Planning, Design and Construction of a Roundabout Corridor

Shiloh Road Corridor Case Study

Montana Association of Planners
Red Lodge, MT
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Kirk Spalding, P.E.

Sanderson Stewart, Billings, MT
ROUNDABOUTS 101
• Typical 4-way Intersection
• Slight Circular Adjustment

- Blue car takes left lane to either turn left or go straight.
- Green car takes right lane to either turn right or go straight.
Roundabouts have very specific design characteristics/parameters:

- Entering vehicles yield to circulating traffic.
- Travel speeds are typically <30mph and.
- Speeds are controlled by physical geometry other visual cues.
- Center island (often landscaped & non-traversable).
Splitter Island

- Entry deflection
- Pedestrian refuge
- Enter/exit separation
Entry Path Deflection = reduced speeds = safety benefits 😊
Circulatory Roadway & Apron
SIGNING
Varieties of Roundabouts

<table>
<thead>
<tr>
<th>Site Category</th>
<th>Recommended Maximum Entry Design Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mini-Roundabout</td>
<td>25 km/h (15 mph)</td>
</tr>
<tr>
<td>Urban Compact</td>
<td>25 km/h (15 mph)</td>
</tr>
<tr>
<td>Urban Single Lane</td>
<td>35 km/h (20 mph)</td>
</tr>
<tr>
<td>Urban Double Lane</td>
<td>40 km/h (25 mph)</td>
</tr>
<tr>
<td>Rural Single Lane</td>
<td>40 km/h (25 mph)</td>
</tr>
<tr>
<td>Rural Double Lane</td>
<td>50 km/h (30 mph)</td>
</tr>
</tbody>
</table>
Single Lane Rdbt
Typical Single Lane
Multilane Roundabout - bigger
Multilane - Airport Road Rdbt (Billings)
Multilane Corridor

City of Golden, Colorado,
How many in Montana???

- 17+ ? on the ground
- 21+ ? planned or in design
Montana Roundabouts (State Hwy System)

**Constructed (9)**
- **City of Billings (4)**
  - King Ave W & St Vincent Way (ML, 2009)
  - Airport Rd & N 27th (ML, 2009)
  - Shiloh & Broadwater (ML, 2009)
  - Shiloh & Zoo Dr (ML, 2009)
- **Lewis and Clark County (1)**
  - Canyon Ferry Road – Lake Helena Drive (SL, 2009)
- **Montana City (1)**
  - S-282 & Jackson Creek Road (SL, 2007)
- **City of Helena (1)**
  - Colonial & Saddle Drives (SL, 2007)
- **City of Kalispell (1)**
  - West Reserve Drive & Stillwater Rd (SL, 2007)
- **City of Missoula (1)**
  - Higgins/Hill/Beckwith (SL, 2009)

**Planned or in design (14)**
- **City of Billings (6)**
  - Shiloh Road (ML roundabouts)
- **Ravalli County (1)**
  - S 203 – Florence East (SL)
- **City of Great Falls (1)**
  - Smelter Avenue – Division Street (SL?)
- **City of Red Lodge (2)**
  - US 212 & MT 78 (SL)
  - US 212 & 2 mile Rd (SL)
- **City of Kalispell (3)**
  - Kalispell Bypass & 3 Secondary Hwys (SL)
- **City of Missoula (1?)**
  - Airway & Expressway (SL or ML)
Montana Roundabouts (Local)

**Constructed (8 +)**
- **City of Bozeman (3)**
  - Baxter Lane & Ferguson Avenue (SL, 2003)
  - Laurel Parkway & Annie Street (SL, 2003) (traffic circle)
  - Laurel Parkway & Glenellen Street (SL, 2003)
- **City of Kalispell (1)**
  - Within mall complex (SL)
- **City of Missoula (1)**
  - England Blvd/Union Pacific & Connery Way (SL)
- **City of Billings (3)**
  - Ironwood Drive & Woodcreek Drive (SL, 2003)
  - King Ave W & Olympic Blvd (ML, 2008) – Montana’s First Multilane
  - Shiloh Crossing Business Complex (SL, 2008)

