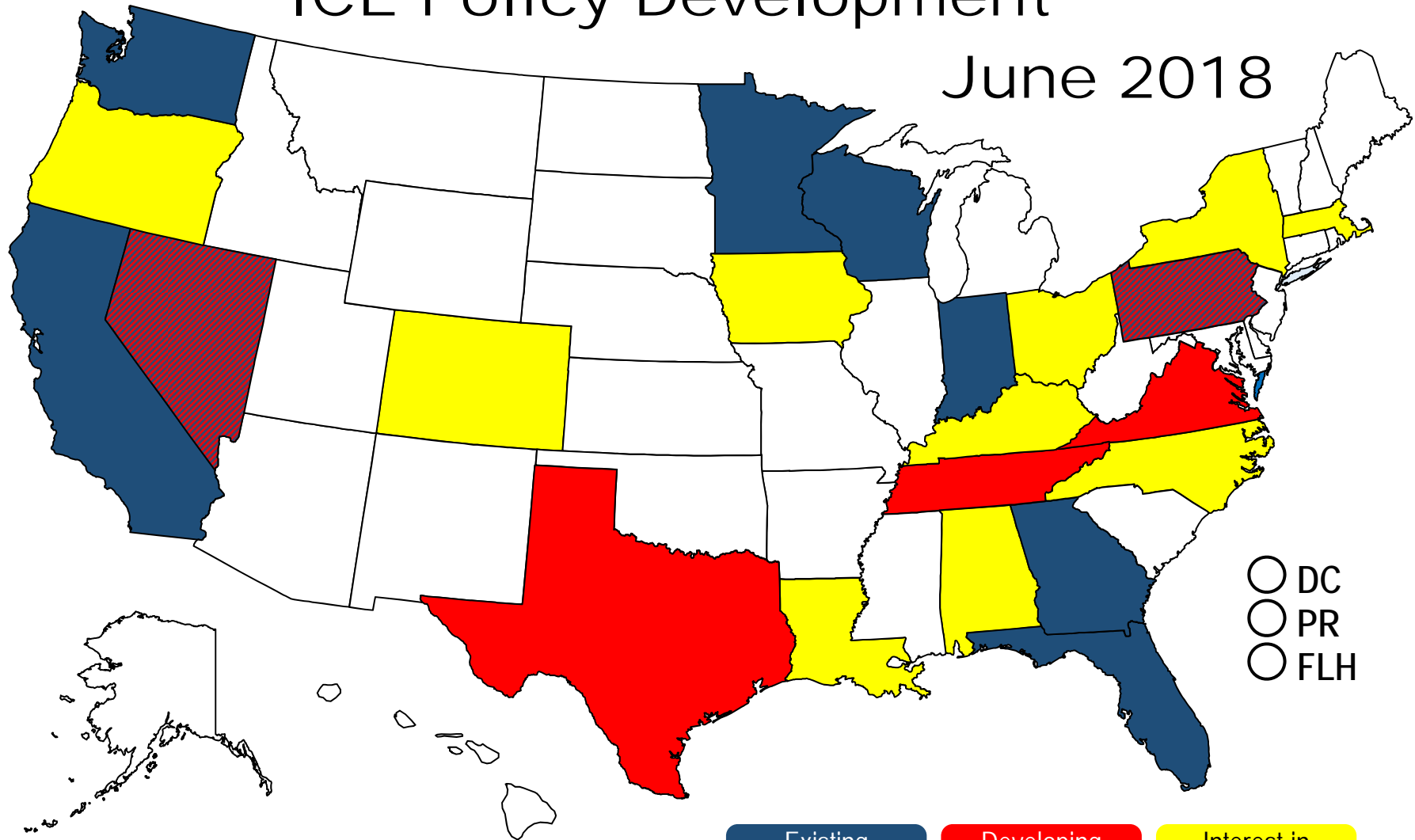
Step 2. ANALYSES produce key findings to inform decision-making



STATE OF CALIFORNIA • DEPARTMENT OF TRANSPORTATION		
POLICY DIRECTIVE		
TR-0011 (REV 9/2006)		
TRAFFIC OPERATIONS POLICY DIRECTIVE	NUMBER: 13-02	PAGE: 1 of 10
DENNIS T. AGAR, Chief Division of Traffic Operations <i>Dennis T. Agar</i>	DATE ISSUED: August 23, 2013	EFFECTIVE DATE: August 30, 2013
SUBJECT: Intersection Control Evaluation (ICE)	DISTRIBUTION	
	<input checked="" type="checkbox"/> All District Directors <input checked="" type="checkbox"/> All Deputy District Directors - Traffic Operations <input checked="" type="checkbox"/> All Deputy District Directors - Maintenance <input checked="" type="checkbox"/> All Deputy District Directors - Construction <input checked="" type="checkbox"/> All Deputy District Directors - Design <input checked="" type="checkbox"/> All Deputy District Directors - Transportation Planning <input type="checkbox"/> Chief, Division of Engineering Services <input checked="" type="checkbox"/> Chief Counsel, Legal Division <input checked="" type="checkbox"/> Publications (California MUTCD Website) www.dot.ca.gov/hq/traffops/signtech/mutcdsupp/ca_muted.htm <input type="checkbox"/> Headquarters Division Chiefs for:	

ICE Policy Development

June 2018



3/19/2019

Existing ICE Policies Developing ICE Policies Interest in ICE Policies

An Opportunity for Place-Making

Complete Streets: A Street that is designed to balance safety and convenience for everyone using the road.



