Sustainability Benefits Of Network Wide Roundabout Use Case Study of Carmel, Indiana

Presented By: Michael McBride PE Carmel City Engineer

1996 Carmel, Indiana
- Population 38,000 up from 25,000 in 1990
- Jurisdictional Area of 13 Square Miles
- Rapid Population Growth was Expected to Continue
- Population Growth Means Growth in Traffic
- An Abundance of 4-Way Stop Controlled Intersections and some Signalized Intersections were Contributing to Congestion in Peak Hours.
- Mayor Jim Brainard Takes Office Of Mayor

Carmel Introduces Roundabouts 1997
- Mayor Jim Brainard Proved Quickly to be a Driven Leader With Exceptional Vision
- Clear Understanding That Safe, Efficient Transportation Infrastructure Promotes Quality of Life & Successful Economic Development
- Awareness of Roundabout Success in Other Areas (England and Vail, CO)
- Insisted on Inclusion of Roundabouts In Hazel Dell Project In Spite of Opposition from Outspoken Minority

Carmel's First Roundabouts Hazel Dell Parkway Corridor Constructed in 1998
- Two Intersections Along This 5-Mile, Four-Lane Boulevard Were Chosen to be Controlled by Multi-Lane Roundabouts
- Limited Roundabout Design Guidance Available
- Designers Referenced British and Australian Standards
- Designs Were Reviewed by Vail Roundabout Designers as well as British Designers

Hazel Dell Pkwy Video Clip
Roundabout Benefits Recognized
- Safety! Safety! Safety!
- Less Severe Crashes Means Lower Cost
  Crashes
- Construction and Operation Cost Savings
- Efficiency Benefits of Roundabouts
- Environmental Benefits
- Aesthetic & Quality of Life Benefits
- Roadway Improvements Present Opportunity To Enhance Property Value & Encourage Private Investment

First Roundabouts A Success
- Hazel Dell Roundabout Considered a Great Success
- Roundabouts Gain Public Acceptance In Carmel
- Four Roundabouts Constructed in Brainard’s First Term (’96-’99)
- Success Of Early Roundabouts Prompt City Officials to Rethink Use of Roundabouts in Comprehensive Plan

Planning Incorporates Roundabouts
- One Mile Grid Public Land Survey Road System
- Blank Slate for Development

Planning Incorporates Roundabouts
- Subdivision Infill With Internal Street Connectivity
- Despite Connectivity Traffic Grows on Primary Road Grid

Planning Incorporates Roundabouts
- Greater Capacity Needed on Primary Grid Streets
- But No One Wants to Live Next to a “Highway”

Roundabouts The Obvious Choice
- Desire to FULLY and Safely Utilize the City’s Existing Grid System of Streets
- City Land Use Plans Encouraged Traditional Neighborhood Development, “Wide Nodes, Narrow Roads” Concept
- Equally Functional System of Parallel Roads That Maximizes Single Lane Capacity
- Pedestrian and Bicycle Friendly Transportation Corridors
- Maintain “Residential” Roadway Experience When Possible
Access Management

- Preservation of “Residential” Roadway Feel Requires Strict Access Management Policy in Conjunction with Roundabouts

Access Management

- Quality of Life Benefits
Quality of Life Benefits

Westfield Blvd. & 96th St. Signal Conversion Video Comparison Before & After

Carmel Experiences Safety Benefits

City Wide Crash Data 2002 – 2006

% Accidents With Injury at All Intersections 29%
% Accidents With Injury at Single Lane Roundabouts 4%
% Accidents With Injury at Dual Lane Roundabout 7%

Accident Damage Cost Savings

Average Cost of Accident
Signal $10,500 vs. Roundabout $2,500
Average Cost of Accident has been Reduced by $3,000
(Statistics from Carmel Police Dept. 2007)

Carmel, Indiana

• Carmel’s Population Grew from 38,000 in 1996 to 80,000 in 2010
• Over the past 8 years, Carmel has invested over $500 Million in transportation infrastructure
• Carmel currently has 67 roundabouts in place, and another 16 that are currently in design.
• City named one of “best places to live in America” (Money Magazine Dec. 2003)

City Wide Accident Reduction

• Carmel roundabout now number 63 and signalized intersections have been decreased to only 39.
• What has been the impact on the safety of Carmel’s roadway network as a whole.

2003 Data
Carmel Road Miles = 220
Total Injury Accidents = 252
51% Decrease in Injury Accidents/Road Mile

2008 Data
Carmel Road Miles = 395
Total Injury Accidents = 223
Roundabout WILL Be Option #1

Hazel Dell Parkway Geometric Adjustments
• 2020 design AADT’s were projected to be 12,840
• Hazel Dell currently carries more than 25,000 VPD
• Flat entry paths allowed for higher entry speeds
• Entry path overlap also observed as an issue
• Frequency of minor accidents higher than desired
• Injury accidents still consistent with other roundabouts

Lessons Learned

Hazel Dell & 126th St. Roundabout
• Current Configuration

Hazel Dell & 126th St. Roundabout
• Proposed Configuration

Hazel Dell & 131st St. Roundabout
• Completed 2010
9/22/2011

Hazel Dell & Cherry Creek Blvd. Roundabout

2010 Construction

Carmel’s First Roundabout Interchanges

Keystone Parkway (Formerly SR 431)

Existing Corridor

Existing Traffic Conditions

- Corridor Formed a Significant Barrier Dividing the Community
- Safety and Quality of Life Concerns
- All intersections operating at a LOS D or worse
- State’s Plan Was to Add Travel Lanes
- Adding travel lanes would only improve corridor to LOS D
- Grade separations warranted, but funding focused on Parallel US 31 Corridor Improvements

106th St. & Keystone Pkwy

Before

106th St. & Keystone Pkwy

After
126th St. & Keystone Pkwy
Before

126th St. & Keystone Pkwy
After

Integration of VISSIM with 3D Modeling

Fifty Mile Radius and Beyond

Questions?
Mike McBride, PE
One Civic Square
Carmel, IN 46032
(317) 571-2441
mmcbride@camel.in.gov
Loveland, Colorado
Sweet Heart City
Roundabout-Sustainability

• Solving Access Needs
• The 2010 Experience - 2 Interchanges/ 1 Intersection –
• High Growth Burst - Long term savings along the Gateway to the Rockies
Loveland Intersections

- Modern Roundabouts 20/2011 up from 6 in 2005 and 0 in 997
- Traffic Signals: 49 in1995 now 93
- 70,000 People up from 50,000 in 2000
- High Growth >>> Lifestyles Mall + Regional Hospital + Motorplex + Events Ctr.+ Budweiser Events Ctr.+++  

Roundabout #1

- Designed and Constructed 1998
- Problem solved – Spacing/Stacking
- Ourston and Doctors Design
- 5 accidents – 1 injury crash reported by 2005
- Saved 65 w/9 injury crashes (est.)

Intersection Differences for Sustainability

- I-25/Crossroads – 0 signals
- I-25/US 34 – 2 Signals
- Madison/US 34 – CFI – 3 Signals
- Support Systems for Signals Operations Maintenance Computers/Communications/IT
Wide Roads, Narrow Nodes?

New Interchange Roundabouts

Modified + 2 Signals
Contact Information

- Bill Hange, PE, PTOE
- City of Loveland – City Traffic Engineer
  hangeb@ci.loveland.co.us
  Office Phone # 970-962-2528