

## **Appendix 1**

# **Problem Identification for MoT Business Cases**

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## Context

Different levels of planning are used to identify problems in the earliest phases of capital program development.

Strategic planning at the provincial level identifies highway corridor problems using system-wide information from sources such as the ministry's Collision Information System (CIS), formerly known as the Highway Accident System – (HAS). It identifies a vision for the highway corridor, outlines challenges, and considers investment strategies – not only construction strategies but also more detailed planning and design needed to improve our understanding of how to maintain and improve performance. Performance criteria have been identified for safety, mobility, and reliability.

The next level of planning is typically the “corridor management plan” (CMP) which further identifies and defines performance problems and develops improvement concepts at problem locations. Further planning work may address specific locations in order to better understand improvement options, costs, constraints and impacts. These levels of planning require business cases.

Performance criteria are used in all levels of planning work in order to show whether safety, mobility and reliability problems are significant enough to stand out from the typical performance to be expected for the type of highway under consideration.

## Data

The following data should be considered when identifying problems for a business case:

- most recent 3 year average collision rate for highway segment or location, and the critical collision rate
- listing of collision prone locations and collision prone sections
- past, current and projected directional traffic volumes
- health area population growth estimates, as a guide to forecasting future rural traffic volumes
- in larger urban areas, forecast future urban travel demand from a model such as Emme/2 if one exists
- vehicle classification (and in urban areas: occupancy counts)
- road closure statistics: hours of closure per year
- pavement quality index (PQI), load restriction status, equivalent standard axle load (ESAL) forecasts
- bridge condition index (BCI) and seismic retrofit classification
- peak hour average travel speeds along corridors between key activity centres
- signal locations and information on delay
- input parameters for capacity and level of service, where relevant
- truck climbing speeds and “percent following” for proposed passing and climbing lanes

## Performance Criteria

Performance information is required for the “base case” and the ‘proposed case” over the planning period.

Deficiencies can occur at different times according to different scenarios:

- they may exist now, and may worsen if no action is taken
- they may not exist now, but will appear before the planning horizon (typically 25 years) if no action is taken
- some improvement options may resolve some deficiencies but not other deficiencies
- some deficiencies may be resolved by an option but will re-appear before the horizon year

In each case, the timing and the severity of deficiencies need to be defined.

Performance criteria are listed in Table 1. Where a criterion is not relevant or applicable, this should be stated. Although pavement condition and bridge condition are not usually directly applicable to a business case for capital program funding because these aspects are typically funded by the rehabilitation program, they are included here because there are dependencies between the two programs. If it makes sense to do rehab work at the same time as capital work, any dependencies on non-capital budgets should be pointed out. For example, deferral of capital work may mean that rehab costs may be incurred which would otherwise not be incurred if capital improvements are made. In addition, there may be bridge replacement capital projects which rely upon bridge condition or seismic rating characteristics to form part of the business case.

### **Table 1: Performance Criteria: Problem Identification**

1. Customer service	<u>Deficiency Criteria</u> (also see notes below)
a. safety.....	> critical collision rate, and/or collision prone locations or sections exist
b. rural corridor mobility.....	Primary: <80 km/h, Secondary: <75 km/h
c. rural segment mobility .....	Outside of built-up areas: National Highway System: 90 km/h; other rural highways: < 85 km/h
d. rural passing mobility .....	> 60% following
e. rural climbing mobility.....	criteria for truck speed reduction, truck volumes & total volumes exceeded
f. urban corridor mobility.....	Primary: <70 km/h, Secondary: <40 km/h
g. urban segment mobility .....	<32 km/h
h. urban person movement .....	see notes below
i. reliability .....	>30 hours annual closure, & incident response time optimized
2. Infrastructure condition	
a. pavement condition .....	PQI < 6.4, and/or load restrictions exist
b. bridge condition.....	BCI rating > 3.0, and load restrictions < 57 tonnes
c. bridge seismic rating .....	per status in Bridge Seismic Retrofit Program

## **Notes Regarding Deficiency Criteria:**

### **Safety**

- To establish a deficiency, either the existing 3 year average collision rate must exceed the calculated critical collision rate, or collision prone locations & segments must be identified. The latter is available using MoT's Highway Accident System (HAS). HAS outputs should be augmented by information from local sources, such as MoT Districts, municipalities, police (see "Corridor Safety Analysis Guidelines").