How? Large Vehicles



Large Vehicles



Near Walmart Distribution Center – Porterville, CA

Large Vehicles



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How? Emergency Vehicles



Emergency Vehicles Circulating Through Roundabout
Courtesy of City of Clearwater, FL

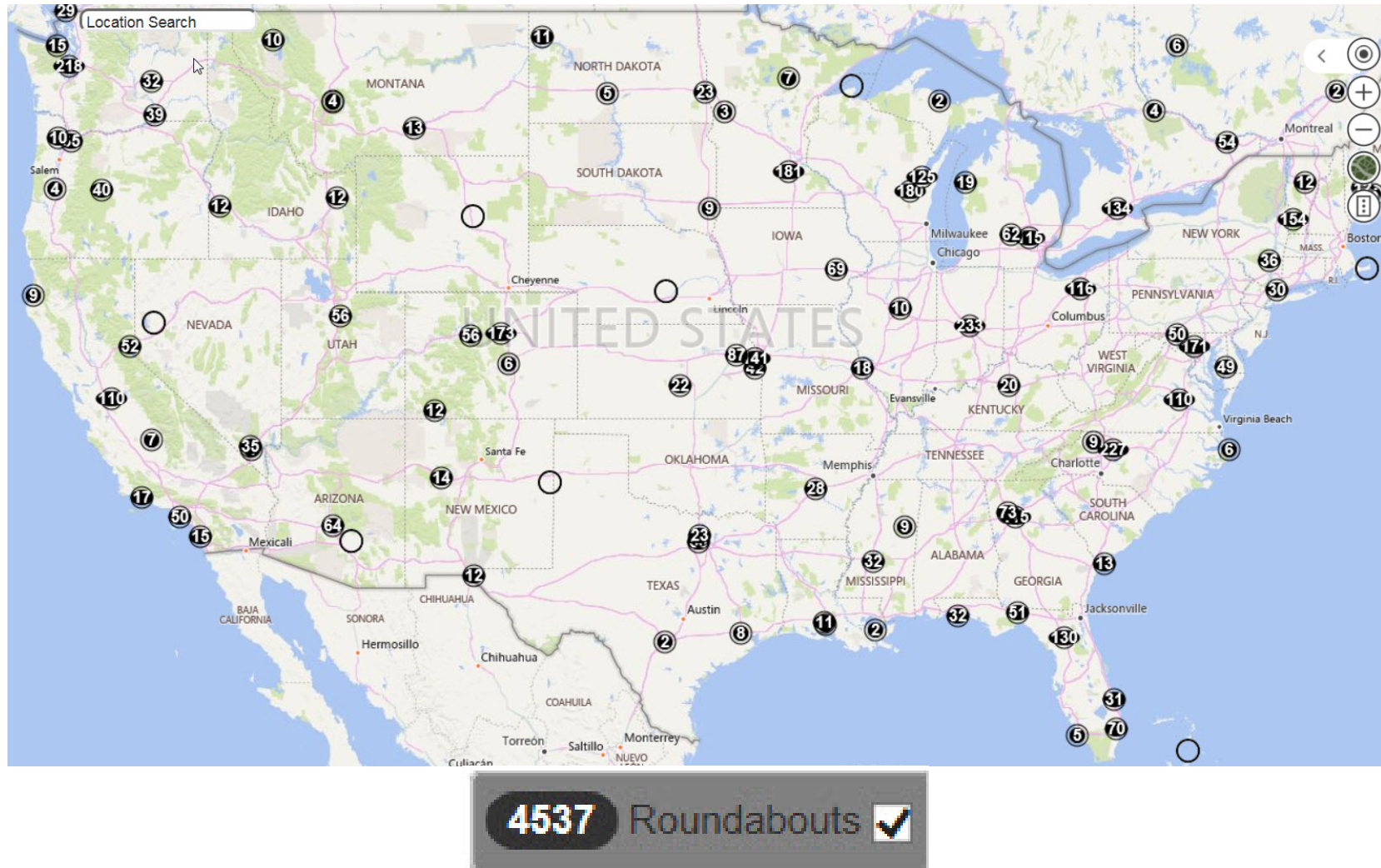
How? Emergency Vehicles



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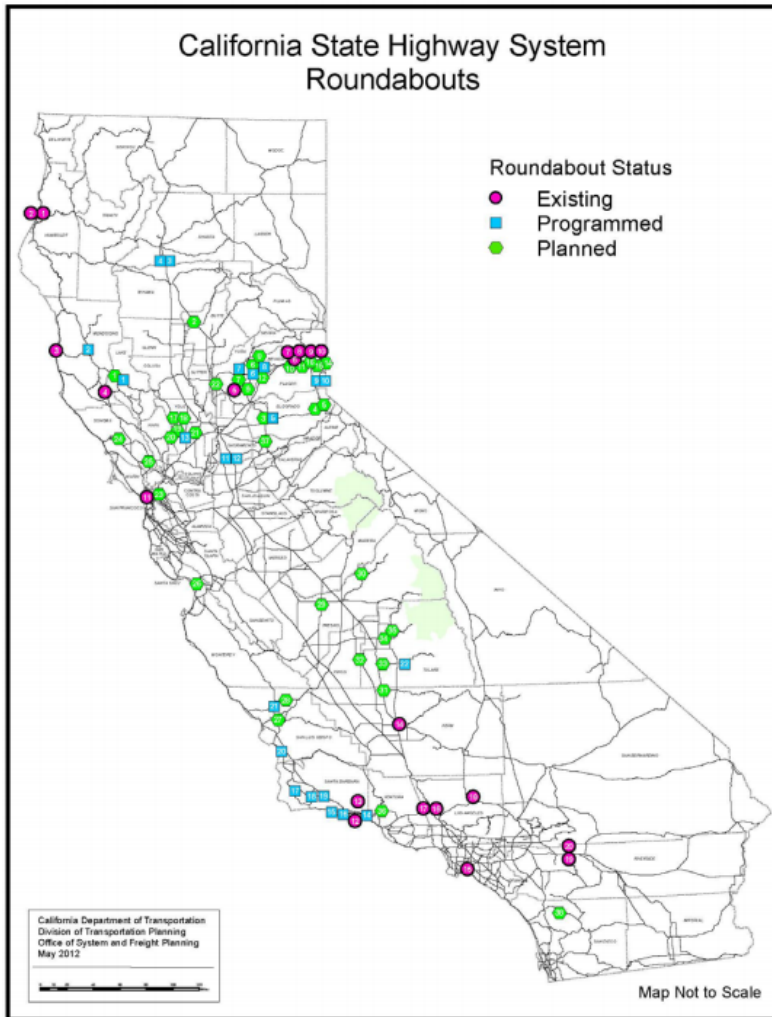