**Planned or In Design (7+)**
- **City of Billings (5)**
  - Shiloh Crossing Blvd & local access (SL, 2010?)
  - Three (3) roundabouts in “The Village” subdivision (SL, 2010)
  - West Park Plaza (SL)
- **City of Helena (1)**
  - Helena, Last Chance, Neill, Cruse (SL)
- **City of Bozeman (1)**
  - 11th & College (SL)
Montana City
Helena
So why all the hype about Roundabouts?
SAFETY is #1 reason!!!
Intersections are responsible for:

- Approx 25% of all traffic fatalities
- Nearly 50% of all traffic injuries
Roundabout Safety Benefits

- Fewer accidents
  - Reduced driver decisions
  - Reduced conflict points
  - Reduction in speeds

- Lower accident severity
  - Lower speeds
Before & After Roundabout Implementation (single-lane roundabouts)

Findings of the INSURANCE INSTITUTE FOR HIGHWAY SAFETY, (1999)

- Studied 24 intersections
  - Accident reduction is:
    - 39% for all crashes
    - 76% for injury and fatal crashes
    - 90% for incapacitating injuries and fatal crashes
A four-leg, single-lane roundabout has 75% fewer vehicle conflict points compared to a conventional intersection.
Other benefits

- Significant capacity
- Provides opportunity for more strict access control
- Softer form of intersection
- Environmental – emissions, energy
- Low maintenance
- “Share the Road”
- Aesthetics
Roundabout Efficiency

- Congestion and delay is reduced
- Long term cost savings – lower maintenance
- Reduction in speeds and yield produce smooth, steady flow
- At high volume intersections, the roundabouts occupy far less space than the signalized equivalent intersection.
So how does Planning relate to roundabouts?
A lot for Transportation Engineers, particularly when roundabout is in an urban setting…..

- Roadway and intersection improvements such as roundabouts are built to mitigate existing and future deficiencies and to achieve goals/needs for the locale that they serve. In an urban setting, there are a lot of stakeholders and users the facility must serve.

- Fortunately, planners have done a lot of the footwork in many cases for us engineers so we can get our feet on the ground…..
DESIGNER SHOULD INCORPORATE GOALS AND OBJECTIVES OF PREVIOUSLY DEVELOPED PLANS, POLICIES AND GUIDELINES

1. Utilize regional/local plans and objectives
   - Transportation plans
   - Growth policy/plans
   - Multimodal plans (bus, transit, pedestrian and bicycles, other)
   - Landscaping plans
   - “District” plans/themes/stdlibs
   - Storm drain plans
   - Water and sewer plans

2. Private utility plans (usually up to designer to coordinate with)
   - power, fiber, phone, gas, etc.

3. Land Use Planning
   - Anticipate land development and account for it (can require coordination with city/county planning dept)
Having formally adopted plans/efforts in-place assists designer in having some ‘backbone’ to the introduction of something like the roundabout

- Roundabouts are contentious with the public
- There are a lot of “what’s” and “why’s” when the term roundabout comes into play
- Most plans relate to managing and/or controlling something for the well-being of all it serves....growth, traffic, utilities, community spirit/image, etc.... Roundabouts seem to serve the objectives of many different types of plans....often a good fit
Engineers have to do some planning

1. Traffic projections and land-use projections
   - Work with agencies or ‘locals’ to assess future growth so we don’t ‘under-design’ the intersection
   - Need to include transportation network changes from local/regional plans
   - Project traffic within the design horizon (5, 10, 20, 50 yrs)

2. Determine site constraints and locate to minimize impacts
   - R/W
   - Utilities
   - Environmental (MEPA, NEPA; i.e., wetlands, 4f, 6f, waters of the U.S.)
   - Design vehicle – do we need to account for any special accommodations (interstate truck, mobile home, crane service, pre-stress beams, wide-loads, emergency services, service vehicles, combine, etc.)

