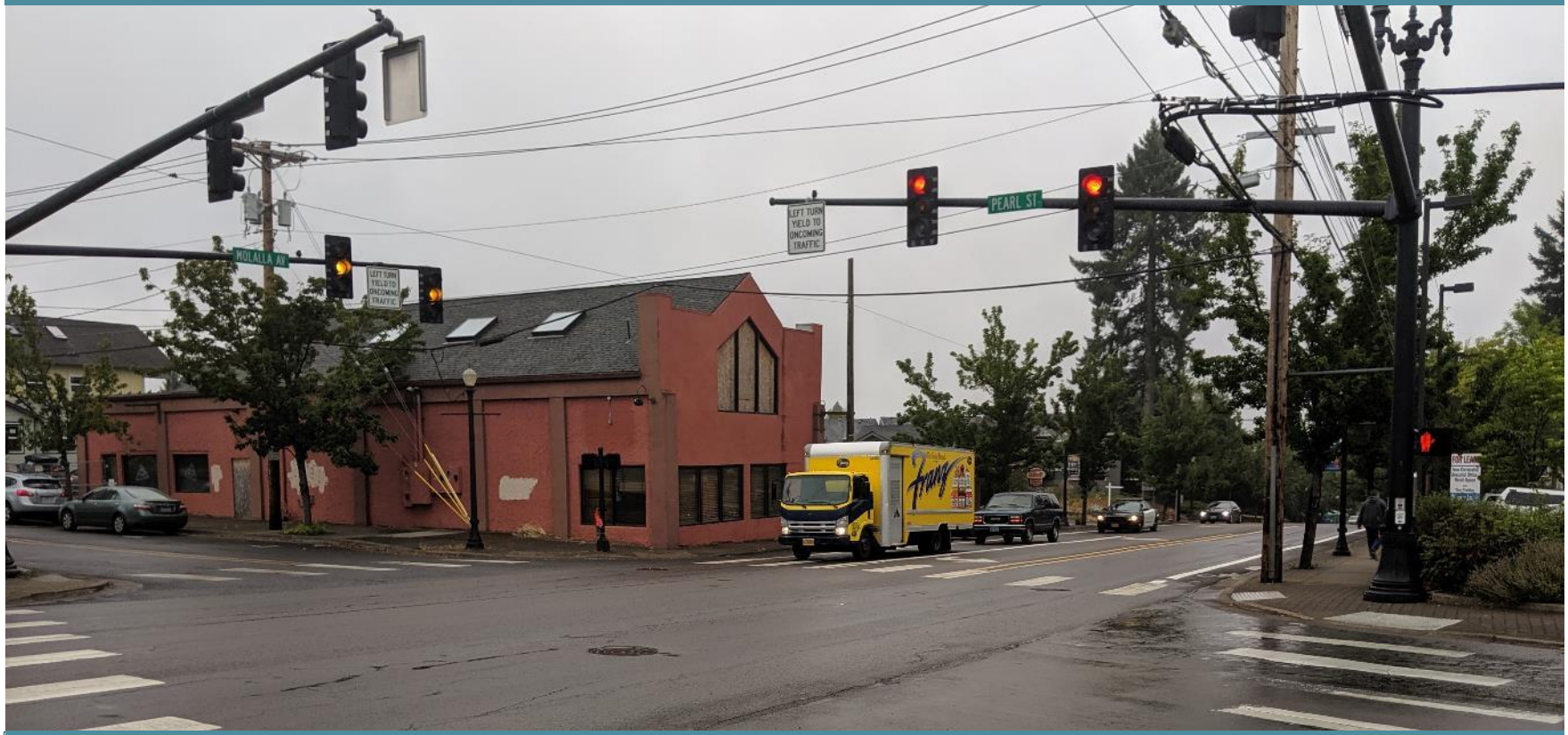
Molalla Ave./Pearl St. Safety Study



Key Findings and Recommendations

DKS Associates, Oregon City, Clackamas County

Nov. 19, 2019

Presentation Outline

Background

- Past Safety Performance
- Traffic Volumes

Field Observations

