CITY OF URBANA, ILLINOIS
DEPARTMENT OF PUBLIC WORKS

ENGINEERING

MEMORANDUM

TO: **Mayor Laurel L. Prussing and Members of the City Council**

FROM: **Joseph L. Smith, Senior Civil Engineer**

Gale L. Jamison, Assistant City Engineer

William R. Gray, Public Works Director

DATE: **January 18, 2012**

RE: **Visually Impaired Access at Proposed Roundabouts for Philo Road/Florida Avenue and Race Street/Windsor Road**

At the August 22nd, 2011 meeting of the Committee of the Whole, intersection control options were presented by Mark Lenters of Ourston Roundabout Engineering for the intersections of Race Street and Windsor Road and Philo Road and Florida Avenue. More specifically, the feasibility of installing a modern roundabout was explored for each of the two intersections. These studies were prepared at the request of the City Council to meet the goals and objectives for sustainability in public infrastructure improvements. The meeting generated much public input from the visually impaired community. As a result of that input, the City Council asked staff to research options to accommodate the visually impaired users at roundabouts. There are ongoing studies being conducted by the FHWA (Federal Highway Administration), NCHRP (National Cooperative Highway Research Program), PROWAC (Public Rights-of-Way Access Advisory Committee) and several independent consultants that address this issue. Without including links to voluminous studies, this memo attempts to summarize the key points and potential treatments to improve the access for the visually impaired.

Background

Modern roundabouts are rapidly replacing traditional intersections in many parts of the U.S. primarily because of their benefits to traffic operations and safety Approximately 3,000 are in use or proposed for construction today. This trend has led to concerns about the accessibility of these free-flowing intersections to pedestrians who are visually impaired. Pedestrians of all types crossing at a roundabout are generally recognized as safer than crossing at other types of intersections due to roundabout characteristics of geometrics and operation. On the other hand, a roundabout can be a new experience to visually impaired pedestrians crossing. Specifically, the problems posed for visually impaired pedestrians occur at several locations throughout the crossing experience. The four crossing components are:

- Locating the Crosswalk. Pedestrians with vision impairments may have trouble finding crosswalks because crosswalks are located outside the projection of approaching sidewalks, and the curvilinear nature of roundabouts alters the normal audible and tactile cues they used to find crosswalks. A landscape strip or other detectable edge treatment between sidewalks and roundabouts can help lead all visually impaired pedestrians to a crosswalk. Ramp tile bars at the landing of each crosswalk ramp are also another useful guide.

- Aligning to Cross. Once the crosswalk has been found, the proper alignment should be easily recognized so that the pedestrian does not start the crossing with an unsuccessful alignment. Roundabouts do not typically include the normal audible and tactile cues used by pedestrians with vision impairments to align themselves with the crosswalk. This alignment task can be simplified if sidewalk ramps and splitter island cut-through walkways are aligned with the crosswalk and if detectable warnings are installed on curb ramps and splitter islands.
- Identifying a Crossing Opportunity. The most critical issue at roundabouts for pedestrians with vision impairments is the fact that the sound of circulating traffic masks the audible cues that blind pedestrians use to identify the appropriate time to enter the crosswalk. It may be impossible to determine by sound alone whether a vehicle has actually stopped or intends to stop. This is especially problematic at roundabout exits because without visual confirmation, it is difficult to distinguish a circulating vehicle from an exiting vehicle. At multilane roundabouts, such as discussed at Race Street and Windsor Road, this problem is magnified by the need to assess traffic traveling in multiple directions in multiple lanes.
- Maintaining Alignment During Crossing. Finally, the fourth component is the task of maintaining alignment during the crossing, which is greatly facilitated by perpendicular geometry. Far side locator beacons or other treatments can be extremely helpful in properly aligning and maintaining crossing alignment.

Potential Pedestrian Treatments at Roundabouts

Many pedestrian crossing treatments at roundabouts are available to aid engineers in designing safe crosswalks. One source (NHRCP Report 674) identified 28 candidate treatments that showed potential to improve visually impaired pedestrian accessibility by improving gap and yield utilization, minimizing risk, and reducing delay during the crossing task. Treatments for accommodating visually impaired pedestrians fall into six categories:

1. Driver information treatments. Examples are a standard continuous flashing beacon (Exhibit A), or an in-roadway warning sign such as “State Law – Stop for Pedestrians”(Exhibit B), or active-when-present flasher beacon which are push button activated and may also have an auditory cue that tells the visually impaired pedestrian the beacon is on. A new technology being used is Rectangular Rapid Flash Beacon (RRFB) (Exhibit C) which uses an irregular flash pattern with high intensity amber LEDs and in studies has shown an increased driver yielding rate to pedestrians over traditional flashing overhead or side of the road beacons.
2. Traffic calming treatments. Examples of traffic calming treatments include posting lower speed limits or installing a raised crosswalk (Exhibit D).
3. Pedestrian information treatments. Examples of pedestrian information treatments include pavement surface alterations/rumble strips (Exhibit E) which generate auditory cues of approaching or yielding traffic. Other more complex and costly methods are yield detection systems, gap-detection systems and combination yield and gap detection systems.

