

# Development Opportunities Golden, Colorado Case Study

Minnesota Roundabout Conference

April 5-6, 2006

Alex J. Ariniello, P.E., P.T.O.E.



City of Golden  
COLORADO



# Overview

- **Golden Roundabouts**
- **Other roundabout applications**
  - **Retail/business**
  - **Residential**
- **Roundabout Market Potential**



# NO WAY OUT?

Drivers fond of straight lines balk at traffic roundabouts, but experts say that despite initial confusion, there's safety in circles.

By Robert Sanchez  
Denver Post Staff Writer

**Golden**  
From his storefront window overlooking one of the city's circular intersections, John Berninoni has seen his share of smashed bumpers, broken headlights and raised middle fingers.

"The wrecks are like no other," the 27-year-old tire store manager says of the South Golden Road circle, one of four along the stretch of road about a mile south of downtown.

First, there was the case of the wayward driver who went the wrong way into one of the circles — called a roundabout — then narrowly escaped amid the screeches and horn honking of oncoming traffic. Some drivers had side-to-side scrapes with other vehicles, while a few poor souls were so confused that they stopped midway through the curve, earning themselves a busted tail light.

But as drivers attempt to navigate the sometimes-problematic road, an increasing number

of cities and towns statewide have this to say: Get used to it.

Already common in Europe and a mainstay in some Colorado ski towns, roundabouts are popping up at intersections in subdivisions across metro Denver, outside office complexes in Greeley and along busy roads from Fort Collins to Durango as the newest way to control burgeoning communities' traffic headaches.

In fact, transportation planners across Colorado have become so enamored of the traffic devices that the numbers have more than doubled in the state, from about 70 in 2000 to as many as 200 this year.

Colorado accounts for nearly one-eighth of all roundabouts nationwide, putting the state among the most roundabout-happy places in the nation, along with Florida, Kansas, New York and Oregon.

"A traffic signal doesn't have to be the only option anymore," says Alex Ariniello, vice president of Denver-based LSC Transportation,

which built 60 of the circles statewide. Roundabouts "are everywhere now."

The circles differ from their rotary cousin in that the roundabout is larger, faster and has better sight lines for drivers in many East Coast states.

Traffic engineers say roundabouts are among the safest and most reliable traffic-management options, keeping vehicles moving at a steady pace while eliminating deadly T-bone crashes at traditional intersections.

But some folks who navigate them say a roundabout is circular logic, at best.

"It's a live-for-all when you get into them," says Berninoni, who regularly drives the Golden Road roundabouts now that the wrecks at a nearby cash-advance business. "You've got to pay attention or someone's going to clip you."

In an attempt to help wayward drivers, Jefferson County created a Internet-based simulator (think poor-man's Progame) showing drivers how to properly navigate the circles. The town of Parker sent pamphlets to residents several years ago to help residents understand that town's first roundabout.

"People get into one and realize that they're going to have to pay attention," says Philip Christensen, a senior planner with Parametrix Consulting in Denver, a transportation planning firm. "When you drive a roundabout, you have to think, and that's what we want."

Roundabouts work like this: Vehicles merge counterclockwise on a two-way road dotted with yield signs and constructed around a landscaped center. The design lacks traffic lights, and motorists entering the loop yield to drivers inside the circle. Typical speeds are between 25 and 35 mph.

At a cost of \$100,000 to \$1 million, depending on the size, roundabouts are considered cheaper alternatives to stoplights because there are no electrical components, and maintenance is rarely needed.

More than 1,000 roundabouts are in use nationwide, up from just 500 just a few years ago. The first modern roundabout was built in Las Vegas 40 years ago, and the idea was later embraced in Colorado.

When the state's first roundabouts were built in 1970, nearly a decade ago, drivers in the city's six-edged traffic fell from 90 minutes to 10 minutes. The state's roundabout proliferation began from there.

Colorado Springs has more than two dozen, according to estimates. Arvada has 11 and Loveland has at least seven, with 11 more planned in the city.

"We were concerned about public perception of fast, but when we opened our mind to them, we found that they're a

## ROUNDBABOUT: Traffic circles here to stay

CONTINUED FROM 1A

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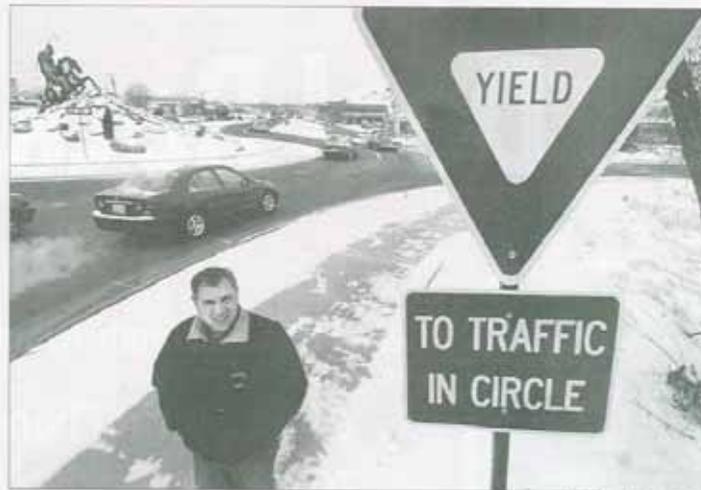
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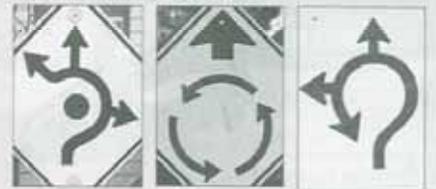
Ken Hartman, Golden's director of public works, supported putting the four traffic circles on South Golden Road. He often fielded a lot of complaints about the roundabouts, but Hartman says there have been fewer accidents and injuries.

### Roundabouts vs. rotaries

The biggest difference between the two are in vehicle speeds and in how entering the circle.

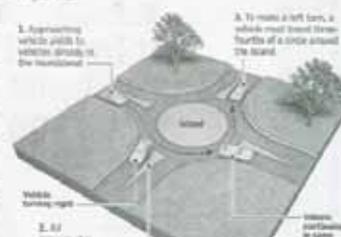
- In roundabouts, drivers generally travel between 15 and 20 mph and have the right-of-way, meaning outside traffic must yield.
- In rotaries, where vehicles can top 45 mph, entering traffic has the right-of-way, meaning traffic inside the circle must yield.
- While the number of roundabouts nationwide is growing dramatically, the number of rotaries appears to be declining. In New Jersey, for example, some rotaries are being eliminated because of long backups and serious crashes.

### Examples of roundabout signs



### Getting the runaround

Roundabouts are becoming more prevalent in Colorado. Here's how to navigate one.



complaints.

Reported crashes dropped from about 60 a year ago, and injury accidents have fallen from roughly 10 a year to one or two since the project was completed six years ago. The roundabouts have been so successful, that planners from Illinois and Texas have studied them.

And the roundabout revolution is gaining even more headway in Colorado. Another dozen or so are planned from Grand Junction to Superior.

The council in Erie is debating whether to put one at a busy intersection. Lakewood is planning one outside two schools, and Longmont is considering its first.

Not all that planning doesn't elicit some drivers' ill-fated days of good old headlights, wails to drive around," says Pat Holloway, a Jefferson County commissioner who gave out his best advice: "There's a sign to be sold for going in line."

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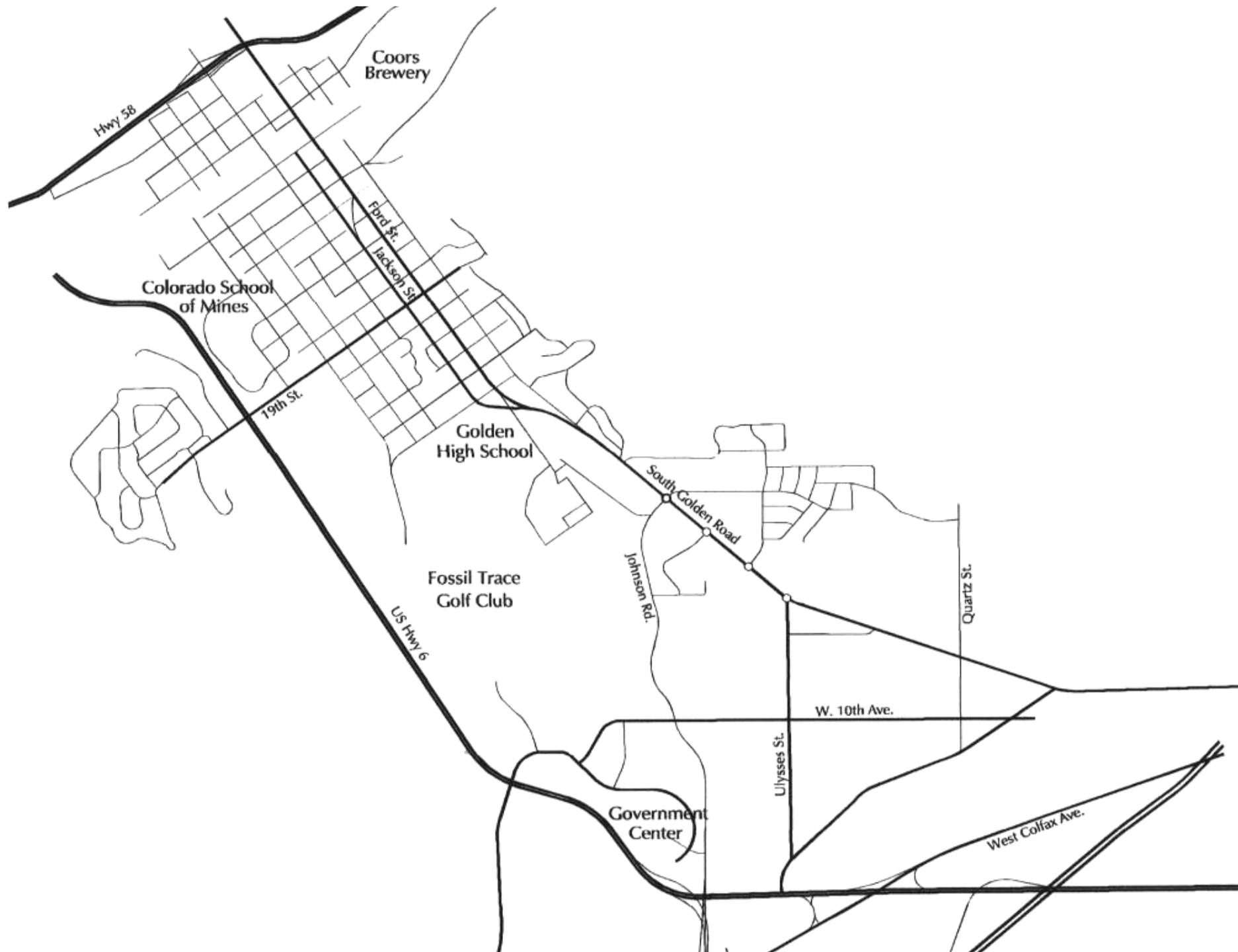
> See ROUNDBABOUT on 5A