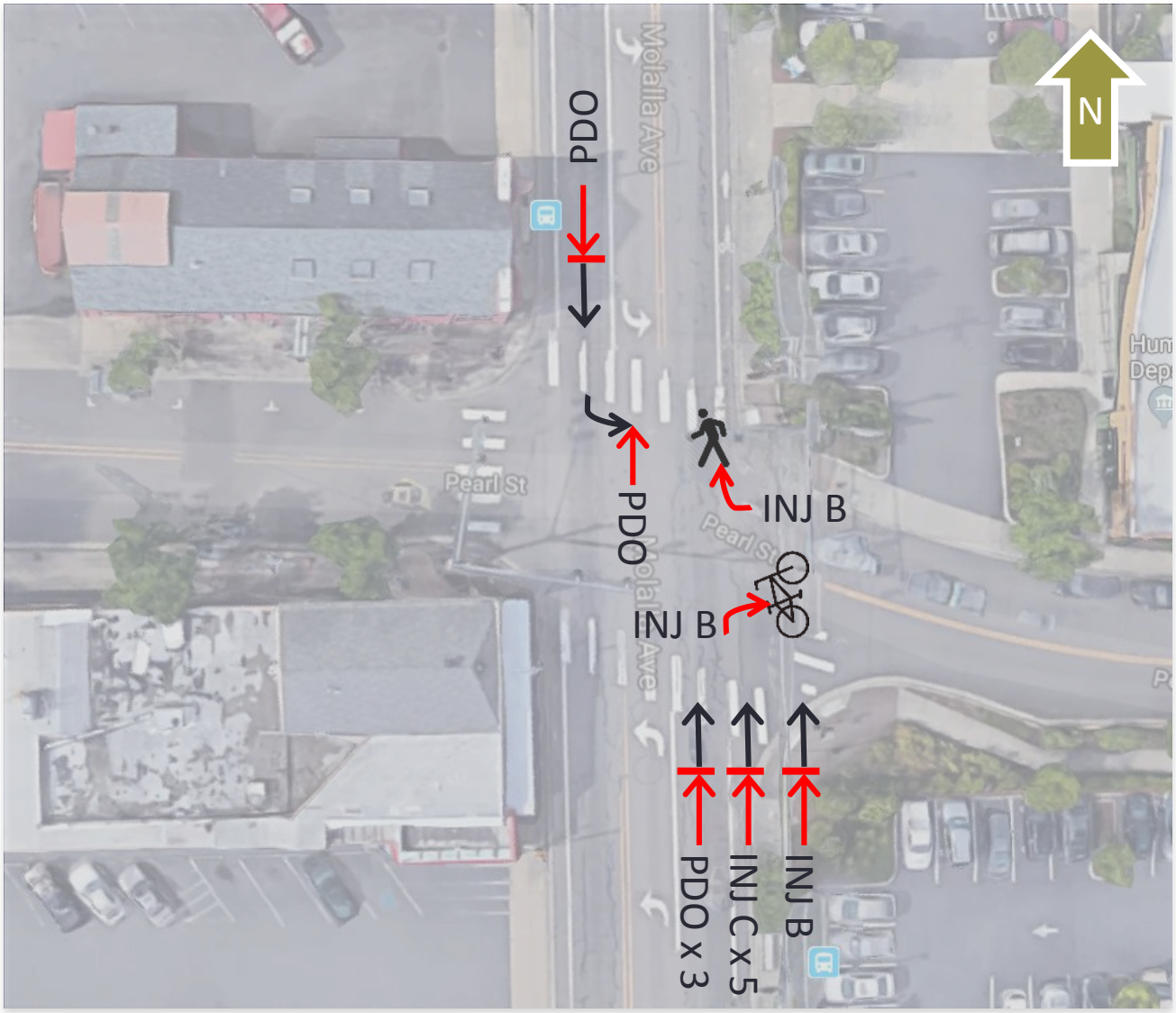
- Key Findings

Recommended Improvements

- Short-Term
- Long-Term

Crash History 2013-2017

- 13 Crashes
  - 10 Rear End
  - 1 Turning
  - 1 Ped
  - 1 Bike (turning)
- 0.39 Crash Rate (below critical crash rate)
- 69% are northbound (downhill) rear-end crashes



