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Roundabouts: A Study in Green

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Honors Research Project

Roundabouts: A Study in Green

Benjamin Shaub

THE DRS. GARY B. & PAMELA S.
WILLIAMS



**HONORS
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Introduction

“Roundabouts: A Study in Green” is an in-depth review of two roundabout conversion projects that have been completed in the City of Green: the 619/Pickle roundabout (constructed in 2018) and the 619/Myersville roundabout (constructed in 2019).

Proudly proclaiming itself as “prosperous, progressive, promising,” the City of Green is a municipality local to Akron, Ohio. One front on which the City of Green has been especially progressive is in its implementation of roundabouts as an alternative to traditional intersections (such as stop-controlled). Since 2010, the City of Green has completed the construction of five roundabouts. A federally-funded project involving a series of three roundabouts is currently under construction, and another seven roundabout projects are under consideration for the future.

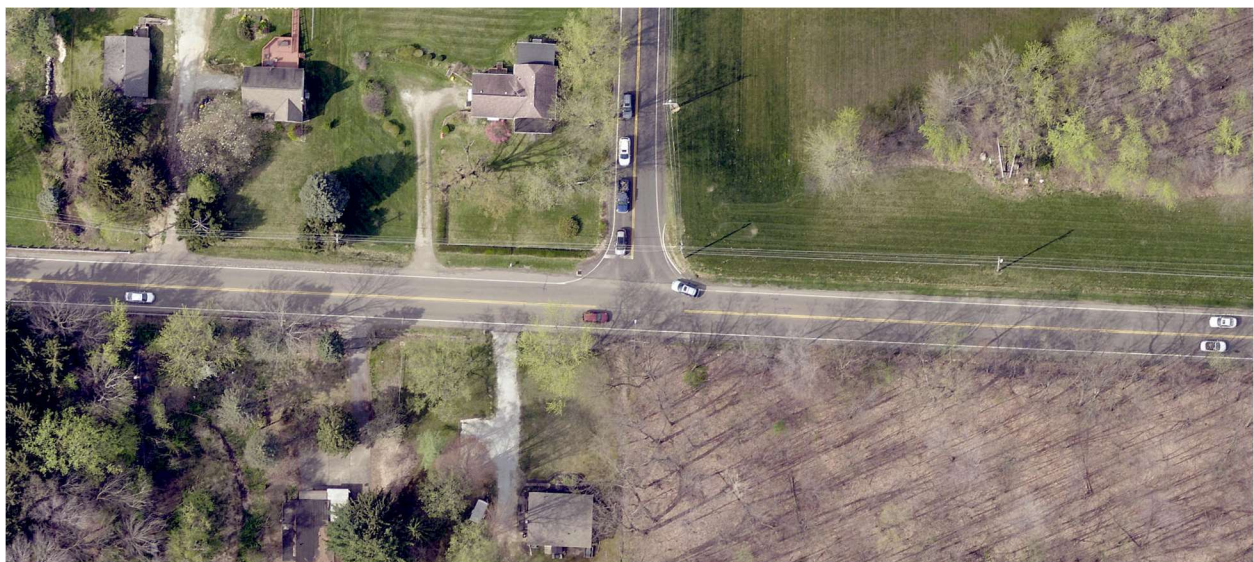
The purpose of reviewing the 619/Pickle and 619/Myersville roundabout projects is to provide insight on the considerations behind roundabout conversion, and to present other factors involved in the project process from start to finish, including anticipated improvements and public engagement, for example. By focusing on the details of these two intersection improvement projects, this review ultimately seeks to contribute to a more comprehensive understanding of roundabouts and their function, in addition to the nuances characterizing their implementation.

619/Pickle Roundabout Project

Describing the intersection of State Route 619 and Pickle Rd while introducing the roundabout project to residents at a public meeting, City Engineer Paul Pickett stated, “It’s won the ‘People’s Choice Award’ for a lot of years, in terms of one of the most difficult intersections in the city.”

Initial Conditions

When consulted by the City of Green to evaluate the consideration of converting each of 7 different traditional intersections needing improvement to roundabouts, American Structurepoint ranked the intersection of State Route 619 and Pickle Road as the second-most-suitable candidate for reconstruction (following the intersection of State Route 619 and Myersville Road). The aerial imagery below (retrieved via the online Parcel Viewer application provided by County of Summit GIS Open Data Portal) shows the layout of the intersection in the year 2017, prior to reconstruction.



Aerial imagery of the intersection of SR 619 and Pickle Rd before roundabout conversion (2017). Retrieved from <https://summitmaps.summitoh.net/ParcelViewer2.0/>

In the image above, SR 619 is the major street, running from east to west (from right to left across the page). With the exception of delays caused by eastbound drivers of SR 619 waiting for a gap

in oncoming traffic to make the left turn onto Pickle Rd (due to the absence of any turn lanes), through traffic on 619 flowed freely.

For southbound drivers on Pickle (the minor street), however, there was a stop sign located where the road dead-ended at 619, leaving them to sit and wait for a break in the traffic stream (note the queue of four cars in the preceding image). The free flow of traffic on the major street made it challenging for those on the minor street to enter the intersection safely, an issue compounded by high vehicle velocities (in excess of the posted speed limit of 45 mph) and sight distance inadequacies (the east approach features a vertical crest curve that limits the sightline between drivers heading westbound on SR 619 and drivers waiting at the stop sign on Pickle Rd). For vehicles waiting to turn left onto SR 619 during the PM peak hour, openings in the cross-traffic stream were especially few and far between, making for excessive delays.

American Structurepoint's Roundabout Evaluation Report reported an anticipated delay of 35.9 seconds for traffic heading southbound on Pickle Rd during the 2018 PM peak hour, identifying this as the worst approach leg. Based on existing conditions, the intersection was expected to operate at a Level of Service E during the 2018 PM peak hour if no improvements were made. It was predicted that intersection operation would only worsen over the course of time. Looking further into the future, American Structurepoint reported a projected Level of Service F for the PM peak hour in the design year 2038, with the anticipated delay for vehicles traveling southbound on Pickle Rd during the PM peak hour expected to increase from 35.9 to 189.7 seconds between 2018 and 2038 (American Structurepoint, Inc., 2017). "We've known for a lot of years that there are long delays there," said Paul Pickett. "It's difficult finding gaps large enough to get out onto 619" (Aransky et al., 2017).