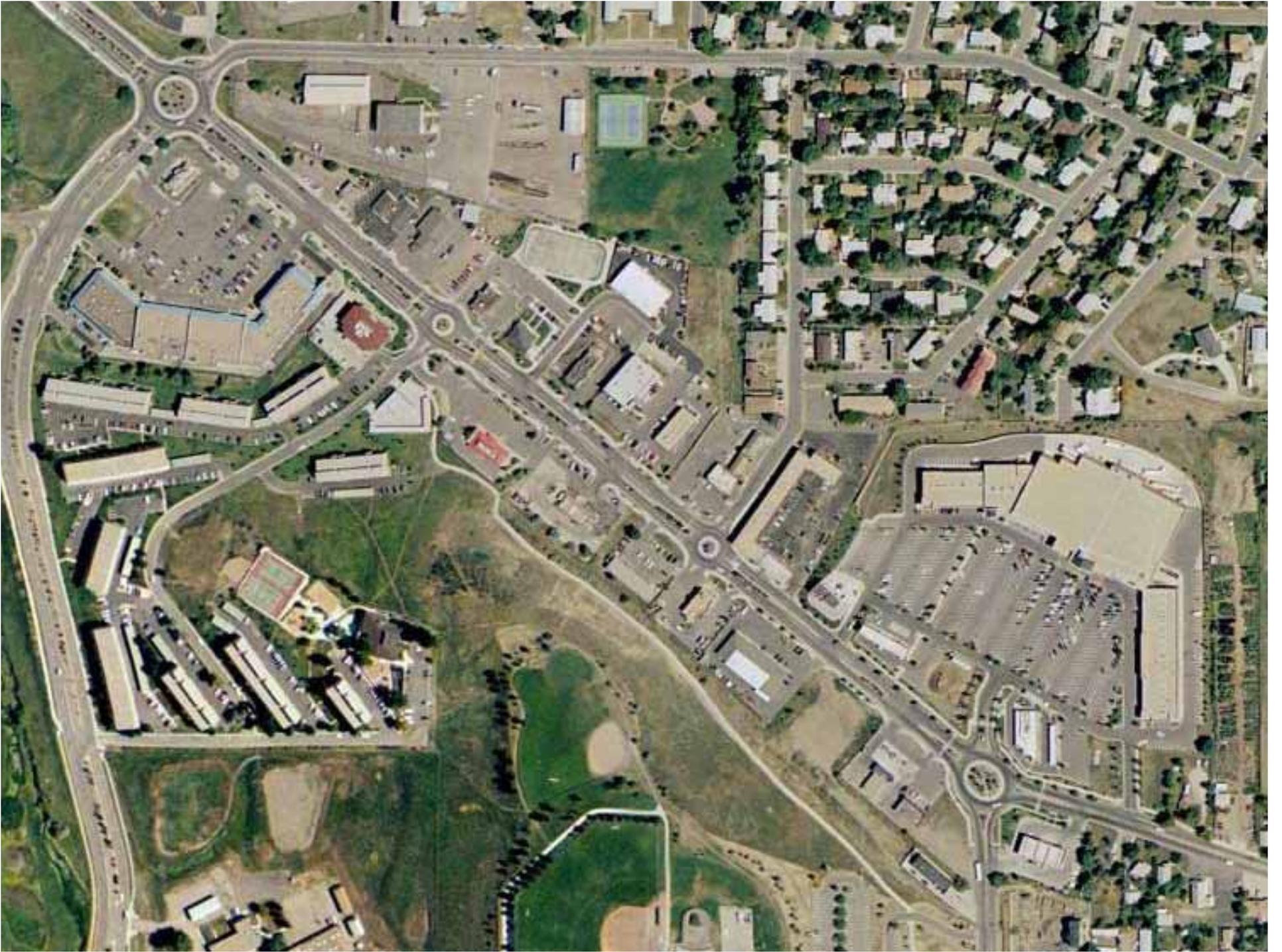
# Golden Roundabouts

## City of Golden

- 17,000 people
- Colorado School of Mines
- Coors Brewery







# South Golden Road

## Suburban Highway

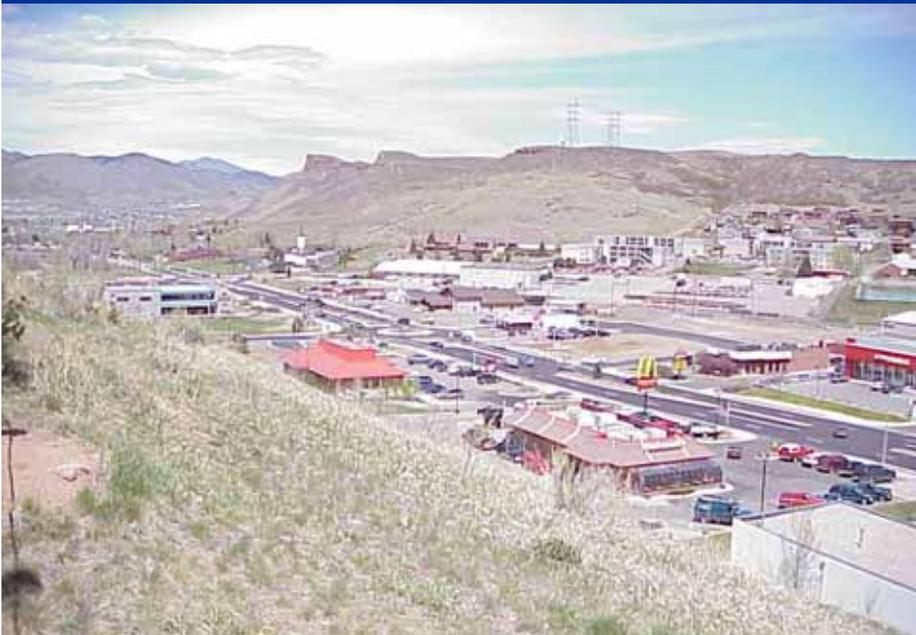
- Four Travel Lanes
- Center Turn Lane
- Parking/Shoulders
- 84 feet in Width
- Driveways allowed indiscriminately



# Strip Retail Area

**Many Businesses, including**

- **Several Fast Food Restaurants**
- **Small Shopping Center**



# Safety Concerns

- **Unrestricted Access**
- **Center Turn Lane**
- **Width of roadway encouraged speeding**
- **Was difficult to cross**



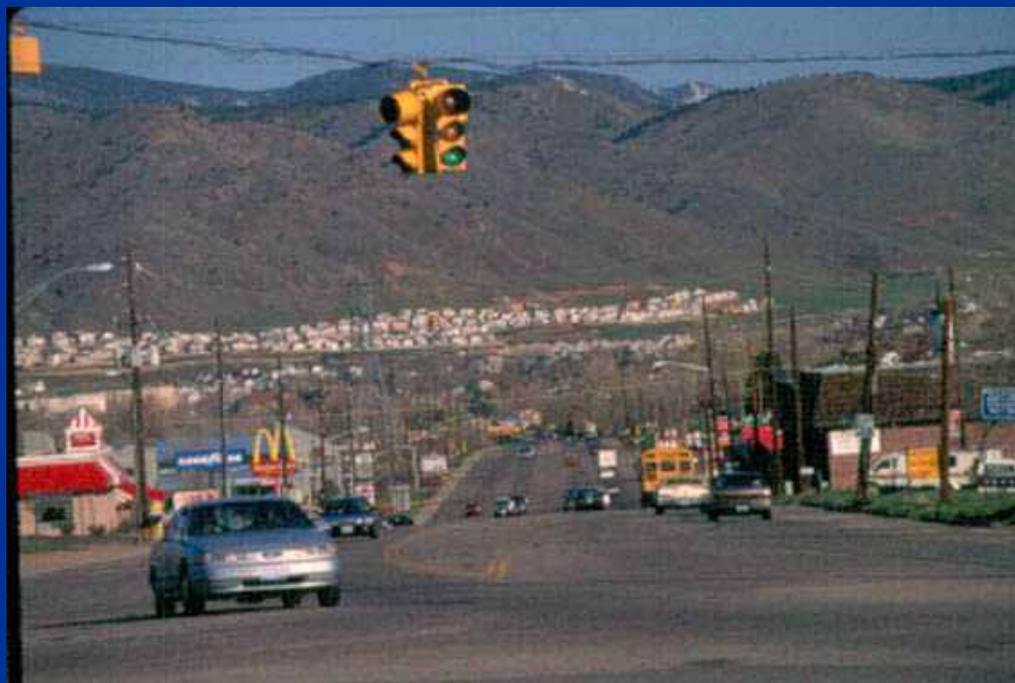
# Impetus To Project Start

- Development proposal for a shopping center
- Need for a traffic signal at Utah Street



# City Objectives for South Golden Road

- Reduce vehicular conflicts and increase safety
- Create a more aesthetically pleasing area
- Create a more pedestrian-friendly environment
- Reduce delays for entering traffic at Utah Street
- Reduce queue delays to reduce travel time



# Initial Concept for South Golden Road

- **Narrow the roadway**
- **Provide medians and wide detached sidewalks**
- **Construct two roundabouts at Utah St. and Ulysses St.**



# City Reaction

- **Receptive to roundabout concept**
  - **Traffic calming aspects**
  - **Obvious operational qualities of roundabout concept**
  - **Ease of U-Turns at the roundabouts**
  - **Requested addition of a third roundabout**