3. Public Process
   - Agencies
   - Emergency Services
   - Stakeholders
   - Owners
   - Funding source
Think **holistically** initially and then delve into more detailed considerations

- Is a single-lane or multi-lane roundabout required?
- What is character of setting and who are users?
- What physical and social environment would it be placed in?  
  - Urban  
  - Rural (high speeds, RVs, trucks)  
  - Residential  
  - Industrial  
  - Lots of pedestrians?  
  - High speed or low speed roadway?  
- What is growth potential on, and along roadway?  
- What is localized and regional public perception of roundabouts?  
- Who are PRPs (principal responsible parties)? Client, reviewing agencies, users  
  Jurisdiction, reviewing authority and funding source? (City, County, State, Federal, Tribal, private)  
- Special interest groups, media and nay-sayers  
- Will politics support or kill the concept?  
- Who will be responsible for operation and maintenance?  
- Any odd traffic flow characteristics?  
- Is there a nearby signal or one planned?  
- Is there a facility with ‘special event’ potential (school, church, etc.)?  
- Do approaches come together at ‘odd’ angles?  
- Geometric constraints?  
  - How much room is available  
  - Are there undesirable vertical approach grades  
  - Are there major utility features present  
- Are there special access considerations (gas station or C-store on corner)?
Mock Demo – good planning tool
CASE STUDY
SHILOH ROAD

- 4.5 Mile urban arterial
- I-90 to Hwy 3 connection
- Principal Arterial
- City limits are engulfing Shiloh Road
- Area of extreme growth
- Identified in Transportation Plan
- Traffic anticipated to triple in 20yrs
In 2002
West Billings Plan ‘Gateway’ Concept
Planning Documents

- **Heritage Trail Plan (2004)**
  - Identified the need for trail improvements and connections to Shiloh Road

- **Billings Urban Area 2000 Transportation Plan**
  - Predicted need for 4-lane roadway

- **West Billings Plan (2001)**
  - Identified Shiloh Road as Gateway
  - Emphasized consideration for landscaping
And these must work together for the project to be successful...

- **Yellowstone County**
  - Commissioners
  - Public Works Dept.
  - Planning Dept.
  - Parks Dept.

- **City**
  - Council
  - Public Works
  - Planning Dept.

- **MDT**
  - Traffic & Safety
  - Planning
  - Environmental
  - Utilities
  - Right-of-Way
  - Access
  - Hydraulics
  - others

- **FHWA**
  - MEPA/NEPA
Project Advisory Committee

1. Provide input on process and development of transportation improvements
2. Serve as liaison between project team and community

- City Administrator
- Billings City Council Members, Ward III, IV, V
- Director, Billings Public Works
- City Traffic Engineer, Billings Public Works
- Director, MET Transit
- Director, City-County Planning Department
- Transportation Planner, City-County Planning Dept
- Chairperson, Yellowstone County Planning Board
- Yellowstone County – Road and Bridge
- Yellowstone County Commissioner
- District 5 Administrator, MDT
- Consultant Design, MDT
- FHWA
The **PURPOSE** of the proposed project is to improve the mobility in the Shiloh Road Corridor by increasing roadway capacity and providing bicycle, pedestrian, and transit improvements.