Crash History: 2019

- 2 Ped/Bike Crashes
  - South crosswalk
  - Westbound left turns
  - 1 Fatal
  - 1 Injury

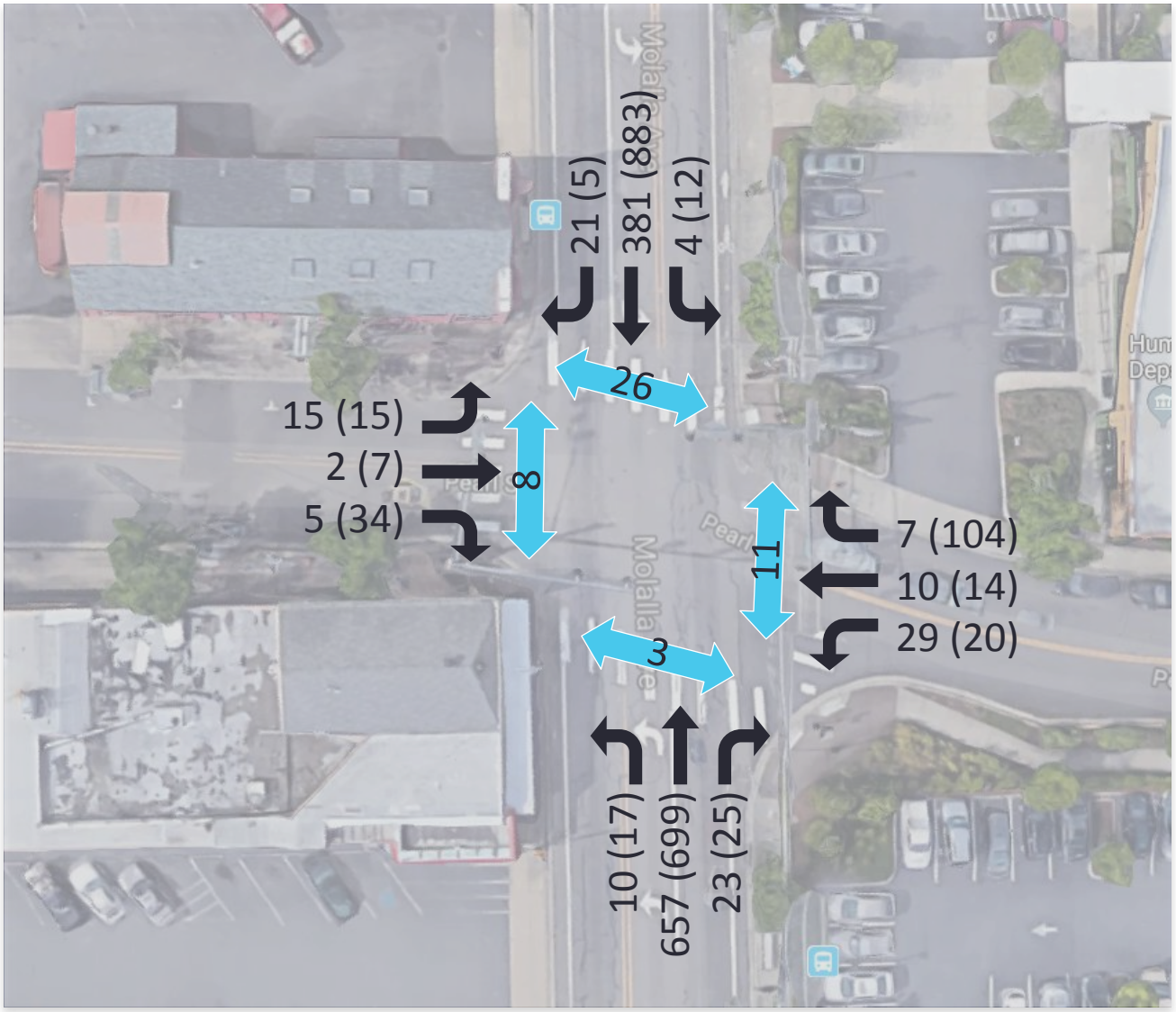
Safety Priority Index System (SPIS)

