City of Dublin

Office of the City Manager
5200 Emerald Parkway • Dublin, OH 43017-1090
Phone: 614.410.4400 • Fax: 614.410.4490

Memo

To: Members of Dublin City Council

From: Dana McDaniel, City Manager

Date: January 5, 2017

Initiated By: Megan O'Callaghan, PE, Director of Public Works
Paul Hammersmith, PE, Director of Engineering/City Engineer
Jean-Ellen Willis, PE, Engineering Manager-Transportation

Re: SR 161/Riverside Drive Traffic Operations Update

Background

City Council has requested an update regarding the traffic operations at the SR 161/Riverside Drive roundabout. The SR 161/Riverside Drive roundabout opened to traffic in the early hours of August 13, 2016. Since the opening of the roundabout and the previous staff report dated August 31, 2016, which is attached for your reference, several physical and operational changes have been made. These changes are mainly due to construction progress and field observations.

Changes due to Construction Progress

The permanent overhead signs for each approach to the intersection were installed on September 29, 2016 (see Figure 1). The temporary wood poles, strain wires, and flat sheet signs were removed. The permanent signs will also receive lighting before the final close-out of the construction project. The contractor has ordered the light fixtures, but they have not been delivered, so staff is unsure of the anticipated installation date. Staff has been working with the contractor, however, to emphasize the importance of the installation of the lights as soon practical after they are received.

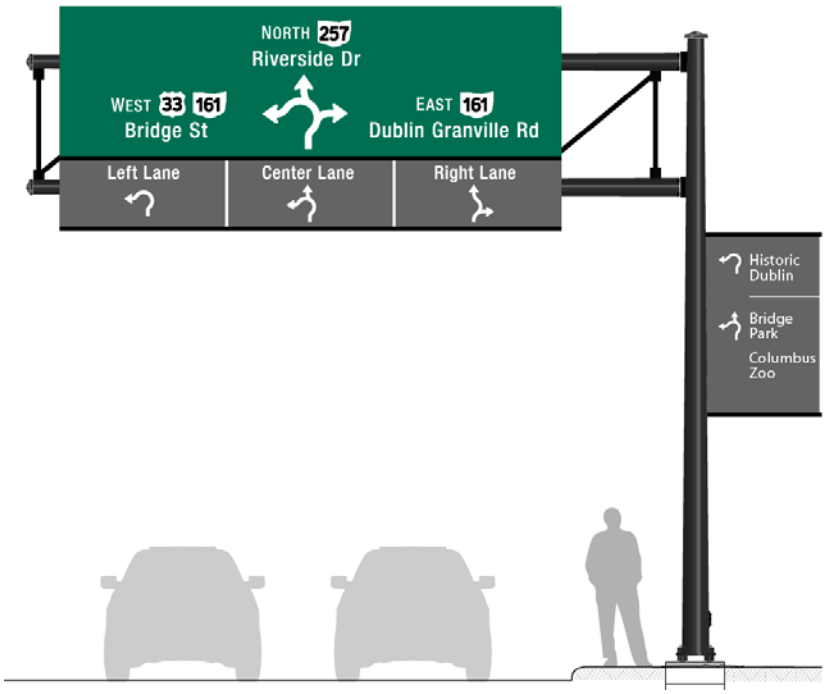


Figure 1: Permanent Overhead Sign (Northbound)

As construction progressed, additional travel lanes opened. The section of Riverside Drive south of the roundabout approach opened in the middle of October, as shown in Figure 2. In conjunction with the permanent overhead signs, the additional northbound lane has helped drivers choose the appropriate lane earlier and reinforce that there are two through lanes available through the intersection.

The southbound bypass lane opened, along with the second northbound lane of Riverside Drive north of the roundabout on November 11, 2016. (See Figure 3) This was the final day of active roadway construction for the project.

The opening of the southbound bypass lane has removed approximately 7,000 to 10,000 vehicles per day, reducing the number of vehicles at the surface intersection, which could potentially conflict. Likewise, the opening of the second northbound lane north of the roundabout has been important as now drivers can maintain their lane through the active project area, or in other words, not have to change lanes to remain on Riverside Drive, which reduces the number of potential conflicts.