**NEED**
- Improve Roadway Capacity (existing and planned)
- Improve Safety…some fatalities and serious accidents
- Shiloh Rd currently has narrow shoulders, roadside hazards and a high accident rate
- Identified by City/County as a “entryway” to Billings
- Shiloh Overlay Zoning District regulates character of development
- Improve Alternative Mode Facilities per Heritage Trail Plan and other guiding plans/documents
- Existing bicycle and pedestrian facilities are lacking
- Improve Transportation System Connectivity
- Currently, north-south street connections for West Billings are limited.
### Environmental Research & Analysis

<table>
<thead>
<tr>
<th>Effects on Transportation System</th>
<th>Community Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic</td>
<td>Local and Regional Economics</td>
</tr>
<tr>
<td>Access</td>
<td>Land use and Local Plans</td>
</tr>
<tr>
<td>Safety</td>
<td>Right-of-Way and Relocations</td>
</tr>
<tr>
<td>Transit</td>
<td>Utilities</td>
</tr>
<tr>
<td>Pedestrians &amp; Bicycles</td>
<td>Energy</td>
</tr>
<tr>
<td><strong>Natural and Physical Environment</strong></td>
<td>Cultural/Archaeological/Historical Resources</td>
</tr>
<tr>
<td>Floodplains</td>
<td>Construction Impacts</td>
</tr>
<tr>
<td>Water Resources</td>
<td>For all alternatives</td>
</tr>
<tr>
<td>Wetlands</td>
<td>Transportation impacts</td>
</tr>
<tr>
<td>Vegetation</td>
<td>Community</td>
</tr>
<tr>
<td>Wildlife</td>
<td>Natural/Physical Environment</td>
</tr>
<tr>
<td>Aquatic Species</td>
<td>Secondary and Cumulative Impacts</td>
</tr>
<tr>
<td>Threatened and Endangered Species</td>
<td>For all alternatives</td>
</tr>
<tr>
<td>Air Quality</td>
<td>Transportation impacts</td>
</tr>
<tr>
<td>Section 4(f) properties</td>
<td>Community</td>
</tr>
<tr>
<td>Section 6(f) properties</td>
<td>Natural/Physical Environment</td>
</tr>
</tbody>
</table>
Quick Lowdown

- Environmental Document – expanded Environmental Assessment
- Data collection and traffic projections…HUGE EFFORT
- Developed Preliminary Alternatives
- Screened Preliminary Alternatives
- Established Alternatives for EA
- Conducted Environmental Research & Analysis to Further Screen Alternatives
- Coordination W/ Private and Public Entities
- Proactive Director from MDT – expedited process
- Obtained FONSI
- Commenced Design
- Initiated R/W during preliminary design…VERY UNUSUAL
- NO CONDEMNATION for the 135 parcels
- Project Split into 3
- President Obama elected = Stimulus Plan = Project funded w/ ARRA
- Construction underway
SHILOH ROAD

- Substandard shoulders
- Surface Rutting and Cracking
- Shiloh Drain
- 12” High Pressure Gas Main
- Obstacles in Clear Zone (ditches, power poles, etc)
- Overhead Utilities
- Park Property

*Constructed in 1956
*Speed Limit - 45 mph to 55 mph
UTILITIES

In addition to overhead, there are underground:

- Phone
- Gas
- Storm Drain
- Sanitary Sewer
- Water
- Fiber optic
- Electric
- Irrigation

King Ave and Shiloh Rd intersection (looking South)
During construction season, the daily “sends” from JTL averages:

- 300-500 loads of gravel
- Up to 120 loads of concrete
- Up to 150 loads of asphalt

That’s 570-770 one-way trips, or 1040-1540 total in-and-out
ROW varies from 60 to 160 feet. Generally < 120’
Evaluate traffic conditions

- **Data collection**
- **Existing conditions analyses**
  - Level of Service
  - Accident History
  - Pedestrian accommodations
  - Access conditions
  - Others
- **Traffic Modeling**
  - Opening year and design year (2027)
  - Developed corridor model
  - Incorporate City/County transportation planning
- **Future Conditions Analysis**
  - Level of Service
  - Consider future land and infrastructure development
- **Future operational and geometric requirements**
Evaluated roundabouts and signals to meet Purpose and Need
# Traffic Analysis for All Alternatives

