The Region wished to examine the underlying causal factors that contribute to queues at signalized intersections adjacent to railway crossings. Typical view of an intersection shown in Figure 2.

Region of York placed a video trailer at the six signalized intersections of traffic signal control and railway crossing active warning systems. Signal pre-emption serves to ensure that the actions of these warning systems coordinate between traffic signals and the railway warning systems.

Traffic in the left turn lane was observed to be forming with the potential to extend past the railway tracks. The 95th percentile queue length determined based on signal timing data and turning movement counts provided by the Region. The results were plotted. Figure 3 provides an example of the intersection study.

The freight train became infeasible at these locations due to: the greater distance between the signals and the railway tracks; the greater uncertainty that the queue would be completely cleared prior to the arrival of the train; and the greater distance that the advance warning would need to be placed to activate pre-emption at the traffic signals.

Adding Turn Lanes

At two of the surveyed intersections, the turning movement counts and the video footage indicated a heavy right turn traffic volume and therefore consideration was given to adding a right turn lane. Solution: When modeling operations at these intersections with the addition of a right turn lane, there was a substantial decrease in the 95th percentile queue length.

Queue Detection

Queue detectors, placed further back from the traffic signals and closer to the railway tracks, can be used to detect a queue that is forming with the potential to extend past the railway tracks.

At one intersection, traffic in the left turn lane was observed to be forming with the potential to extend past the railway tracks. The use of a queue detector should be considered in the context of the operations on the crossing road approaches and number of railway crossings.

If the likelihood of being queued detection triggered is modeled (less than 5 times per hour) or if the crossing road approaches experience excessive queue delays (20+ minutes), this method should not be considered.

CONCLUSIONS

This project has demonstrated how a road authority can: identify and prioritize signalized intersections using video footage gain insights into why queues are extending from traffic signals back to a set of railway tracks; and identify potential mitigating measures using Synchro 7.

The Region of York has been proactive in identifying and characterizing the issue of queues forming at signals that are close proximity to railway tracks. The TxtDOT worksheet (prepared by the Texas Department of Transportation) was used to determine if additional time is required for the traffic signal to move a stationary vehicle left of the railway tracks before the arrival of a train.

Many of the solutions identified, such as access management and making adjustment to signal timing, are dependent on the signal timing frame and are viable alternatives to signal pre-emption.

Further treatment, such as adjustments to lane configuration and queue detection, while higher in cost, still offer a solution that are viable alternatives to signal pre-emption.

Queue pre-emption needs to be considered in the context of: distance between the signals and the railway tracks; the greater uncertainty that the queue would be completely cleared prior to the arrival of the train; and the distance upstream that the advance warning would need to be placed to activate pre-emption at the traffic signals.

FURTHER INFORMATION

For further information, please contact Jeff Suggett at suggett@jpr.ca

REFERENCES

- Associated Engineering (Ont) Ltd. completed an analysis of video footage at signalized intersections that are in close proximity to traffic signals.
- The analysis done using Synchro 7: the operations at the intersections were modelled.
- The 95th percentile queue length determined based on signal timing data and turning movement counts provided by the Region. The estimates of the different mitigation measures on queue length, such as implementing changes to signal timing, modifications to lane storage or the addition of a lane.
- Changes to signal timing or queue detection were not considered to be feasible if existing conditions on the cross street approaches to the same intersection indicated a failing level of Service (LOS F) and/or extensive queuing.
- Observations and identified mitigating measures
- Operations at the intersections were modelled using Synchro.
- Many of the solutions identified, such as access management and making adjustment to signal timing, are dependent on the signal timing frame and are viable alternatives to signal pre-emption.

The solutions discussed above are infeasible at these locations due to: the greater distance between the signals and the railway tracks; the greater uncertainty that the queue would be completely cleared prior to the arrival of the train; and the distance upstream that the advance warning would need to be placed to activate pre-emption at the traffic signals.

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This project has demonstrated how a road authority can: identify and prioritize signalized intersections using video footage gain insights into why queues are extending from traffic signals back to a set of railway tracks; and identify potential mitigating measures using Synchro 7.

The Region of York has been proactive in identifying and characterizing the issue of queues forming at signals that are close proximity to railway tracks. The TxtDOT worksheet (prepared by the Texas Department of Transportation) was used to determine if additional time is required for the traffic signal to move a stationary vehicle left of the railway tracks before the arrival of a train.

Many of the solutions identified, such as access management and making adjustment to signal timing, are dependent on the signal timing frame and are viable alternatives to signal pre-emption.

Queue pre-emption needs to be considered in the context of: distance between the signals and the railway tracks; the greater uncertainty that the queue would be completely cleared prior to the arrival of the train; and the distance upstream that the advance warning would need to be placed to activate pre-emption at the traffic signals.

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