These systems use in-road sensor and video image processing and are just in the infancy stage of testing so little is known of their effectiveness.

4. Crosswalk geometry modifications. This approach would place all or parts of the crosswalk further away from the circulating lane to separate pedestrian-vehicle interaction. The most promising is the offset or zigzag crosswalk (Exhibit F) which moves one leg of the crosswalk on the roundabout exit lane farther away from the circulating traffic in the roundabout. Another idea is to move all the crosswalks away from the roundabout and manage the pedestrian crossings mid-block (Exhibit G).

5. Signalization treatments with APS. Examples include a pedestrian scramble phase, or pedestrian-actuated signals with traditional 3 color signals or PELICAN abbreviated from PEdestrian LIght Control ActivatioN, or using a pedestrian hybrid beacon also know as HAWK abbreviated from High intensity Activated CrossWalK (Exhibit H), or pedestrian-actuated signals either at locations upstream or downstream from the roundabout in a mid-block setting using either the HAWK or PELICAN signal. Signals at roundabouts represent a more costly and intrusive treatment for providing a safe crossing environments for pedestrians. They may also introduce delays to both pedestrians and vehicles. Additionally, vehicle queues can spill back on the roundabout exit from the signal to affect roundabout circulating flow. In regards to multi-lane roundabouts, the current 2011 draft of PROWAG (Public Rights-of-Way Access Guidelines) endorsed by the FHWA, includes a requirement to install accessible pedestrian signals at all crosswalks across any roundabout approach with two or more lanes in one direction. This requirement for multi-lane roundabouts can typically add $160,000 to $200,000 to the project.

6. Grade-separated crossings. Examples are overpasses or underpasses (Exhibit I). While a preferred solution they are not an option in this circumstance due to very large capital expense, purchase of additional right-of-way and visually impaired users may not actually use them.

Conclusions

It is clear from staff investigations that current roundabout design practices do not yield the same access to crossing information for visually impaired pedestrians as for sighted pedestrians. However, the research about the accessibility for the vision impaired pedestrian at modern roundabouts is in its beginning stages. Several of the above-mentioned potential improvements are still under study and continued installations of these improvements will further test their effectiveness to roundabout usability by pedestrians who have vision impairments.

The most beneficial control devices are those that both the vehicle drivers and pedestrians will obey. The variations in pedestrian and driver behavior and the variations in pedestrian and vehicle volumes at roundabout crosswalks will require warrants or detailed guidelines to fit each situation and guide engineers in their design and implementation. As of today those guidelines or warrants do not exist in the U.S. nor are they specific enough to determine when and what devices or treatments should be used. Instead local agencies will need to analyze the effectiveness and potential costs of new devices or treatments and the financial constraints of their budget and then implement those treatments on a need and fiscal basis that will best improve the safety of visually impaired pedestrians at roundabouts.

EXHIBITS FOR VISUALLY IMPAIRED PEDESTRIANS AT ROUNDABOUTS

EXHIBIT A

Standard Flashing Beacon

EXHIBIT B

State Law-Stop for Peds Sign

EXHIBIT C

Rectangular Rapid Flashing Beacon

EXHIBIT D

Posting Lower Speed Limits and Installing Raised Crosswalk

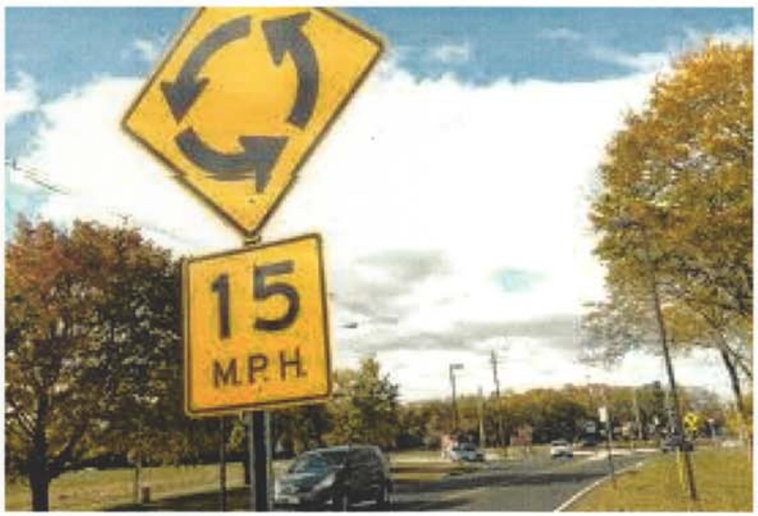

EXHIBIT E

Rumble Strips or Raised Sound Strips

EXHIBIT F

Zigzag Crosswalk

EXHIBIT G

Crosswalk located farther away

<u>EXHIBIT H</u>

PELICAN and HAWK Signals

EXHIBIT I
Example of Underpass Pedestrian Crossing