DESIGN BULLETIN #86/2015 (Revised Nov 2018)

Benefit Cost Model and User Guide

November 2018: Release of the Alberta Transportation Benefit Cost Model Version 20181002
- Added Cheat Sheet to assist with use of Excel spreadsheet
- Updated Calibration factor for Texas Method
- Added unprotected model
- Added training materials including presentation and example files

February 2017: Release of the Alberta Transportation Benefit Cost Model and User Guide Version 2
- Removed Scenarios 2 and 3
- Updated description of terminology and combined under one section – Glossary
- Removed RehabCosts tab and changed to manual user input in each ProjectCostsAlt# tab
- Removed Original Project Age / New Project Age in Alt# tabs
- Added Delay (Time Loss) Costs – applicable to Project Type: Intersection (new or upgrade)
- Removed Salvage Value – no longer considered in calculation
- Removed Cost Increase Rate from Specified Maintenance – cost increases with traffic growth rate only
- Inserted example on emission cost calculation

Summary

This Bulletin is issued to inform designers, planners, consultants and other staff working for Alberta Transportation that the department has implemented a new benefit cost model. This Benefit Cost Model and accompanying User Guide are being issued as the Department's updated method of performing benefit cost analysis on transportation construction projects, practices and select programs as required. Benefit cost analysis evaluates changes in benefits and costs over time arising from an investment in one or several alternatives, as compared to a 'do minimum' (status quo) option. When an analysis shows that benefits exceed costs, a number of economic indicators can be generated to quantify how beneficial the investment is. Benefit cost analysis can be used with other information to select which alternative among competing alternatives is the most beneficial, and to compare the long-term economic effects of improvements that may accomplish different objectives. This analysis method can also be used to compare projects and to compare programs based on economic considerations.

Use of Alberta Transportation Benefit Cost Model and Excel Spreadsheet.

On projects where options involving significant differences in potential user costs (e.g. collision costs, vehicle operating costs, user time costs) are being considered, an economic analysis can be used as a tool to support decision making on option selection (see Highway Geometric Design Guide Chapter A.13). While the use of the department's Benefit Cost Model tool is not mandated for this purpose, principles and mandated parameters as stated in the Benefit Cost Model and associated user guide

(http://www.transportation.alberta.ca/5847.htm) are to be used (see HGDG A.13). The Benefit Cost Model has been designed to efficiently and consistently handle many of the scenarios associated with infrastructure projects. As such, use of the model is encouraged for this purpose. Note that department staff may use the model when reviewing economic analysis submitted by a project consultant.

Submission of a filled in Benefit Cost Model spreadsheet is not considered a deliverable for an infrastructure project. Economic analysis results should be addressed within the engineering design reports. However, there may be cases where it is beneficial to interact with department staff when finalizing the economic analysis, particularly during the initial implementations of this tool on projects. For this purpose, it may be desirable to use and share the "protected" version of the Benefit Cost Model with project related inputs with department staff to confirm that the required approach is being followed as intended. Use of the "protected" version will ensure that only project inputs have been changed. An "unprotected" version of the spreadsheet is available and may be used to gain a better understanding of the tool or to customize certain elements if justified for a particular purpose.

Applicable Files
- Alberta Transportation Benefit Cost Model – ATBenefitCostModelV20181120protected.xlsx
- Alberta Transportation Benefit Cost Model – ATBenefitCostModelV20181120unprotected.xlsx
- Alberta Transportation Benefit Cost Model Training Material (presentation and example files)
- Alberta Transportation Benefit Cost Model User Guide – ATBCMUserGuideV2.pdf

Key Points
- The User Guide gives an overview of the model, explains how to work with the model, how to complete an analysis, how to interpret the results, and how to input project-specific values. The Model allows the user to enter information where required; otherwise the cells are locked to avoid accidental alteration of a formula. However, the formulas remain visible to the user.
- The analysis components include: Initial Construction Project Costs (Capital Investment), Operating and Maintenance Costs, Rehabilitation Costs, Road User Costs (vehicle operating costs, travel time costs, collision costs), and Environmental Costs.
- Analysis of up to three Alternatives (including a 'Do Minimum' Alternative).The analysis timeframe is user-defined, up to a maximum of 80 years. Future traffic growth is predicted by the model based on a user-selected rate and driver.
- Sensitivity analysis of each Alternative, where the user may vary the discount rate, capital costs, operating and maintenance costs, road user costs and emission costs. The "standard" annual discount rate currently used in the model is 4% which is considered appropriate for Alberta government projects. This value is set by the Government of Alberta.

- Contains flexible, user-defined categories, such as: project definition, construction cost, construction period, operating and maintenance cost, and vehicle definition.
- Vehicle Operating Costs can be calculated in one of two ways:
    - California (Fuel & Non-Fuel) Approach: utilizes average fuel costs (liter/100 km) and non-fuel vehicle operating costs ($/km) by vehicle type to estimate vehicle running costs. It is recommended the California (Fuel & Non-Fuel) approach be used for all projects unless the curvature or gradient varies significantly between alternatives, in which case the Texas (Curvature & Gradient) approach would be used.
    - Texas (Curvature & Gradient) Approach: utilizes gradient and curvature cost factors (the same factors as those in the Alberta Transportation 1991 model, but the factors have been updated to reflect current values based on the Transportation Price Index from 1998 to 2012). This approach should only be used when the curvature/gradient vary significantly between alternatives.
- Results of the Benefit Cost Analysis include: Internal Rate of Return (IRR), Payback Period, Net Present Value (NPV), Benefit Cost Ratio, and NPV / investment cost ratio.
- All sources of information are outlined in the appendix of the user guide and numerical details are provided in the spreadsheet.
- Alberta data was used where available.

For reference, the Department's previous benefit cost analysis user guide (published in 1991 by Alberta Transportation and Utilities) is available on the Department's website.

Effective Date
Version 1:   April 8, 2015
Version 2:   February 3, 2017
Version 20181002: November 20, 2018

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Attachments
- Alberta Transportation Benefit Cost Model: ATBenefitCostModelV20181120protected.xlsx
- Alberta Transportation Benefit Cost Model: ATBenefitCostModelV20181120unprotected.xlsx
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- Alberta Transportation Benefit Cost Model User Guide: ATBCMUserGuideV2.pdf

Recommended: Approved:

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