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number of passengers boarding and alighting should receive these amenities before bus stops that are less well-used.

BICYCLE NETWORK IMPROVEMENTS

Add Bicycle Facility to Duane Avenue between Lawrence Expressway and Stewart Drive

Issue: The bicycle lanes planned for E. Duane Avenue do not connect to Lawrence Expressway. This leaves a substantial gap between bicycle lanes within the Plan Area and bicycle lanes on Oakmead Drive, just east of Lawrence Expressway.

Recommendation: Add bicycle lanes or, at a minimum, green-backed shared lane markings (sharrows) to Duane Avenue between Lawrence Expressway and the E. Duane Avenue/Stewart Drive intersection. Narrowing the existing 12' vehicle travel lanes to 10' would permit the addition of 6' bicycle lanes in each direction. However, 10' lane widths may be inadequate for trucks or transit vehicles traveling on this stretch of roadway. To permit a minimum 11' lane width, the City of Sunnyvale may also consider a combination approach with an eastbound bicycle lane and westbound green-backed sharrow treatment. Both bicycle lanes and sharrows should be located to minimize conflicts between bicycles traveling straight through the intersection and drivers turning right: bicycle lanes should be located to the left of dedicated right turn lanes, and sharrows should be located in the center of shared travel lanes. If sharrows are used in the westbound lanes, we further recommend adding signs to alert drivers turning right onto westbound Duane that bicycles may be present.

We recommend the use of green-backed sharrows because they enhance bicyclist visibility to motorists, which is critical on a shared roadway. Guidance for the design of green-back sharrows can be found in the *NACTO Urban Bikeway Design Guide*, which was endorsed by Caltrans in April 2014. Per the *California Manual on Uniform Traffic Control Devices* (2012), these treatments are still experimental. The City of Sunnyvale should determine whether to implement these treatments through the formal FHWA experimentation process or to implement them under its own discretion, as other local jurisdictions have done recently.

Improved Bicycle Lanes on Deguigne Drive

Issue: The bicycle lanes on Deguigne Drive are of substandard width and partially located in the gutter, resulting in inadequate and unwelcoming conditions for bicyclists. Based on field observations, the existing center left turn lane appears to be underutilized; driveway consolidation with future development at 915 Deguigne Drive will further reduce the need for this turn lane.

Recommendation: Reallocate space from center turn lane to bicycle lanes and on-street parking. Widen existing bicycle lanes on Deguigne Drive to 7', measured from concrete

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gutter edge to outer stripe. Add on-street parking to west side of Deguigne Drive to serve residential developments.

Dashed Bicycle Lanes and Two-Stage Left Turn Treatment at Major Intersections

Issue: Bicycle lanes are dropped at major intersections, reducing the visibility of bicycle riders to motorists and potentially leading to conflicts, particularly for bicyclists turning left.

Recommendation: Continue bicycle lanes through major intersections using dashed lane markings. Add two-stage turn queue boxes at major intersections to facilitate bicyclists making left turns. At a minimum, these treatments should be considered at:

- Stewart Drive/E. Duane Avenue
- N. Wolfe Road/Stewart Drive

Depending on cyclist volumes and whether conflicts are observed between motorists and bicyclists, additional treatments may be considered at:

- Deguigne Drive/Stewart Drive
- Deguigne Drive/E. Duane Avenue

We recommend that these treatments be implemented according to the *NACTO Urban Bikeway Design Guide*, endorsed by Caltrans in April 2014. Per the *California Manual on Uniform Traffic Control Devices* (2012), these treatments are still experimental. The City of Sunnyvale should determine whether to implement these treatments through the formal FHWA experimentation process or to implement them under its own discretion, as other local jurisdictions in Santa Clara County have done.

PEDESTRIAN NETWORK IMPROVEMENTS

Enhanced Intersection across Duane Avenue at San Miguel

Issue: No crosswalks are marked at the Duane Avenue/San Miguel Avenue intersection, presenting a barrier for students walking and bicycling to school at San Miguel Elementary and preventing access between the Plan Area and neighborhoods to the north. On Duane Avenue, plants in the sidewalk landscape strip and parked cars reduce visibility for drivers exiting San Miguel, leading them to pull into the unmarked crosswalk across San Miguel Avenue while they wait to run onto Duane Avenue.

Recommendation: Add enhanced intersection across Duane Avenue at San Miguel Avenue. The intersection should include:

- Curb extensions (bulb outs) on the northwest and northeast corners of the intersection

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- High-visibility crosswalk markings (continental style) on each side of San Miguel Avenue
- Advanced yield lines on eastbound approach (west side of intersection) where more than one lane of traffic is present
- In-roadway lights on the outside of the marked crossings

Based on a review of guidelines from the 2012 Highway Capacity Manual, in-roadway lights should result in drivers yielding to pedestrians. If they are not observed to yield, additional measures, such as overhead beacons (HAWK or RRFB) should be considered.

Enhanced Intersection across Duane Avenue east of Deguigne Drive

Issue: No crosswalks are marked on Duane Avenue east of Deguigne Drive, limiting pedestrian access between the Plan Area and neighborhoods to the north.

Recommendation: Add an enhanced intersection across Duane Avenue east of Deguigne Drive, similar to the intersection treatment proposed for San Miguel Avenue. The location of this treatment should be determined as parcels within the Plan Area redevelop and with input from community residents and City of Sunnyvale staff.

Add Marked Crosswalks at Deguigne Drive and Santa Real Avenue

Issue: Crosswalks are not marked on the east or west sides of the Deguigne Drive/Santa Real Avenue intersection, despite the presence of Swegles Park immediately south of the intersection. The addition of new residential development within the Plan Area will likely increase the number of people crossing at this location.

Recommendation: We recommend adding continental or ladder striped crosswalks on the east side of the Deguigne Drive/Santa Real Avenue intersection to improve access to Swegles Park. This recommendation should be implemented whether or not stop control or traffic calming treatments are added at this location.

Add Marked Crosswalks at Key Locations

Issue: Crosswalks are not marked along E. Duane Avenue, E. Duane Court, Stewart Drive and Deguigne Drive. This may lead to pedestrians crossing at unpredictable locations and is likely to discourage walking within the Plan Area. In some cases, curb cuts with truncated dome treatments are present without a marked crosswalk. This may be confusing to pedestrians, especially if they are visually impaired.

Recommendation: We recommend striping continental or ladder striped crosswalks at key locations along E. Duane Avenue, Stewart Drive and Deguigne Drive. The locations of these crosswalks should be determined with input from community members. Depending on vehicle volumes and speeds on these streets, additional measures, such as

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pedestrian crossing signs, in-roadway lighting, and advanced yield lines should be considered for these crosswalks.

ADDITIONAL CONSIDERATIONS

School Traffic on Duane Avenue

Issue: Traffic along Duane Avenue during the AM peak hour is substantially affected by school drop-off traffic for The King's Academy and Rainbow Montessori. During the school drop-off period, several drivers were observed making illegal left turns across the double yellow line on Duane Avenue. Although these schools are outside of the Plan Area, unpredictable and/or illegal maneuvers from drivers near the schools will affect auto and bicycle traffic along Duane Avenue, and may have effects on pedestrian comfort and safety.

Recommendation: We recommend that the City of Sunnyvale continue to work with schools located along Duane Avenue to educate drivers and manage school traffic. The City should also continue to implement safety and operational improvements outlined in the *City of Sunnyvale Comprehensive School Traffic Study (2012)*.