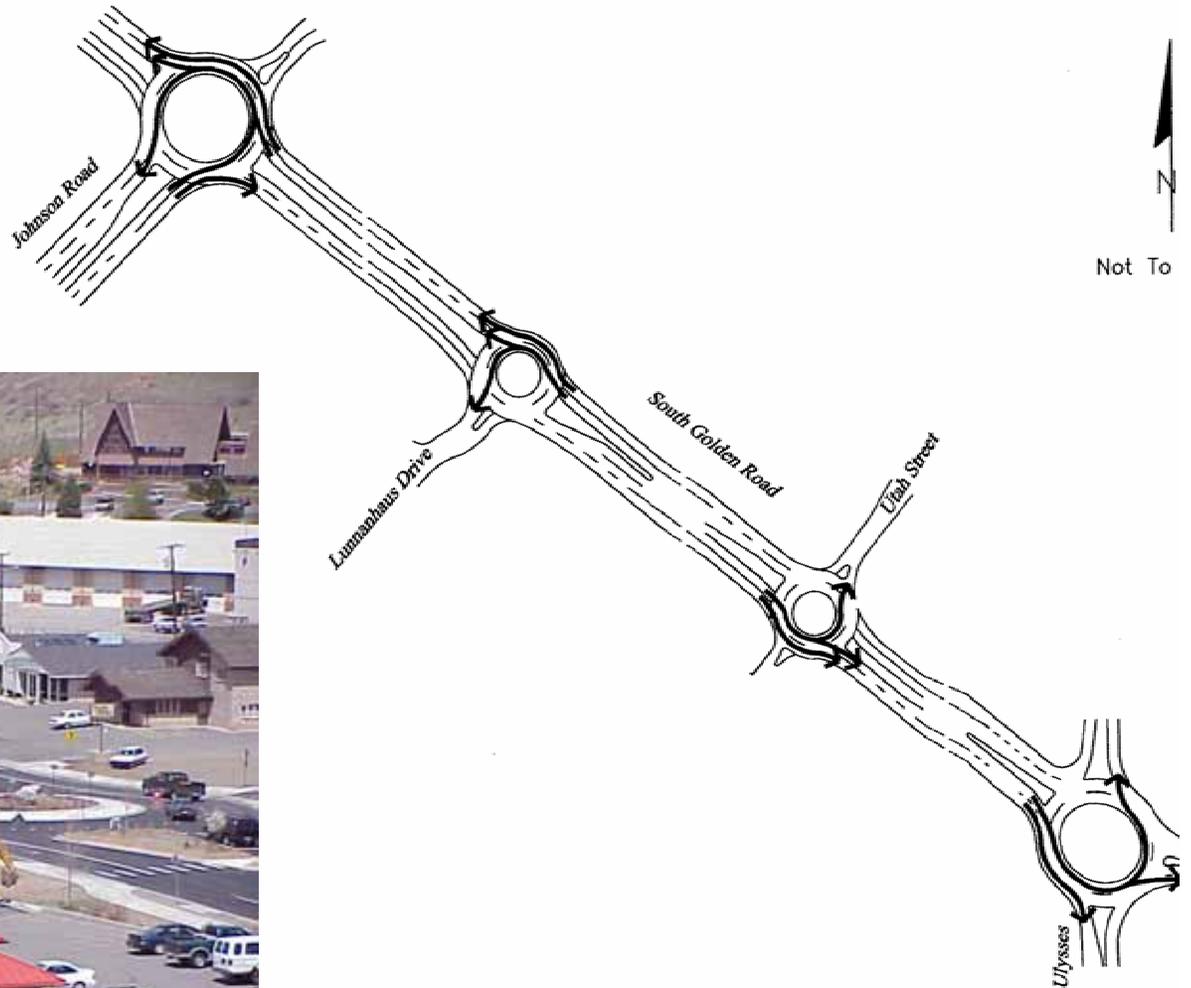
# Selling the Roundabout

- **Biggest opponent was King Soopers, the major tenant of the new shopping center**
- **City offered to tear roundabout out if sales revenues didn't meet expectations**



# Selling The Roundabout

- Meeting with local merchants
- Fourth roundabout



# Implementation

- King Soopers exceeded its sales projections
- Ulysses roundabout constructed on fast track schedule
- Opened in November, 1998
- The other three roundabouts were completed in 1999



# Roundabout Dimensions

<b>S. Golden Road Roundabouts</b>	<b>Inside Diameter</b>	<b>Outside Diameter</b>
<b>Ulysses Street (single-lane)</b>	<b>90</b>	<b>145</b>
<b>Utah Street</b>	<b>50</b>	<b>105</b>
<b>Lunnanhaus Drive</b>	<b>50</b>	<b>105</b>
<b>Johnson Road</b>	<b>100</b>	<b>155</b>



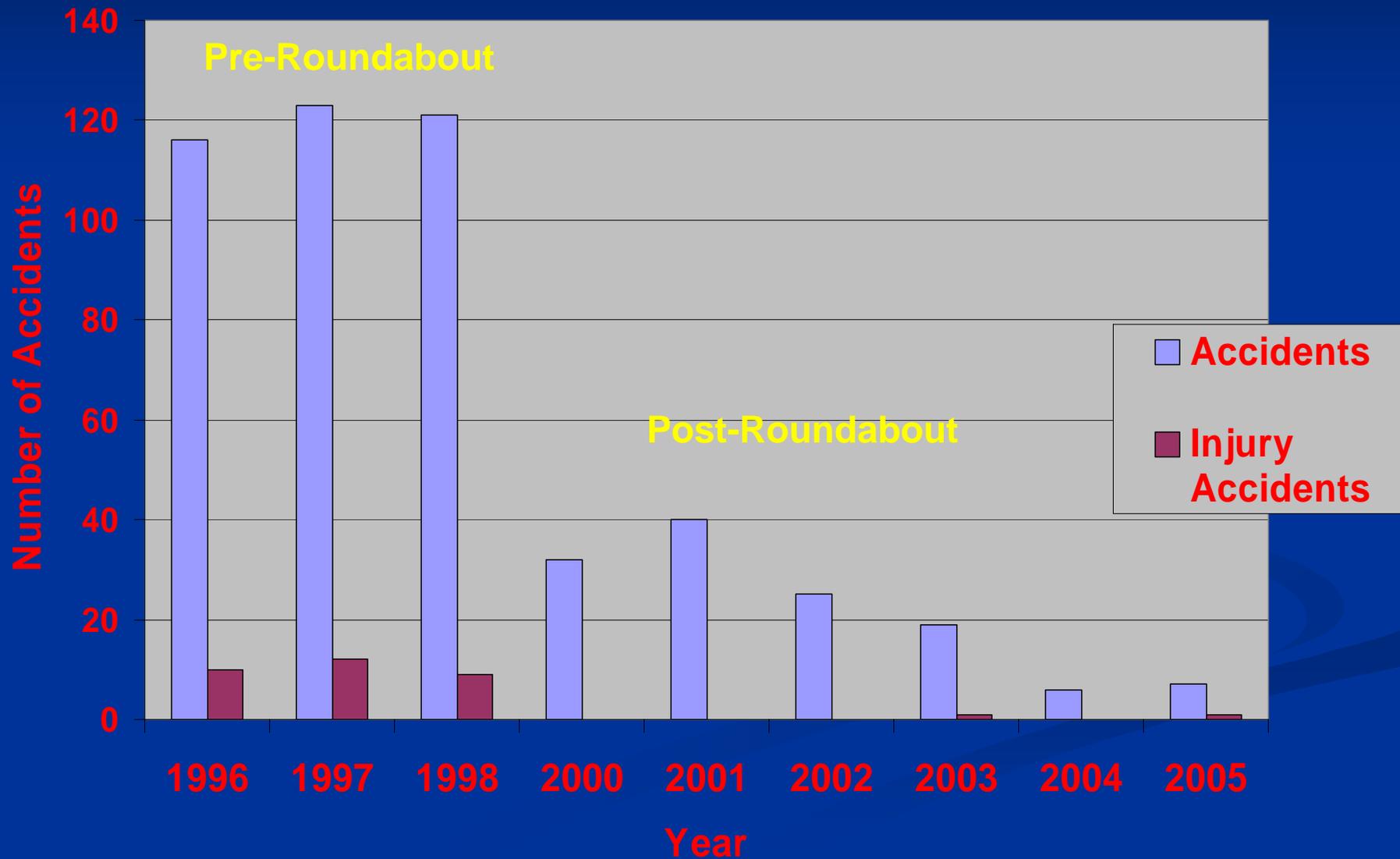
# Project Costs

**The 3/4 mile long project  
cost 1.3 million:**

- **Four Roundabouts**
- **Roadway  
Reconstruction**
- **Medians, Detached  
Sidewalks, Utility  
Relocations**
- **Design and  
Landscaping**



# Accident History



# South Golden Road Experience

4 Roundabouts within 1 mile

	3 years prior	5 years after	% Reduction
<b>Total Accidents in Corridor</b>	<b>360</b>	<b>120</b>	<b>- 60%</b>
<b>Injuries</b>	<b>31</b>	<b>2</b>	<b>- 96%</b>
<b>Average Daily Traffic</b>	<b>15,000</b>	<b>21,000</b>	<b>+ 40%</b>
<b>Accident Rate (per million vehicle miles)</b>	<b>26</b>	<b>10</b>	<b>- 62%</b>

# Slower Speeds But Faster Travel Times

## Prior to roundabouts:

- 2 traffic signals
- Travel time of 78 sec.
- With 3rd signal  
Predicted travel time of 103 seconds