- SPIS is a ranking system developed by ODOT to identify possible safety concerns on roadways across the state based on crash frequency, crash severity, and traffic volumes over a three-year window
- Prioritized list of top 15% of statewide SPIS sites is created for each region; top 5% are investigated by the Region Traffic managers' offices

Molalla Avenue/Pearl Street intersection was a top 10% SPIS site in 2014 and a top 15% SPIS site in 2015

Intersection Volumes

- AM Peak
  - 7:30-8:30 AM
- (PM Peak)
  - 4:15-5:15 PM
- <-Ped. Peak->
  - 8:00-9:00 AM
- Intersection operates under capacity with minimal delay



Field Observations

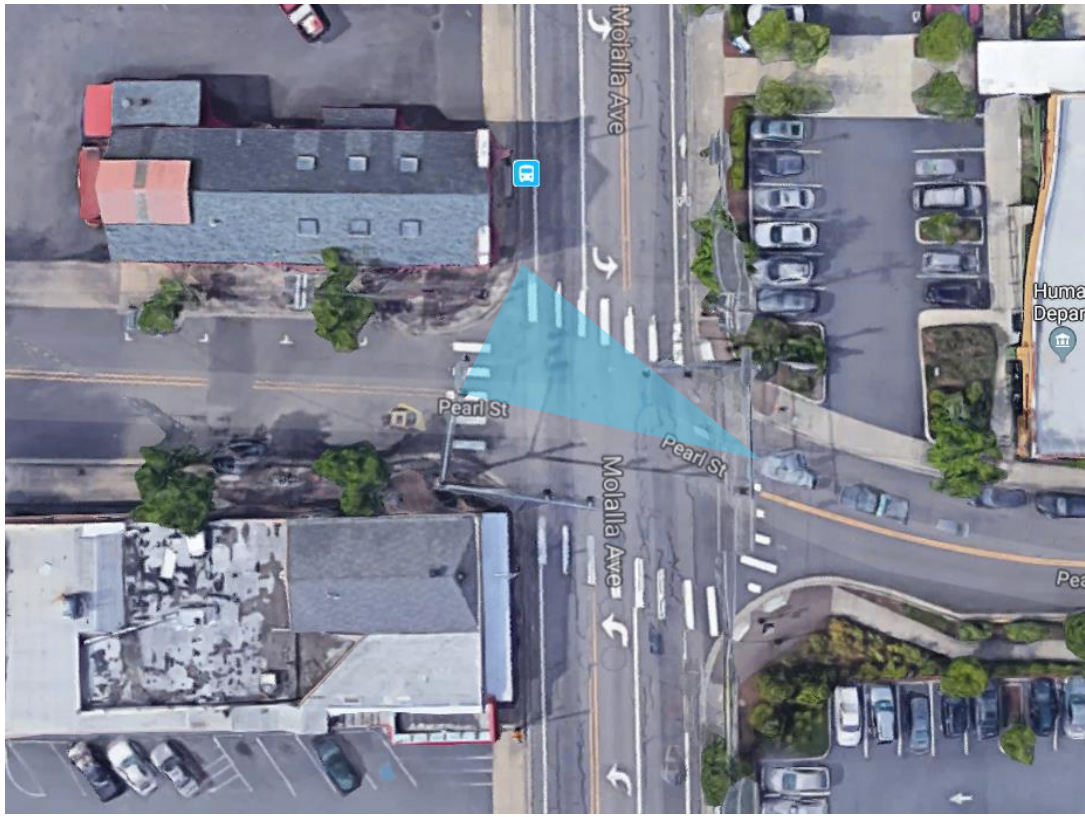
- Conducted on August 8, 2019
  - Morning peak, midday, afternoon peak, and sunset
- Data collected
  - Lane geometry
  - Signal timing
  - Intersection operations
  - Sight distance/visibility
  - Pedestrian activity/generators
  - Human behavior
  - Near-miss events
  - Travel speeds