Minimal breaks in the SR 619 traffic stream not only incurred delays for vehicles traveling southbound on Pickle Rd, but may have also increased risky maneuvers among these drivers. The longer they wait, the more likely drivers are to find themselves becoming less selective when it comes to identifying gaps in the traffic stream they deem safe enough to allow them to enter an intersection. Patience wears thin under the influence of excessive delay, and drivers may possibly perceive pressure applied by the drivers waiting in line behind them. “Sometimes people will get overly aggressive,” explained American Structurepoint Project Manager Mike Long, “and that could lead to an accident” (Aransky et al., 2017).

Between 2010 and 2015, a total of 40 accidents took place at this intersection, incurring an estimated \$1,168,000 in damages. According to the report, injury accidents accounted for 20% of the total accident count (American Structurepoint, Inc., 2017). Rear-end collisions accounted for two thirds of the total, with most of these occurring on the west leg, among drivers traveling east on 619. “There would be a car wanting to turn left on Pickle. That car would be stopped. Cars aren’t expecting that when approaching from behind,” said Mike Long (Aransky et al., 2017). Accident reduction potential was the primary factor contributing to the high ranking of the 619-Pickle intersection in the consideration of roundabout conversion (American Structurepoint, Inc., 2017).

Anticipated Improvements

As alluded to in the preceding paragraphs, the issues that set the 619/Pickle intersection apart as a prime candidate for roundabout conversion were its proven past as a high-crash-rate intersection (8 injury accidents and 32 non-injury accidents in the span of 5 years), and its projected future as a low-level-of-service intersection (Level of Service E projected for PM peak hour performance

in 2018, Level of Service F projected for PM peak hour performance in 2038). As part of its Roundabout Evaluation Report, American Structurepoint not only provided evidence for the problems present at each intersection, but also evaluated the potential improvements that could be expected by introducing a roundabout. For the 619/Pickle intersection, anticipated improvements included both accident reduction and performance enhancements (American Structurepoint, Inc., 2017). “That’s how we got [to] the number two ranking,” said Frank Aransky, Senior Project Manager at American Structurepoint, “through mostly the combination of congestion relief and the safety benefit” (Aransky et al., 2017).

Specifically speaking, American Structurepoint expected an 87.3% reduction in injury accidents and a 71.5% reduction in non-injury accidents, which the report indicates would equate to a cost savings of \$974,160 from the accident cost of \$1,168,000 estimated for the period of 2010 to 2015 (American Structurepoint, Inc., 2017). “That’s another benefit of the roundabout,” says Frank Aransky, “when you do have accidents, you don’t necessarily have the high injury rate” (Aransky et al., 2017).

Dave Schemansky, Project Manager for the City of Green, also reflected expectations of accident reduction at the intersection once the roundabout was built, comparing this project to the first roundabout the city had constructed:

[The roundabout at] Massillon and Steese has been out there for 8 years. The previous 8 years, when it was a signalized intersection, there were 19 injury accidents at that intersection. There have been 8 years since the roundabout has been in. There have been 4 injuries in those 8 years. That’s 4 versus 19. (Aransky et al., 2017)

Schemansky later referenced the city's second-ever roundabout, completed at the intersection of Lauby Rd and Greensburg Rd in August 2015. According to Schemansky, in the 3 years before roundabout conversion, there were 42 accidents, but in the 3 years to follow, only 7 – none of which involved any injuries. “That’s what I would expect to happen here,” he concluded (Aransky et al., 2017).

The Federal Highway Administration’s informational guide on roundabouts describes two problems characteristic of intersections like that of SR 619 and Pickle Rd as 1) “congestion on the minor street caused by a demand that exceeds capacity” and 2) “queues that form on the major street because of inadequate capacity for left turning vehicles yielding to opposing traffic.” On the basis that “they provide more favorable treatment to left turns than other control modules,” the guide offers roundabouts as a remedy, adding that “‘T’ intersections are especially good candidates [for roundabout conversion] because they tend to have higher left turning volumes” (Federal Highway Administration, 2020).

In terms of capacity analysis, American Structurepoint’s Roundabout Evaluation Report conveyed that roundabout conversion would result in the intersection operating at a Level of Service A during both the AM and PM peak hours in the design year 2038, whereas Levels of Service E and F were expected for the PM peak hour in 2018 and 2038, respectively, if no improvements were made. Where PM peak hour delay had been projected to reach 189.7 seconds by the design year 2038 for those driving southbound on Pickle Rd if no improvements were made, it was determined that roundabout conversion would reduce the corresponding delay to only 10.9 seconds, a reduction of nearly 3 minutes (American Structurepoint, Inc., 2017).

Roundabout conversion was also expected to contribute to speed reduction for the intersection. “With the geometry of the roundabout, the curbs, cars are forced to slow down as they approach it,” explained Mike Long. “They’re forced to slow down as they go in. It’s still a free flow, so they’re not slowed to a stop, like a stop sign or a signal, but it’s slowed enough to reduce those severe accidents.” Besides decreasing accident frequency and severity, reduced speeds on major street approaches would subsequently open up opportunities for vehicles on the minor street to safely enter the intersection as well, one of the contributing factors behind the anticipated reduction in traffic delays (Aransky et al., 2017).

Long expanded on the benefit he expected for Pickle Rd drivers:

Why a roundabout? With a roundabout...everyone makes the same motion. They approach the roundabout, they yield, they wait for an appropriate gap, they get in, and then they exit. This would happen on 619. This would also happen on Pickle. So there’s not a priority to the 619 traffic. It gives equal opportunity for the traffic along Pickle. The roundabout gives each leg an equal opportunity to make their turn. (Aransky et al., 2017)

