City of Columbia

701 East Broadway, Columbia, Missouri 65201

Department Source: Public Works
To: City Council
From: City Manager & Staff
Council Meeting Date: September 5, 2017
Re: Public Hearing-Forum Boulevard and Green Meadows Road Intersection Improvement

Executive Summary

A public hearing for the construction of the Forum Boulevard and Green Meadows Road intersection improvement project as identified in the 10-year plan for the 0.25 percent Capital Improvement Sales Tax ballot initiative passed in August of 2015. As directed by Council at the first public hearing held on September 6, 2016, staff worked with the engineering consultant to evaluate and develop additional options for the intersection improvement and solicited a recommendation from the Bicycle/Pedestrian Commission.

Discussion

Project Existing Conditions:

Forum Boulevard is a four-lane divided road classified as a minor arterial and Green Meadows is a two-lane road classified as a major collector in both the Columbia Area Transportation Study Organization (CATSO) 2040 Major Thoroughfare Plan and the City Major Roadway Plan. A site location map (Exhibit A) and a layout of the existing intersection (Exhibit B) are attached.

This intersection was identified for improvement due to both safety and traffic congestion concerns prior to the 2015 CIP Sales Tax Ballot Initiative. The existing layout of the intersection with four-lanes verses two-lanes can be confusing for drivers. It is difficult to know which vehicle has the right of way to enter the intersection when multiple vehicles stop at the same time, causing delay, confusion and increasing the potential for collisions. During daytime peak traffic the intersection becomes a bottleneck as vehicles queue behind the stop signs in a stop and go situation and staff has received many complaints that drivers do not come to a complete stop in order to "beat" the other vehicles into the intersection. The intersection is also difficult and dangerous for pedestrians to cross. All of these issues are expected to worsen as improvement projects along Nifong are under construction and as the City continues to grow to the south and southwest.

To summarize collision and traffic data collected at the intersection, there were 14 collisions reported between January 2011 and April 2017 (7 right-angle collisions, 2 rear-end collisions and 5 left-turn collisions). This data consists of recorded police reports indicating that the collisions were significant in nature. Minor collisions like a fender-bender usually do not result in a police report; therefore, minor accidents are not captured in the data. Traffic counts were taken at the intersection on January 21, 2016 from 7:00 a.m. to 7:00 p.m. A total of 14,772 vehicles went through the intersection in the 12-hour period, with 1,754 vehicles counted during the peak hour of 4:45 p.m. to 5:45 p.m.

Public Involvement and Design Options:
The IP meeting for the project was held April 28, 2016, and a public hearing was held on September 6, 2016. Staff's recommendation at that time was to construct a 150-foot diameter partial double-lane roundabout. Due to opposition to the proposed roundabout by residents of the Country Club Villas, Council directed staff to evaluate additional intersection improvement options. Council also directed the Bicycle/Pedestrian Commission to review the information and make a recommendation.

Staff worked with Bartlett and West Consulting Engineers on both the initial design of the roundabout and the additional options to improve the intersection. Five options were developed and are summarized below. The total estimated concept project cost includes construction, utility relocation, easement acquisition, and design. A layout of each option is attached as Exhibit C.

1. **Full Signal**
   - Full length right turn and left turn lanes for vehicle storage at each leg of the intersection.
   - Dual through lanes on Forum.
   - Bike lanes at each leg of the intersection.
   - Islands at each leg of the intersection for pedestrian crossing havens.
   - Total estimated concept project cost is $914,700.

2. **Reduced Signal**
   - Right turn lane storage on the east leg of Green Meadows was reduced in length.
   - Right turn lane and a pedestrian island at the preschool were removed.
   - Pedestrian islands remain on the northeast, southeast, and northwest corners.
   - Bike lanes at each leg of the intersection.
   - Total estimated concept project cost is $868,900.