Pedestrian Activity

- Office complex and off-site parking supply generate significant pedestrian activity at the intersection
- Several near-miss events observed (including DKS team)
- Skewed geometry and adjacent buildings restrict pedestrian visibility

Intersection Skew

- Current alignment of the eastern leg of the intersection orients vehicles to face north-west instead of due west. Restricts visibility of pedestrians in south crosswalk.
- WB thru vehicles make awkward movements to get around EB left-turning vehicles that are yielding within the intersection



Intersection Skew

- On-street parking on east leg limits visibility of intersection and crosswalks as drivers approach from the east (looking west)

Red Light Running

- Observed high speeds and red light running on northbound approach (downgrade)
- Posted speed 30 mph
- Northbound 85th Percentile Speed 34 mph
- 40 mph speeds were registered

Vehicle Turning Compliance

- The right turn on red restriction is needed due to limited sight distance, however drivers disregard this restriction.

Driver making right turn on red despite “No Turn on Red” sign

Intersection Operations

- Continuous (false) signal calls due to parking adjacent to traffic signal inductive loop

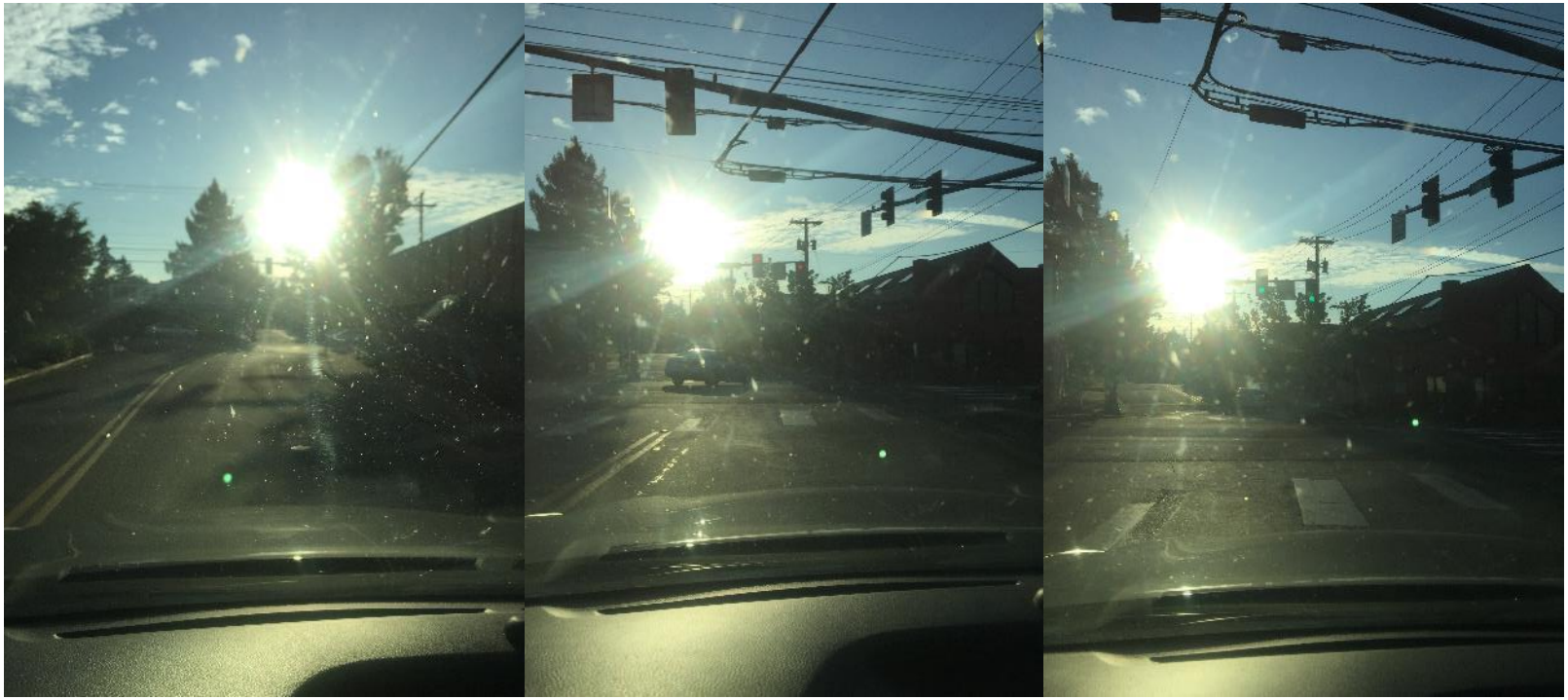
Parked vehicle next to loop on EB approach

