METROLINX

THE ECONOMIC VALUE OF REGIONAL STRATEGIES TO IMPROVE TRANSPORTATION OUTCOMES:

MANAGED HIGHWAY LANE NETWORK AND TRANSIT USE ECONOMIC AND FINANCIAL PERSPECTIVE

Background Paper to the
Draft 2041 Regional Transportation Plan

Prepared for Metrolinx
by CPCS and David Kriger Consultants Inc.
2016

METROLINX
An agency of the Government of Ontario
Une agence du gouvernement de l'Ontario

THE ECONOMIC VALUE OF REGIONAL STRATEGIES TO IMPROVE TRANSPORTATION OUTCOMES

MANAGED HIGHWAY LANE NETWORK AND TRANSIT USE

ECONOMIC AND FINANCIAL PERSPECTIVE

FINAL REPORT

PREPARED BY

CPCS

IN ASSOCIATION WITH

DAVID KRIGER
TRANSPORTATION POLICY AND RESEARCH

DECEMBER 2016 (REV.)

TABLE OF CONTENTS

1.0 EXECUTIVE SUMMARY

Overview

This analysis investigates the potential economic value of a network of managed lanes on the Greater Toronto and Hamilton Area's (GTHA's) freeways. The investigation comprised a benefit-cost analysis (BCA) and a financial impact analysis. The investigation focused on the transit impacts of the managed lanes, thereby distinguishing itself from, and complementing, other managed lane impact analyses that are being conducted by the Ontario Ministry of Transportation (MTO). The analysis demonstrates how the transit benefits could add to benefits experienced by other managed lane users.

Key Findings

Many studies have examined the potential benefit of managed lanes for auto users. This focus is reasonable, given that auto users are the primary users of the highway network. At the same time, little is said about the benefits of managed lanes to other users, notably transit.

This study reviewed the potential benefits of several scenarios of managed lane networks for transit users on the GTHA's expressways. The study found clear benefits to transit users and operators of routes that currently use the expressways, because of reduced and more reliable journey times when general purpose lanes are converted to managed lanes. Moreover, some new riders likely would be attracted from other modes, mainly from the auto.

By design, the study looked only at transit, given the paucity of transit-focused analysis. Further analysis would be required to consider the impacts on transit benefits from the volumes of other traffic that would share the managed lane under different operational or tolling schemes.

An assessment of the infrastructure requirements for the different network scenarios was not within the scope of this study. Nonetheless, it is unlikely that the transit benefits alone could offset the annualized lifecycle costs of new managed lanes (construction, operations and maintenance), should new infrastructure be required. Accordingly, the transit benefits should be viewed as incremental benefits that should be added to those derived from other managed lane users, such as carpoolers in an HOV scheme or even single-occupant vehicles under a HOT lane regime. For newly constructed managed lanes, the benefits to transit users can add up to 16 basis points (+ 0.16) to the benefit-cost ratio for multi-user managed lanes, as long as these lanes are designed to support a high quality of transit service. As such, planners and policymakers should consider the potential benefits for transit users when making decisions regarding policies, investments, and facility design and operations related to managed lanes.

Definition of Scenarios

Four managed lane scenarios were examined:

- Scenario 1 includes a base scenario (existing and planned managed lanes, and the Highway 407 ETR), plus potential HOV / HOT initiatives being considered by MTO.

- Scenario 2 extends Scenario 1 to make continuous corridors, with managed lanes implemented at two strategic locations.
- Scenario 3 extends Scenario 2 to develop a continuous, circumferential managed lane network that provides suburb-to-suburb links, while connecting two key suburban employment growth clusters.
- Scenario 4 assumes a continuous managed lane system across the entire GTHA expressway network.

Approach

The analysis was based on estimates of transit travel time savings that could be gained through the implementation of managed lanes on the 400-series highways as well as the Don Valley Parkway and the Gardiner Expressway. These savings were derived from GPS-based travel time data that were provided by GO Transit from its buses. Specifically, achievable time savings were estimated by comparing actual travel speeds and target free-flow travel speeds. GO travel time data from the 2015 PanAm / Parapan Am Games temporary HOV lanes were used to calibrate projected time savings, specifically by accounting for the impacts of managed lane length and discontinuity by applying a merge penalty to reflect delays incurred by buses entering and leaving the lane from and to mixed traffic. The analysis differentiated travel time savings by time of day, thereby accounting for congested conditions.

By design, the scope of this analysis did not include carpooling, focusing instead on transit. Nor is this analysis intended to consider alternate structures and regimes for a managed lane structure, again by design and scope. However, the aforementioned GO Bus gains, on which this analysis is based, were observed in managed lanes that mostly were shared with HOV3+ vehicles. Further analysis, beyond the scope of this study, is required to assess the impacts of alternate managed lane structures on bus travel time savings (e.g., HOT versus HOV usage, or an HOV2+ regime, and so on).