Design Features

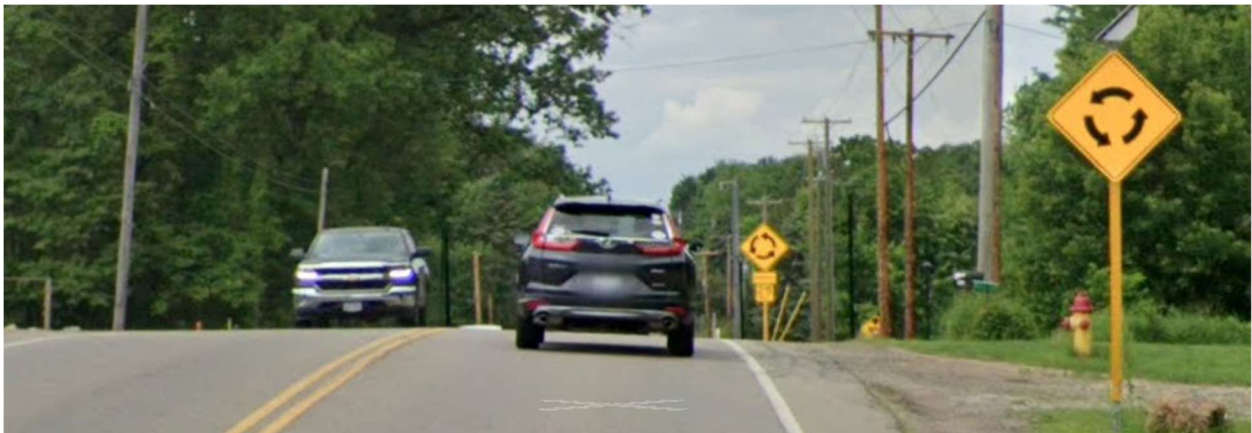


Digital rendering of the 619/Pickle roundabout designed by American Structurepoint.

Based on the findings of the Roundabout Evaluation Report, American Structurepoint was hired by the City of Green to design the 619/Pickle roundabout in 2017 (Kelly & Long, 2020). Incorporated into the design were a couple of key components that would ultimately optimize the roundabout's operation. Chief among design considerations were factors of safety.

Contributing to the enhanced safety of this intersection was a unique design feature implemented at the westbound approach, where drivers of 619 would be cresting the hill to the east of the intersection and approaching the roundabout at presumably high speeds. As a countermeasure against high vehicle velocities, American Structurepoint treated the east leg entry as a high-speed approach, modifying the design to include a chicane (Kelly & Long, 2020), which, as described by Mike Long, “is basically a series of curves” (Aransky et al., 2017). In an article that appeared in *scanner Magazine* – a publication by the American Society of Highway Engineers (ASHE) – Long writes that “the chicane was designed using successive horizontal reverse curves that reduce

in radii as you approach the roundabout.” As designed, both approaches along 619 also featured raised curbs and extended splitter islands to funnel traffic into the roundabout, further reducing speeds with narrowing entries. Special LED-lighted signage was also installed to make westbound 619 drivers aware of the roundabout that awaits them upon cresting the hill (Kelly & Long, 2020).



Google Street View imagery of intersection approach from the east, featuring LED-enhanced signage to inform westbound drivers of the roundabout (obscured from view) ahead.

Project Construction

American Structurepoint’s Roundabout Evaluation Report included ease of construction as one of the factors contributing to roundabout conversion, accounting for estimated costs of construction and right-of-way acquisition. Based on this analysis, the intersection of SR 619 and Pickle Rd ranked second in terms of ease of construction, offering the low right-of-way acquisition costs and the lowest construction cost among the intersections studied. Ease of construction played an important part in prioritizing this intersection as the first to be built (American Structurepoint, Inc., 2017). Plans to fund the project entirely on its own budget allowed the City of Green freedom and flexibility in establishing the project schedule. Taking advantage of this opportunity, the city adopted an aggressive construction schedule in hopes to complete the project as soon as possible.



Aerial imagery of roundabout at the intersection of SR 619 and Pickle Rd upon completion (2018)
Retrieved from <https://www.thesuburbanite.com/news/20190425/green-receives-ashe-ward-for-pickle-roadroute-619-roundabout-project>.

Once American Structurepoint had completed the final design, the project was put out to bid, and a construction contacted awarded to Karvo Companies. Despite some delays due to inclement weather, the project was completed within the span of three months, opening up during Thanksgiving weekend, 2018. Overall, construction costs amounted to a total of \$1,215,633.34.

Project Outcomes

In 2019, the 619/Pickle roundabout earned the City of Green, American Structurepoint, and Karvo Companies the Outstanding Highway Project Award (in the \$5-million-and-under category) from the Cuyahoga Valley Section of the American Society of Highway Engineers (Kelly & Long, 2020). “We are particularly pleased with the overwhelming positive response to this new roundabout and how efficiently it moves traffic,” said Mayor Gerard Neugebauer, commenting on the award (Beacon Journal, 2019).



Google Earth satellite imagery of 619/Pickle roundabout (2021).
Retrieved from <https://earth.google.com/web/@40.97407098,-81.47506023,348.21233536a,540.64601351d,35y,-0h,0t,0r>

Project Complications

Like any infrastructure improvement project, the 619/Pickle roundabout did not come without its share of complications, with a couple of unexpected incidents taking place in years since its opening. For one, only after construction did the City of Green Engineering Department come to find out that it was not uncommon for oversize-load vehicles to be routed through this segment of State Route 619. It is worth noting that the diameter of this roundabout was limited to 140 feet as a means to control vehicle speeds. However, this scale has proven rather constricting for oversize-load vehicles. While oversize loads have not been entirely inhibited by the roundabout, their passage through the intersection leaves behind a path of damaged landscaping. Besides the inconvenience of cleanup and the delays resulting from the extended time required for oversize-load vehicles to maneuver the roundabout, however, these occasional incidents do not represent much of a serious issue. Simply stated, oversize loads were not the design vehicle. And if they had been, the facility could have been considered over-engineered.



Landscaping damage at 619/Pickle roundabout caused by oversize-load vehicle (May 2019).



Resident security camera footage of oversize load traversing 619/Pickle roundabout (June 2019).



City of Green footage of oversize load passing through 619/Pickle roundabout (May 2019).



City of Green footage of oversize load passing through 619/Pickle roundabout (May 2019).



City of Green footage of oversize load passing through 619/Pickle roundabout (May 2019).

More interesting still, another unanticipated maintenance cost has been the replacement of a small number of light poles both at this roundabout and at the roundabout later constructed at the intersection of SR 619 and Myersville Rd, as they have been hit by drivers. It is not entirely understood why the roundabouts' light poles have proven prone to be hit, but in consideration of the corresponding maintenance costs, the Engineering Department staff will likely be taking a closer look at the proximity between light poles and the vehicle path in the design of future roundabout plans.

Public Engagement

In the ASHE *scanner* Magazine, Mike Long writes,

Public education became an important component of the project's preliminary design. Prior to construction of this project, only two roundabouts existed within the city limits. It became vitally important to publicize information regarding the operation of roundabouts in order to foster a positive public perception before construction began.