3. **J Turn**
   - Eliminates the Green Meadows left turn movements at the intersection.
   - Left turns are still allowed off of Forum Blvd.
   - U-turn areas are located farther down Forum for the Green Meadows left turn movements.
   - Scottson Way will be made into a cul-de-sac.
   - Bike lanes are included on Forum.
   - No pedestrian crossing facilities are included with this option.
   - Total estimated concept project cost is $1,208,200.

4. **J Turn with Ped Signal**
   - Left turn movement for both Forum and Green Meadows have been removed.
   - Crosswalk and pedestrian actuated signal have been included at the intersection.
   - Left turn movements for both Forum and Green Meadows will need to utilize the U-turn movement farther down on Forum.

- Bike lanes are included along Forum.
- Scottson Way will be made into a cul-de-sac.
- Total estimated concept project cost is $1,248,700.

5. **Roundabout**
   - Splitter islands are included at each leg of the intersection for pedestrian crossing havens.
   - Crosswalks are set back from the intersection to allow vehicles more time to react before merging in and out of traffic.
   - Left turn movement is eliminated thus eliminating collisions and delay caused by left turn movement.
   - Bicyclists can choose to ride through the roundabout with traffic or use the sidewalk/pedestrian crosswalk. Vehicles speeds will be slower in the roundabout as compared to a signal for bikes riding with traffic.
   - Total estimated concept project cost is $1,166.500.

Per Council direction, staff provided the Bicycle/Pedestrian Commission with a copy of the council memo prepared for the September 6, 2016 public hearing, and the additional improvement options designed by Bartlett and West. This information was discussed at their November 16, 2016 meeting, and the Commission voted to support a roundabout concept.

Staff prepared a report and presented the additional intersection improvement options to Council at their January 17, 2017 meeting. Council directed staff to hold a second IP meeting and set another public hearing to present all five of the improvement options.

The second IP meeting was held on June 27, 2017 with a total of 88 people in attendance and 55 comments received. Of those 55 comments (Exhibit D), 27 were in favor of the roundabout, 21 were in favor of a signal option, and 7 did not state a definite preferred option. Nine of the comments received were from Canterbury Drive residents who requested speed humps or some other traffic calming measures to be included in the project in order to minimize cut-through traffic on that street. As part of this project, traffic calming measures will be considered for both Canterbury Drive and Scottson Way.

Staff Recommendation:
The Forum and Green Meadows intersection was identified for improvement due to both safety and traffic congestion concerns. Based on the analysis of the additional intersection improvement options, the recommendation from the Bicycle/Pedestrian Commission and the adoption of Vision Zero by Council, staff recommends the roundabout as the best solution because it is considered overall the safest improvement for all modes of transportation (motorized and non-motorized).

For the following **safety** reasons, staff recommends a roundabout over the signal options and the J-turn options:

- The partial double-lane roundabout has 62% fewer vehicle conflict points compared to a signalized intersection. The severity of a collision is determined largely by the speed and angle of impact. A roundabout changes the geometry of the roadway in a way that forces drivers to slow down and alter their direction resulting in fewer and less severe collisions. Signalization relies on driver's obedience of traffic control devices to eliminate right-angle collisions. The most severe collisions at signalized intersections occur when there is a violation of the traffic control device designed to separate conflicts by time. Also, the rear-end collision rate may increase with a traffic signal given the historical trends of signalizing intersections due to queues at the light. With roundabouts the most severe types of crashes (right-angle, left-turn, and head-on) are unlikely to occur. The conflict diagram (Exhibit E) graphically shows the conflict locations for vehicles for both an all-way stop and a roundabout.

- A pedestrian crossing a double-lane signalized intersection faces seven potential vehicular conflicts, each coming from a different direction. A pedestrian crossing the partial double-lane roundabout will face four potential vehicular conflicts. The first two potential conflicts will both be coming from the left, with a refuge on the median island, before facing the other two potential conflicts, which will both be coming from the right. The intersection conflict diagram (Exhibit E) graphically shows the conflict locations for pedestrians.