## After the Roundabouts:

- Travel time reduced to 68 seconds



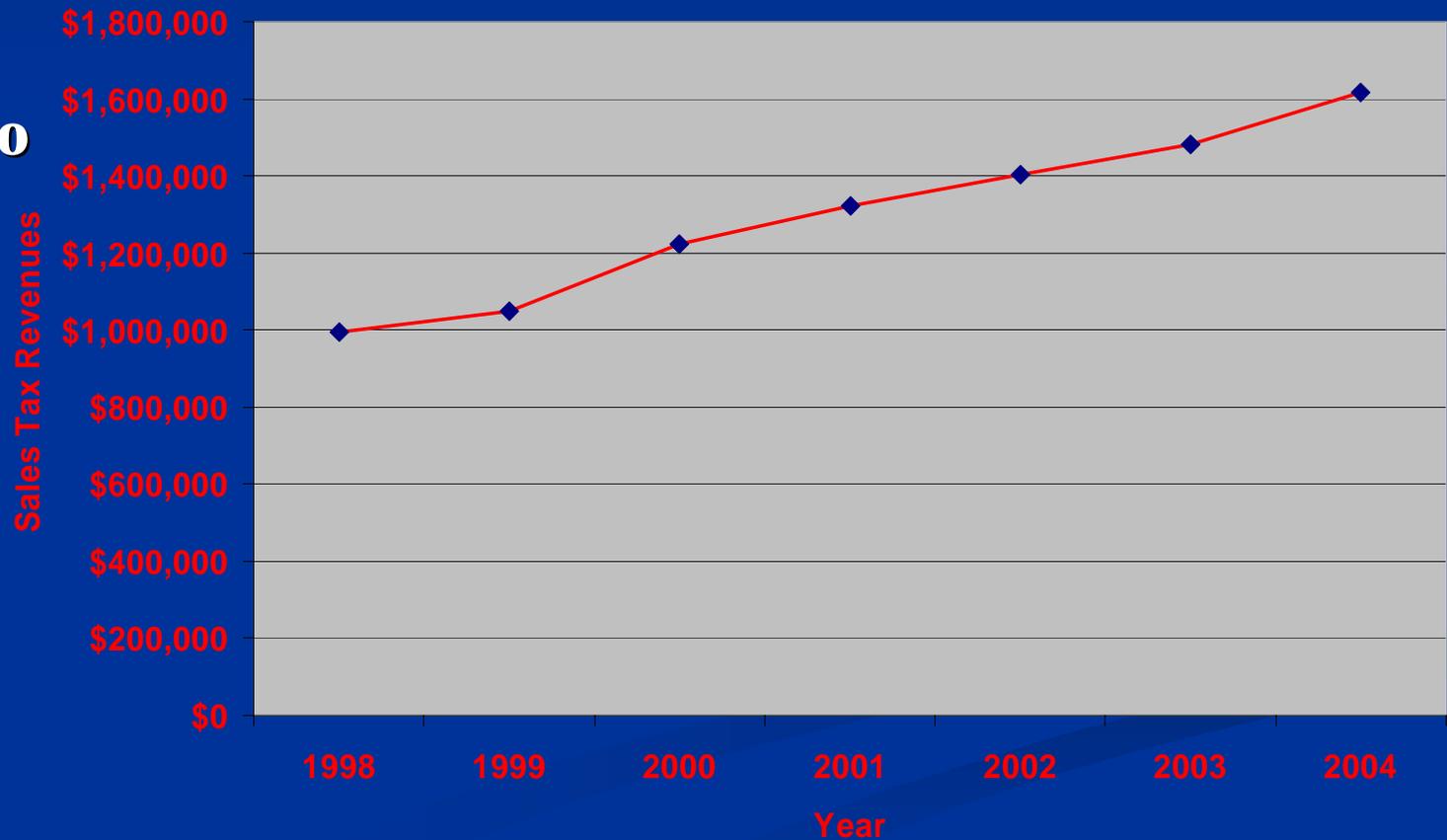
# Business Access

	Seconds of Delay	
	<u>Before</u>	<u>After</u>
<b>Average Delay at Access Points</b>	<b>28</b>	<b>13</b>
<b>Maximum Delay at Access Points</b>	<b>118</b>	<b>40</b>



# Sales Tax Revenues

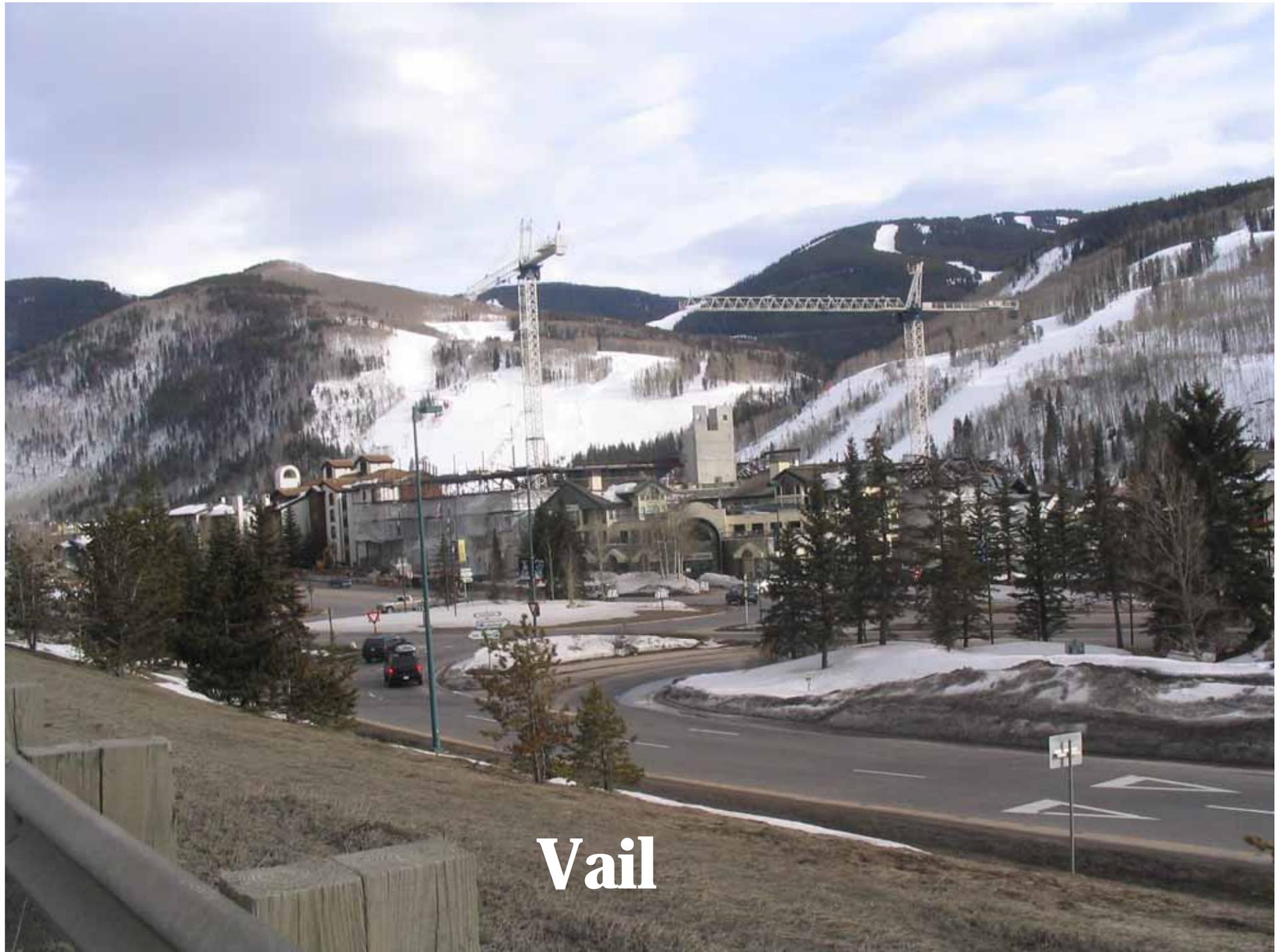
- 60% increase in sales tax revenues
- Only area to experience continued sales tax growth



# Summary and Conclusions

- **Roundabouts in a Strip Commercial Area**
- **Slower Speeds, Faster Travel**
- **Reduced Delay at Access Points**
- **62% Reduction in Accident Rates**
- **60% Increase in Sales Tax Revenues**

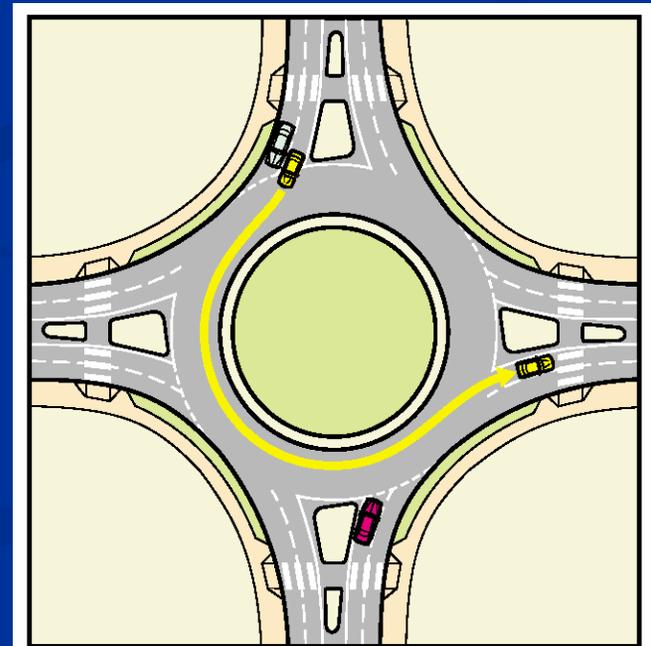




Vail

# Roundabout Applications

- **Within Shopping Centers**
- **Adjacent to Shopping Centers**
- **Major Collectors**
- **Rural/Urban Interface**
- **Mini Roundabouts**



