

Dunbrack St and Lacewood Dr

MicroTraffic Video Diagnostic Findings and Recommendations

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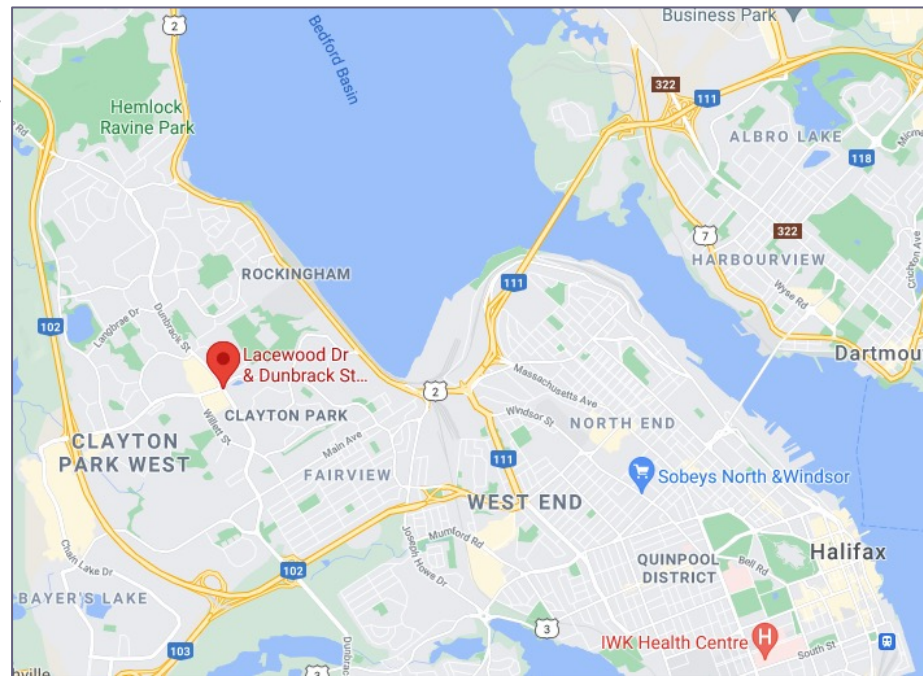
Video Conflict Analysis



Key Issues and Recommendations

Intersection Overview

- Dunbrack St is an arterial road that runs parallel to Highways 102 and 2 through Clayton Park (north west from downtown Halifax)
- Lacewood Dr feeds east from Highway 102 and transitions to Titus St, Dutch Village Rd and Bayers Rd before connecting back into Highway 102 near the West End.
- The land use at Dunbrack and Lacewood is mixed. There are commercial establishments in the NW, NE and SW quadrants, as well as a forested, undeveloped area in the SE quadrant. Single and multi-family residential establishments surround the intersection.
- Video analytics indicates that the intersection is used by approximately 15 cyclists and 550 pedestrians (not including the north crossing), as well as 25,000 vehicles per day (not including right turning vehicles). Note that the counts were completed in November/ December when VRU volumes may be depressed.



Lacewood Dr. Looking East



Lacewood Dr Features:

- Two through lanes and a left turn auxiliary lane
- Right turn channelization islands
- 50 km/h posted speed limit
- Four signal heads EB (one nearside) and five signal heads WB (one nearside)
- Left turn signalization: EBL protected/ permissive and WBL permissive only
- No reflective back plates on signals
- Sidewalks on both sides of the intersection with boulevard separation
- Hydro poles located <0.5m away from the roadway (east of the intersection)

Dunbrack St. Looking South



Dunbrack St Features:

- Two through lanes, a left turn auxiliary lane and a right turn auxiliary lane
- Painted bike lane (<1.5m wide) with dashed mixing zone adjacent to the travel lane.
- Right turn channelization islands
- 60 km/h posted speed limit
- Three signal heads SB and three signal heads NB (one nearside)
- No reflective back plates on signals
- Left turn signalization: SBL protected/ permissive and NBL permissive only
- Sidewalks on both sides of the intersection with boulevard separation
- Hydro poles located <0.5m away from the roadway (east of the intersection)



Eastbound-Right and Westbound-Right have approximately 50m of an acceleration lane available for merging; however, differences in road surface type/colour may lead to poorly utilized use of the lane.

