

Objective

- Assess the potential impact of **signal optimization** for truck traffic.
- Develop traffic signal configurations to **reduce** the frequency of **stopped trucks**.
- Reduce** overall **traffic delay** for trucks and passenger cars.

Rationale

- Stopped trucks** increase congestion at intersections due to low acceleration rates (Fig. 2) while high volumes of trucks may block all lanes (Fig. 3).
- Congestion causes **traffic delays** that lead to economic and environmental costs for trucks and additional frustration for other drivers.
- Many studies and applications exist for transit signal priority (TSP), **but truck signal priority (TkSP)** is comparatively unknown.

Study Area

- 5 km **Dixie Rd.** corridor between highways 401 and 407 in the Region of Peel.
- 8 signalized and 3 Non-signalized** intersections.
- Highest average hourly daily volume of 2,778 vehicles consists of approximately **31% trucks**.

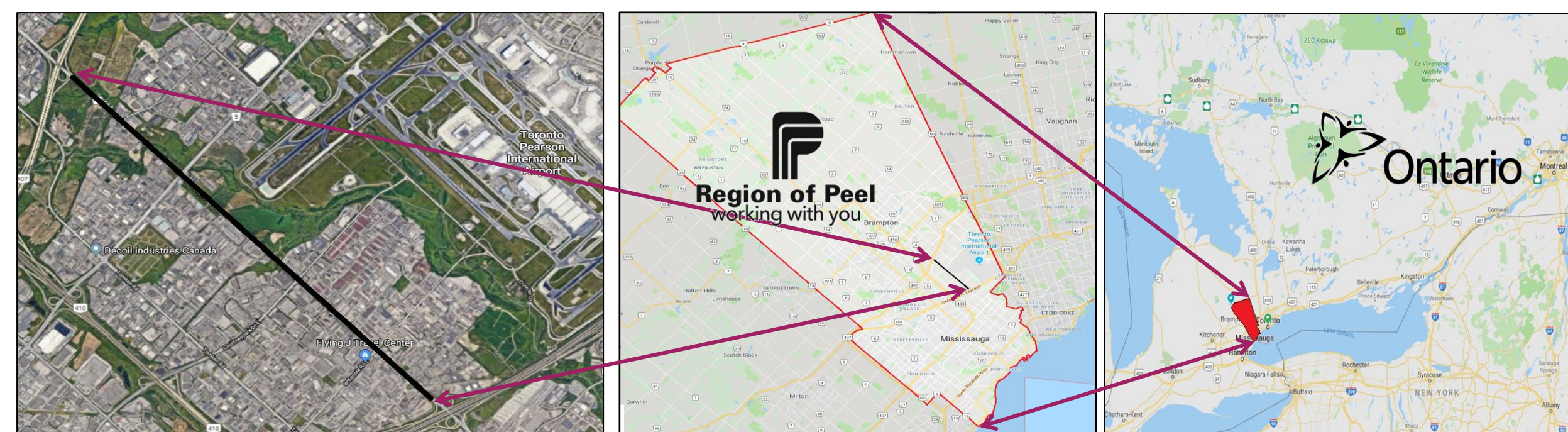


Fig 6a: Dixie Rd Fig 6b: Region of Peel Fig 6c: Ontario

The authors are thankful for data provided by **Region of Peel**.

Methodology

- Microsimulation analyses** are performed using VISSIM software (Fig. 4) to test several different scenarios.
- Vehicle detection** (Fig. 1) is needed upstream of a signal as a real-time tool to implement active signal timing configurations.
- TkSP scenarios** (to the right) are analyzed using a **green** time extension strategy.