Source: *The Highway Code (UK) (9)*, converted to right-hand drive

# Within Shopping Centers

- **Acceptance  
by Business  
Community**

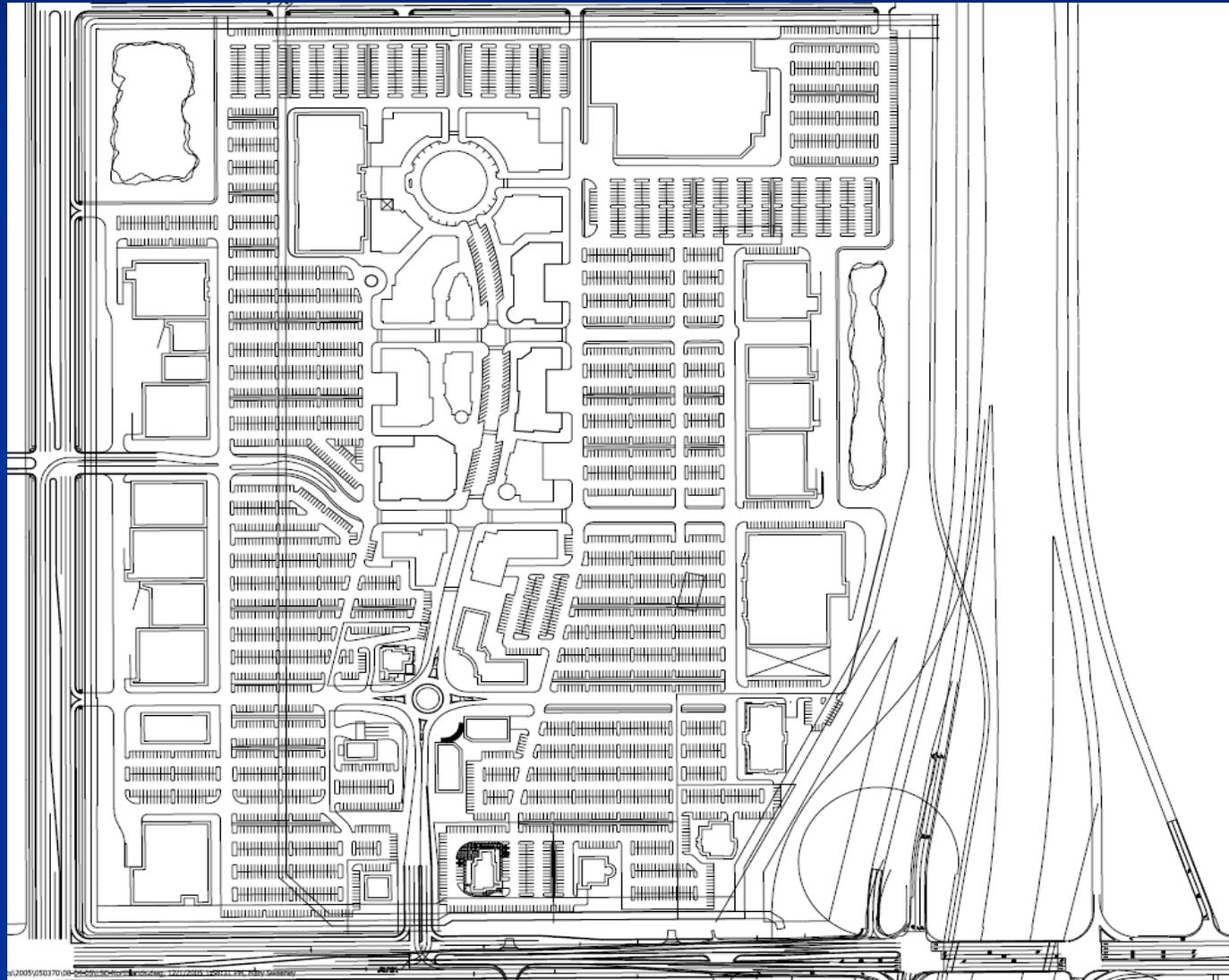


Superior Marketplace  
Superior, Colorado

750,000 SF  
Shopping Center

# Shopping Centers

## Northlands, Broomfield, CO



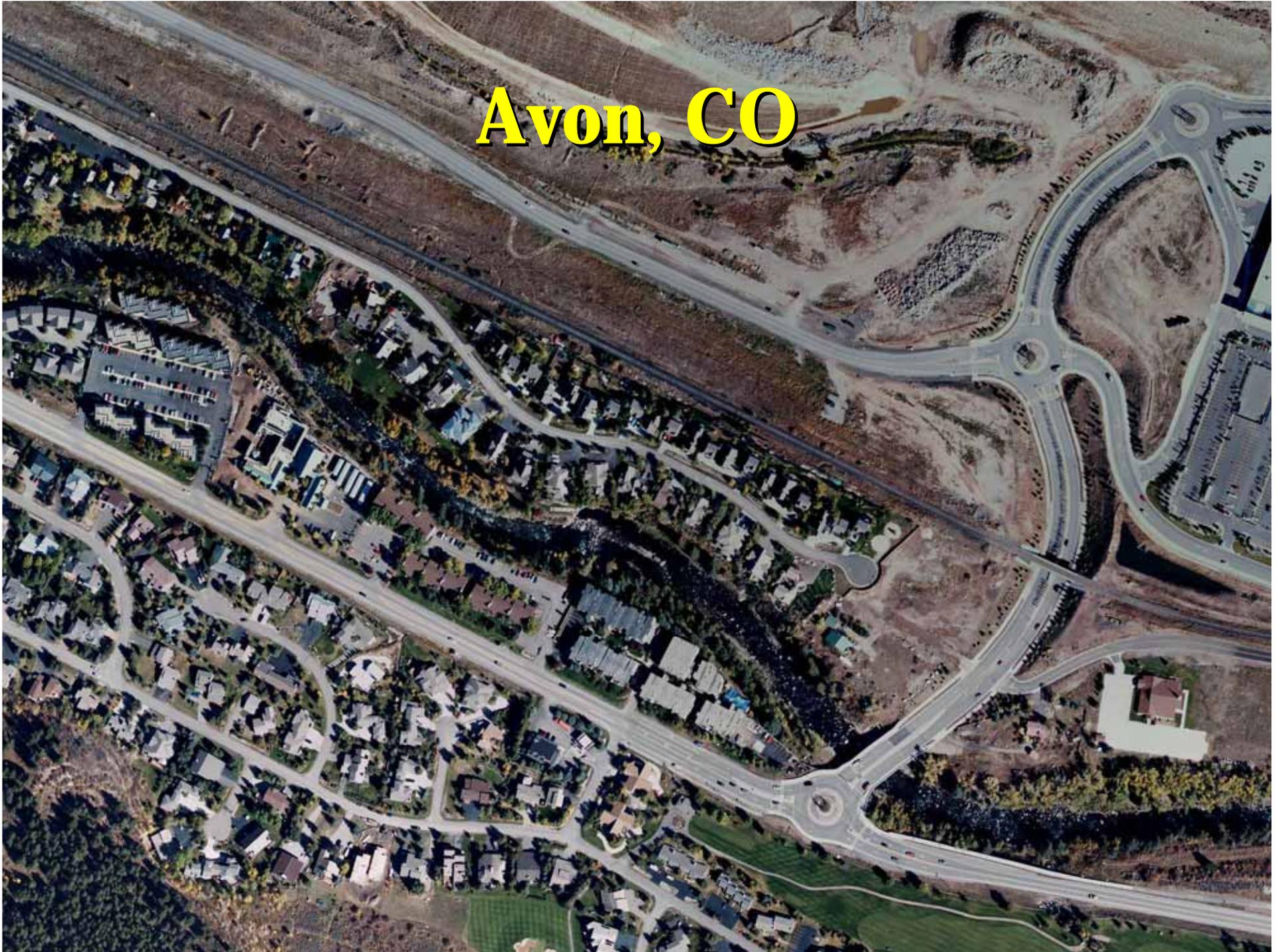
# Adjacent to Shopping Centers

## Factory Outlets, Loveland, CO

- In operation since 1998



# Avon, CO



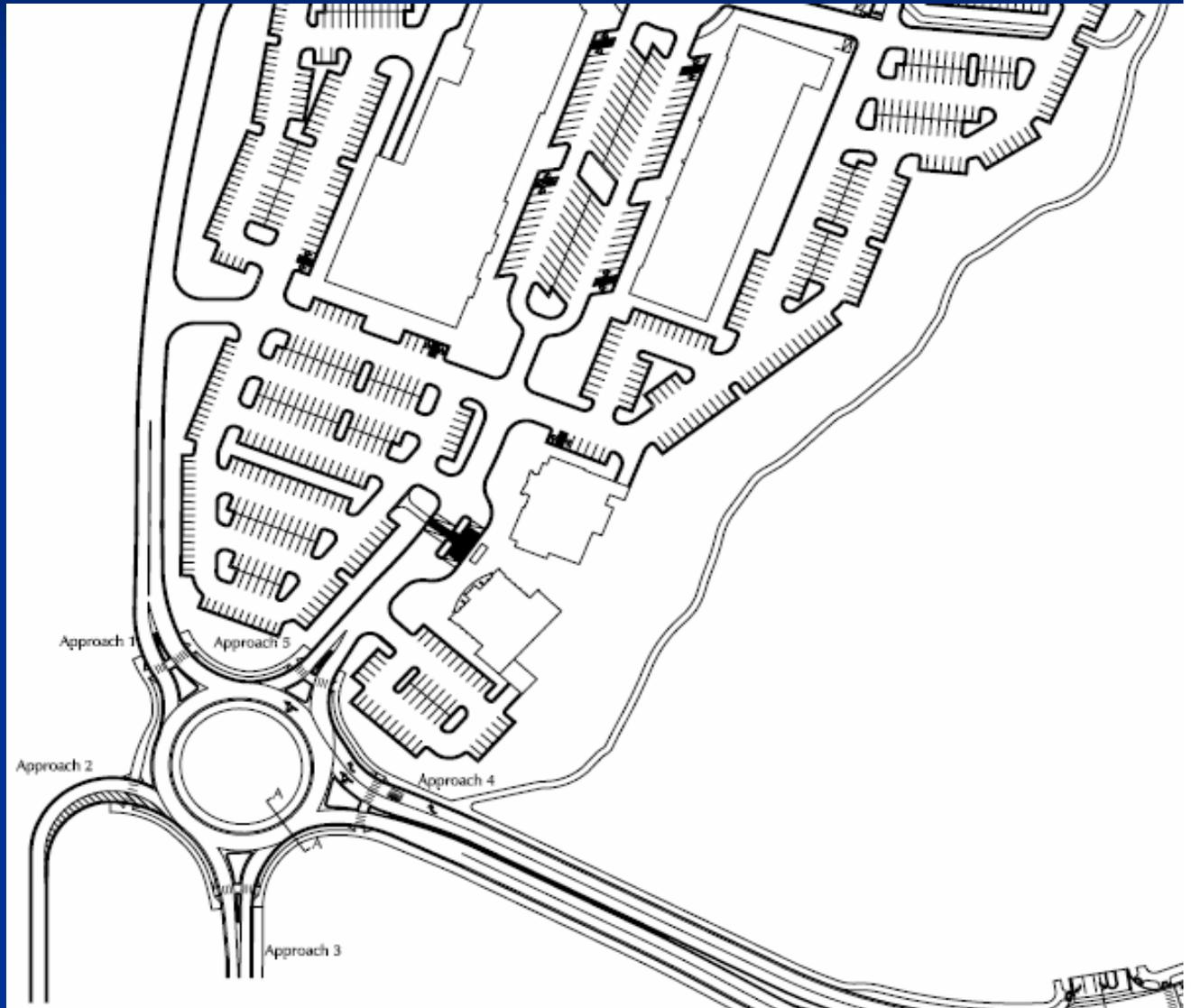


**Avon**

# Adjacent to Shopping Centers

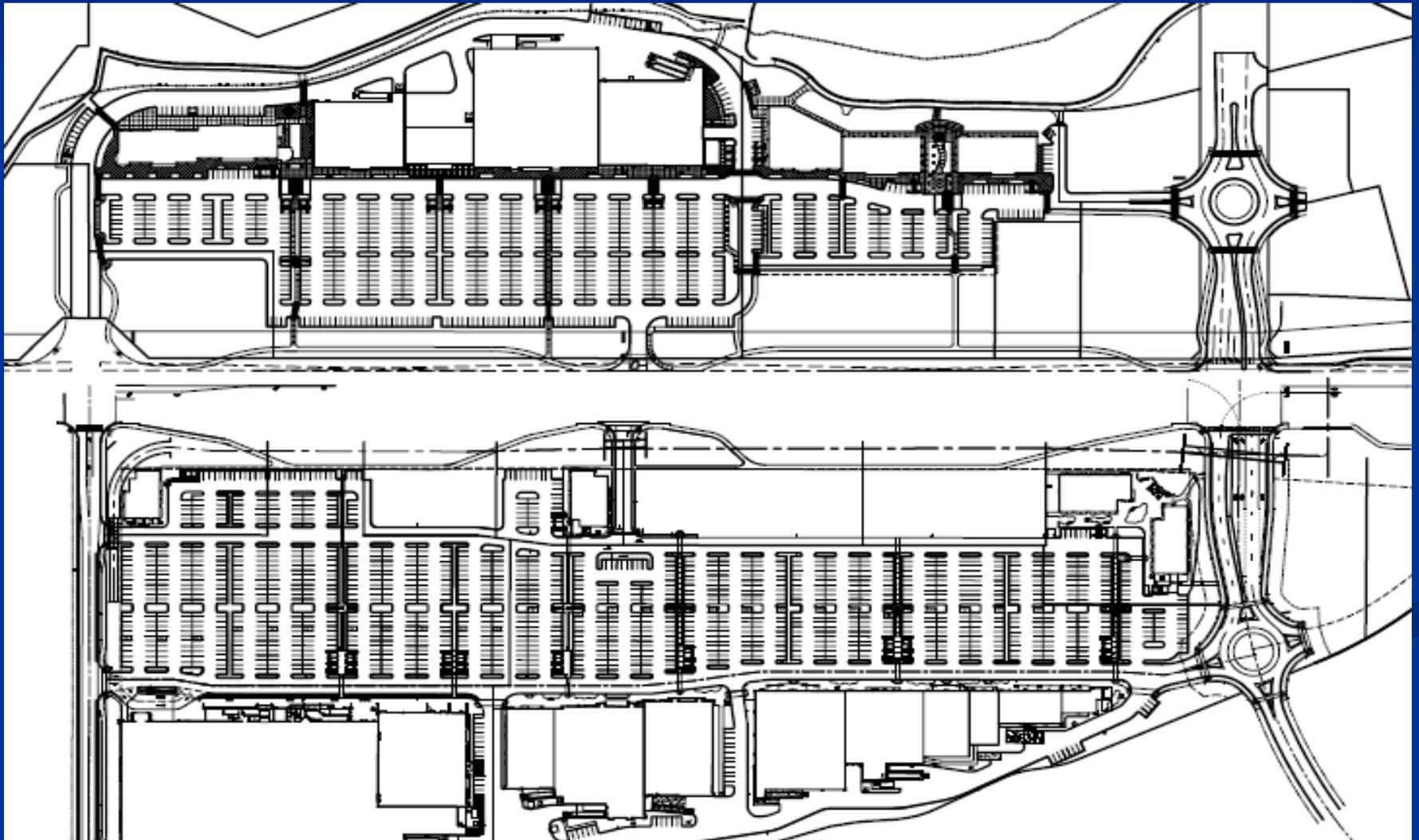
## Centerra Lifestyle Mall, Loveland

- 5 Legs
- Entry Statement



# Adjacent to Shopping Centers

Harvest Junction, Longmont, CO