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US Roundabout Summary



California Roundabout Summary

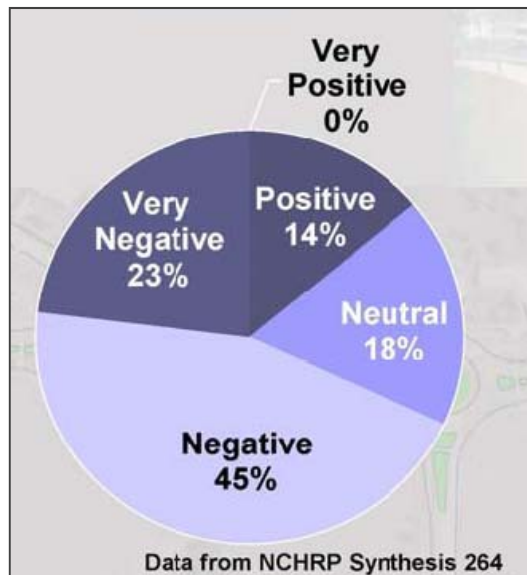
On the state system



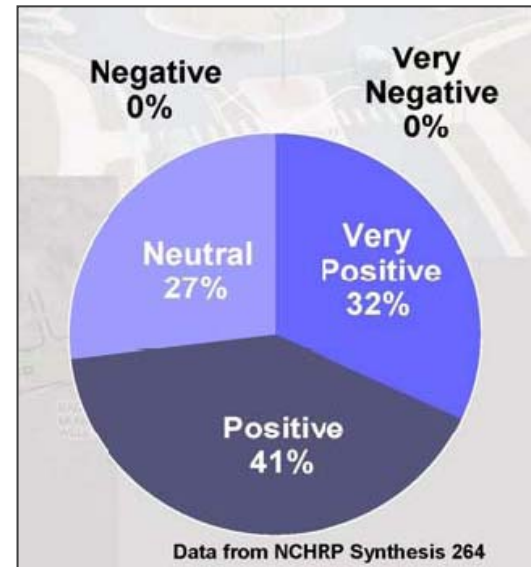
Source: CA DOT 3/19/2019

Public Opinion of Roundabouts

Before Roundabout Installation



After Roundabout Installation



Public Perception Changed from 68% Negative to 75% Positive after Installation

Questions?