Following the format of many of major municipal projects, the process of community engagement began with a public meeting. For the 619/Pickle roundabout, this took place in November 2017, several months in advance of the anticipated construction start. The event began with a formal presentation by City Engineer Paul Pickett and American Structurepoint design consultants Frank Aransky and Mike Long, followed by a questions and answers session during which concerns of the general public were met with the considerations of engineering professionals.

One common concern that was addressed was the notion that many drivers may not be familiar with how to navigate roundabouts. Paul Pickett explained that the simplicity of the single-lane design in combination with appropriate signage and pavement markings should make this intersection easier to navigate than the city's multilane roundabout (Aransky, Long, Pickett, & Schemansky, 2017).



City of Green public engagement meeting for 619/Pickle roundabout project (November 2017).

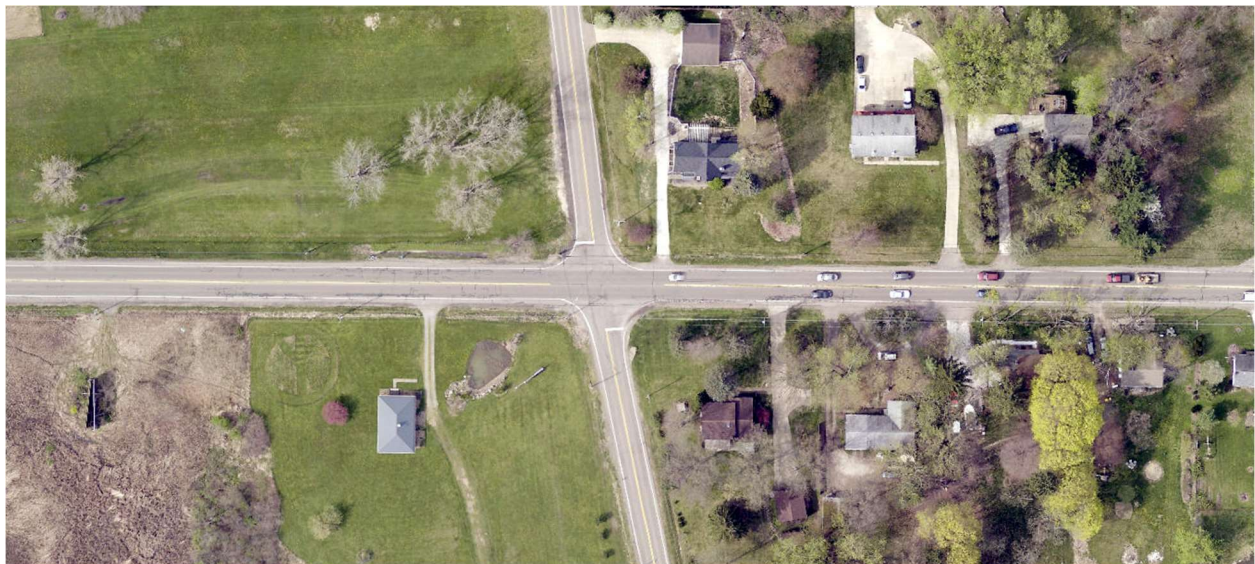
Another common question was why a traffic signal was not considered at this intersection. “We thought about a signal,” answered Mike Long, “and we thought about the additional turn lanes needed for that signal.” Compared to the turn lanes that would be required to facilitate functional traffic signal operation, a roundabout offered a much smaller footprint (money saved on right-of-way acquisition costs). “We also thought about the signal being red for the 619 traffic,” Long continued, explaining that it would not be desirable to have drivers stopped where no stop was necessary before – especially when thinking about cars coming over the hill at high speeds that would be unable to react in time to stopped traffic. “It might not be the best design to have cars stopped and congested there,” he concluded. A final point he mentioned was that based on American Structurepoint’s evaluation, it did not appear that this intersection would show any significant improvement in level of service from signalization (Aransky et al., 2017).

619/Myersville Roundabout Project

“The first question that comes up is why are we proposing a roundabout at the 619-Myersville intersection? The answer is, we have a safety problem there,” remarked AECOM Senior Project Manager Jeff Noble, while introducing the 619/Myersville roundabout project to residents at a public open house meeting. “It was really all about the safety of the intersection.”

Initial Conditions

Among the 7 intersections investigated as part of the Roundabout Evaluation Report provided by American Structurepoint, the intersection of State Route 619 and Myersville Rd ranked number one in terms of roundabout conversion candidacy. Similar to the conditions observed at the intersection of State Route 619 and Pickle Rd, the most prominent issues at this intersection involved safety concerns and level of service considerations.



Aerial imagery of the intersection of SR 619 and Myersville Rd before roundabout conversion (2017). Retrieved from <https://summitmaps.summitoh.net/ParcelViewer2.0/>

As seen above, the intersection of SR 619 and Myersville Rd is a 4-legged intersection at which SR 619 is the major street, running east to west (right to left as viewed on this page), and Myersville

Rd is the minor street, running north-south. Prior to reconstruction as a roundabout, the intersection of SR 619 and Myersville Rd was a TWSC (two-way stop-controlled) intersection, meaning that east-west traffic flowed freely through the intersection, while the north and south approaches each featured a stop sign. While drivers of SR 619 may never have had any indication of the need for improvement at this location, it was no doubt apparent to any Myersville Rd drivers who were forced to wait considerable periods of time before being able to safely enter the intersection – especially for those waiting to turn left.

For drivers of SR 619, problems at this intersection were probably imperceptible. Myersville Rd drivers, however, likely shared a different perspective – one which probably aligned well with that of Pickle Rd drivers. Drivers of Pickle Rd and Myersville Rd confronted a common challenge: long delays experienced while awaiting safe opportunities to enter the intersection, and when no such opportunities arise within a reasonable amount of time, the consequences of risky maneuvers. At both intersections, drivers of the minor street were at the mercy of the major street traffic stream, provided neither protection nor priority.