Loop in close proximity to parking spot (WB approach)

Intersection Operations

- False signal calls due to parking adjacent to detection loop lead to maximum green times on minor street increasing the delays to the major street

Sun Glare during Sunset



Observed sun glare approaching the intersection from the east.

Nightime Lighting Conditions

- Evening observations (7:00 p.m. – 9:00 p.m.)
- Lighting appeared sufficient in immediate vicinity
- Extents of intersection were dim

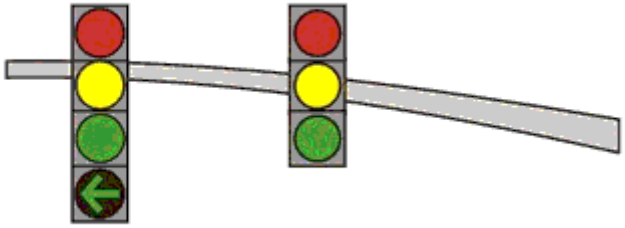
Decorative acorn lights provide less light than traditional cobrahead luminaires would.

Recommended Improvements

- Short-term and low-cost improvements to implement quickly
- Other improvements require more planning and investment
- Crash Reduction Factors (CRFs) are the percentage crash reduction that might be expected after implementing a given countermeasure, based on national research.
  - All CRF values presented are from the ODOT-approved CRF list

Split Phasing on Pearl Street

- Provides protected green phase (ie. right of way) for all vehicle movements on one approach followed by opposite approach
- Removes left-turning vehicle and pedestrian crossing conflict
- Removes left-turning vehicle and oncoming through vehicle conflict
- **CRF = 99% (left-turn crashes)**



Common signal head arrangement for split phasing

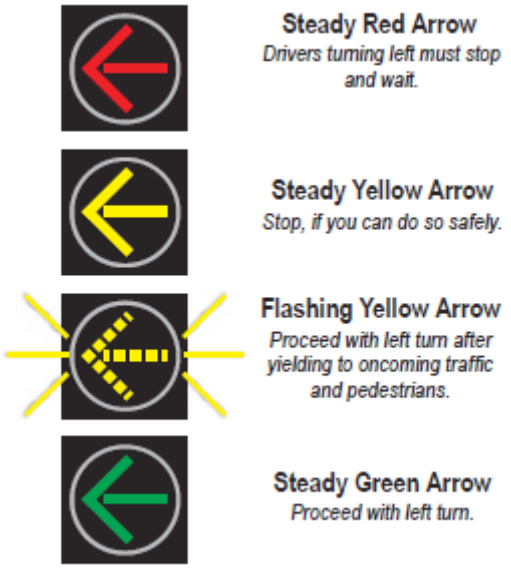
Leading Pedestrian Interval

- Pedestrians can enter the crosswalk before vehicles are given the green light
- Enhances visibility of pedestrians in the intersection and reinforces right-of-way over turning vehicles
- Recommend 4-second leading pedestrian interval for south crosswalk (eastbound phase)
- **CRF = 37% (bike and ped crashes)**