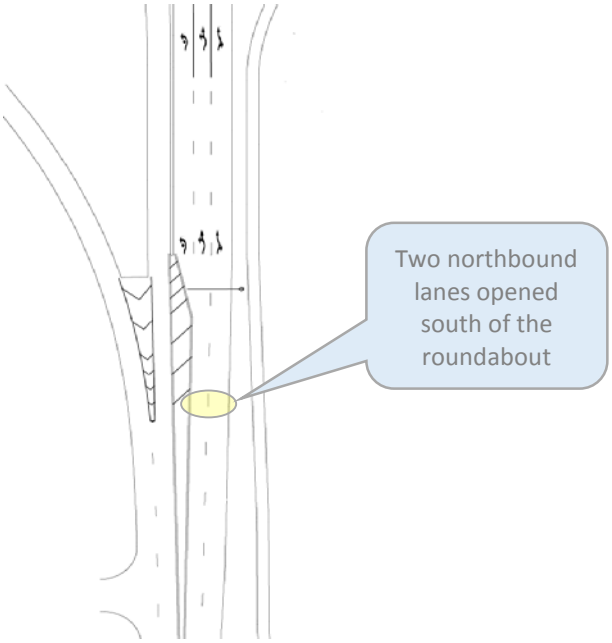


Figure 2: NB Lane Open South of the Roundabout

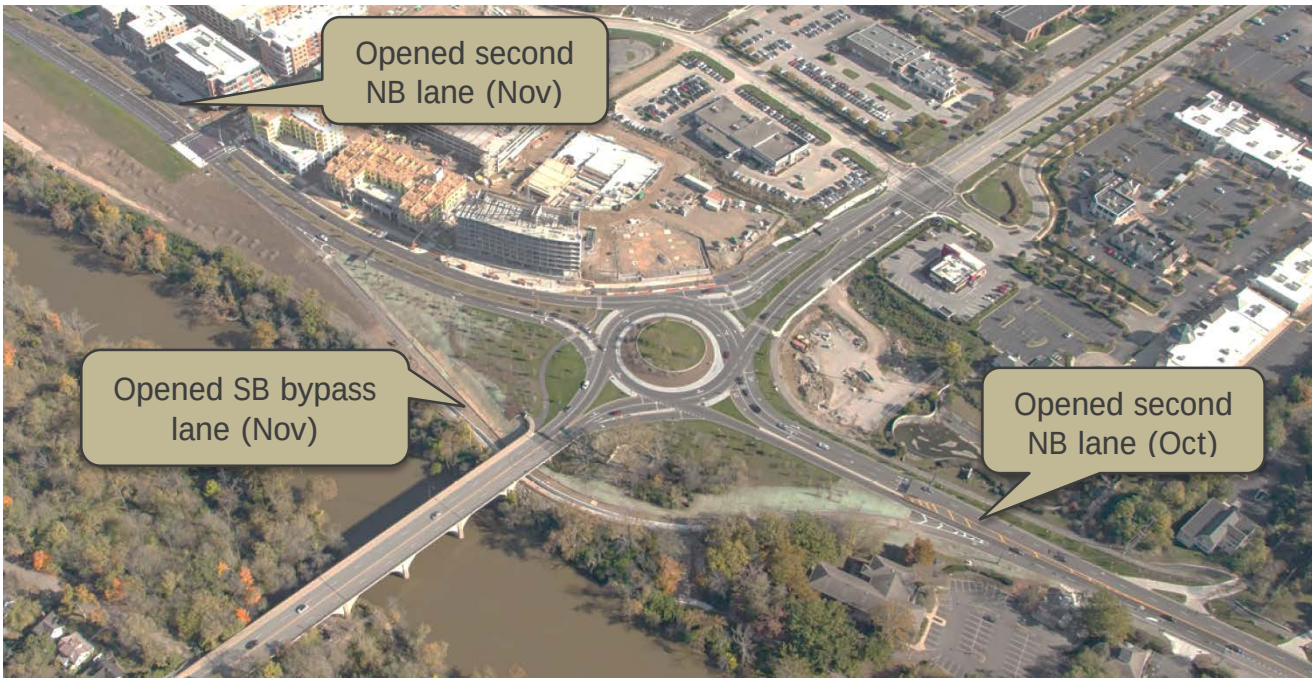


Figure 3: Open Lanes

Changes due to Field Observations

As described in the previous staff report, several modifications were made to the signing and striping plan for the roundabout. All of these improvements have been completed.

