

# Summary of the Proposed Guidance for the use of Alternative Tools in the 2010 HCM

This document summarizes the organization of the proposed guidance for the use of alternative tools to be presented in the 2010 edition of the HCM. The proposed 2010 HCM structure involves a set of three separately bound volumes and a fourth volume that will be entirely electronic. The manner in which the guidance material will fit into the 2010 HCM is illustrated in Attachment 1 at the end of this document.

## Volume 1: Concepts

As the title suggests, this volume will deal with traffic analysis concepts as they relate to the HCM. It will be a bound volume, as opposed to a loose-leaf format to provide an enduring and authoritative reference. There will be nine chapters. The following chapters will contain material on alternative tools:

### Chapter 6: Analysis Tools

Among other things, this chapter will contain most of the general guidance developed by NCHRP Project 3-85 on the use of alternative tools. Topics include:

- *Appropriate use of Alternative Tools*: Presents a detailed list of conditions under which it might be appropriate to apply alternative tools in addition to or instead of the HCM.
- *Application Framework for Alternative Tools*: This is a new section that recognizes the fact that alternative tools have been used for many years to provide decision support and that not all of their applications have any particular requirement for HCM compatibility. Therefore HCM compatibility is not a universal requirement or desire. The guidance is addressed specifically to analysts who are seeking some degree of compatibility with the HCM procedures through the use of alternative tools.
- *Application Guidelines for Simulation Tools*: Based on a highly abridged version of the general simulation guidelines presented in the Traffic Analysis Toolbox and other references.

### Chapter 7: Interpreting and Presenting Results

Among other things, this chapter will contain the following additional guidance topics from NCHRP Project 3-85:

- *Performance Measures from Alternative Tools*: Based on the work on performance measures from alternative tools performed by Dowling [2]. This material will be augmented by the project findings.
- *Use of Vehicle Trajectory Analysis in Comparing Performance Measures*: We have revised this section substantially in response to Panel comments. The trajectory-based definitions of delay have been presented in more detail and each of the determinants of delay has been discussed. We have de-emphasized the simplistic HCM definition and have reoriented it to emphasize the fact that it creates a delay definition that other tools should strive to replicate.
- *Stochastic Aspects of Simulation Analysis*: In response to a Committee resolution to the effect that the 2010 Highway Capacity Manual should include a discussion of the randomness inherent in the results of traffic simulation models and recommendations for dealing with this aspect of traffic simulation.

### Chapter 9: Glossary & Symbols

Some terms related to alternative tools will be added to the glossary

## Volume 2: Uninterrupted Flow and Volume 3: Interrupted Flow

These two volumes will be published in loose-leaf format. Together they will cover the material presented in Part III of the HCM 2000. Each facility (e.g., signalized intersections) will be covered in a separate chapter. Each procedural chapter with potential applications for alternative tools will contain a section (probably close to the end of the chapter) with the heading “*Guidance for the Use of Alternative Traffic Analysis Tools.*” This section will present succinct guidance, with liberal references to other documents such as the final report, the *Toolbox*, etc. The organization of the material will be the same for all procedural chapters and will conform to the following outline insofar as practical. The alternative tool guidance for each procedural chapter has been developed around the following outline:

## **Strengths of the HCM Procedure**

The section starts by explaining the strong points of the HCM procedure that justify its use as the default traffic analysis tool.

## **Limitations of the HCM Procedures that Might Be Addressed by Alternative Tools**

Each chapter will contain a table describing the identified limitations of the HCM procedure and an assessment of the potential of alternative tools to overcome these limitations. Follow up narrative will identify the most common types of applications in which alternative tools are typically employed

## **Additional Features and Performance Measures Available from Alternative Tools**

Alternative tools typically report a more comprehensive set of performance measures than the HCM procedures. The additional measures for each chapter will be described in this section.

## **Development of HCM-Compatible Performance Measures Using Alternative Tools**

In some cases the performance measures produced by alternative tools are based on different definitions than those with similar terminology in the HCM. Guidance will be given here on how to recognize the differences and what, if any adjustments can be made to improve compatibility. When direct comparison with HCM-based measures is not meaningful, guidance will be provided on how the alternative tools can be used to produce relative measures that may be used to compare alternative design treatments. The basic experiments carried out under the NCHRP project will be the main source of information for this material.

## **Conceptual Differences between the HCM and Simulation Modeling that Preclude Direct Comparison of Results**

Even when the HCM performance measure definitions are compatible with those of an alternative tool, direct comparisons may still not be meaningful because differences in the computational methodology may be expected to lead to different results. For example, random arrivals at a signalized intersection are treated entirely differently by analytical and simulation tools. Most analysts are unaware of the difference and are at a loss to explain why HCM delays can differ considerably from simulated delays with the same input data. The literature is full of studies that have found such inexplicable differences. The basic experiments carried out under this project will also be the main source of information for this material.

## **Adjustment of Simulation Parameters to the HCM Parameters**

Some adjustments will generally be required before an alternative tool can be used effectively to supplement or replace an HCM procedure. For example, the parameters that determine the capacity of a signalized approach (e.g., steady state headway and startup lost time) should be adjusted to ensure that the simulated approach capacities match the HCM values. One exception to this rule is the case when HCM limitations prevent credible computations of capacity (e.g., short turn lane spillover).