Pedestrians receive “Walk” signal before vehicles receive green light (FHWA)

Protected/Permissive Left Turn Phasing

- Recommend adding protected left-turn phasing on Molalla Avenue (northbound and southbound approaches)
- Maintain existing permissive left-turns (yield to oncoming vehicles)
- Requires 4-section signal head and additional wiring
- **CRF = 16% (left-turn crashes)**



4-section signal head example

Intersection Operations

Intersection	Jurisdiction	Operating Standard	AM Peak			PM Peak		
			v/c	*Delay*	*LOS*	*v/c*	*Delay*	*LOS*
Existing Conditions								
Molalla Ave/Pearl St	Oregon City	v/c ≤ 1.0, LOS D	0.58	4.6	A	0.71	8.8	A
Proposed Safety Improvements (Split Phasing, Protected/Permissive Left-Turns, Leading Ped. Interval)								
Molalla Ave/Pearl St	Oregon City	v/c ≤ 1.0, LOS D	0.65	13.6	B	0.75	24.6	C

Signalized intersections:

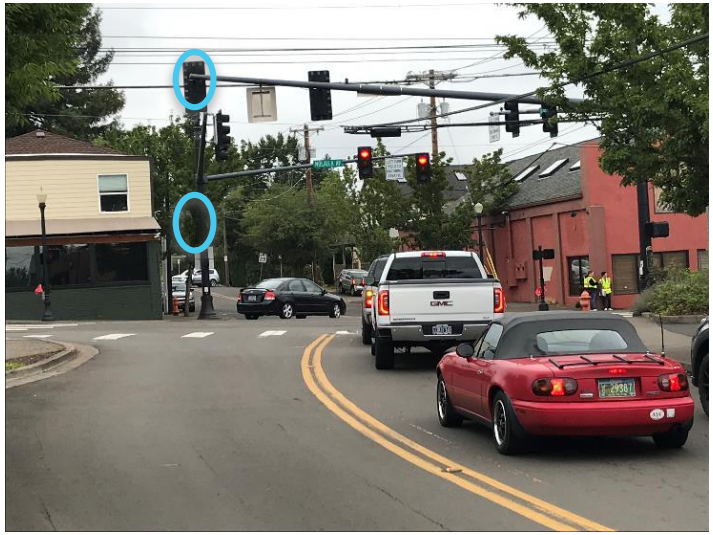
v/c = Volume-to-Capacity Ratio of Intersection
Delay = Average Stopped Delay per Vehicle (sec)
LOS = Level of Service of Intersection

Improve Signal Visibility

- Recommend adding backplates with retroreflective borders to vehicle signal heads to improve visibility
  - Sun-glare in westbound direction
  - High frequency of rear-end crashes in northbound direction
- Recommend installing supplemental signal head for westbound approach

CRF = 20% (all crashes)

Retroreflective border example



Possible supplemental signal head location for westbound approach

Relocate Turn Restriction Sign

- Sign is in place for eastbound approach due to limited sight distance caused by building in northwest corner
- Often ignored (placed behind eastbound stop bar)
- Recommend relocating onto mast arm servicing eastbound traffic