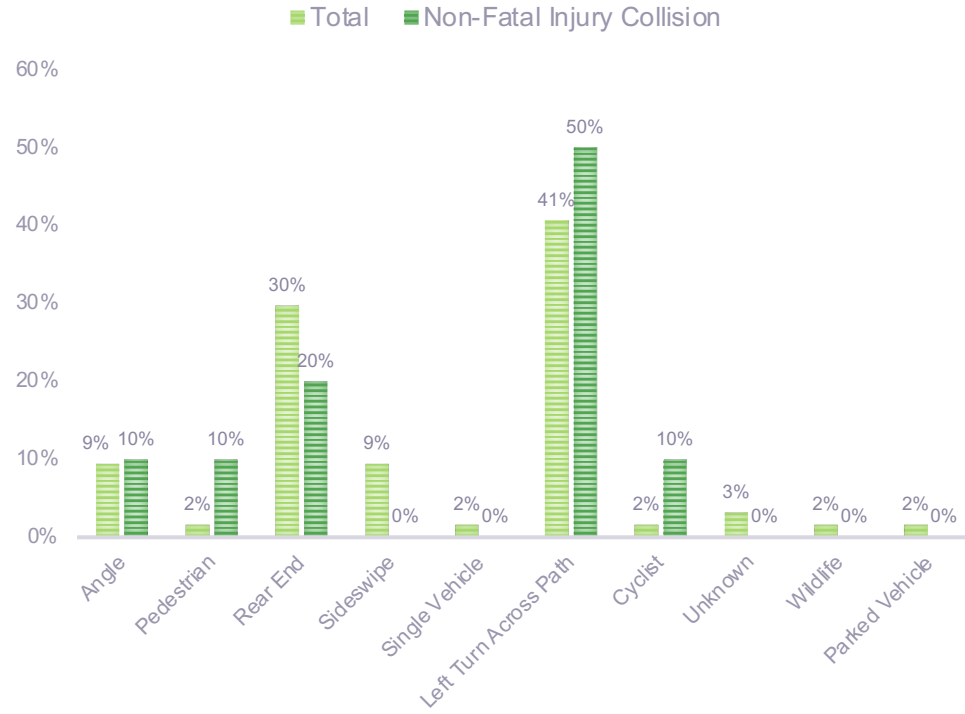
The yield sign may also contribute to driver lane use confusion, although it is recognized that the available acceleration length may be insufficient in Nova Scotia for it to be considered a merge condition.

The lane extension also presents a longer mixing zone for cyclists using the painted bike lane.

Collision Analysis

- The provided collision data included 64 collision records from January 1, 2018 to April 12, 2021. Of the 64 records, 16% were classified as non-fatal injury collisions and 84% as property damage only collisions.
- The collisions were classified into the general descriptions shown in the adjacent figure based on the initial impact type and provided directional information.

CONFIGURATION DISTRIBUTION OF COLLISIONS



The collision data revealed the following key points:

- Pedestrian and cyclist collisions represent 20% of the non-fatal injury collisions (1 pedestrian and 1 cyclist event). The pedestrian collision occurred at the access to the Sobey's parking lot (NW quadrant) and not directly at the intersection. The cyclist collision involved a northbound-left vehicle. *It is possible for NBL drivers to not see SB cyclists past vehicles in the SB through lanes, and also possible for NBL vehicle drivers to underestimate the speed of SB cyclists on a downgrade.*
- Left turn across path collisions represent 41% of total collisions and 50% of the non-fatal injury collisions. Of the known directions, the distribution was 28%, 24%, 20% and 28% for Eastbound-left, Westbound-left, Southbound-left and Northbound-left respectively.
- Angle collisions represent 9% of total collisions and 10% of the non-fatal injury collisions. 83% of the angle collisions (5 events) involved an eastbound vehicle running a red light; the remaining events (1) involved a westbound vehicle running the red light.
- Rear End collisions represent 30% of total collisions and 20% of the non-fatal injury collisions. Of the known directions, the distribution was 13%, 33%, 40% and 13% for Eastbound, Westbound, Southbound and Northbound respectively. The southbound concentration corresponds with SB downgrade.

