REPLINGER & ASSOCIATES LLC
TRANSPORTATION ENGINEERING

To: John Lewis, Public Works Director
From: John Replinger, PE
Subject: Pedestrian Crossing Analysis at Molalla/Char Diaz
Date: March 30, 2016

Issues

In response to a request from neighbors in the vicinity, the city requested that I evaluate possibilities to improve pedestrian crossings at the vicinity of Molalla Avenue and Char Diaz Drive.

One of the principal reasons for pedestrian crossings in the vicinity is to access the bus stop for TriMet's #33 buses. The northbound stop is on the east side of Molalla Avenue just opposite Char Diaz Drive. The southbound stop is on the west side.

This memorandum responds to those issues. It explains the site conditions and summarizes options available. Finally, it provides my recommendations.

Location and Site Conditions

Molalla Avenue is a major arterial street running in a north-south orientation. In the vicinity of Char Diaz Drive, it is three lanes wide with a single northbound lane, a center turn lane, and a single southbound lane. The posted speed in the vicinity is 35 mph.

On-street bike lanes are marked both northbound and southbound. Sidewalks exist for most of the east side of Molalla Avenue; sidewalks are intermittent on the west side of Molalla Avenue. Sidewalks are notably absent for a distance of approximately 150 feet on the west side of Molalla Avenue north of Char Diaz Drive. Sidewalks are present on both sides of Char Diaz Drive, except on the north side for approximately 50 feet west of Molalla Avenue.

The nearest pedestrian crossings of Molalla Avenue at signalized intersections are at Highway 213, approximately 900 feet to the south, and at Gaffney Lane, approximately 1700 feet to the north. The nearest marked crosswalk is on the north side of Garden Meadow Drive, approximately 1000 feet to the north. The marked pedestrian crossing on the north side of the Garden Meadows Drive intersection features an island that serves as a pedestrian refuge and allows pedestrians to independently cross the northbound and southbound lanes of Molalla Avenue.

Under state law, pedestrian crosswalks exist at every intersection unless the crossing is specifically closed and identified by signs stating "CROSSWALK CLOSED." Many motorists incorrectly believe that a crosswalk only exists if it is marked. Failure of motorists to yield to pedestrians is common, which makes pedestrians reluctant to cross streets with moderately high volumes of fast moving traffic.

The city's 2014 traffic volume tables for Molalla Avenue indicate average daily traffic (ADT) of 14,600 north of Fir Street and 14,000 west of Highway 213. The city's speed survey for 2014 indicates an average speed of approximately 28 mph at both locations and an 85th percentile speed of 33 or 34 mph at both locations.

A vicinity map is included as an attachment to this memorandum.

Potential Solutions

With a curb-to-curb distance of approximately 50 feet, pedestrians walking at a speed of 4 feet per second require just over 12 seconds to cross Molalla Street. Excluding the bike lanes, the crossing time is reduced to about 10 seconds. When one considers that many on-coming vehicles are approaching at 34 mph (50 feet per second), a pedestrian requires as much as 600 feet between vehicles approaching in both directions to feel safe when crossing.

Though no pedestrian counts were available, it is clear from casual observation that the pedestrian volumes are not sufficient to warrant installing a full traffic signal such as that at Molalla Avenue and Gaffney Lane. It takes an extraordinary volume of pedestrians for many hours per day to meet the pedestrian volume warrant described in the *Manual on Uniform Traffic Control Devices*. Those conditions clearly do not exist at this location.

Rectangular Rapid Flash Beacons (RRFB) are an increasingly popular approach to improving pedestrian crossings. Numerous examples have been installed in the Portland metro region. They may be used at mid-block crossings and at unsignalized intersections. They may be used on two-lane and on multi-lane roadways. They have been shown to increase driver awareness of potential pedestrian conflicts. The RRFBs are used in combination with signing and pavement markings. The Federal Highway Administration (FHWA) estimates the cost of the beacons to run from $10,000 to $15,000 for a pair. Site work, such as curb extensions, islands, signing, and pavement marking, are additional.

Marked crosswalks with signing and pavement markings alone have produced mixed results. The most definitive study on the pedestrian safety issue is probably the report commissioned by the FHWA and undertaken by the University of North Carolina's Highway Safety Research Center. *Safety Effects of Marked versus Unmarked Crosswalks at Uncontrolled Locations: Final Report and Recommended Guidelines* was published in August 2005. The study, conducted by Charles V. Zegeer and others, involved five years of pedestrian crashes at 1000 marked and 1000 unmarked crosswalks. The study included various road types, speeds, and volumes. The study concluded "that on two-lane roads, the presence of a marked crosswalk alone at an uncontrolled location was associated with no difference in pedestrian crash rate, compared to an unmarked crosswalk."