Pavement markings described in the August memo were installed on August 29, 2016, including extra lane arrows in the northbound, westbound and southbound direction. Additionally, the word "YIELD" was added on the pavement for all three lanes of the northbound approach. Signing updates occurred throughout September, October, and November.

On September 15, 2016, the plaques under the yield signs were amended to read "To all lanes in Roundabout" on the northbound, southbound, and westbound approaches. Eastbound was not revised, as there is only one circulating lane at this entry. The northbound signs were further modified on October 5, 2016 to simply read "To BOTH Lanes." (See Figures 4 and 5).

Since the northbound approach is the most complex, it is important that the messaging for this approach is as simple and clear as possible. This sign modification simplifies the message that the approach must yield to the two circulating lanes in the roundabout.

Figure 4: Revised YIELD Sign Assembly

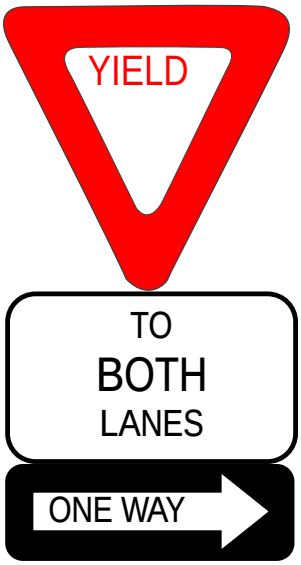


Figure 5: Revised Northbound YIELD Sign Assembly

A third set of southbound lane arrows was added on September 16, 2016. (See Figure 6) There is a small hill on this approach that was limiting the visibility of the previous arrows placed. This final set was placed to ensure drivers have enough time to choose the appropriate lane prior to the final approach to the roundabout.

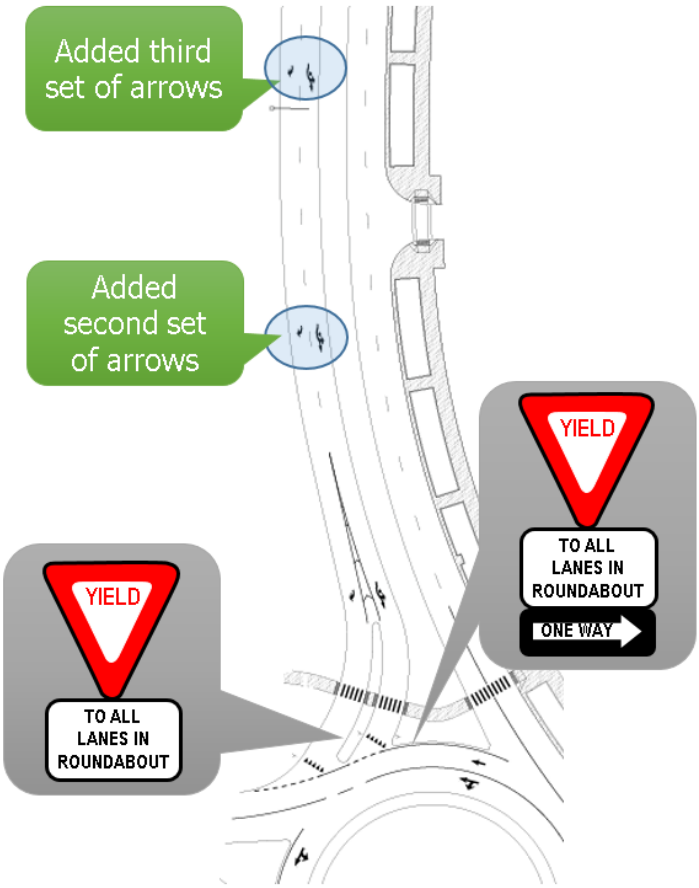


Figure 4: Southbound Lane Arrows

The week of November 7, 2016, a sign was installed for SB traffic to avoid the low clearance under the bridge for oversized vehicles (See Figure 7). This sign was placed prior to the diverge point for the southbound bypass lane to ensure drivers have time to choose the most appropriate lane.