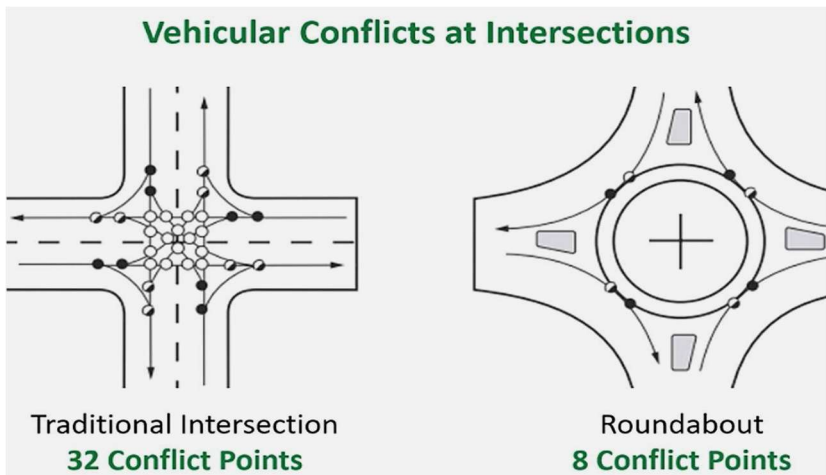
Just like at Pickle Rd, the difficulty that drivers on Myersville Rd experience was due to the heavy volume and high speeds of vehicles traveling on SR 619, often in excess of the 45-mph speed limit. Another similarity among these two intersections is that the westbound approach to Myersville Rd also has some sight distance insufficiencies as the result of a hill that sits east of the intersection on 619. The inability of Myersville Rd drivers to see westbound 619 drivers approaching over the hill made it even more difficult to identify traffic gaps. As 619 drivers blindly approached the intersection, they were unlikely to perceive any need to slow their speeds or stop because to them, it was simply a straight stretch of roadway.

for southbound Pickle Rd vehicles, American Structurepoint reported 50.4 seconds for the 2018 PM peak hour delay for southbound Myersville Rd vehicles. The Roundabout Evaluation Report indicated that this delay was expected to be 721.6 seconds (*around 6 minutes*) by the design year 2038, if no improvements were implemented. An anticipated Level of Service F was reported for both 2018 and 2038 (American Structurepoint, Inc., 2017).

Anticipated Improvements

Among the 7 intersections explored in American Structurepoint's Roundabout Evaluation Report, the 619/Myersville intersection ranked highest for both accident reduction and level of service improvement potential

“What the statistics tell us is that roundabouts are the safest way to improve intersections like this,” Jeff Noble told public meeting attendees. The statistics Noble referenced included a 35% reduction in accidents resulting from roundabout conversion. “That’s a direct result of the lower number of conflict points that result from an intersection of a roundabout versus a standard intersection,” Noble explained.



Conflict point reduction characteristic of roundabout conversion.

<https://bloximages.newyork1.vip.townnews.com/thealmanac.net/content/tncms/assets/v3/editorial/f/bf/fbf28446-5b67-11eb-bc29-a77898fa7041/6008a31529630.image.jpg?resize=1200%2C774>

More specifically, roundabouts reportedly reduce injury accidents by 76% and accident fatalities by over 90%. “We’re eliminating the high-risk movements,” said Noble. “Even if we do end up having accidents,” he elaborated, “those accidents tend to be low-speed, property-damage-only

type accidents” (Noble & Pickett, 2018). Where costs for the accidents between 2010 and 2015 had been estimated at \$1,464,000, American Structurepoint reported that the accident reduction rates characteristic of roundabout conversion could result in a savings of \$1,235,320 (American Structurepoint, Inc., 2017).

More striking still was the level of service improvement expected to result from dramatically reduced delays for the minor street approaches. American Structurepoint’s calculations concluded that in the design year 2038 (if a roundabout was built), drivers traveling southbound on Myersville Rd during the PM peak hour would experience only one fifth of the delay time they would be expected to experience during the PM peak hour in the year 2018 (if no improvements were made). The southbound PM peak hour delay in the design year 2038 was projected to be 10.1 seconds with a roundabout, versus 721.6 seconds without any intersection improvement. Consequently, roundabout conversion was predicted to enhance intersection performance from a Level of Service F to a Level of Service A from the time of opening through the design year 2038 (American Structurepoint, Inc., 2017).

Noble added that “not only will [the roundabout] operate significantly better [than a signalized intersection] during the peak hours, but it really makes a difference during the off-peak hours.” Reminding residents of the times they have experienced frustration while sitting and waiting at a signal when no one was coming, Noble followed up that “in a roundabout situation, you don’t ever have to make that stop.” Fewer stops lead to less idle time, resulting in savings on fuel consumption and ultimately, reduced pollution (Noble & Pickett, 2018).

Design Features

Located in close proximity to the city’s eastern limits, the intersection of SR 619 and Myersville Rd could be considered “the gateway to Green.” Developers of the 619/Myersville roundabout considered this an opportunity to design something special to enhance this entrance to the city, warmly welcoming westbound drivers. To this end, AECOM incorporated decorative landscaping into the design of the roundabout’s center island, which included construction of a stone wall bearing the name of the city, along with decorative steel panels. “We want this to be a place that people identify,” remarked Jeff Noble (Noble & Pickett, 2018).



619/Myersville roundabout as viewed by drivers entering the City of Green from the east.
Retrieved from <https://cityofgreen.org/424/Recently-Completed-Projects>



Closeup of 619/Myersville roundabout wall welcoming westbound drivers into the City of Green.
Retrieved from <https://cityofgreen.org/424/Recently-Completed-Projects>

From a technical standpoint, the proposed 619/Myersville roundabout featured a fairly standard design. Like the 619/Pickle roundabout, the 619/Myersville roundabout was designed with a diameter of 140 feet to regulate speeds around the 15-25 mph range (Noble & Pickett, 2018).



Rendering of the proposed 619/Myersville roundabout designed by AECOM.
Retrieved from <https://www.thesuburbanite.com/news/20181031/green-plans-to-construct-roundabout-at-myersville-road-and-619-in-2019>

Project Construction

Karvo Companies was awarded the contract for construction of the 619/Myersville roundabout in early 2019 for around \$1.7 million. The construction process lasted from May 2019 until August 2019. Goals for construction scheduling included completing the project over the summer while school was out of session and detouring would not interfere with bus routes. While Myersville Rd (the minor street) would be closed for most of the project duration, hopes were to keep SR 619 (the major street) open for as long as possible. As stipulated by the construction contract, closure of SR 619 would be constrained to a maximum of 6 weeks (Noble & Pickett, 2018).