<table>
<thead>
<tr>
<th>Alternative</th>
<th>No Build</th>
<th>Traffic Signals at Arterials (seven traffic signals)</th>
<th>Roundabouts at Arterials (seven roundabouts)</th>
<th>Traffic Signals at Arterials and Major Development (eleven traffic signals)</th>
<th>Roundabouts at Arterials and Major Development (eleven roundabouts)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purpose and Need (Mobility and Safety)</strong></td>
<td>Does not meet purpose and need.</td>
<td>Meets purpose and need.</td>
<td>Meets purpose and need.</td>
<td>Meets purpose and need.</td>
<td>Meets purpose and need.</td>
</tr>
<tr>
<td><strong>Traffic Operations</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northbound</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Travel Time (min.)</td>
<td>45.0</td>
<td>9.3</td>
<td>7.7</td>
<td>10.0</td>
<td>8.9</td>
</tr>
<tr>
<td>Average Speed (mph)</td>
<td>6.1</td>
<td>29.4</td>
<td>34.5</td>
<td>27.3</td>
<td>30.8</td>
</tr>
<tr>
<td>Corridor Level of Service*</td>
<td>F</td>
<td>C</td>
<td>B</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>Southbound</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Travel Time (min.)</td>
<td>48.8</td>
<td>8.6</td>
<td>7.7</td>
<td>9.3</td>
<td>9.8</td>
</tr>
<tr>
<td>Average Speed (mph)</td>
<td>5.6</td>
<td>31.7</td>
<td>36.5</td>
<td>29.4</td>
<td>30.9</td>
</tr>
<tr>
<td>Corridor Level of Service*</td>
<td>F</td>
<td>C</td>
<td>B</td>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td><strong>Traffic Patterns</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Safety</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Projected Accident Trend</td>
<td>Increase in right-angle, rear-end and left-turn accidents anticipated.</td>
<td>Increase in right-angle and rear-end accidents anticipated.</td>
<td>Accident severity lower than signals or no build. Accident frequency comparable to signals or no build.</td>
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<td>Accident severity lower than signals or no build. Accident frequency comparable to signals or no build.</td>
</tr>
<tr>
<td>Driver Experience</td>
<td>Drivers would be familiar with corridor operations but exclusive double left-turns at intersections not common.</td>
<td>Drivers initially would be less familiar with operations for roundabout.</td>
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<tr>
<td><strong>Pedestrians and Bicycles</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td>Poor conditions due to lack of continuous pedestrian and bicycle facilities in the corridor.</td>
<td>Good conditions due to provision of multi-use path and sidewalk. Opportunity for pedestrian/bicycle signals on intersection approaches; however, large crossing distances at some intersection locations.</td>
<td>Good conditions due to provision of multi-use path and sidewalk. Only requires pedestrians/bicycles to consider vehicles in one direction. There are no signal protected crossings for pedestrians/bicycles; however, vehicles must yield to pedestrians/bicycles on approaches.</td>
<td>Good conditions due to provision of multi-use path and sidewalk. Opportunity for pedestrian/bicycle signals on approaches. Large crossing distances at some locations.</td>
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</tr>
<tr>
<td><strong>Access</strong></td>
<td>Accessing Shiloh Road would be difficult due to congestion.</td>
<td>Access management would improve safety and corridor mobility. More consistent with MDT access management guidelines than eleven intersection alternatives.</td>
<td>Access management would improve safety and corridor mobility. More consistent with MDT access management guidelines than eleven intersection alternatives.</td>
<td>Access management would improve safety and corridor mobility. Less consistent with MDT access management guidelines than seven intersection alternatives.</td>
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</table>
Public Involvement efforts suddenly grew

- Public Meetings
- Press Releases
- Websites
- Media Interviews
- Special Interest Groups
- Newsletters
- Project Advisory Committee
- City Council Presentations
- County Commissioner Meetings
- Landowner & Stakeholder Meetings
- Mock-Roundabout Demonstration
Mock-Roundabout Demonstration
Intersection Comparison