CRF not available

Proposed “No Turn on Red” sign relocation

Pedestrian Warning Signage

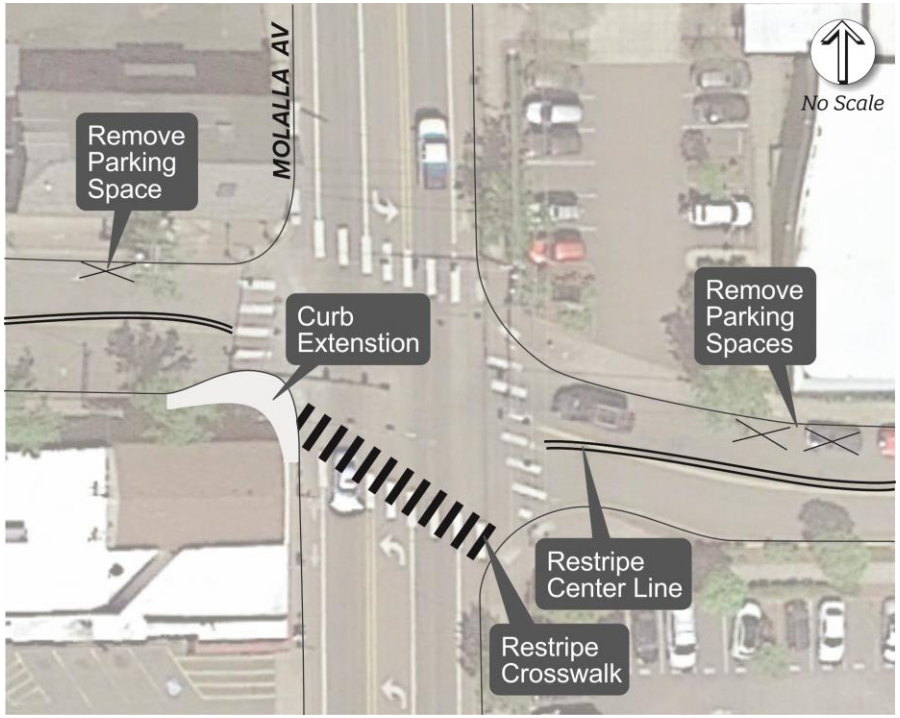
- “Turning Vehicles Yield to Pedestrians” sign (MUTCD-R10-15)
- Recommend placing adjacent to signal heads for the through-right shared lanes
- Especially helpful for eastbound approach (limited visibility of south crosswalk)

CRF not available

Restripe Pearl Street

- Short Term Improvements
  - Proposed restriping orients westbound vehicles to face west
  - Remove 2 parking spaces (prevents false signal calls that currently exist)

  CRF = 48% (injury crashes)



- Long Term Improvement
  - Curb extension on southwest corner shifts south crosswalk further north and makes pedestrians more visible

  CRF not available

Additional Recommendations

- Signal Communications
  - Existing overhead fiber optics running along Molalla Avenue
  - Connect to Molalla/Pearl controller cabinet
  - Allow for signal coordination and remote monitoring/adjustments
- Upgrade lighting
  - Replace acorn lights with clamp-on luminaire lights to improve visibility and safety
  - Could be completed by modifying poles instead of replacing
- Pedestrian warning signage
  - Part-time restriction LED sign to prohibit right turn on red when there are pedestrian calls

Recommended Improvements Summary

Improvement Description	Crash Reduction Factor (CRF)	Cost Estimate
Short Term Improvements		
Split Phasing on Pearl Street: includes changing signal timing settings in traffic signal controller and removing overhead "Left Turn Yield to Oncoming Traffic" sign on each approach	99% (Left Turn Crashes)	$1,200
Leading Pedestrian Interval on South Crosswalk: includes changing signal timing settings in traffic signal controller	37% (Bike and Ped Crashes)	$1,000
Protected/Permissive Left Turn Phasing on Molalla Avenue: includes adding 4-section signal heads to both the northbound and southbound mast arms as well as running additional wiring to these mast arm poles to accommodate the additional phase	16% (Left Turn Crashes)	$5,000-$10,000
Signal Visibility: Add 3-inch yellow retroreflective sheeting to signal backplates and install supplemental signal head	20%	$5,000
Restripe Pearl Street	48% (Injury Crashes)	$5,000
Install Pedestrian Warning Signs	N/A	$1,000
Relocate "No turn on red" Sign	N/A	$1,000
Long Term Improvements		
Add Curb Extension in SW corner & realign south crosswalk	N/A	$50,000
Fiber Connection at Traffic Signal	N/A	$3,000
Convert Acorn Lighting to Luminaire Lighting	N/A	$20,000-$30,000
Install Dynamic Turn Restriction Sign	N/A	$1,000