



City of Arts & Innovation

Transportation Board

TO: TRANSPORTATION BOARD **DATE: JUNE 1, 2016**

FROM: PUBLIC WORKS DEPARTMENT **WARDS: ALL**

SUBJECT: PILOT PROJECT OF THE FLASHING YELLOW LEFT-TURN VEHICULAR INDICATION FOR PROTECTED/PERMISSIVE LEFT-TURN PHASING

ISSUES:

The issue for Transportation Board consideration is a pilot project for the flashing yellow left-turn vehicular indication.

RECOMMENDATION:

That the Transportation Board recommend that the Transportation Committee approve a one-year pilot project to equip no more than seven traffic signals with flashing yellow left-turn vehicular indications to assess safety, vehicular delay, and motorist comprehension.

BACKGROUND:

Urban cities have increased traffic volumes creating fewer gaps in traffic for drivers to make safe and efficient left-turns at signalized intersections. To address this concern, traffic signals can provide protected left-turn phasing to increase safety but at the cost of increased motorist delay as opposing thru traffic must come to a stop to allow the protected left-turn movements. To improve efficiency, traffic signals at select locations are designed to protect left-turn movements with an exclusive green left-turn arrow (protected) during a portion of the traffic signal cycle and allow permissive left-turn movements (circular green ball) during the remainder of the cycle. This phasing is referred to as protected/permissive left-turns (PPLT).

Traditionally, the Federal Highway Administration (FHWA) has recommended a five-section signal display for PPLT and many states and agencies including the City have adopted the five-section cluster display, see Attachment 3, to implement PPLT phasing. This type of operation improves efficiency, however, some motorists are confused and will not make a left-turn maneuver during the permissive phase and the PPLT phasing may not be effective during the morning and evening peak traffic hours as there are fewer gaps in traffic to allow permissive left-turns. Implementation of PPLT often requires significant costs and engineering efforts to modify traffic signal systems and place the 5-section indication on the signal mast arm to split the left-turn and thru lane as the indication serves both movements. Thus, industry leaders, academia, and engineers have collaborated to conduct additional research to provide improved safety, motorist understanding, operational improvements, and facilitate PPLT implementation.

The National Cooperative Highway Research Program (NCHRP) conducted research to

evaluate protected/permmissive left-turn phasing to improve capacity and reduce overall intersection delay. The research was conducted over a seven year period to determine the optimal signal display for protected/permmissive control. In particular, the study focused on current practices, driver understanding of PPLT phasing, analyzed crash data and operational data, and tested experimental vehicular indications. Unlike previous research, the NCHRP study focused heavily on human factors and reaction times as they play a critical role in accident avoidance. The extensive research and efforts were culminated in NCHRP Report No. 493 titled *Evaluation of Traffic Signal Displays for Protected/Permmissive Left-Turn Control* which was published in March 2014. In summary, the report recommends a flashing yellow arrow display, see Attachments 1 & 4, as the best signal display for PPLT.

The research determined that the flashing yellow arrow display is best comprehended by motorists, improves safety and operations over traditional 5-section PPLT displays, provides flexibility to engineers as the flashing yellow arrow can be disabled during peak traffic hours, and can be easily adapted to existing traffic signals which have existing protected left-turn phasing. NCHRP's conclusions and recommendation have allowed many states and agencies to begin deploying the flashing yellow left-turn indications to implement PPLT. In Southern California, cities such as Pasadena, Fullerton, Montclair, Indio, La Habra, El Cajon, Encinitas, and others have already deployed this type of signal display.

Attachment 1 illustrates the preferred implementation for Flashing Yellow Left-turn Arrows, using a 4-Section signal display. The implementation shown in Attachment 1 would require a more significant retrofit for intersections currently using traditional protected/permmissive operations. Attachment 2 illustrates a potential retrofit to allow use of Flashing Yellow Left-turn Arrows using existing 5-Section signal displays – which is not an industry recommended practice and offers only minimal savings. Attachments 3 & 4 illustrate the phasing of a 5-Section and 4-Section indication under what is referred to as the “Yellow Trap” scenario. These attachments highlight the safety benefits of the proposed 4-Section Flashing Yellow Left-turns.

The Public Works Department recommends conducting a one-year pilot project to test up to seven traffic signals with the flashing left-turn arrow displays to assess safety, efficiency, delay, and motorist comprehension of these new indications. Upon conclusion, Public Works will submit a report to the Transportation Board and Transportation Committee with findings and recommendations. The traffic signals in the pilot project may be a mixture of existing PPLT locations and new intersections to be equipped with these newer signal displays.

FISCAL IMPACT:

The cost to install the 4-section yellow flashing arrows would be under \$50,000. There are sufficient funds available in Project Account No. 9586133-440313, Measure A Miscellaneous Signal Revisions, for completing the project.

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Attachments:

1. 4-Section Flashing Yellow Left-turn Arrow Signal Display and Phasing
2. 5-Section Flashing Yellow Left-turn Arrow Signal Display and Phasing

3. Illustration of “Yellow Trap” During Regular Protected / Permissive Phasing
4. Illustration of removing the “Yellow Trap” using Flashing Yellow Left-Turn Arrows