Typical Roundabout Intersection Configuration

Typical Signalized Intersection Configuration
Grand Avenue Roundabout Alternative

- 6-ft sidewalk w/ 5-ft boulevard
- 10-ft multiuse path
- Raised median
- Truck apron
- 2 exit lanes
- Crosswalk
- 2 entry lanes
- 6-ft sidewalk w/ 5-ft boulevard
Access Benefits of Roundabouts on Shiloh Road

- Roundabouts allow legal and safe u-turns
- Accesses can be located closer
- Signals difficult to install within ¼ mile of each other due to left-turn bay req’s
Existing access

Signal spacing req’s

Signal spacing req’s
## Things to Consider: Safety

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accident Rate</td>
<td>Lower accident &amp; severity rates compared to traffic signal</td>
</tr>
<tr>
<td>Driver Familiarity</td>
<td>Relatively new concept in Montana, would require some driver education</td>
</tr>
</tbody>
</table>

## Operations

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>U-Turns</td>
<td>Facilitates U-turns</td>
</tr>
<tr>
<td>Traffic Flow</td>
<td>Cars yield to circulating vehicles</td>
</tr>
<tr>
<td></td>
<td>motorists encounter minimal delay under low to medium traffic volumes</td>
</tr>
</tbody>
</table>

## Costs

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROW</td>
<td>Requires less ROW upstream &amp; downstream of intersection than signal</td>
</tr>
<tr>
<td>Construction</td>
<td>Comparable to signal</td>
</tr>
<tr>
<td>Maintenance</td>
<td>Low maintenance costs, although there may be higher landscape maintenance cost</td>
</tr>
</tbody>
</table>

## Ped/Bike

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alignment</td>
<td>Crosswalks would line up well with the multi-use trail alternatives</td>
</tr>
<tr>
<td>Movement</td>
<td>Traffic must yield to pedestrians</td>
</tr>
<tr>
<td></td>
<td>Bicycles can use the travel lane in roundabout or utilize crosswalks</td>
</tr>
</tbody>
</table>

## Design Treatment

<table>
<thead>
<tr>
<th>Category</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Landscaping</td>
<td>Can landscape approaches &amp; center island</td>
</tr>
</tbody>
</table>

## Example Location Shown:

- King Avenue & Shiloh Road

## Other Possible Locations Along Shiloh Road:

- Grand Avenue
- Broadwater Avenue
- Central Avenue
- Monad Road
- King Avenue
- Hesper Road
- Zoo Drive

## Note:

Roundabout configuration would vary from intersection to intersection.
**THINGS TO CONSIDER:**

**SAFETY**
- Accident Rate
- Driver Familiarity
- Signalized intersections have higher accident rates & severity rates compared to roundabouts
- Conventional Design

**OPERATIONS**
- U-Turns
  - Doesn't facilitate U-turns very well (or at all if restricted)

**COSTS**
- Raw
  - Requires more raw upstream & downstream from intersection for turn lanes
- Comparable to roundabout in many cases
- Higher signal maintenance cost & no landscape maintenance cost

**PED/BIKE**
- Alignment
  - Crosswalks located close to intersection
- Movement
  - Pedestrians generally have protected movement & must wait otherwise
- Bicycles travel through intersection with vehicles or by using crosswalks

**DESIGN TREATMENT**
- Aesthetics
  - No landscape treatment, except low-lying grasses & shrubs at intersection

**EXAMPLE LOCATION SHOWN:**
- King Avenue & Shiloh Road

**OTHER POSSIBLE LOCATIONS ALONG SHILOH ROAD:**
- Grand Avenue
- Broadwater Avenue
- Central Avenue
- Monad Road
- King Avenue
- Hesper Road
- Zoo Drive

**NOTE:**
- Number of lanes would vary from intersection to intersection

**SIGNAL ALTERNATIVE**
Intersection Decision Matrix

(tool utilized for screening alternatives at individual intersections and system-wide)

