

Main St and Major St

MicroTraffic Video Diagnostic Findings and Recommendations

Contents



Intersection Overview



Collision Analysis



Video Conflict Analysis



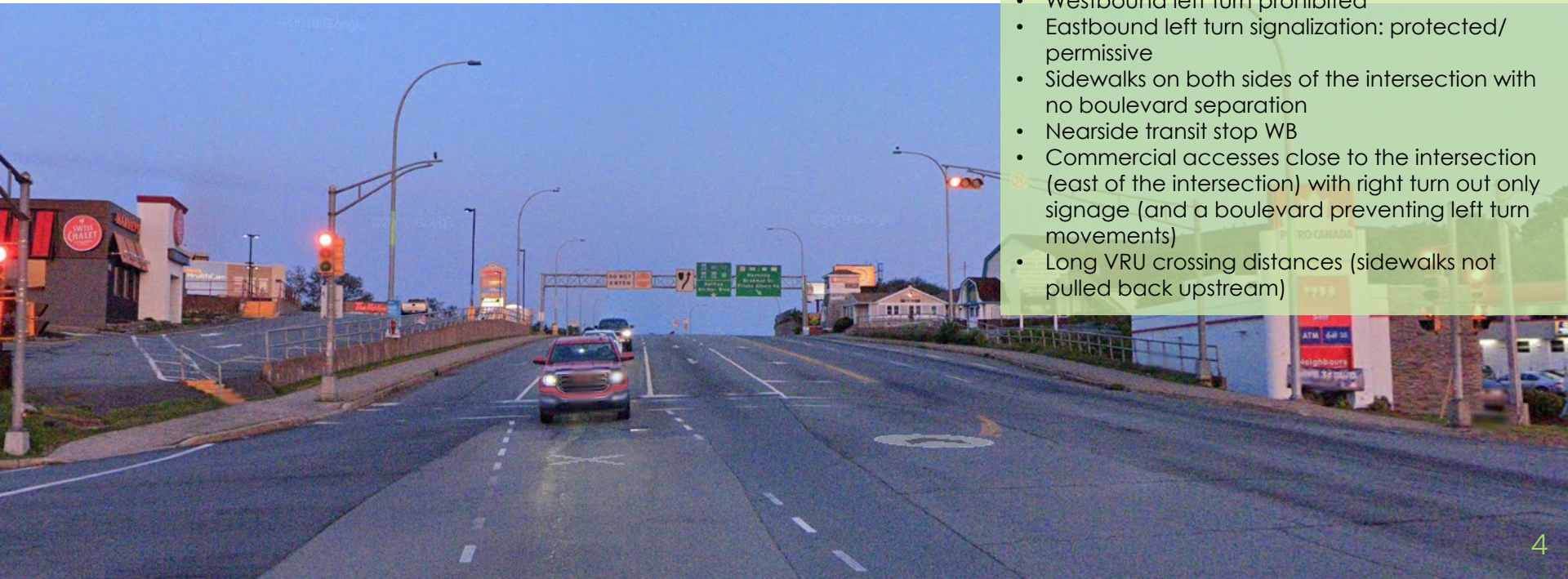
Key Issues and Recommendations

Intersection Overview

- Main St and Major St is located in Dartmouth, across the inlet from downtown Halifax.
- Main St is the portion of Highway 7 that runs East from the interchange with Highways 111 and 318.
- Major St provides access from the Westphal neighbourhood to the Tacoma Plaza shopping mall. South of Main St, Major St transitions to Gordon Ave and the off ramp from highway 111.
- The land use directly surrounding the intersection is primarily mixed commercial establishments. North of the intersection is single-family residential homes.
- Video analytics indicates that the intersection is used by approximately 15 cyclists, 420 pedestrians, and 41,200 vehicles per day from 5:00-24:00. Note that the counts were completed in November when VRU volumes may be depressed.