The report also explains that for two-lane roads, "The results for unmarked crosswalks show the only statistically significant effect to be for pedestrian volume." This means that increases in

pedestrian volumes are likely to result in more crashes involving pedestrians, but the rate of crashes involving pedestrians would be the same.

The study also assessed the crash severity and concluded "Crash severity did not differ significantly between marked and unmarked crosswalks on two-lane roads."

The study differentiated between two-lane roads and wider roads with varying speeds. The results summarized above are only those associated with two-lane roads, which are relevant to this analysis.

Another option possible for the site would be a marked crosswalk in combination with a pedestrian island. It could be similar to that put in place just north of Garden Meadows Drive, though it could involve a larger island with additional features. The most important advantage of such an installation is that allows a pedestrian to cross each lane of traffic individually. With an island occupying most of the center lane, the pedestrian crossing distance is reduced from 50 feet to less than 20 feet, allowing the average pedestrian to cross to the island in less than 5 seconds. The probability of finding a 5-second gap in the oncoming traffic stream is much greater than finding simultaneous 10-to-12-second gaps in the two on-coming steams as is necessary currently for a curb-to-curb crossing of Molalla Avenue.

Location Issues

The Molalla Avenue Boulevard and Bikeway Improvements Plan adopted by the city in 2001 calls for the relocation of the driveway serving the church on the east side of Molalla Avenue to align with Char Diaz Drive. The current offset between the driveway and Char Diaz Drive is approximately 40 feet. This means that the extension of the sidewalk on the south side of Char Diaz Drive aligns with the church driveway. Due to the existing offset, aligning a crosswalk with the south sidewalk on Char Diaz Drive would be problematic.

As noted in an earlier section of this memorandum, sidewalks are lacking on the west side of Molalla Avenue for a distance of approximately 150 feet immediately north of Char Diaz Drive. They are also absent on the on the north side of Char Diaz Drive for approximately 50 feet west of Molalla Avenue. On the other hand, aligning a crosswalk with the paved asphalt walking area parallel with and on the north side Char Diaz Drive would intersect in a reasonable location on the east side of Molalla Avenue.

It is generally understood that the Americans with Disabilities Act (ADA) requires that have ADA compliant ramps at each end of a crossing as well as truncated domes and other features affording sight-impaired individuals to identify the crossings and vehicle space. These would be necessary components for the installation of a crosswalk in this area.

Recommendations

If the city were to decide to proceed with pedestrian improvements, I think the preferred location would be to align it with the north sidewalk of Char Diaz Drive. This location allows a good

landing point on the east side of Molalla Avenue. The landing on the east side of Molalla Avenue would require installation of an ADA-compliant ramp. Aligning a crosswalk in this location would also require the extension of the sidewalk along Char Diaz Drive to the curb line of Molalla Avenue. Ideally, sidewalks on the west side of Molalla Avenue north of Char Diaz Drive would also be completed, but this might not be strictly necessary for compliance with the ADA.

If a pedestrian refuge island were used as part of the crossing solution, the choice of installing it on the north side of Char Diaz Drive is far superior to installing it on the south side. An island precludes left turns so eliminating left turns into the church parking lot would be less impactful than into the Char Diaz Drive neighborhood. Church traffic has the option of making left turns at the church's existing north driveway; those turning left into the neighborhood have few good options.

I think that either the installation of a pedestrian refuge island or RRFB beacons would be a significant enhancement to pedestrian accessibility. The pedestrian refuge island would allow pedestrians to cross Molalla Avenue in two stages. The RRFB would alert motorists to the pedestrian conflict and increase the likelihood of motorists stopping to allow pedestrians to cross more safely.

The installation of either a marked crosswalk with a pedestrian island or installation of RRFB beacons would be expensive because of the amount of site work required, including installation of ADA compliant ramps and extension of the sidewalk along Char Diaz Drive.

Improving the pedestrian crossing opportunities with physical changes at Molalla Avenue and Char Diaz Drive would appear to be beneficial, but the desire for these improvements must be judged in comparison to other locations and evaluated against the available resources.

Expires 12/31/16

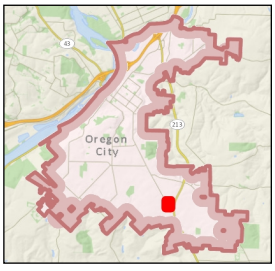
Oregon City GIS Map

Legend

- Taxlots
- Taxlots (Outside UGB)
- Unimproved ROW
- City Limits
- UGB
- Basemap

Notes

Overview Map



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