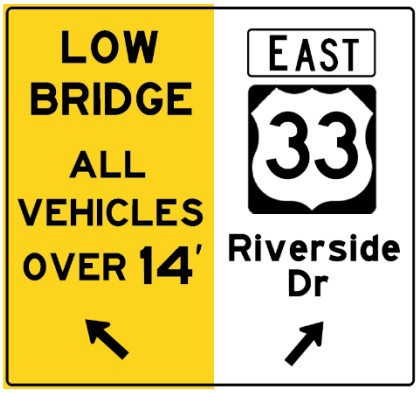


Figure 5: Southbound Clearance Sign

In addition to the pavement marking and signing operational work performed, a speed study will be conducted in 2017 to evaluate speed zone options on the new alignment of Riverside Drive, from Martin Road to Bright Road. The purpose of the study will be to determine if reducing the speed limit from 40 mph to 35 mph can be justified within the study limits.

Traffic Incidents

As of December 12, 2016, there were 57 total crashes reported since we entered the final phase of construction and the full movements at the roundabout opened. The crashes appear to be trending downward, and we are optimistic this trend will continue. Seven of the crashes resulted in an injury. Four of the injury crashes were listed as a “possible” injury, and the other three, two from motorcycle crashes, were listed as “non-incapacitating” injuries.

The northbound approach has the most occurrences of crashes, 32 of 57 crashes with reports available. The type of crashes are mainly failure to yield at the entry to the roundabout, 40 of 57 crashes. Other crash types include improper lane changes within the roundabout, following too closely prior to entry, and failure to control. Nearly all of the crashes have occurred during the daylight hours, with 21 of the 57 occurring between 4:00 p.m. and 7:00 p.m., when traffic volumes and the potential for conflict are the highest.

Stated speeds of drivers in the crashes range from 0 mph to 35 mph. The average stated speed of the at-fault driver is 12 mph, whereas the average stated speed of the other driver is 17 mph. It is interesting to note that the stated speed of the non-cited driver is higher than the at-fault driver. The advisory speed for travel within the roundabout is 25 mph. Given the stated speeds of drivers and the fact that most collisions to date have resulted in property damage only, it is reasonable to conclude that driver speeds are within the normal operating range.

Since the speeds of the vehicles in the crash reports are stated speeds by the drivers, and to better understand how drivers are traveling through the intersection, the Police Department collected speed data of drivers in the roundabout using a hand held laser gun. The 85th percentile speeds were approximately 25 mph as the vehicles departed the roundabout (final curve before exiting).

On September 13, 2016, Police, in conjunction with the Ohio State Highway Patrol Aviation, conducted an enforcement detail during the evening rush hours, resulting in seven written warnings. Five officers assisted in the detail, including two from first shift patrol.

The directed enforcement watched for Failure to Yield violations and other driving activity likely to increase the risk of a traffic crash. Violators were identified by the Highway Patrol Pilot and stopped by Dublin officers in the area. The focus of the detail was to educate our drivers than write citations. Using a pamphlet provided by engineering staff containing graphics similar to this example, officers explained to drivers how to properly navigate the roundabout safely. Every driver officers spoke with expressed confusion over how to proceed at the intersection,