Main St. Looking West



Main St. Features:

- Eastbound: Left turn auxiliary lane, two through lanes and a right turn lane with a short diamond lane in the receiving east cross section
- Westbound: Two through lanes
- High EB/WB right turn radii (high speed)
- 50 km/h posted speed limit
- Five signal heads EB and WB (one nearside each)
- No reflective back plates on signals
- Westbound left turn prohibited
- Eastbound left turn signalization: protected/ permissive
- Sidewalks on both sides of the intersection with no boulevard separation
- Nearside transit stop WB
- Commercial accesses close to the intersection (east of the intersection) with right turn out only signage (and a boulevard preventing left turn movements)
- Long VRU crossing distances (sidewalks not pulled back upstream)

Major St. Looking North



Major St. Features:

- One through lane and one left turn auxiliary lane. Southbound receiving lane is ~7.5m wide
- High NB right turn radius (high speed)
- Sightline limitations between southbound vehicles and VRUs on the sidewalk (NW quadrant) due to topography and Petro-Canada signage
- 50 km/h posted speed limit (assumed)
- Three signal heads NB and SB (one nearside each)
- No reflective back plates on signals
- Left turn signalization: NBL protected/ permissive and SBL permissive only
- Sidewalk on east side of the roadway with no boulevard separation
- Commercial accesses close to the intersection (Petro-Canada gas station and Harvey's)



Google Streetview from July 2018 shows previous WB cross section and permissive left turn. This layout is shown in the aerial imaging.



Google Streetview from July 2019 shows re-configured cross section with prohibited left turn movement, a boulevard and a small diamond lane.



Left: Sightline from southbound vehicles to vulnerable road users approaching the North Crosswalk from the west is obstructed due to Petro-Canada sign and building. With the downhill slope approaching the intersection, cyclists, pedestrians and e-scooters may be moving faster than expected by drivers.

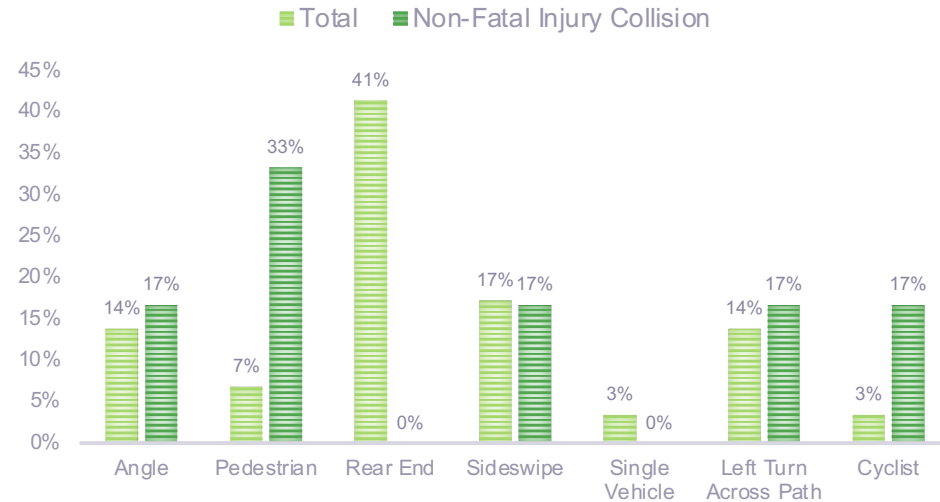
Below: Curb cuts are narrow and without a tactile surface. Pedestrians with mobility limitations may have difficulty using the crossing. Tactile surfaces improve safety for pedestrians with visual impairments.



Collision Analysis

- The provided collision data included 29 collision records from January 1, 2018 to April 12, 2021. Of the 29 records, 21% were classified as non-fatal injury collisions and 79% as property damage only collisions.
- Collisions with cyclists that were listed as property damage only were modified to non-fatal injury 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

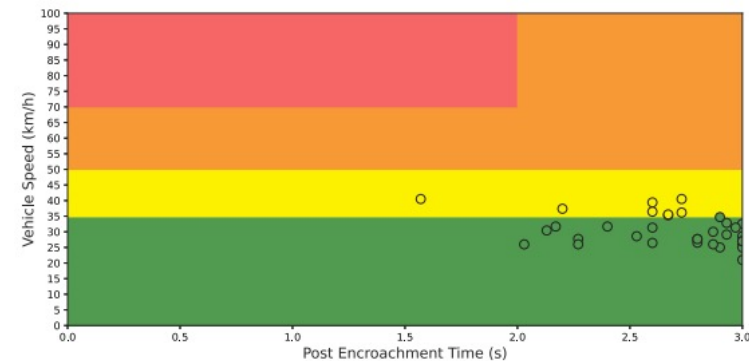


The collision data revealed the following key points:

- Pedestrian collisions represent 33% (2 events) of the non-fatal injury collisions. The pedestrian collisions involved a westbound-right vehicle and a southbound-through vehicle (reversing when it hit the pedestrian). The 1 cyclist collision involved a westbound-left vehicle (but WBL has now been prohibited, effectively mitigating this risk).
- Left turn across path collisions represent 14% (4) of total collisions and 17% (1) of the non-fatal injury collisions. The direction distribution is 25%, 25%, and 50% for Eastbound-left, Westbound-left, and Northbound-left respectively.
- Rear End collisions represent 41% of total collisions. 56% of the collision events with known directions involved westbound vehicles.