- In a study completed by the Transportation Research Board (TRB), it was found that following the conversion of 23 intersections from either a stop sign or a traffic signal to a roundabout, there was approximately a 40% decrease in crashes of all severities; 80% reduction of injury crashes; and approximately 90% reduction of fatal and incapacitating injury crashes. An abstract of this paper is attached as Exhibit F. Ongoing research by the Federal Highway Administration (FHWA), the National Highway Traffic Safety Administration (NHTSA), the Insurance Institute for Highway Safety (IIHS), the TRB and other industry sources continues to indicate roundabouts are one of the safest types of intersection control (see Exhibit G for a list of papers). Improvements have been made to some specific elements of roundabout design over the years, but the principle of providing physical deflection in order to reduce speeds remains a key component for driver, pedestrian and cyclist safety.

- Vehicular speeds are lower in a roundabout allowing more time for vehicles and pedestrians to react, which reduces the consequences of error. Also, the crosswalks are set back at the roundabout to allow drivers more time to react to pedestrians while merging into or out of the roundabout.

- For both the signal and the J-turn options, vehicles on Forum will not need to stop or slow down at the intersection unless making a left turn or stopping for a red light; thus, resulting in higher vehicle speeds at the intersection for through traffic. Whereas, the geometry (layout and islands) of the roundabout forces drivers to slow down to 15-20 mph as one approaches and drives through the roundabout.

The "Safety Benefits of Modern Single-Lane Roundabouts" (Exhibit H) identifies the safety benefits of a roundabout. Although the document is written to address signal-lane roundabouts, most of the discussion applies to partial double-lane roundabouts as well.

For the following **traffic flow and maintenance** reasons, staff recommends a roundabout over the signal options at this intersection:

- Roundabouts bring conflicting traffic streams into a steady flow and allow vehicles to merge without the stop-and-go conditions. Roundabouts provide greater traffic flow benefits by reducing average vehicle delay and vehicle queuing compared to a signal.

- Roundabouts eliminate left turns thus eliminating the delays caused by left-turning vehicles.

- Roundabouts keep traffic flowing even during non-peak periods since vehicles would not have to wait at a red light when little or no traffic is coming from the conflicting direction.

- Long-term maintenance costs are lower for a roundabout than a signal due to the electrical and operation/maintenance costs of a signal.

- A roundabout could potentially have as many as seven landscaped Adopt-A-Spots compared to four at a signalized intersection.

In conclusion, the Forum and Green Meadows intersection project was identified for improvement due to both safety and traffic congestion concerns. The current configuration is confusing and presents a legitimate safety concern that will only get worse as future road construction and growth occur in the south and southwest. In an attempt to be proactive, staff is proposing to improve the intersection now to lessen the impact during future roadway construction. Based on the analysis of the additional intersection improvement options, the recommendation from the Bicycle/Pedestrian Commission to support a roundabout concept, and adoption of Vision Zero by Council, staff recommends construction of a partial double-lane roundabout as the preferred improvement option for this intersection project.

Fiscal Impact

Short-Term Impact: The estimated total project cost for staff's recommendation of a partial double-lane roundabout is $1,166,500 (design, right of way, utilities, and construction), and will be funded from 0.25% Capital Improvement Sales Tax.
Long-Term Impact: Routine maintenance for a roundabout is estimated at $2,000 per year.

Vision & Strategic Plan Impact

Strategic Plan Impacts:
Primary Impact: Infrastructure, Secondary Impact: Public Safety, Tertiary Impact:
Comprehensive Plan Impacts:
Primary Impact: Infrastructure, Secondary Impact: Mobility, Connectivity, and Accessibility, Tertiary Impact: Not Applicable

Legislative History

Date	Action
04/28/2016	Interested Parties meeting held
08/01/2016	R103-16 Setting a public hearing for September 6, 2016
09/06/2016	PH30-16 Public hearing held
01/17/2017	REP3-17 Council Report with additional improvement options for the intersection & Bicycle/Pedestrian Commission recommendation
06/27/2017	Interested Parties meeting held

Suggested Council Action

After public input and Council discussion, direct staff to move forward with final plans and specifications for the construction of the Forum Boulevard and Green Meadows Road intersection improvement project.