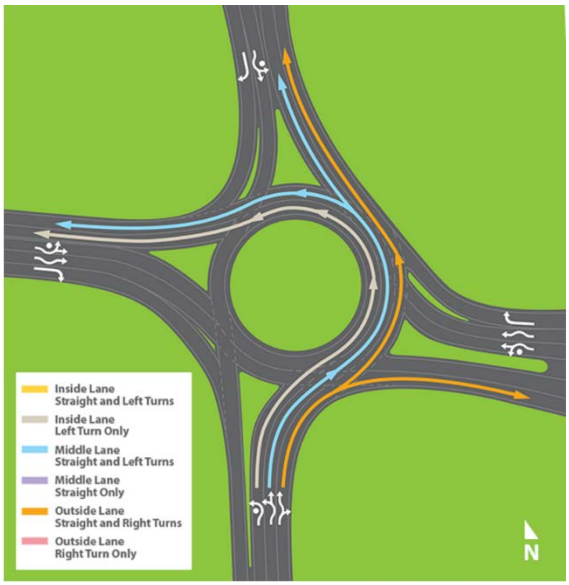


Figure 6: Enforcement Detail Education Graphic

but gained a better understanding once information from the pamphlet was provided to them.

In addition to the official enforcement detail, Traffic Enforcement Unit officers have made it a priority during their shifts to dedicate time to this intersection. Officers spend fifteen to thirty minutes in and around the area to raise awareness and enforce violations as needed with an emphasis on moving violations contributing to traffic crashes, such as failure to yield and unsafe lane change.

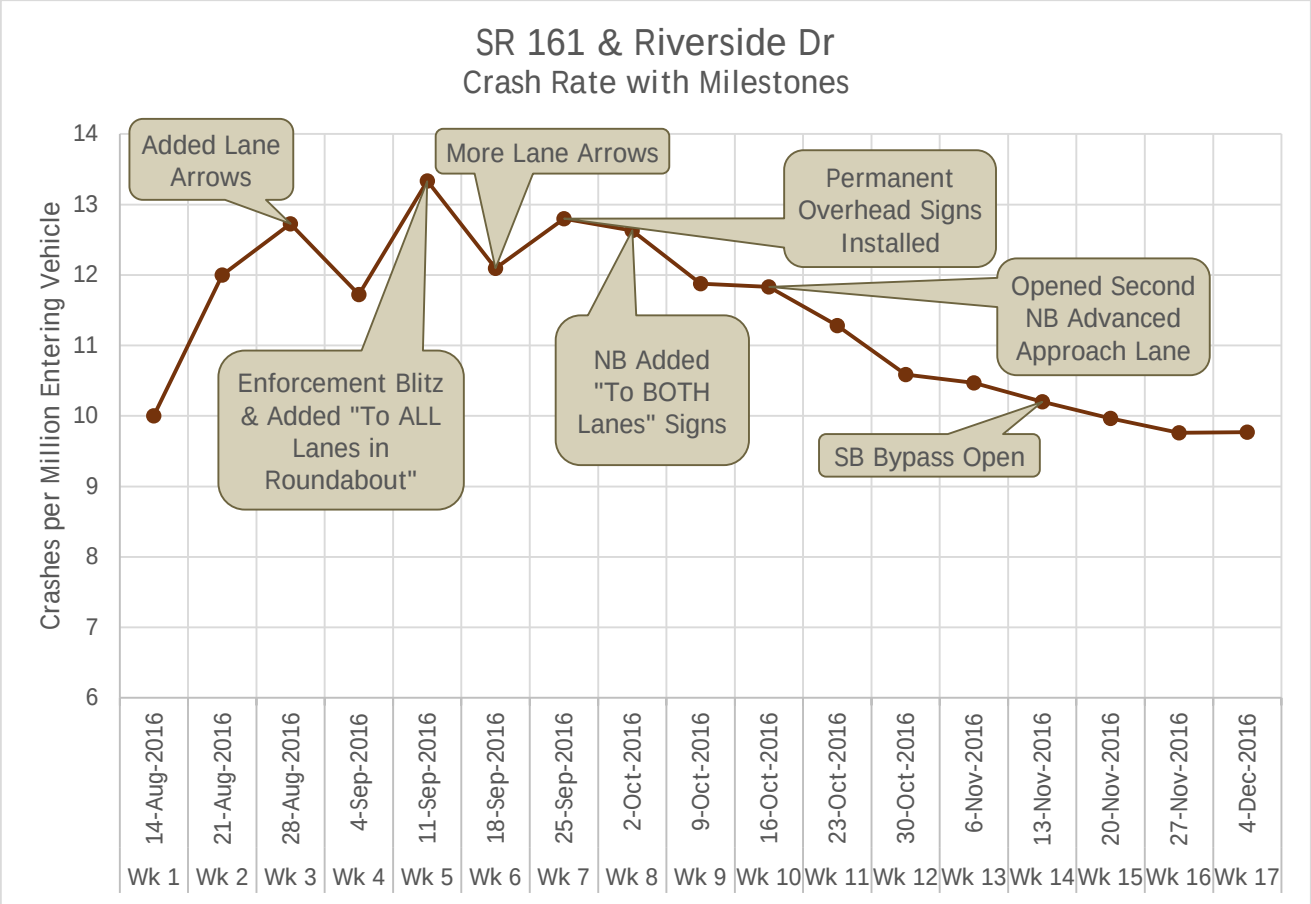
The Table below summarizes the cumulative number of crashes by week and marks the timing when important improvements were made.