Video Conflict Analysis – VEH-VEH

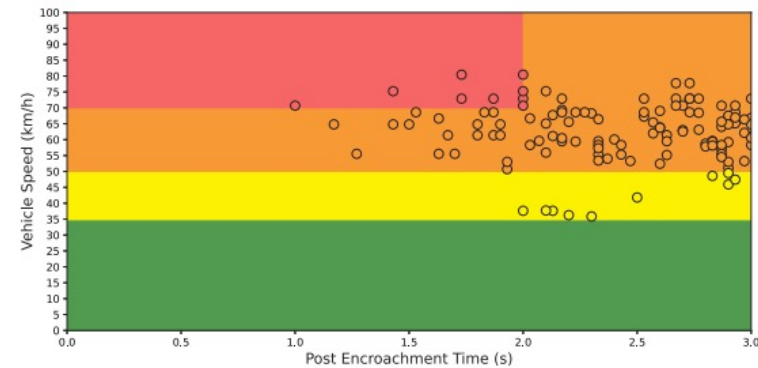
- 5 through vs through conflicts were detected during the 51-hour analysis period (west-through vs south-through).
- These conflict types require a signal violation, which are typically infrequent events.
- No other right-angle conflict configurations were detected during the 51-hour observation period.
- SB vehicles on downgrade: review clearance, conspicuity, friction.
- Video shown: SBT blocked by NBL at end of phase (NBL permissive only)



South-through vs East-through: PET = 1.8s, vehicle speed 25 km/h

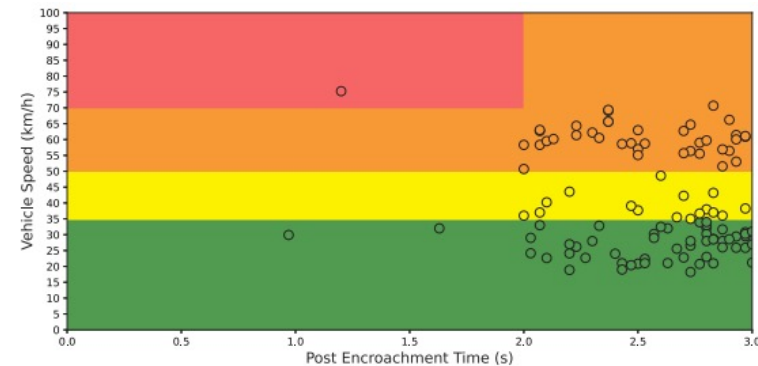
Video Conflict Analysis – VEH-VEH

- Several left turn across path conflicts were detected during the 51-hour analysis period, as follows:
 - 122 North-Left vs South-Through conflicts
 - 109 South-Left vs North-Through conflicts
 - 156 East-Left vs West-Through conflicts
 - 71 West-Left vs East-Through conflicts
- The signalization is protected/permissive for SBL and WBL and permissive only for NBL and WBL turn movements.
- 103 High-Risk and 9 Critical-Risk events were detected for North-left vs South-through. When comparing the conflict rate of NBL vs SBT events to benchmark values for similar sites across North America, NBL drivers at Dunbrack and Lacewood are 1.7x more likely to be involved in a high-risk conflict event.