# Douglas County, CO



Future Light  
Rail Station

Transit-Oriented Development  
1,200 Acres  
2,000 Dwelling Units  
5 million SF Office/Retail  
Major Hospital  
Light Rail Station

School

Rec. Center



# Promontory, Greeley, CO



**Mixed Use Development**  
**670 acres**  
**5,000 employees**  
**1,500 Dwelling Units**  
**300 SF Retail**

HWY 257

US 34 Business

US 34 Bypass



# Mini-Roundabouts

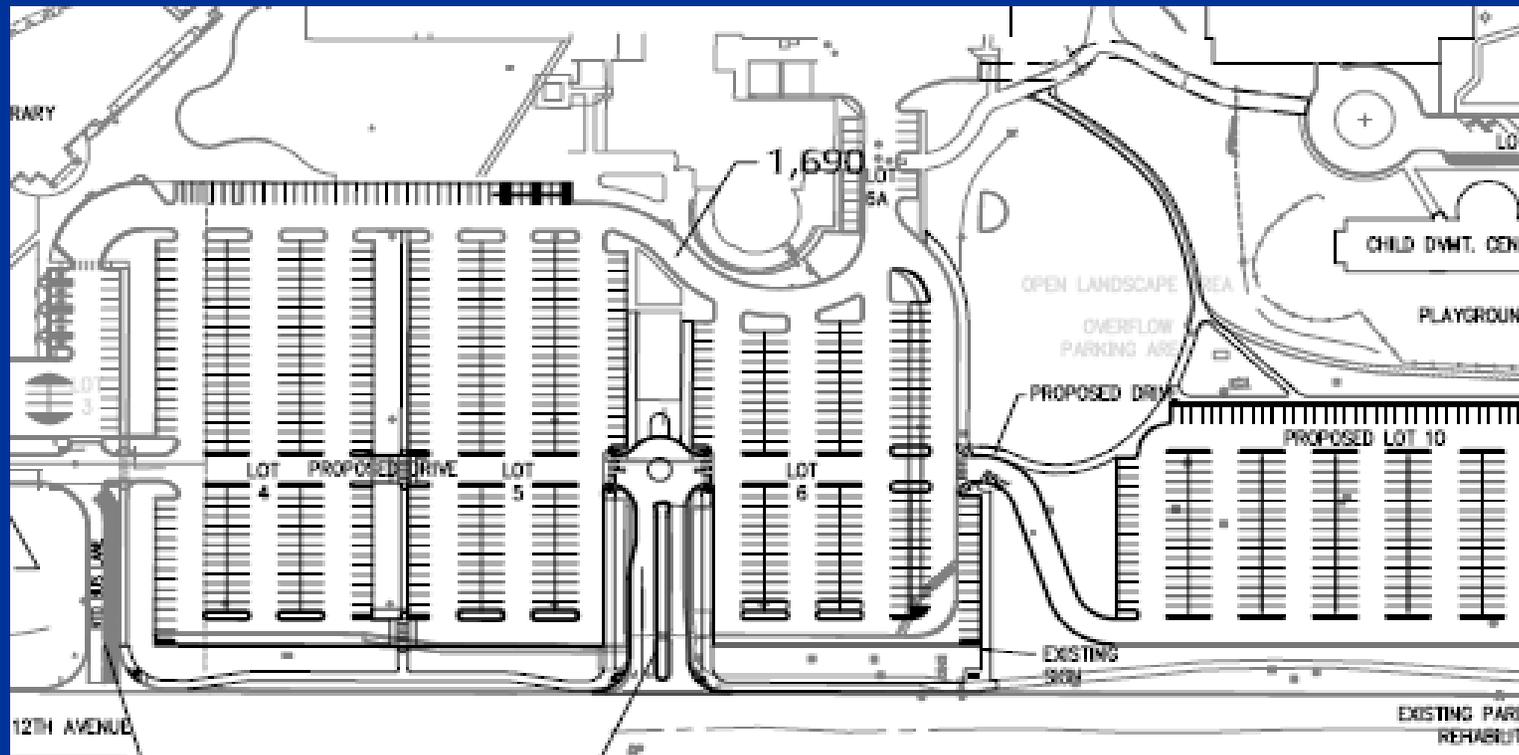
- **Internal Distribution**
- **Smaller Design Vehicle**
- **Smaller size**



# Mini-Roundabouts

## Front Range Community College, Westminster, CO

- Connect parking lots/main access to 112<sup>th</sup> Ave
- Back-ups during peak hours
- Entry Statement