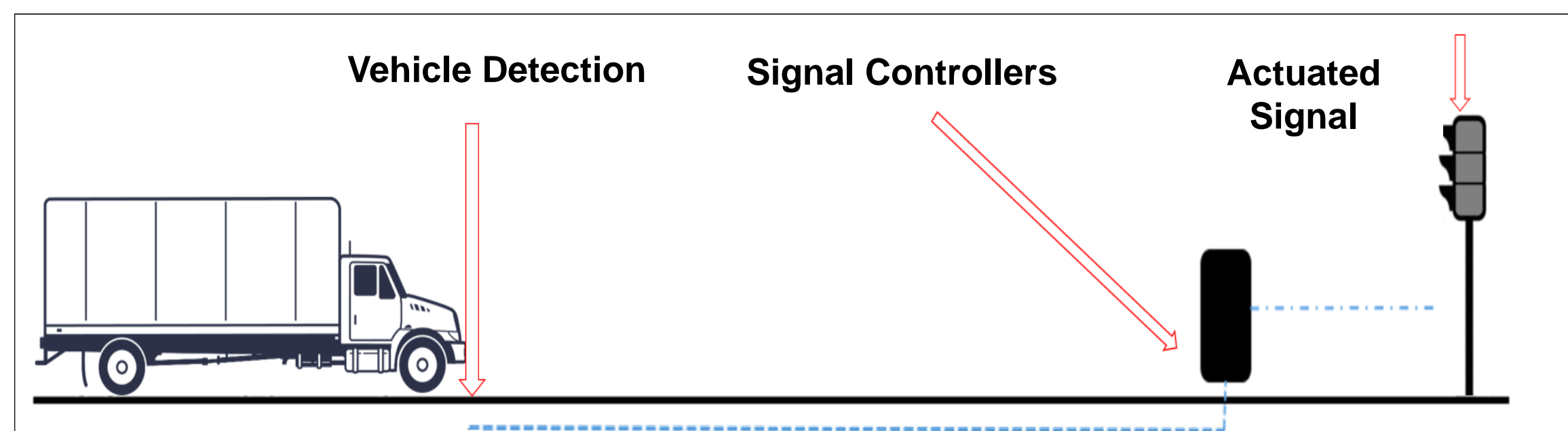


Fig 1: TkSP detection



Fig 2: Lower truck acceleration from full stop

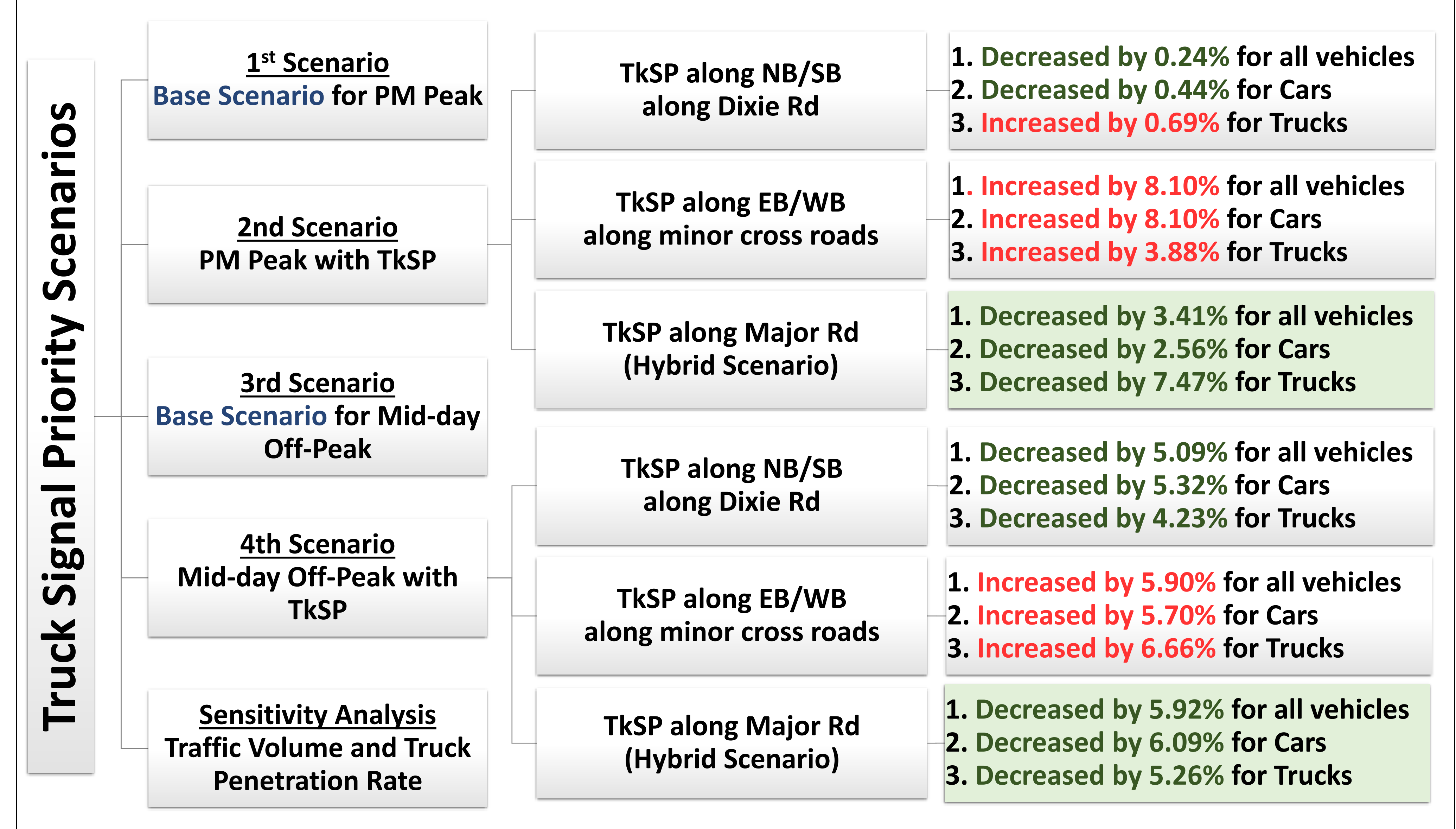


Fig 3: Trucks blocking traffic



Fig 4: VISSIM Simulation

Average Total Network Travel Time Analysis



Simulation Results

- PM Peak TkSP along Dixie Rd. (NB/SB):** Initial results for the PM peak using TkSP green time extensions counterintuitively led to a 0.67% increase in travel time for trucks. An analysis revealed that the increased travel time occurred along the Derry Rd. cross street due to high truck volumes.
- PM Peak TkSP along cross streets. (EB/WB):** Green light extensions along the cross-streets also led to a 3.88% increase in travel time for trucks due to the reduced green times along the Dixie Rd. corridor.
- PM Peak hybrid TkSP (NB/SB and EB/WB):** It was concluded that poor results were caused by heavy truck traffic along both the Dixie Rd. corridor and