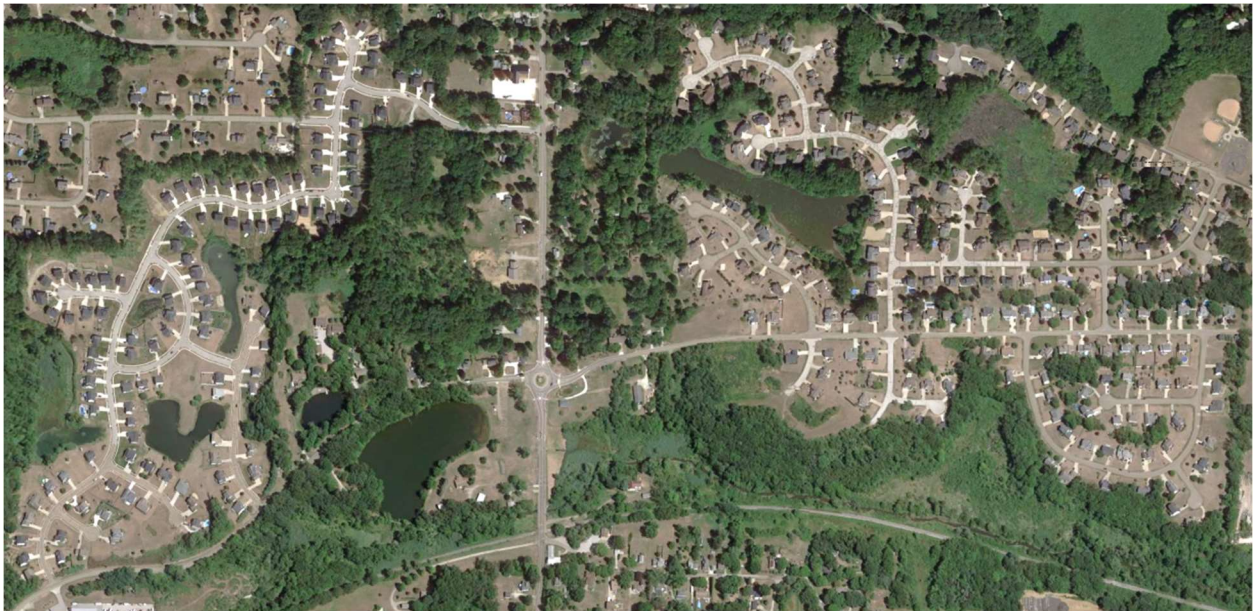
Public Engagement

Efforts by the City of Green Engineering Department to inform residents of the 619/Myersville roundabout project began first with the advertisement of its public open house meetings, hosted on September 13, 2018, and September 26, 2018 – several months in advance of any anticipated construction activity. Following the format of the 619/Pickle roundabout public open house meeting, each event began with a formal presentation provided by City Engineer Paul Pickett in cooperation with the design consultant, AECOM, represented by Senior Project Engineer Jeff Noble. At the conclusion of the presentation, residents were provided the opportunity to express any questions, comments, or concerns. Though the formal presentation portion of the first public meeting lasted a total of about 10 minutes, the questions and answers session carried on for no less than 75 minutes, as thoroughly intensive discussion between concerned residents and the city’s engineers ensued. While a very painstaking part of the process, the public open house meetings are no less a very necessary part of the project, as they present the first opportunity for residents and project representatives to engage one another with regard to the proposed improvement plans. For the sake of the brevity of this section of the report, specific outtakes from the public meeting have been included as a separate section, later in this report (see “Questions and Answers”).



City of Green Engineer Paul Pickett (left) and AECOM Senior Project Manager Jeff Noble (right) presenting 619/Myersville roundabout project at public open house meeting (September 13, 2018).

In terms of the Engineering Department's public engagement initiative for this project, the public open house meetings were only the beginning. Identifying that there were two considerably-sized housing developments feeding into the intersection (in addition to several dozen houses located along SR 619 in close proximity to the project area), the Engineering Department staff was intent on striving to increase its public engagement efforts in order to proactively make project information readily available, and in so doing, promote as positive a perspective as possible among the people most directly impacted by the project.



Housing developments feeding into 619/Myersville intersection (post-construction aerial view). Retrieved from <https://earth.google.com/web/@40.97500761,-81.42308726,329.41044203a,844.68619256d,83.64066719y,90.12233574h,0.06803327t,-0r>

Ultimately, the City of Green achieved a high degree of project publicity – but not without a great deal of legwork by the Engineering Department staff. In order to be sure that all residents living within close proximity of the project were made aware of when closure of the intersection could be anticipated to occur, members of the Engineering Department went door to door delivering informational brochures to all of the houses shown in the image above (and more).

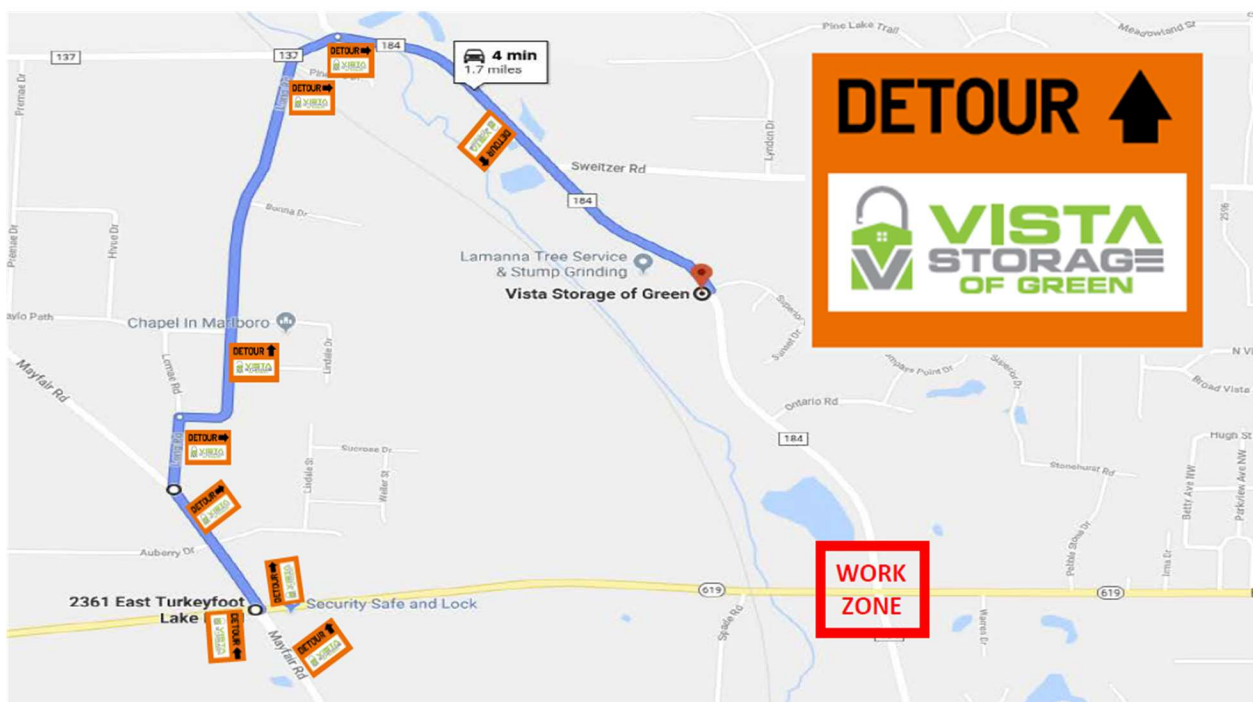
Recognizing that the demographic of SR 619 drivers was not limited to neighboring residents, and that there were far more people traveling the 619/Myersville intersection than lived nearby (with an ADT of over 12,000 vehicles), the Engineering Department went one step further, introducing “619/Myersville Roundabout Coming Soon” signs all around the intersection to provide advanced notice of construction activity. Many of these signs were placed to face drivers traveling along all four legs of the intersection, with others strategically located where locals would be pulling out of their neighborhoods onto either SR 619 or Myersville Rd.