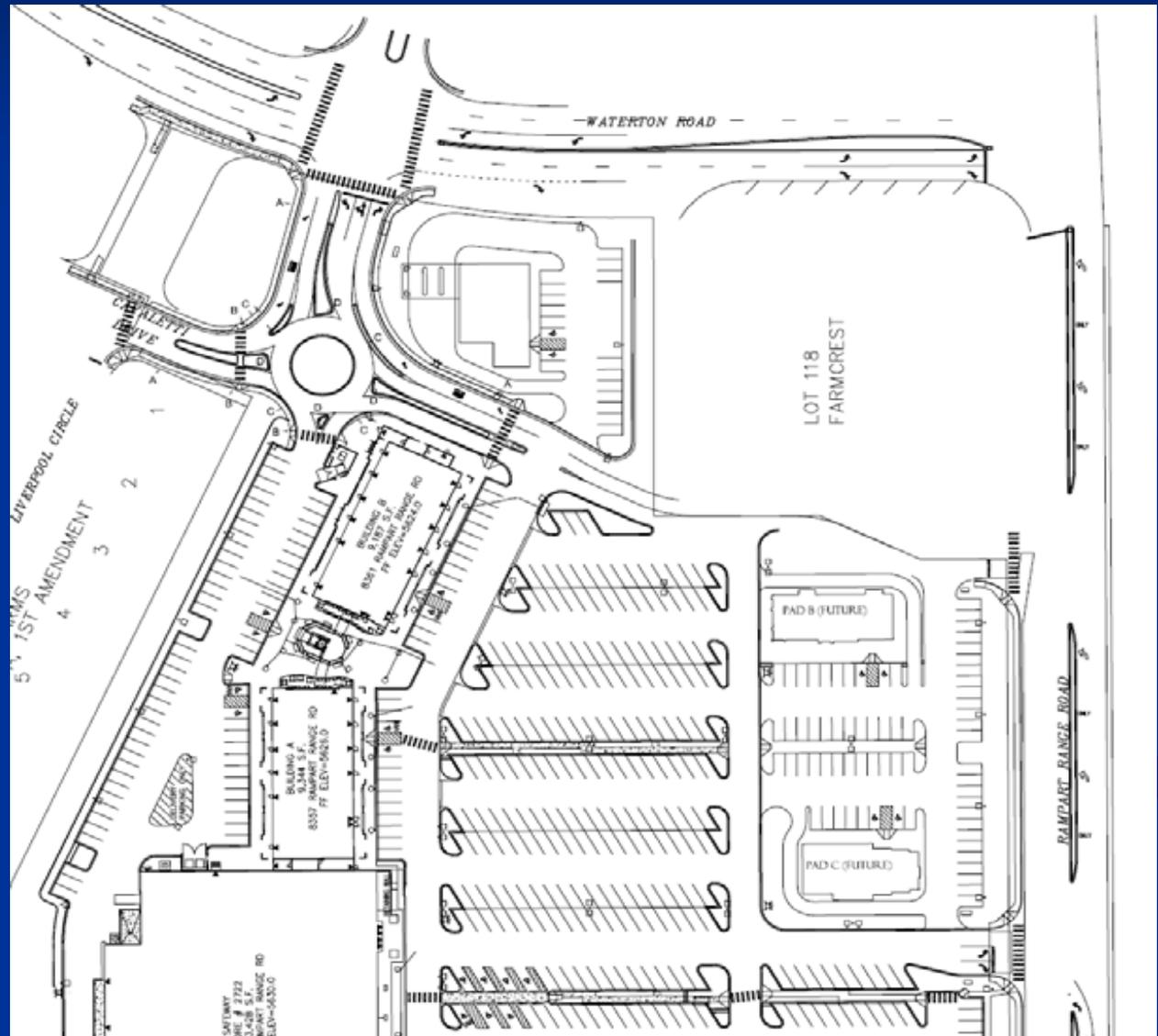




# Mini-Roundabouts

## Roxborough Marketplace

- 100 ft. Dia.
- Close Spacing



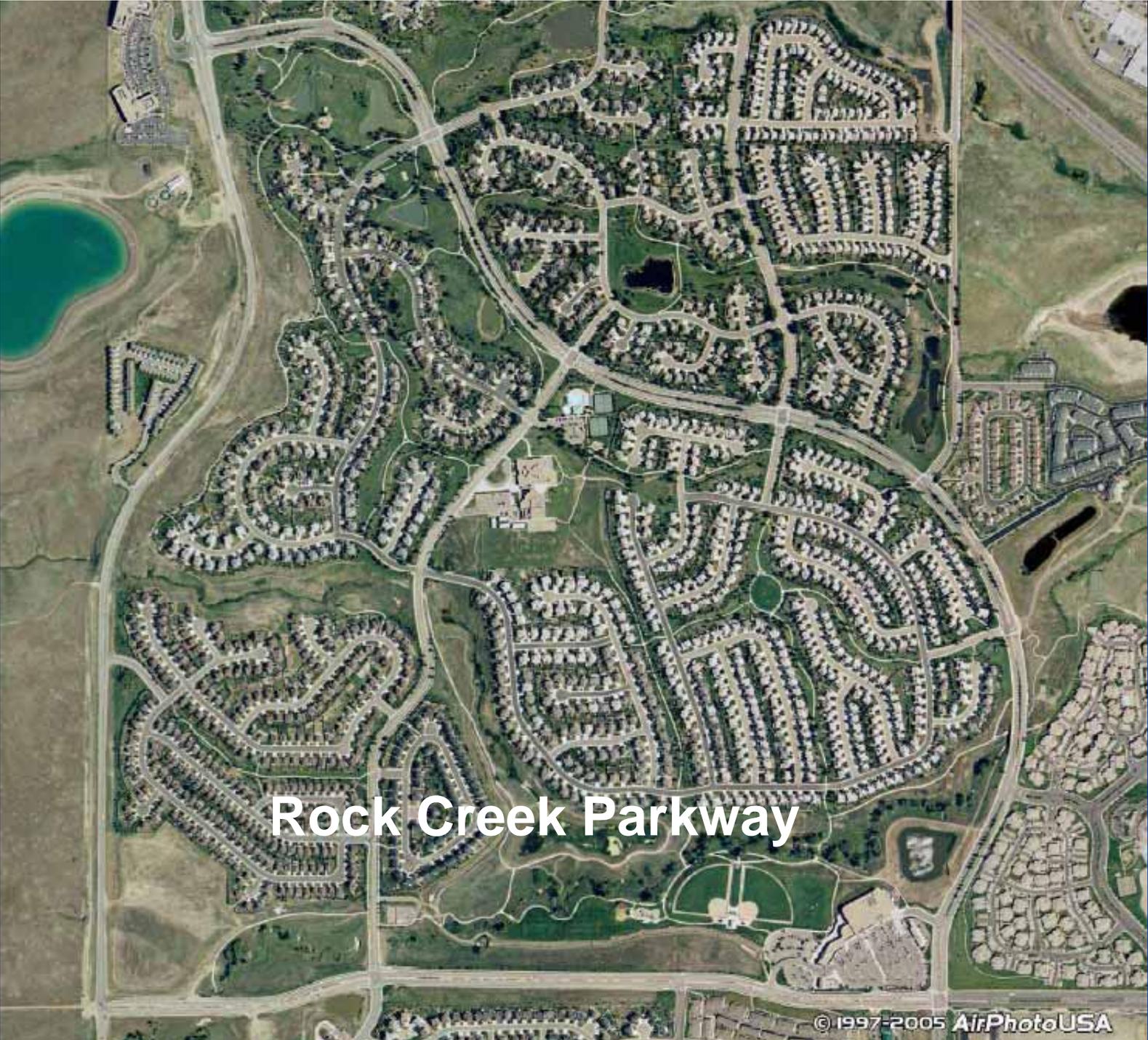
# Major Collectors

## Rock Creek Parkway, Superior, CO

### Residential area

- 4 through lanes
- Turn lanes at major intersections
- High Speeds
- Difficult for Pedestrians to cross



An aerial photograph of a residential development. The image shows a dense network of winding roads and numerous houses. A prominent road, labeled 'Rock Creek Parkway', winds through the center of the development. The surrounding area includes green spaces, a large pond on the left, and some commercial or industrial buildings on the right. The overall layout is a mix of residential and landscaped areas.