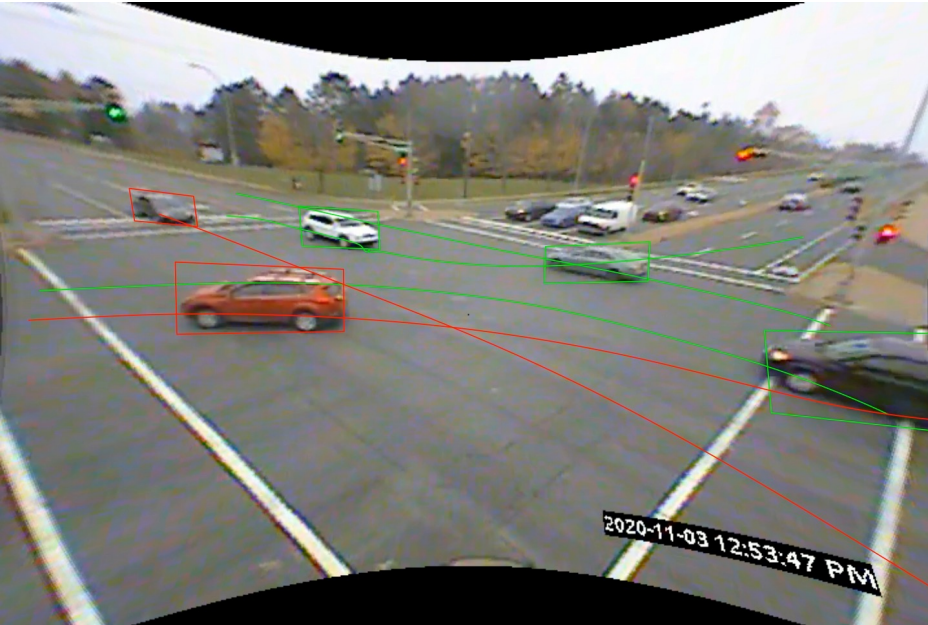


North-left vs South-through (above) and South-Left vs North-through (below) conflict data shows several conflicts occurring with through vehicle speeds exceeding the 60 km/h posted speed limit (up to 80 km/h).

At impact speeds above 60 km/h, opposing drivers have a >65% chance of a severe injury (MAIS 3+), which increases to >95% at 80 km/h.



Video Conflict Analysis – VEH-VEH (LTAP)



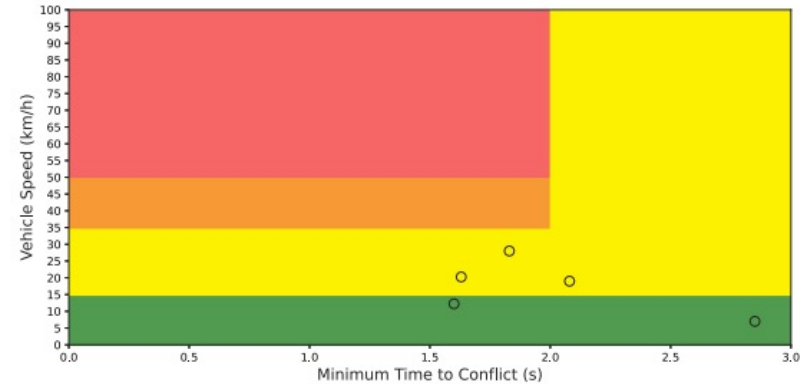
East-left vs West-through: PET = 2.1s, vehicle speed 50 km/h



South-left vs North-through: PET = 1.2s, vehicle speed 75 km/h

Video Conflict Analysis – VEH-VRU

- Right hook conflicts and near-side conflicts were not measured due to camera placement and limited approach view.
- No cyclist conflicts were detected during the 51-hour analysis period. However, the video collection occurred in Nov/Dec and the 24-hour cyclist counts indicate a low volume of cyclists crossing the intersection.
- Several pedestrian left-hook conflicts were detected during the 51-hour analysis period, as follows:
 - 1 North-Left Hook conflict
 - 5 South-Left Hook conflicts
 - 1 West-Left Hook conflict
- All of the pedestrian conflict events happened between 15:00 and 21:00. In dark conditions vulnerable road users are more difficult for drivers to detect, especially when wearing dark clothing.



Pedestrian South-Left Hook conflict data show conflicts occurring with through vehicle speeds of nearly 30km/h.
At impact speeds of 30 km/h, pedestrians have a 25% chance of a severe injury (MAIS 3+).