One of many “619/Myersville Roundabout Coming Soon” signs publicizing the proposed project.

The City of Green Engineering Department was not only concerned for its residents located in relative proximity to the project limits, however, but also took into consideration local businesses

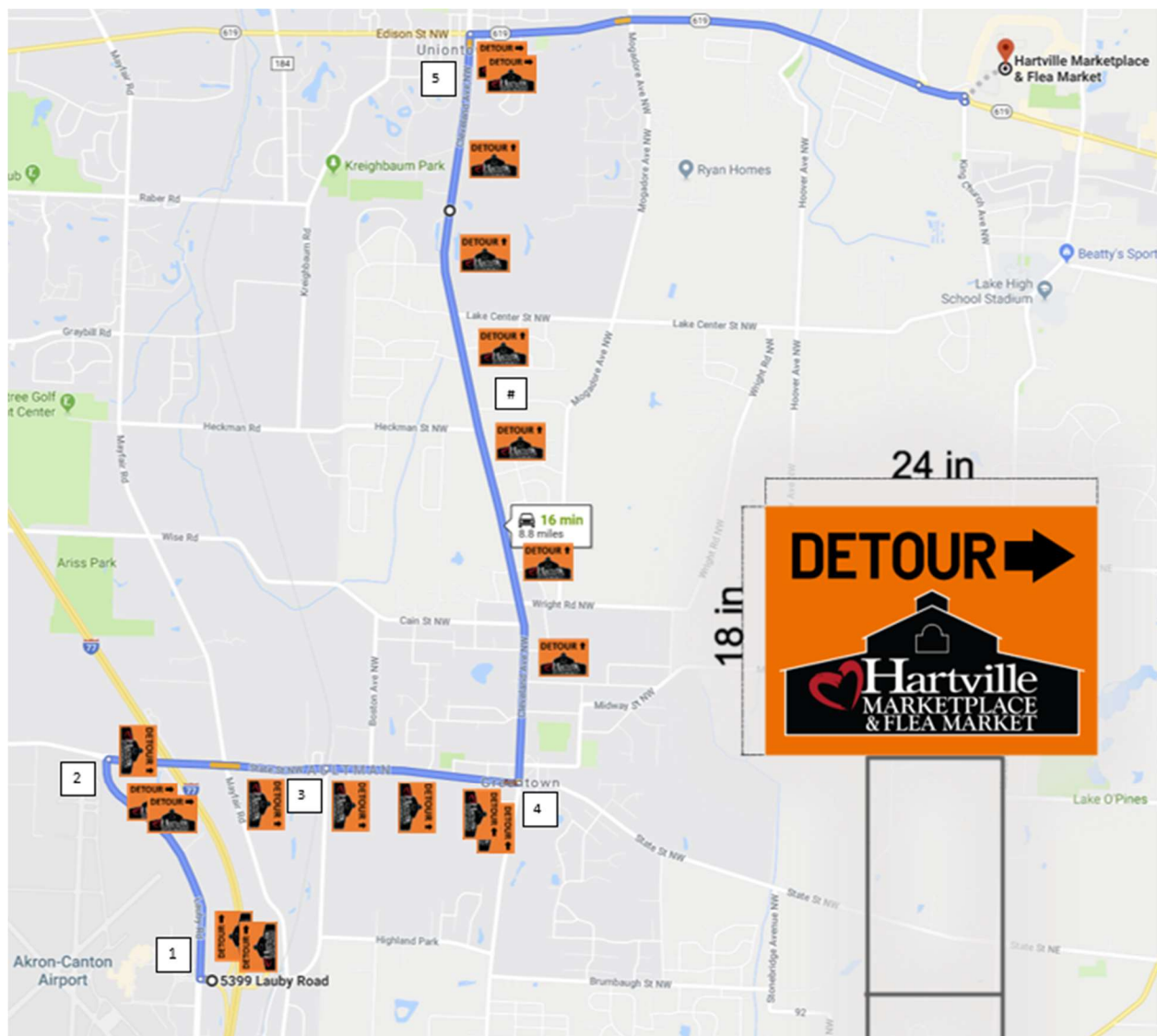
that would be negatively influenced by construction activity – or in the case of Vista Storage, cut off from convenient access by road closure. For the few months that Myersville Rd was closed at its intersection with SR 619, the most direct route to Vista Storage from the south was temporarily terminated. Naturally, the owner expressed some preoccupation regarding lost clientele. In response, the Engineering Department staff sought out a creative, cost-effective way to alleviate construction labor pains. Ultimately, members of the department came upon the idea to develop a custom, business-specific detour to help customers navigate their way around the project area to reach this destination. Blazing the trail were more than 20 orange 18”x24” corrugated plastic yard signs, ordered from a local sign shop and strategically located along the detour route.



Part of the custom detour developed for access to local business during Myersville Rd closure.

A similar (but much more large-scale) detour plan was customized for tourists whose destination was the neighboring community of Hartville. Well known as a local landmark, the Hartville Marketplace and Flea Market would be experiencing its peak season during the time of the

619/Myersville intersection closure. Normally, the route from the Massillon Rd exit of Interstate 77 to Hartville would be a straight shot via SR 619. To ensure that Hartville-bound visitors would not experience extra difficulty reaching their destination while SR 619 was closed, a custom detour signage plan was implemented to direct drivers from the highway ramps all the way into Hartville. Part of the plan involved using a changeable message board to encourage Hartville-bound traffic to exit Interstate 77 at Lauby Rd, rather than Massillon Rd. Once they had exited at Lauby Rd, the drivers would then be directed by the custom detour signs as shown below.