- Safety
- Traffic Operations
- Traffic Patterns
- Private Access
- Pedestrians and Bicycles
- Right-of-way
- Economic
- Environmental
- Local Plans
- Construction Impacts
SHILOH ROAD CORRIDOR STUDY

NO BUILD

EXISTING CONDITIONS

RURAL

RURAL BASIC ALTERNATIVE

URBAN

URBAN BASIC ALTERNATIVE

ELEMENTS COMMON TO ALL ALTERNATIVES

ROADWAY
- 2 TRAVEL LANES EACH DIRECTION
- SHOULDERS (NO PARKING ALLOWED)
- CENTER MEDIAN
- DRAINAGE
- TURN LANES AT SIGNALIZED INTERSECTIONS (NOT REQUIRED AT ROUNDABOUTS)

PED/BIKE
- 5.25' WIDE SIDEWALK ON ONE SIDE
- 10' WIDE MULTI-USE PATH ON ONE SIDE

LIGHTING
- BOTH SIDES OF ROAD (STYLES VARY)

DESIGN TREATMENT
- LANDSCAPING/AESTHETIC (TYPES VARY)
“Rural Basic”
Urban “enhanced” Alternative

SHILOH ROAD CORRIDOR STUDY

THINGS TO CONSIDER:

ROADWAY
TRAVEL LANES
2 EACH DIRECTION
SHOULDER (NO PARKING)
2" PAVED BOTH SIDES
CENTER MEDIAN
CURBED CENTER MEDIAN MOUNDED WITH SHRUBS & TREES (SEE GENERAL NOTE)
DRAINAGE
ROAD SLOPES TO OUTSIDE

PED/BIKE
SIDEWALK
ONE SIDE: 5.25" WIDE
MULTI-USE PATH
ONE SIDE: 10" WIDE

LIGHTING
DECORATIVE

DESIGN TREATMENT
UTILITIES
POWER POLES RELOCATED OR LINES BURIED IF POSSIBLE
LANDSCAPE
NATIVE & ORNAMENTAL SHRUBS & TREES ALONG ROAD (SEE GENERAL NOTE) REQUIRES IRRIGATION
OTHER
ARCHITECTURAL SIGNAGE WILL BE CONSIDERED (REQUIRES DESIGN EXCEPTION FROM MDT TO LOCATED CLOSE TO ROADWAY)

GENERAL NOTE: Light poles and trees are considered roadside obstacles. Locating them within the "clear zone" and closer to the roadway should be carefully analyzed prior to seeking "design exceptions" and approval from MDT.
Streetscape Alternates

SHILOH ROAD CORRIDOR STUDY

BASIC NOT IRRIGATED

NATIVE GRASS NOT IRRIGATED

NATIVE GROUNDCOVER SHRUBS NOT IRRIGATED

NATIVE GROUNDCOVER/NATURAL TREE CLUSTER - IRRIGATED

STREET TREES AND LAWN IRRIGATED

URBAN STREETSCAPE

RURAL STREETSCAPE

THINGS TO CONSIDER:
- Lowest maintenance requirement
- Lowest construction cost
- No irrigation required

THINGS TO CONSIDER:
- Lower maintenance requirement
- Lower construction cost
- No irrigation required
- Green during springtime only

THINGS TO CONSIDER:
- Lower maintenance requirement
- Lower construction cost
- No irrigation required
- Green during springtime only

THINGS TO CONSIDER:
- Higher maintenance requirement
- Higher construction cost
- Trees require watering
- Green most of the year

THINGS TO CONSIDER:
- Highest maintenance requirement
- Highest construction cost
- Trees require watering
- Green most of the year

GENERAL NOTE: Light poles and trees are considered roadside obstacles. Locating them within the "clear zone" and closer to the roadway should be carefully analyzed prior to seeking "design exceptions" and approval from MDOT.
SHILOH ROAD CORRIDOR STUDY