## Rock Creek Parkway

# Major Collectors

## Rock Creek Parkway / 88<sup>th</sup> Street



# Major Collectors

## Rock Creek Parkway / 88<sup>th</sup> Street

- Reduced Delays
- Reduced Queues
- Accidents reduced from 8 to 2



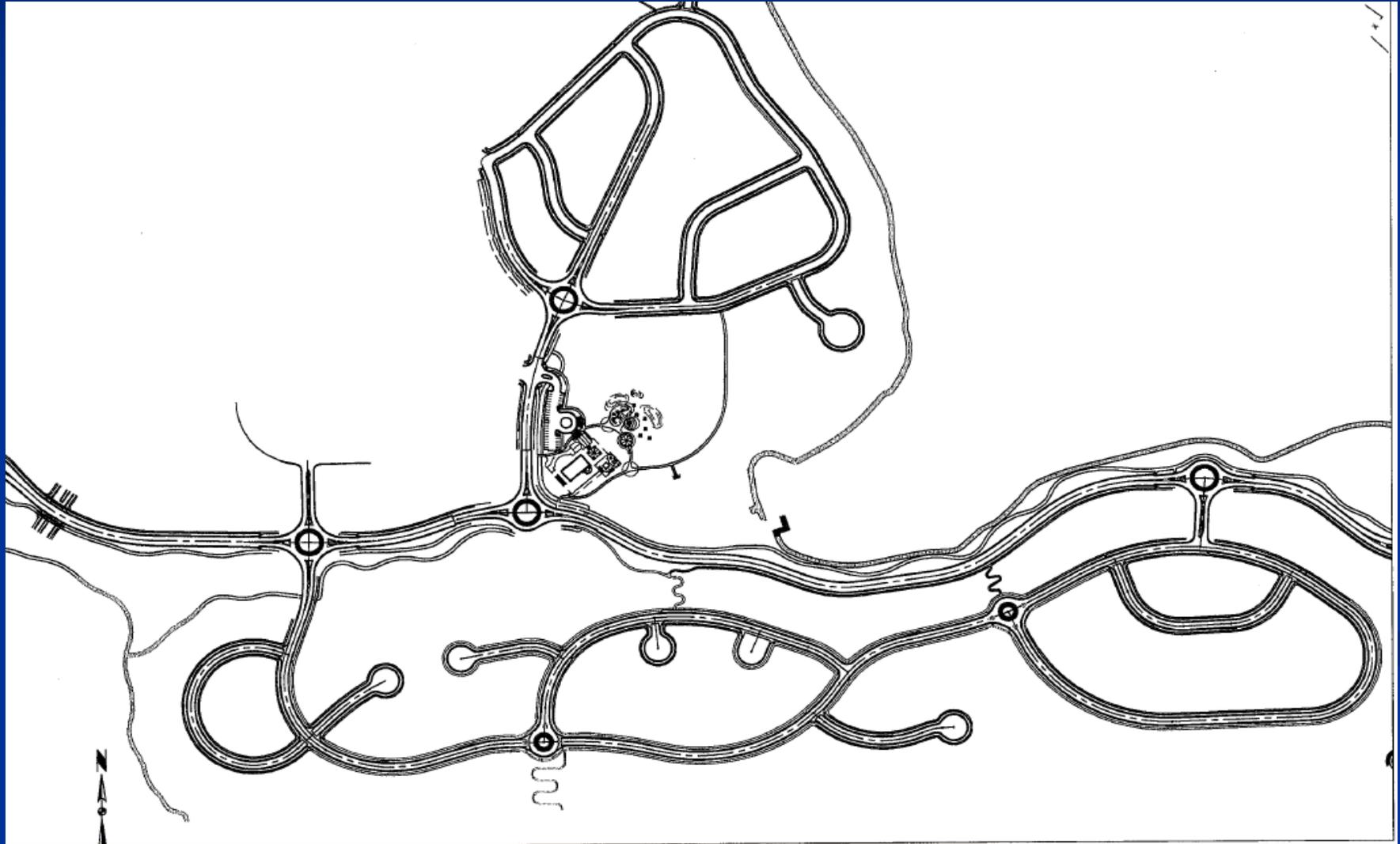
# Major Collectors

## Bike/Pedestrian Treatments



# Major Collectors

Mountain Shadows, Arvada



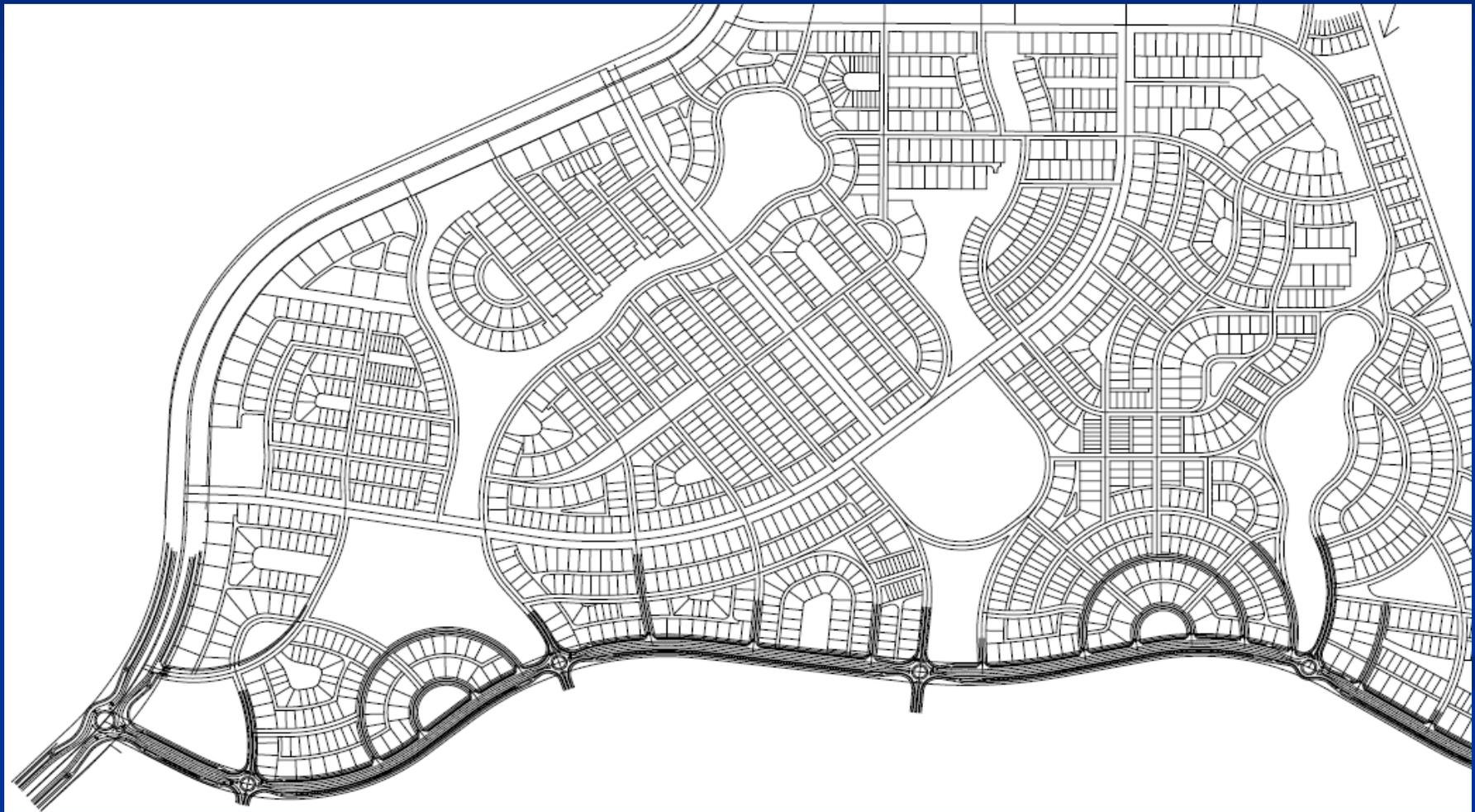
# Major Collectors

## Deer Valley Drive, Festival Ranch, AZ

- Linear Park
- Grid Network

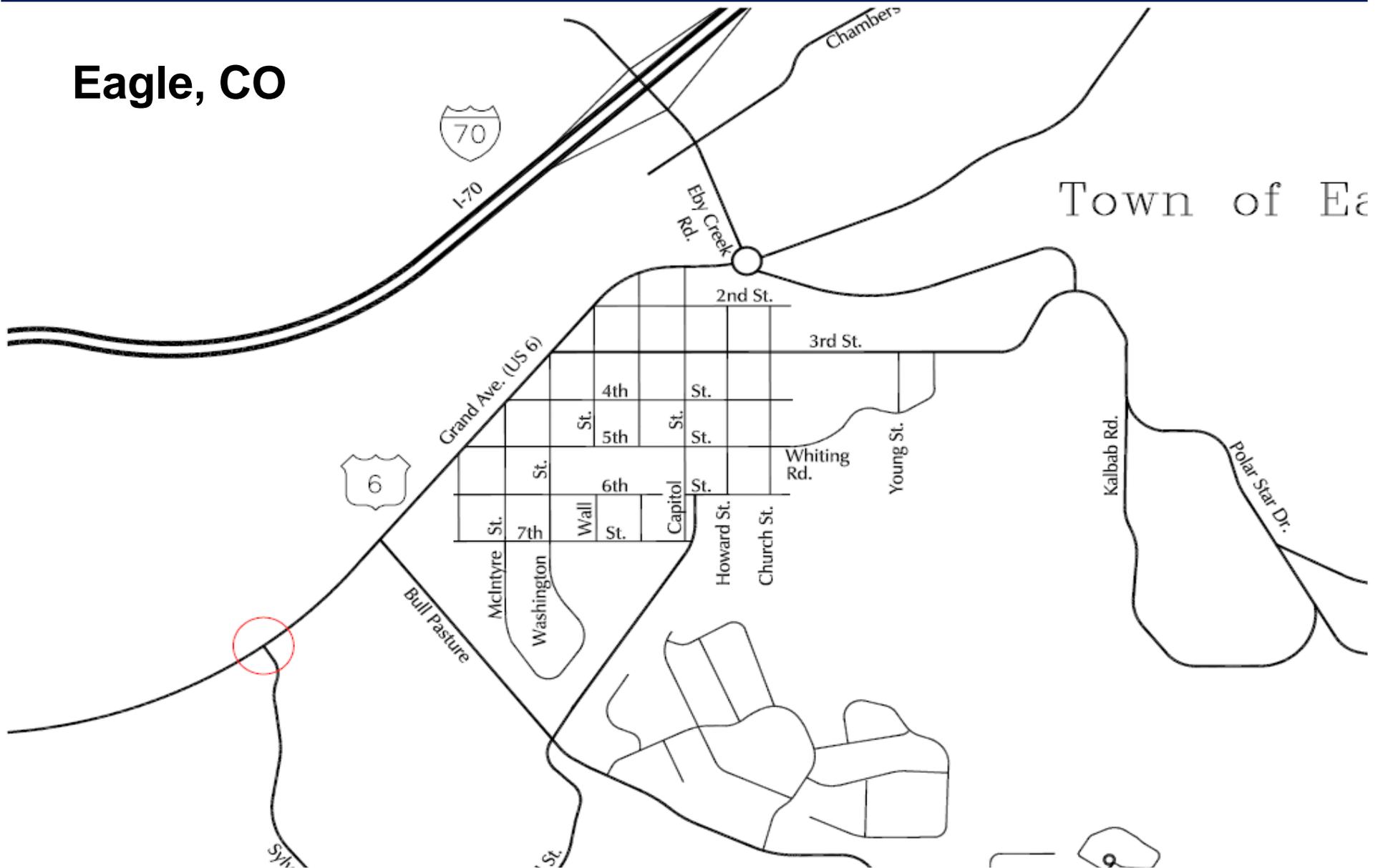


# Deer Valley Drive, Festival Ranch, AZ



# Rural/Urban Interface

Eagle, CO



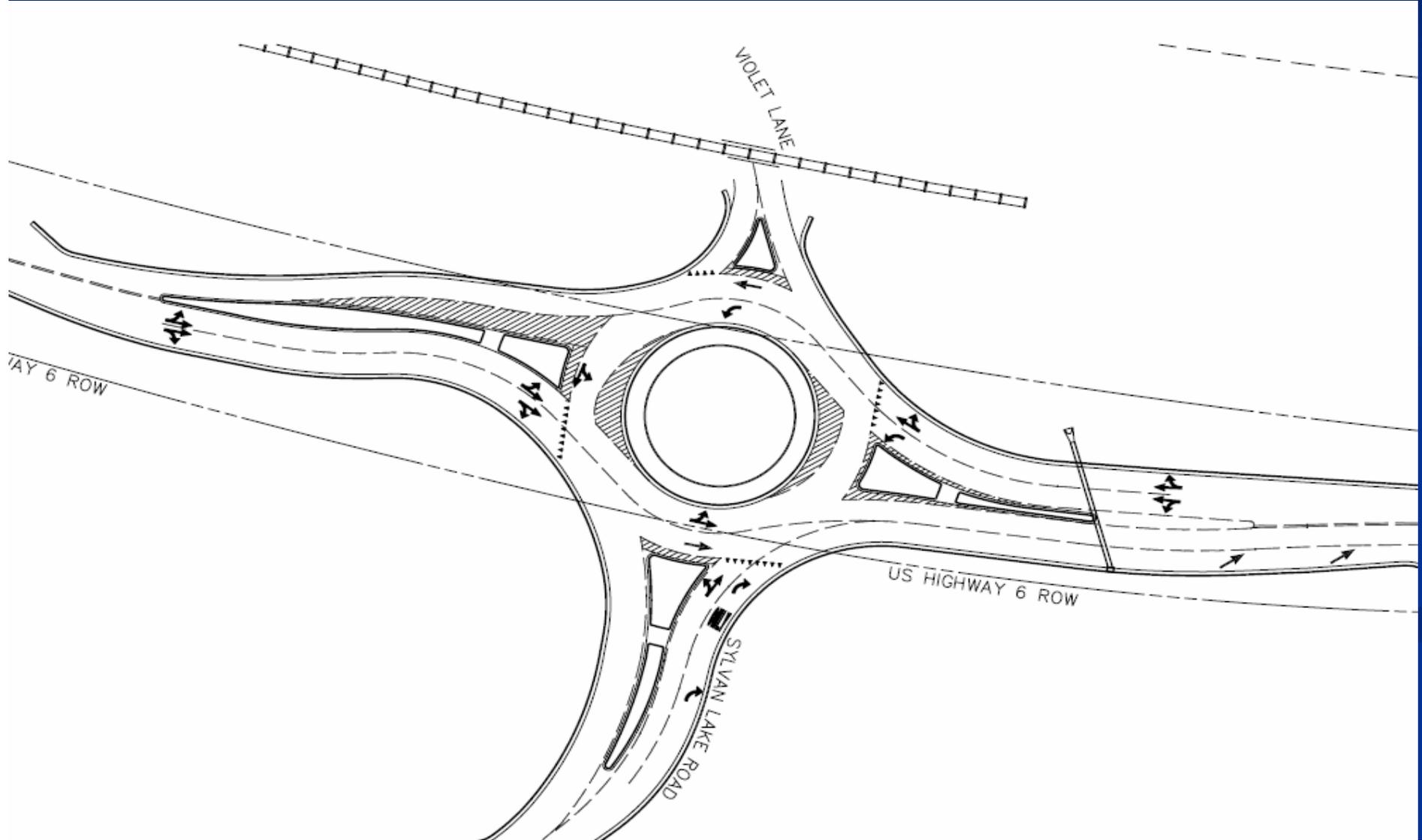
# Rural/Urban Interface

## Eagle, CO

- 2-lane roadway
- Slow speeds
- Delay need for 4 lanes
- May eliminate need to widen structures



# Rural/Urban Interface



# Roundabout Market Potential

- Roundabouts in France 20,000
- Extrapolation to US 93,000
- At \$1 million each \$93 billion



# Minnesota Roundabout Potential

- 337 roundabouts per 1 million people
- 5.15 million people in Minnesota
- Extrapolation to Minnesota

**1,735 Roundabouts**

- 35 Existing

**1,700 To be constructed  
or 85/yr for 20 years**



# **Motor Fuel Savings for 1,700 new roundabouts**

- **20,000 gallons per year per intersection**
- **34 million gallons per year savings for 1,700 roundabouts**
- **½ to 1% of total Minnesota motor fuel consumption**

# Roundabouts and Highway Safety

- **2003 Fatalities (FARS) – 42,600**
  - **Injuries – 2,889,000**
- **Intersection/intersection related crashes**
  - **8,700 fatality (23% of all)**
  - **894,000 injury**
  - **1,664,000 property damage**

# Traffic Signals and Highway Safety

- **Signal Percentage of all intersection/intersection related crashes:**
  - **23% - 2,700 fatality**
  - **51% - 451,000 injury**
  - **47% - 789,000 property damage**

# **Recent Research**

## **Signalization and Safety**

### **Richard G. Sarchet**

- **112 signals on Colorado State Highways**
- **Collected Accident Data**
- **3 years before and 3 years after**

	<b>3 Years Before</b>	<b>3 Years After</b>	
<b>Fatalities</b>	<b>8</b>	<b>4</b>	<b>-50%</b>
<b>Injuries</b>	<b>651</b>	<b>991</b>	<b>+52%</b>
<b>Prop. Dam</b>	<b>662</b>	<b>1,199</b>	<b>+81%</b>

# Full Deployment of Roundabouts

## ■ For U.S.

- Reduce Fatalities by 25% or 2,000
- Reduce Injuries by 25% or 200,000

## ■ For Minnesota (1,700 new roundabouts)

- Reduce Fatalities by 30 per year
- Reduce Injuries by 3,000 per year

# Summary

- **Roundabouts Are Good For Business**
- **Can Be Integrated Into New Development At Little Cost**
- **Becoming Accepted By Planning & Development Community**
- **Significant Safety Benefits**