- On multiple occasions, the left turning driver did not notice the crossing pedestrian until they initiated their left turn movement. As vehicles yield to the right-of-way pedestrian, they become exposed to a potential conflict with oncoming through vehicles.



Pedestrian North Left-Hook: T2 = 2.6s, vehicle speed 14 km/h



Pedestrian South Left-Hook: T2 = 1.6s, vehicle speed 20 km/h

Key Issues and Recommendations

Key Issue	Recommendation
<p>Left Turn Across Path (LTAP):</p> <ul style="list-style-type: none">• LTAP collisions make up nearly 41% of all collisions• 458 LTAP conflicts were detected during the 51-hour analysis period. A high number of conflict events were detected for both the permissive only phasing (NBL and WBL) and the protected-permissive phasing (SBL and EBL).	<p>Protected only phasing for all left turns</p>
<p>Pedestrian Safety:</p> <ul style="list-style-type: none">• No pedestrian collisions were reported directly at the intersection; however, several left hook conflicts were detected during the 51-hour analysis period.• More than 550 pedestrians were recorded crossing the intersection in the 24-hour counts indicating there is a higher risk exposure for pedestrians.• Pedestrian visibility enhancements may help remove latent pedestrian safety risk at the intersection.• Although right turn channels were not covered by video, we note that they are designed for high speed right turns which is a risk factor for pedestrians.	<p>Protected only phasing for all left turns.</p> <p>Check illumination vs TAC 2006 Guide. We did not do a lighting analysis but it seems that orientation of luminaires with respect to the crosswalks could be improved.</p> <p>Crosswalk striping with durable zebra markings.</p> <p>Extension of east median bullnose could calm EBL and NBL speeds.</p> <p>Consideration should be given to smart right channels for lower speed right turns.</p>

Key Issues and Recommendations

Key Issue	Recommendation
<p>Angle/ Through vs Through vehicle events:</p> <ul style="list-style-type: none">• 9% of collisions were for angle collisions. The majority involved EB vehicles running a red-light.• 5 conflict events were detected in the 51-hour analysis period for south-through vs west-through vehicles. Typically these occurred at a phase change at low vehicle speeds.• Signal perception improvements would be valuable, especially in the EB/WB directions when sun glare may contribute to signal perception failure.	<p>Add reflective backplates to all signals.</p> <p>If any signal heads have lenses < 300mm consider upgrading to 300mm.</p> <p>Review all red clearance times; ensure technical guidance is followed at a minimum. Especially consider the end of SB phase for potential lengthening.</p> <p>Install signal ahead warning signs on SB approach about 200 m upstream of intersection.</p>

Key Issues and Recommendations

Key Issue	Recommendation
<p>Cyclist safety:</p> <ul style="list-style-type: none">• 1 cyclist collision occurred in the last 3 years with a Northbound-left vehicle and likely a southbound through cyclist using the painted bike lane.• No cyclist conflicts were detected during the 51-hour analysis period. It is noted that the November/December video collection period may not have reflected typical cyclist volumes and exposure to risk.• Placement of a painted bike lane with no lateral or physical separation between 60 km/h vehicles exposes cyclists to a high-risk conflicts (95% chance of a severe injury (MAIS 3+) for VRUs impacted by a vehicle at 60 km/h).	<p>Protected only LT for NBL and SBL</p> <p>Convert Dunbrack bicycle lane to physically protected with vertical delineation elements that will also help speed moderation (see below).</p> <p>Shorten the SBR designated mixing zone</p> <p>Green conflict pavement markings at all RT conflict points and through intersection.</p> <p>Smart right channels with low radius and high entry angle, especially for EBR and WBR, to improve line of sight and reduce speeds at bike conflict points.</p>
<p>High Speeds:</p> <ul style="list-style-type: none">• 177 high-risk conflicts (impact vehicle speed >50 km/h) were detected during the 51-hour analysis period. The open cross section and arterial environment Dunbrack may contribute to high speed trends.	<p>Dunbrack posted speed limited reduction to 50 km/h.</p>

Note that the intersection recommendations have been looked at in isolation and will require further analysis by the municipality to determine complete network impacts.