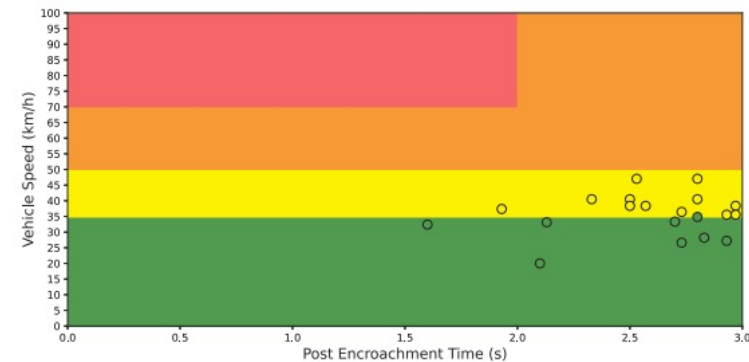
Video Conflict Analysis – VEH-VEH

- Through vehicle vs through vehicle and left-turning vehicle vs through vehicle from left configurations were measured, but no conflicts were detected during the 57-hour analysis period. These conflict types require a signal violation, which are typically infrequent events.
- Several left turn across path (LTAP) conflicts were detected during the 74-hour analysis period, as follows:
 - 34 North-Left vs South-Through conflicts
 - 20 South-Left vs North-Through conflicts
 - 72 East-Left vs West-Through conflicts
 - 3 West-Left vs East-Through conflicts (this movement is prohibited but still made by a few vehicles)
- The signalization is protected/permissive for NB/EB left turn movements, permissive-only for SB left turn movements and restricted for WB left turns.
- Overall, the NBL and SBL conflict patterns are not concerning due to low speeds.

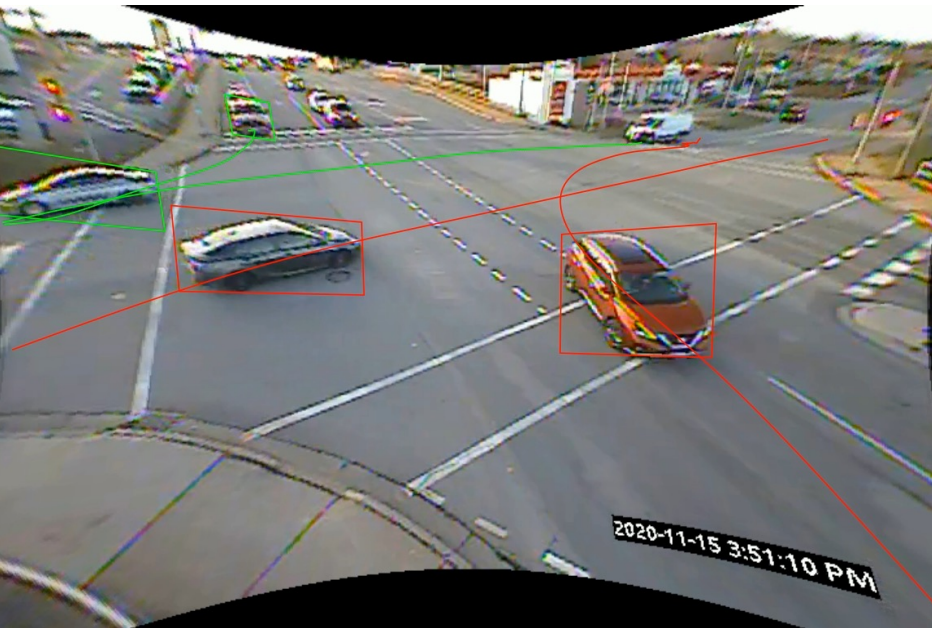


North-left vs South-through (above) and South-Left vs North-through (below) conflict data indicates that the majority of events are occurring at speeds less than 40 km/h, below the assumed speed limit of 50 km/h.

