Guidelines for Preparing MoTI Business Cases

Appendix 1

Problem Identification for MoTI Business Cases

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Problem Identification: Context

Establishing that a performance problem exists is an important part of the overall justification behind a recommendation. Problem identification (PI) is the first of four steps which are at the core of the role of planning in the Ministry of Transportation and Infrastructure (MoTI). It is crucial that PI be done properly because it sets up the next three steps. This four step process guides capital program decision making and provides a foundation for design and construction. The other three steps are:

- Problem Definition: determining what is causing the performance problem(s)
- Option Development: generating and developing alternatives which address the causes of the problems
- Option Evaluation: assessing the costs, benefits, impacts, uncertainty and risks of the options through the use of multiple account evaluation (MAE)

PI confirms whether highway locations and sections are performing poorly using technical criteria. MoTI carries out PI in various ways:

- through its System Level Performance Analysis (SLPA)
- by doing corridor management plans
- by focusing on specific highway locations and sections (project planning)

System Level Performance Analysis

The SLPA is an internally produced system-wide assessment of safety and mobility problems on B.C. provincial highways. MoTI's approach:

- Safety: The Collision Information System (CIS) is used to identify collision prone locations (CPL's) and collision prone sections (CPS's) based on specific collision rate, frequency and severity criteria.
- Rural mobility: Poor mobility on rural highways is identified where Percent Following is greater than 60% in a regularly recurring design hour, or where up-grade and down-grade truck speeds are poor in combination with specific volumes of trucks and total vehicles.
- Urban mobility: Evidence of severe recurring congestion and/or bottlenecks indicate poor urban mobility. This measure is currently being reviewed by MoTI.

Lists of CPL's and CPS's indicate safety problems, but the SLPA does not include problem definition, option development or option evaluation. The SLPA lists of rural mobility problems go further because they point to a specific cause of problems (lack of passing opportunity) and therefore to potential solutions (passing lanes, climbing lanes and 4-laning).

The SLPA is updated periodically and it is a good source of guidance for MoTI regional staff on where to focus project planning activity.

Performance Criteria

Performance information is required for the "base case" during problem identification. Performance criteria are listed in Table 1. The business case should include other measures if deemed relevant, along with a rationale.

Table 1: Performance Criteria: Problem Identification (refer also to the notes below)

1.	Customer service	Deficiency Criteria (see notes below)
a.	safety	collision prone locations or sections exist
b.	rural passing mobility	more than 60% following
c.	rural climbing mobility	MoTI criteria for truck speed reduction, truck volumes & total volumes are exceeded
d.	urban mobility	MoTI criteria (under development) are exceeded
e.	reliability	significant history of road closures (see page 4)

Notes Regarding Deficiency Criteria:

Safety

There are a number of valid methods for identifying collision prone sites. See section 1 of MoTI's "CMP and Project Level In-Service Road Safety Review Guidelines":

http://www.th.gov.bc.ca/publications/planning/Guidelines/CMP_Safety_Review_Guidelines_Nov2010.pdf

One method is to use collision data and collision prediction models along with the Empirical Bayes refinement method.

A second method is to use collision data and threshold criteria for collision rate, severity, and frequency. The following 2 criteria are typically used – only one criterion need be satisfied for a site to be considered collision prone.

1. Collision Rate $\geq$ Critical Collision Rate AND Collision Frequency $\geq$ 3 Collisions/Year
2. Collision Severity Ratio $\geq$ Provincial Average Collision Severity Ratio AND Collision Frequency $\geq$ 3 Collisions/Year

A third method is a drive through safety review carried out by highway safety experts and local highway and police representatives.

MoTI's system level safety performance analysis uses the Collision Information System and the 2 deficiency criteria above to identify and rank CPLs and CPSs throughout the provincial numbered highway system. These sites represent the worst performers, but should generally be thought of as sites that show good potential for safety improvement subject to a more detailed investigation, rather than just poor performers. MoTI planning staff can provide info on system level safety performance problems.

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.
- The average travel speed occurring during the design hour should be estimated for the current and future time periods.