Part of the detour signage plan implemented for Hartville-bound travelers during SR 619 closure.

Questions and Answers

Responding to the accident reduction expected by introducing a roundabout, one resident asked, “Have you factored in any increase in accidents... while people get used to roundabouts?”

Jeff Noble replied that “there have been occasions where we see accidents when roundabouts first open. It’s undeniable, it happens. But we still see that those accidents are less severe than the alternative, which is the T-bones” (Noble & Pickett, 2018).

“Usually when you see [roundabouts], they’re in a commercial area,” remarked one public meeting attendee. Paraphrased, the question to follow was: “So why here?”

Jeff Noble countered with: “That may be the perception, but that’s in fact not the case... We’re starting to see more and more use of [roundabouts] in rural areas” (Noble & Pickett, 2018).

Jeff Noble also answered the quite frequent question of why introducing a roundabout was chosen instead of installing a traffic signal: “When you put a signal in, it has to be warranted. This intersection just doesn’t warrant a signal. The city can’t just put a signal in. They don’t have the legal right to do so.” He later added that “even if it was warranted, we believe that the solution of a roundabout is ultimately a better solution for an intersection like this, because of all the safety considerations...and also the reduced congestion that we see in processing traffic.”

Paul Pickett pointed out that “signals themselves can create issues, especially where there wasn’t a signal before. When you put a signal in, people that never ever had to stop on 619 now have to stop. Delays would be reduced for people on Myersville if we put a signal up there, but not at all for 619 – it’s going to *introduce* a lot of delay there” (Noble & Pickett, 2018).

Another question was: “Have you looked at the cost difference between a roundabout and a light?”

“Specifically at this intersection,” responded Jeff Noble, “we have not done a comparative cost estimate. But I will tell you this... The cost to put in turn lanes on 619, which is what we would need to do, and the right-of-way costs associated with that... what we’re seeing as a whole is that the costs start to be relatively comparable. There’s a misconception out there that you can throw up a signal, it’s way less expensive, and it solves all the problems. That is not the case. The statistics are clear that that’s not the case. When you have to start factoring things in like building turn lanes and the long-term operation and maintenance cost of those signals, you start to see a more even balance to the costs.”

Expanding on Jeff Noble’s explanation, Paul Pickett added, “You’re building more pavement oftentimes for a signal because depending on how long your turns lanes have to be, and the tapers to approach them (in this case it’s a 45-mph road so you end up with a fairly long taper), you can end up building more pavement with a conventional signal than with a roundabout sometimes... Rare would be the scenario that a roundabout would be more [pavement] than a signal.”

Jeff Noble further explained, “We go through a process... where we have to do comparative analysis of intersection improvements. And when we do those comparative analyses, they have all kinds of statistics that evaluate the lifecycle costs of not only the costs of construction and right-of-way, but also the costs to society. Part of those costs to society are the extra costs you have to bear in delays, waiting at a signal, using gas and idling, but it’s also the cost to society in accident claims. As you start looking at these things from a long-term perspective, societally, even if we were to spend a little bit more up front for the roundabout, over the long haul we would see a significant reduction in the cost to society just in the anticipated reduction in accident claims...

Ultimately, it saves society as a whole money when you look at all of the factors involved... When we do these comparative analyses on other projects...the roundabouts almost always come out as a far better solution. And there mere reduction of severe accidents – one accident that someone is severely injured in – can make up all that difference.”

Finally, Jeff Noble concluded that “we recognize that there’s people out there that just don’t support [roundabouts], and we hear a lot of the arguments, and we get it. We all have different perspectives on what’s important to us, and some people will tell you, ‘you should spend your tax dollars on this, not this.’ But again, the reality is, they’re safer, and ultimately, they cost society less money because of the reduction in accidents” (Noble & Pickett, 2018).

Summary

Review of the 619/Pickle and 619/Myersville roundabout projects undertaken by the City of Green is an instructive exercise, lending valuable insight into the engineering considerations and public processes involved in the implementation of a roundabout as an alternative to a traditional intersection.

The Initial Conditions and Anticipated Improvements sections of this report sought to answer the question of *why* municipal engineering authorities would opt for roundabout conversion. For both the 619/Pickle and 619/Myersville intersections, roundabout conversion was selected first and foremost on the bases of the safety improvements and operational enhancements considered characteristic of roundabouts. Specifically, the City of Green and its design consultants were confident that their improvement of these intersections would result in a significant reduction in crashes, with especially fewer injury accidents expected (achieved by decreasing vehicle speeds and collision angles), and substantially enhanced levels of service (achieved by eliminating excessive delay for vehicles on the minor street while introducing only marginal delay for vehicles on the major street).

The Design Features and Project Construction sections of this report addressed the question of *how* roundabouts are designed and delivered to follow up and fulfill the question of *why*. These sections briefly covered some of the unique facts and features of the each project.

The Public Engagement sections of the report focused on the question of *who*. These sections highlighted the reality that the individuals who are impacted by the project process and the final product (the end users of the facility) represent an important element of the project of which engineering authorities must proactively bear consciousness. Public engagement efforts by the

City of Green aimed to connect the point of project and people by promoting public awareness of the project and identifying innovative strategies to reach area residents and businesses at the ground level. This was accomplished through public meetings (involving formal presentations and informal questions-and-answers sessions), the door-to-door distribution of project literature, and outside-of-the-box initiatives to minimize negative impacts for local businesses. The worth of communicating the City of Green's experience with public engagement serves two purposes: first of all to exemplify measures taken by the Engineering Department that can perhaps be adapted and adopted for use by engineering authorities within other local governments, and secondly, to encourage such entities to consider what public engagement practices might be employed *beyond* what has already been seen in the City of Green.

The Questions and Answers section of the report included direct quotes from the dialogue that took place at one of the public open house meetings for the 619/Myersville roundabout project. This particular section is considered to be of great worth, for it is indicative of the dynamic that sometimes persists between municipal engineering authorities and members of the general public. What is revealed here is that there is work being done to bridge the gap between the respective understandings of drivers and designers, taxpayers and decisionmakers, but still more work has yet to be done to achieve a greater mutual understanding. Continued communication is key to increasing community comprehension of the complex considerations behind roundabout conversion.

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