Table 1: Summary of Crashes at Roundabout by Week

Week Number	Week Beginning	Crashes	Cumulative Crashes	Days Open	Event or Improvement
Week 1	14-Aug-2016	**4**	4	8	Roundabout opened August 13, 2016
Week 2	21-Aug-2016	**5**	9	15	
Week 3	28-Aug-2016	**5**	14	22	Added Lane Arrows (NB, SB, WB)
Week 4	4-Sep-2016	**3**	17	29	
Week 5	11-Sep-2016	**7**	24	36	Enforcement Blitz & Added "To ALL Lanes in Roundabout" Signs (NB, WB, WB)
Week 6	18-Sep-2016	**2**	26	43	More Lane Arrows (SB)
Week 7	25-Sep-2016	**6**	32	50	Permanent Overhead Signs Installed
Week 8	2-Oct-2016	**4**	36	57	NB Added "To BOTH Lanes" Signs
Week 9	9-Oct-2016	**2**	38	64	
Week 10	16-Oct-2016	**4**	42	71	Opened Second NB Advanced Approach Lane south of roundabout
Week 11	23-Oct-2016	**2**	44	78	
Week 12	30-Oct-2016	**1**	45	85	
Week 13	6-Nov-2016	**3**	48	92	
Week 14	13-Nov-2016	**2**	50	99	SB Bypass Open and second northbound lane opens north of roundabout
Week 15	20-Nov-2016	**2**	52	106	
Week 16	27-Nov-2016	**2**	54	113	
Week 17	4-Dec-2016	**3**	57	120	

As shown in Figure 9, physical intersection changes are plotted with the running crash rate (crashes per million entering vehicles). Each change is cumulative, working systematically to enhance the entire intersection operations. However, two individual improvements appear to have had significant positive influences: (1) adding the “To BOTH Lanes” signs in the northbound direction and (2) opening the second NB lane prior to the three lane section on Riverside Drive. While still relatively early, it also appears that the opening of the southbound bypass lane is having a very positive effect on the roundabout operations.

Figure 7: Crash Rates with Milestones



Opening the southbound bypass lane in the middle of November removed an estimated 7,000 to 10,000 vehicles per day through the roundabout. At the same time, the construction crews opened the second northbound lane on Riverside Drive north of the roundabout and cleared construction equipment from the site. The bypass lane eliminates a significant amount of potential conflict from the roundabout, and improves the intersection operation, reducing delay. The number of reported crashes since the bypass lane opened, shows about a 40% reduction comparing weekly roundabout crashes before and after the change.

Engineering staff continues to coordinate with Police regarding the traffic operations at the roundabout. Police, like Engineering, is optimistic that crashes will continue to trend downward as driver awareness and familiarity increase.

And while the roadway construction has finished, there is still a lot of private construction activity on going within the project area, which can increase distractions and confusion. With the recent enhancements, an increase in driver familiarity and experience, and operational improvements, we

are optimistic that the intersection operations will continue to improve. Staff will continue to closely monitor the intersection, however, and if they do not, we will continue to pursue innovative ways to improve the vehicular and pedestrian operations at the intersection, including consulting with a national expert to discuss crash trends and potential signing and/or pavement marking changes that could be made to improve the operations and safety at this location.

Recommendation

Staff is providing this information as requested by Council.