Rural Passing Mobility

- A deficiency is considered to occur when the "percent following" exceeds 60% as measured in the field or as calculated by TRARR or an equivalent tool. This figure equates to the LOS C/D interface. MoTI planning staff can provide info on system level rural mobility problems.

Truck Climbing and Descending Mobility

- For a regularly recurring peak hour, warrants must be exceeded to establish a deficiency. 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. Upgrade total volume: >200 vph. Downgrade truck speed warrants use the same values. It may be difficult to estimate actual truck downgrade speeds.

Urban Mobility

- Mobility on provincial urban corridors is a function of travel demand. Demand patterns and timing are affected by land uses, demographics, the economy, the availability and quality of alternate routes, and other factors. Speeds and flows are affected by the level of demand in relation to highway capacity.
- Actual field data is required for problem identification of current conditions. Static and dynamic urban travel demand models may be suitable for estimating future mobility, if they have been appropriately set up, calibrated and validated. This needs to be documented in the business case.
- MoTI is assessing GPS-based proprietary traffic monitoring databases as a means of tracking average speeds on provincial urban highway corridors. This data has good potential to provide information on existing performance for use in business cases, as an alternative to costly data collection in the field.
- Urban intersections having LOS worse than D/E for highway through-movements or off-movements can indicate a problem for which there may be cost-effective solutions. Overall intersection LOS is often inappropriate as a performance indicator because MoTI places a higher priority on flow along the urban highway, and a lower priority on municipal street through movements and left turns. It may be appropriate to calculate multimodal level of service (2010 Highway Capacity Manual).

- One or more intersections (or interchanges) downstream of a problem location may be constraining its performance. The business case should provide appropriate context regarding conditions both upstream and downstream of a problem location. The option evaluation step of a business case must show and account for whether an option results in the problem being moved elsewhere along the corridor.

Reliability: This term can refer to two things. Both are aspects of mobility:

1. The consistency of travel time for any particular trip, mainly in the context of recurring and non-recurring urban and suburban traffic congestion. MoTI has no specific PI criteria for this.

2. The effect of planned and unplanned closures on the availability of the highway. Reasons for planned closures include construction activity and avalanche mitigation. Reasons for unplanned closures include vehicle collisions and natural hazards, e.g. floods, fires, avalanches, landslides. MoTI should be contacted for available information on closures tracked over time.

Data

Data which should be considered when identifying problems includes but is not limited to:

- most recent 3 to 5 years of collision data for highway segment or location, and the provincial average collision rate table
- CPL's and CPS's as determined through the use of the CIS
- past, current and projected directional traffic volumes from MoTI and other sources
- demographic data as a guide to forecasting future travel demand
- in urban areas, static travel demand models (e.g. Emme/2, TransCAD), dynamic mesoscopic simulation models (e.g Dynameq) and dynamic microsimulation models (e.g. Synchro, Paramics, Vissim) outputs can help to show current and future year performance if the models have been diligently set up, calibrated and validated
- GPS-based traffic monitoring databases such as Tom Tom (proprietary data) or Translink's database for certain routes in Metro Vancouver
- vehicle classification (and in urban areas, occupancy)
- free flow and peak hour travel speeds along corridors between key activity centres
- Highway Capacity Manual (HCM) input parameters for capacity and level of service
- truck climbing speeds and "percent following" for proposed passing and climbing lanes

Pavement condition and bridge condition determine the timing of rehabilitation, which is accounted for in benefit-cost analysis. Ideally capital projects are programmed when the existing infrastructure is nearing the end of its useful life. Condition info may be useful to see if capital investment can be timed when rehab is needed, to maximize value for money. It may also be useful to see if there is an opportunity to do nearby rehab work at the same time as the capital work, to take advantage of a contractor being in the area (reduced mobilization costs and possibly better unit prices through economies of scale).

Supporting data from MoTI's pavement management and/or bridge condition and seismic rating systems could be included:

- pavement quality index (PQI), pavement age and any restrictions
- bridge condition index (BCI), BAS II index, bridge age, seismic retrofit classification, and any restrictions

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