HARDSCAPE

NATIVE GRASS NOT IRRIGATION

NATIVE GROUNDCOVER/WILDFLOWER MIX NOT IRRIGATED

GROUNDCOVER SHRUBS IRRIGATED

TREES/SHRUBS/PERENNIALS IRRIGATED

RAISED MEDIAN

things to consider:
- Low maintenance requirement
- Lower construction cost
- Lower maintenance cost

things to consider:
- Low maintenance requirement
- Green during springtime only
- Lower construction cost
- Lower maintenance cost

things to consider:
- Low maintenance requirement
- Lower construction cost

things to consider:
- With raised median only
- Higher construction cost
- Higher on-going water and maintenance expense (which may require another funding source)
- Green throughout the growing season (evergreens year-round)

things to consider:
- With raised median only
- Higher construction cost which may require another funding source
- Higher on-going water and maintenance expense (which may require another funding source)
- Creates greater feeling of separation between opposing traffic
- Changes viewed to Rimrocks
- Trees in median require MDT design exception

FLUSH MEDIAN

SWALE MEDIAN
Preferred Alternative
Typical for Preferred Alternative
Preferred Alternative - roundabout
Preferred Alternative for the Shiloh Road Corridor

All build alternatives presented at the July 2006 Public Meeting achieve the project purpose and needs by improving mobility and safety within the Shiloh Road corridor. However, MDT and FHWA have identified a preferred alternative that best meets the project purpose and needs and is consistent with guidance offered by the Project Advisory Committee and the Billings City Council.

Elements of the Preferred Alternative are summarized below:

- **Corridor Typical Section:** Urban Typical Section (one or two travel lanes in each direction) including a sidewalk and multi-use path

- **Access Management Plan:** The proposed Access Management Plan would be consistent with MDT access control guidelines and would support the Billings area street grid system

- **Intersection Control:** Roundabouts providing full access would be constructed at Zoo Drive, Hesper Road, JTL/County access, King Avenue, Monad Road, Central Avenue, Broadwater Avenue, and Grand Avenue (There would be other limited access locations in accordance with the Access Management Plan.)

Modern roundabouts were selected over traffic signals because, for this corridor, roundabouts would provide:

- slightly better level of service,
- slightly reduced corridor travel time,
- potentially greater reduction in crash rates and severity, and
- reduced right-of-way acquisition requirements.

The locations of the eight roundabouts are shown in the adjacent figure.
Zoo Drive
Shiloh Rd & Zoo Dr - current
Shiloh Road – on Monday
Shiloh Rd – Zoo Dr (look North)
ROUNDABOUTS – in closing……

- Safety Benefits
- Access benefits often realized (u-turns)
- Smooth traffic operations….congestion and delay is reduced
- Traffic calming
- Could yield lower cost and/or less Right-of-Way compared to alts…. 
- Aesthetic opportunities
- Long term cost savings with less maintenance (depends on landscaping)
- At high-volume intersections, the roundabouts occupy far less space than the signalized equivalent intersection.
- Roundabouts can be justified in Montana where there are special safety or access needs identified without meeting requirements of MUTCD, etc.
- Benefits typically outweigh the risks
- Grow thick skin if you’re going to be a roundabout advocate……
Summary

- 8 roundabouts in series….most in U.S.
- Began project in 2002…
- FONSI May 2007
- Construction began April 2009
- Completion anticipated summer 2010
- Total cost around $40M
Additional Resources

http://www.alaskaroundabouts.com/
http://www.dot.state.ny.us/roundabouts/round.html
http://roundabout.kittelson.com/
http://www.iihs.org/research/qanda/roundabouts.html
http://www.k-state.edu/roundabouts/
http://www.roundabouts.ca/
http://www.roundaboutsusa.com/

Kirk Spalding, PE – Associate, Senior Engineer
Sanderson Stewart
phone: 656-5255
e-mail: kspalding@sandersonstewart.com