Derry Rd. A hybrid scenario was subsequently developed with green light extensions NB/SB for 7 signalized intersections along Dixie Rd. and EB/WB for 1 signalized intersection along Derry Rd. This resulted in a 7.47% decrease in travel time for trucks.
- Off-Peak hybrid TkSP (NB/SB and EB/WB):** Similarly to the PM Peak scenarios, the best results were observed when introducing a hybrid TkSP along both the Dixie Rd. corridor and Derry Rd. with a 5.26% decrease in travel time for trucks.

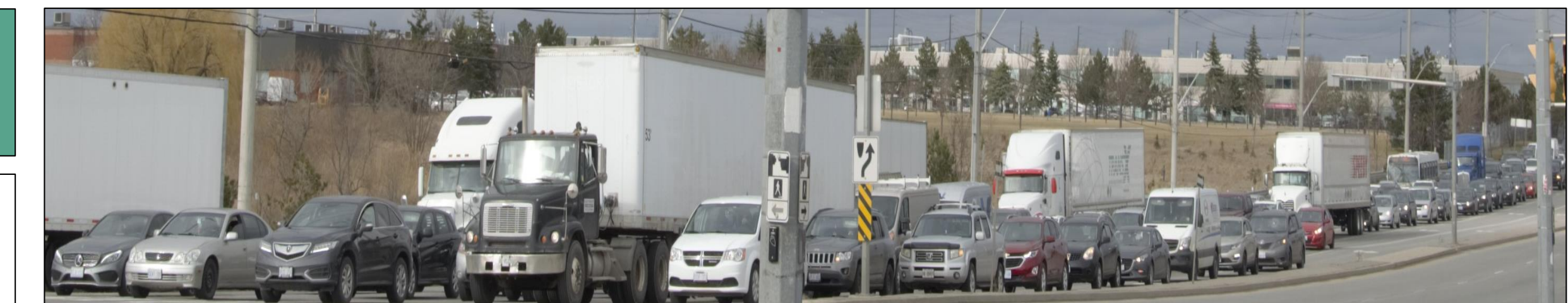


Fig 5: Intersection of Dixie & Derry Rd during the PM peak period

Conclusion

- The results demonstrate that truck signal priority (TkSP) can benefit both trucks and cars.
 - Trucks** observed **7.47%** and **5.26%** decreases in travel time for the best PM Peak and Off-Peak scenarios.
 - Passenger cars** observed **2.56%** and **6.09%** decreases in travel time for the best PM Peak and Off-Peak scenarios.