

CITY COUNCIL REPORT

DATE: July 29, 2015
TO: Mayor and Council Members
FROM: Mark Landsiedel, Community Development Director
Jeff Bauman, City Traffic Engineer
CC: Jeff Meilbeck, Josh Copley, Jerene Watson, Leadership Team
SUBJECT: Flashing Yellow Arrow Permissive Left Turns

raB for mlj

This City Council Report is in response to an email request for information from a citizen, Mark Haughwout, regarding the phased improvements to the Beulah Boulevard corridor (Forest Meadows Boulevard to Lake Mary Road) from "Green Ball" to "Flashing Yellow Arrow" permissive left turn indications.

DISCUSSION:

City Transportation Engineering (TE) staff is always researching and implementing new techniques to improve safety for all users of the transportation network. A well designed and operated traffic signal can increase capacity of its intersection, reduce the frequency of certain types of crashes, especially right-angle and left-turn crashes, and provide crossing opportunities for drivers facing heavy oncoming streams of traffic.

Flashing Yellow Arrow (FYA) permissive left turn indications are one of the latest projects to be implemented. Flashing Yellow Arrows initially gained momentum in the Transportation Profession in 2003 when a National Cooperative Highway Research Program Report (NCHRP) recommended that FYA indications should be used to indicate permissive left turn movements. In 2009 the FYA indication was included in the *Manual of Uniform Traffic Control Devices*, and is now becoming the standard in many states.

A more recent NCHRP study in 2012 investigated the impacts the FYA has had on intersection safety, specifically the before/after analysis of changing permissive left turn phasing from a Green Ball indication to a Flashing Yellow Arrow indication. The results of this study have been published in the *Highway Safety Manual* (HSM). The HSM indicates a crash modification factor for FYA upgrades of between about 0.4 and 0.75, which means an agency should expect between a 25% and a 60% decrease in left-turn crashes after FYA installation has occurred. TE staff will be doing our own before/after analysis of the intersections on Beulah Boulevard once we have at least 12 months of post installation data available.

Implementation Steps:

The intersection of Beulah Boulevard and McConnell Drive was changed to FYA indications approximately six months ago. The intersection of Beulah Boulevard and Woodlands Village Boulevard was upgraded in June. Work has been started on the Beulah Boulevard intersections with Lake Mary Road and Forest Meadows, this work is being completed by Streets crews as their schedules allow, but should be done by the end of August.

If as expected the before/after left turn crash data on Beulah Boulevard shows a positive safety effect of the FYA upgrades, then other City intersections will become candidates for upgrades in the future and FYA permissive left turn indications will become our standard for all new signalized intersections.

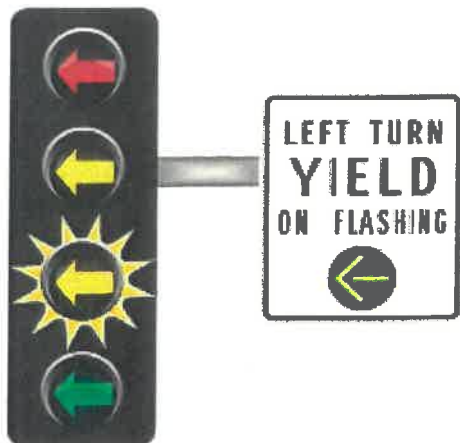
ADDITIONAL INFORMATION ON FLASHING YELLOW ARROWS:

FYA's will replace the green ball on permissive left-turn movements. Permissive movements are when the green arrow is not used and vehicles yield to conflicting traffic and pedestrians, and then proceed, when safe, on a green ball. The FYA will work as a yield for turning movements. Drivers may turn on a FYA, but must first yield to oncoming traffic and pedestrians and then proceed through the intersection with caution.

The left-turn movements along Beulah currently run as a leading phase. A leading phase means that the both opposing left-turn phases go together, followed by the opposing through movements. It is planned to change the intersections left-turn movements to a lagging phase, which means that both opposing through movements start with green, followed by both opposing left-turn phases. This change is expected to increase efficiency of the intersections by allowing many left-turn vehicles to turn on the permissive phase, and then clear out the remaining queue during the protected phase.

In summary, for a left-turn movement with a FYA, the order of operation is as follows:

- A red arrow indication occurs during conflicting phases
- A FYA occurs during the through phases and requires yielding to oncoming traffic
- A green arrow indication is a lagging protected phase
- A steady yellow arrow indication occurs near the end of the protected phase
- A red arrow indication is the end of the protected phase



<http://www.flagstaff.az.gov/index.aspx?NID=3003>

RECOMMENDATION / CONCLUSION:

This report is for information only.