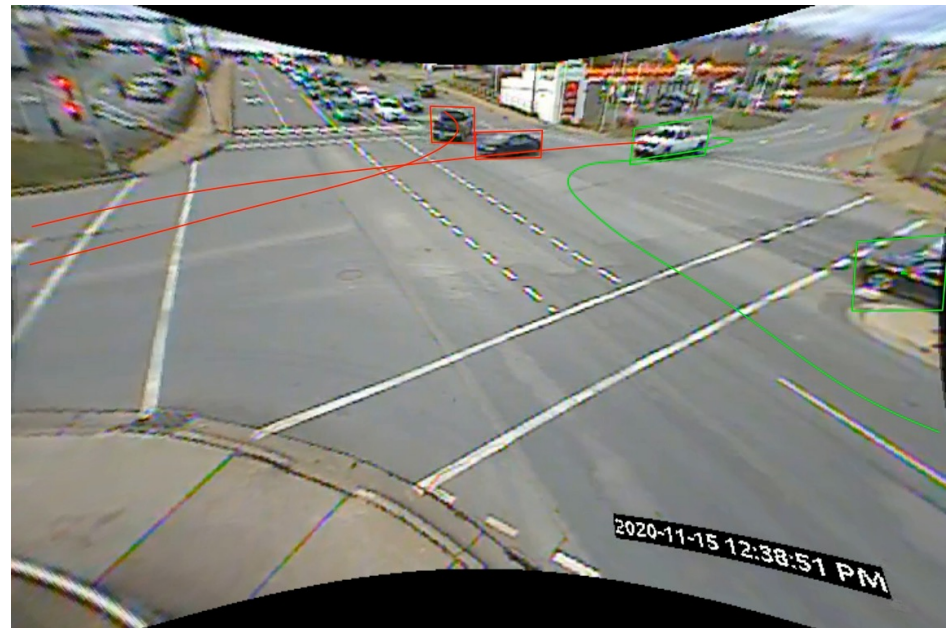
The conflict events most frequently occurred around 12:00pm and at peak PM hours (no conflicts were detected between 21:00 and 7:00 during the 57-hour analysis period).



Video Conflict Analysis – VEH-VEH



South-left vs North-through: PET = 1.9s, vehicle speed = 37 km/h



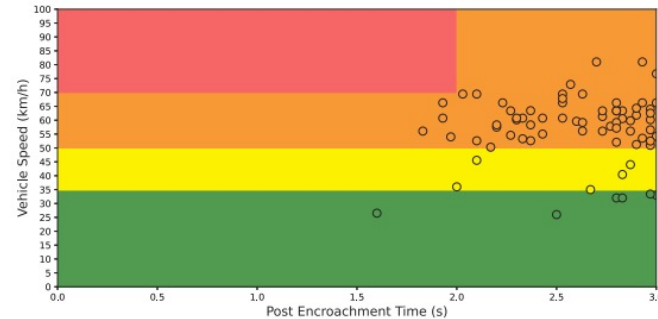
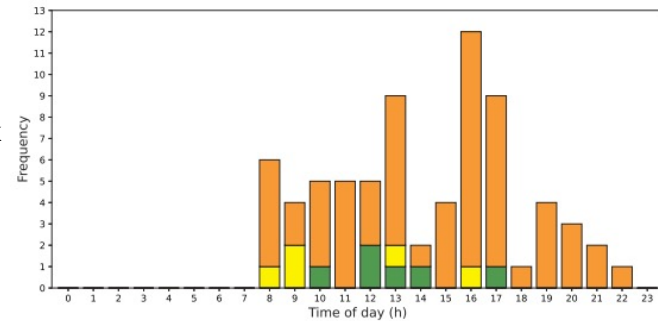
North-left vs South-through: PET = 1.6s, vehicle speed = 41 km/h

Video Conflict Analysis – VEH-VEH (EBL vs WBT)

- High WBT speeds are evident in the EBL vs WBT conflict data, greatly exceeding the 50 km/h speed limit heading towards the on ramps. At impact speeds above 80 km/h, drivers in opposing vehicles have a >95% of a severe injury (MAIS 3+).
- 61 High-Risk events were detected for East-left vs West-through. When comparing the conflict rate of EBL vs WBT events to benchmark values for similar sites across North America, EBL drivers at Main and Major are 1.2x more likely to be involved in a high-risk conflict event.