### **General Notes on Mobility**

- A basic principle is to define the "design hour volume" (DHV) as a "regularly recurring peak" condition, rather than defining it as a single indicator such as the 30HV. For rural highways, it is assumed to be a summer weekday early afternoon hour. For urban highways, it is assumed to be a weekday late afternoon hour. The objective is to avoid choosing a DHV indicative of high demand which occurs relatively infrequently.
- All numerical speed values refer to the average travel speed occurring during the design hour. These should be measured for the existing case and forecast for all future cases. The corridor mobility indicators vary depending on whether the highway has been classified by MoT as primary or secondary in strategic function.
- For shorter trips along a specific urban highway segment, the benchmark is defined relative to the HCM level of service D/E. See below.

### **Rural Corridor Mobility**

- This indicator exists to avoid focusing only on the mobility issues specific to a location or highway segment, rather than on the overall corridor in which the location or segment occurs. The overall corridor average travel speed may be acceptable even though there may be congestion at locations or segments.
- The target of 80 km/hr is to be used for overall travel speed on primary highway corridors including urban areas.
- Existing peak hour average travel speed by direction, between key activity centres, is required.

### **Rural Segment Mobility**

- For the National Highway System, outside of built up areas on rural corridors the performance target is 90 km/hr.
- For other rural corridors, the LOS C/D interface is used as the criterion, since platooning and associated delays and safety problems tend to increase in LOS D. A rural 2 lane arterial at LOS C/D should provide an average travel speed of approximately 85 km/h. This can be adversely affected by specific geometric deficiencies as well as by volumes and vehicle classifications. If the observed average travel speed is less than 85 km/h, the business case should explain why.

### **Rural Passing Mobility**

- A deficiency is considered to occur when the calculated “percent following” exceeds 60% as measured by TRARR or equivalent tool. This figure equates to the LOS C/D interface.

### **Truck Climbing and Descending Mobility**

- The warrants for upgrade truck speed reduction (15 km/h for a 180 grams/watt “design truck” – the tables for this are in the TAC Geometric Design Guide), upgrade truck volume (>20 vph) and upgrade total volume (>200 vph) for a regularly recurring peak hour must be exceeded to establish a deficiency. Downgrade truck speed warrants use the same values. The difficulty lies in estimating actual truck downgrade speeds.

### **Urban Corridor Mobility**

- Existing and forecast peak hour average travel speeds by direction are required, within the segment of urban land use, per the above general notes on urban mobility.

### **Urban Segment Mobility**

- Any portion ("segment") of a primary or secondary highway urban corridor should deliver mobility performance consistent with the Highway Capacity Manual 2000 guidelines for a "principal arterial design category I" at LOS D/E (see pages 10-6 and 15-3). This is a target average travel speed of 32 km/hr. The problem definition aspect of the business case should explain why this target is not being met.

*Note on future conditions for signalized corridors:* The effects of all existing and likely future signalized intersections must be factored into the calculations for highway corridor and segment travel speeds.

**Note on urban intersections:** LOS worse than D/E for highway through-movements or off-movements can indicate a problem for which there may be cost-effective solutions. However the business case must show that fixing the problem would not result in the problem being moved elsewhere along the corridor. Overall intersection LOS is not appropriate as a performance indicator because it incorporates minor street (typically municipal street) LOS which may be problematic but are not generally seen as a provincial priority.

### **Reliability**

- A deficiency is considered to occur when road closures exceed 30 hours per year. Business cases should describe the causes, and impacts in terms of delay. Where information on the average response time to clear incidents is available (e.g. police, maintenance contractor) this should be included.

### **Pavement Condition**

- A deficiency is considered to occur when the pavement quality index (PQI) is less than 6.4, or if seasonal load restrictions exist. For the future case, it is important to discuss the pavement life expectancy, using forecast “equivalent standard axle load” (ESAL) data where possible.

### **Bridge Condition**

- A deficiency is considered to occur when the BCI rating exceeds 3.0, or if load restrictions exceed 57 tonnes.

### **Bridge Seismic Rating**

- Refer to the current Bridge Seismic Retrofit Program for details on seismic retrofit status.

### **Urban Person Movement**

- Peak hour person-movement should be calculated based on volumes and occupancies, by direction. There are currently no firm criteria on what constitutes a deficiency in person movement, but decision makers should be made aware of the status of this. The role and effectiveness of modes which are alternatives to the private passenger auto should be discussed.

### **Conclusions about the problems**

- Summarize the type(s) and magnitude(s) of problems which occur now and are expected to occur in future.
- If other types of existing or future problems are relevant to the “do minimum” scenario, these should also be commented upon (e.g. where an existing facility has environmental or social impacts which point to the need for a capital solution).