GO Transit services make up the large majority of eligible bus routes. Where municipal transit agency data were not available, the GO-generated travel time savings and characteristics such as occupancies were also applied to the expressway portions of bus routes operated by municipal authorities (Brampton Transit, Mississauga Transit, TTC and York Region Transit).

The travel time estimates were applied to existing ridership and bus volumes on the eligible routes, in order to derive vehicle-hours and passenger-hours of savings. Population and employment forecast factors were used to generate ridership forecasts to 2031. In order to account for the potential attraction of the improved services, an elasticity of demand with respect to travel time was applied, using an elasticity value of 0.5, as derived from the literature.

Benefits and Costs

The benefits for each scenario were expressed in terms of travel time saved by transit passengers, accounting for both existing bus riders and new riders who are attracted from other modes to the improved transit service. Also taken into account were savings in operator costs and external benefits relating to decongestion, reductions in traffic accidents, reduced GHGs and reduced CAPs (where the external benefits arise from the diverted new riders who almost entirely formerly use personal autos). All benefits were monetized for input to the BCA, using values of time developed by Metrolinx. The BCA covered a fifteen-year period, from 2017 (the first year) through 2031.

It was recognized that some expressway sections and interchanges have significant geometric, structural or other existing constraints that limit the type of managed lane that actually could be implemented, or which in practical terms would preclude the introduction of a managed lane altogether. It also was recognized that some constraints could be addressed although only at a high, undetermined cost and/or at some undefined time in the future.

Because of the uncertain feasibility of many expressway segments, these geometric and structural constraints were set aside in order to develop meaningful scenarios for the BCA. Instead, the consultant developed high-level, per-kilometre "representative" capital and maintenance costs estimates, based on the available information. These estimates were deemed sufficient for the purpose of this analysis, while acknowledging that the estimates are generic and that detailed analyses would be required to support the implementation of a lane on any specific segment.

It should be noted that the scenarios were modelled on the basis of existing bus routes, adjusted for projected general population and employment growth. Note also that although most of the daily travel time benefits occur during the two commuter peak, a significant benefit does occur during the midday peak – i.e., the benefit is not just limited to commuter peak periods. Detailed projections of future bus route networks – for example, accounting for a potential shift from radial to circumferential bus routes accompanying the implementation of regional express rail – were not available for this study. Similarly, the elasticity of demand with respect to travel time is applied to current route configurations. Moreover, it is conceivable that the travel time savings could increase as highway and road congestion grows across the GTHA. Finally, it can be anticipated that GO Transit and other transit agencies may adjust their entire networks to make better use of corridors with managed lanes; however, such shifts are not modelled in this study. The study results may thus represent a conservative estimate of bus-associated benefits.

A financial case also was developed.

Conclusions

The benefits and costs are compared for each of the four scenarios in Table ES1 below. As noted, only transit benefits are considered (i.e., no benefits from other potential managed lane users, such as HOT single occupant vehicles or HOV multi-occupant vehicles), whereas the full annualized lifecycle costs are assessed, assuming new infrastructure is required. As a result, the benefit-cost ratio remains below 0.2 for each of the scenarios, although the benefit/cost ratio grows as the expansiveness of the network increases because of the "network benefits" associated with corridor continuity. This suggests that constructing a network of new managed lanes purely for bus-associated benefits would not be economically justified, and so the transit benefits are best viewed as an increment that should be added to those that would accrue from other users, such as carpoolers or HOT users. In this case, the benefits listed in the table below would supplement any other benefits to non-bus riders. Furthermore, the cost figures provided in the table apply to the case of new lane construction (i.e. roadway widening). If managed lanes are implemented in such a way as does not require new lane construction, the benefit-cost ratio may be more favourable to managed lanes, although such a scenario is not considered in this study and would have to take into account travel time impacts on other displaced users.

Table ES1: Benefits and Costs by Scenario

	Kilometres	NPV Benefits to 2016	NPV Costs to 2016	B/C Ratio
Scenario 1	352	$34,985,486	$281,474,635	0.12
Scenario 2	377	$40,672,552	$314,770,447	0.13
Scenario 3	545	$89,110,005	$534,851,816	0.16
Scenario 4	1,066	$203,604,524	$1,220,916,629	0.16

Note: Only transit benefits are considered, against full annualized lifecycle infrastructure costs.

Many studies that have examined the potential benefit of managed lanes have focused on the benefits for auto users. The usual focus on auto users is reasonable given that those users are the primary users of the road network. This study reviewed the potential benefits of a network of managed lanes for transit users in the GTHA and found that the benefits to transit users can add up to 16 basis points to the benefit-cost ratio. As such, planners and policymakers should consider the potential benefits for transit users when making decisions regarding policies, investments, and facility design and operations related to managed lanes.