East-left vs West-through: PET = 1.9s, vehicle speed = 66 km/h



Video Conflict Analysis – VEH-VEH (WBL vs EBT)

- WBL is a restricted movement at the intersection. According to Google Streetview, the intersection cross section was re-configured and this movement was restricted between July 2018 and July 2019.
- Turning Movement Counts from 5:00-24:00 conducted in November 2020 indicated that 7 vehicles violated this restriction.
- 3 conflicts were detected during the 57-hour analysis period (2 medium and 1 high-risk). Due to the low volume of left turning vehicles, nearly 15% of all WBL vehicles were involved in a conflict event.



West-left vs East-through: PET = 2.8s, vehicle speed = 69 km/h

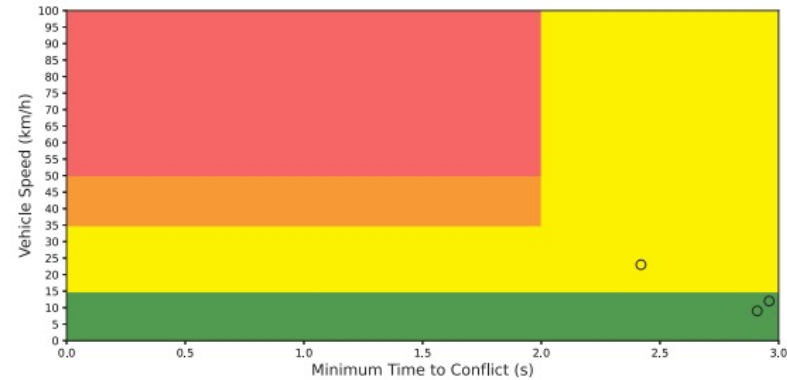
Video Conflict Analysis – VEH-VEH

- Traffic lights were down with flashing red in all directions on November 15, 2020 from 14:08:23-14:50:45.
- Several conflicts were detected during this period but were not included in the Risk Diagnostic Report as they do not represent typical operating conditions.



Video Conflict Analysis – VEH-VRU

- West-left hook conflicts, northbound far-side conflicts and near-side conflicts were not measured due to camera placement and limited approach view.
- No cyclist conflicts were detected during the 57-hour analysis period. However, the video collection occurred in November and the 24-hour cyclist counts indicate a low volume of cyclists crossing the intersection.
- The following pedestrian conflicts were detected during the 57-hour analysis period:
 - 2 North-Left Hook conflicts
 - 3 East-Right Hook conflicts



Pedestrian East-Right Hook data shows a conflict occurring with a through vehicle speeds >20 km/h. At impact speeds of 20 km/h, pedestrians have a 10% chance of a severe injury (MAIS 3+).

Video Conflict Analysis – VEH-VRU



Pedestrian East-Right Hook: $T_2 = 2.4s$, vehicle speed = 23 km/h

Pedestrians are difficult to detect in low light conditions, especially when wearing dark clothes.



Pedestrian South-Left Hook: $T_2 = 2.4s$, vehicle speed = 15 km/h

The southbound-left vehicle approach visibility was restricted due to camera placement. This may have limited south-left hook conflict detection. Pedestrians are exposed to vehicles over a long crossing distance on Main. 16

Key Issues and Recommendations

Key Issue	Recommendation
<p>High Speeds:</p> <ul style="list-style-type: none"> 62 high-risk conflicts (impact vehicle speed >50 km/h) were detected during the 57-hour analysis period. 98% of these events included WB vehicles. Minimal speed limit signs were posted on Main and Major. The wide arterial environment may encourage higher operating speeds, especially considering the close proximity to surrounding highways. 	<ul style="list-style-type: none"> Low cost speed mitigation: vertical centerline and median delineation. Automated speed enforcement on Main Street.
<p>Pedestrian Safety:</p> <ul style="list-style-type: none"> 2 pedestrian collisions have occurred in the past 3 years. A limited number of pedestrian conflicts were detected during the 57-hour period; however, more than 400 pedestrians crossed the intersection in a day (in November). Right turn radii are generally high, allowing vehicles to complete turns at higher speeds. General improvements to pedestrian visibility and access at the crossing would be valuable, especially considering the volume of pedestrians crossing the intersection. 	<ul style="list-style-type: none"> Provide durable reflective zebra markings at crossing Check and improve night time illumination Reduce turn radii and pull crossings upstream to shorten them and allow refuge space for turning vehicles.
<p>Left Turns</p> <ul style="list-style-type: none"> EBL vs WBT conflicts were frequent and high severity due to WBT speed WBL conflicts and movements occur despite prohibition. 	<ul style="list-style-type: none"> See high speed recommendation above Improve no WBL signage

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