This section should indicate for each chapter the most important simulation parameters that should be fine tuned to put alternative tools on a “level playing field” with the HCM.

## **Step by Step Instructions for Applying Alternative Tools**

Many of the steps required to conduct highway capacity analyses with alternative tools are common to all procedural chapters and will therefore be covered in the “Application Framework” section of the General Guidance. Steps that are specific to a particular chapter will be covered here.

## **Sample Calculations Illustrating Alternative Tool Applications**

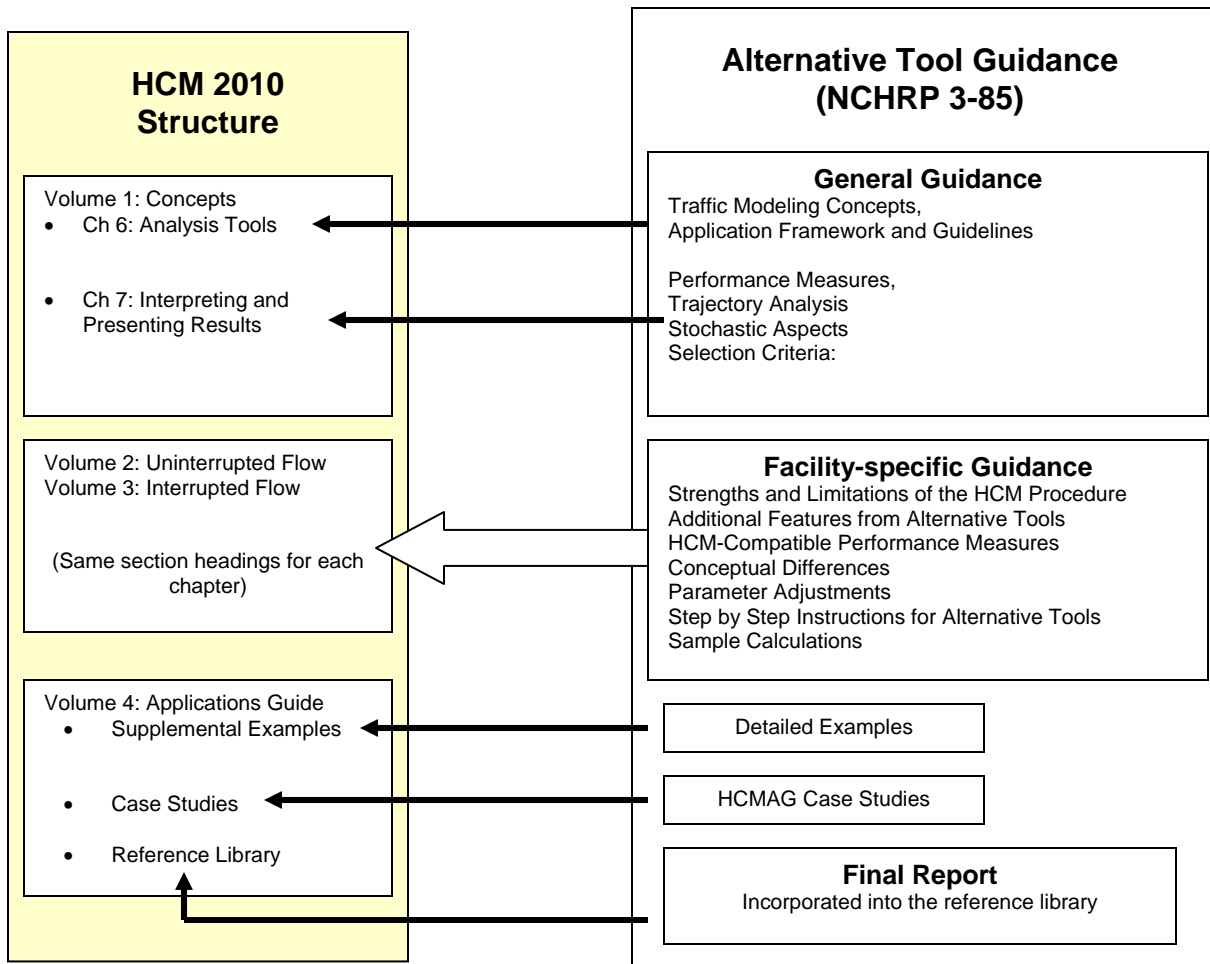
Sample calculations from the HCM 2000 will be used to illustrate the use of alternative tools. In their current form, all of the sample calculations demonstrate appropriate uses of the HCM procedures. The use alternative tools will be demonstrated by introducing conditions that exceed HCM limitations.

The sample calculations are intended to illustrate the proper use of alternative tools. Therefore they will adhere to the principles and other guidance presented earlier in this section. Each of the sample calculations will begin with a determination of the necessity to use an alternative tool, based on an identified limitation of the HCM procedure. Each case may, where appropriate, include a discussion of common “workarounds” (i.e., planning approximations) that have been used to extend the HCM procedures beyond their limitations. Note, however, that the development of such workarounds is not within the scope of NCHRP project 3-85.

### Volume 4: Applications Guide

The introduction of Volume 4 as a virtual document represents a significant departure from previous editions of the HCM. This recommendation was made in recognition of the growth in the body of knowledge, and the size limitations of a paper document. Volume 4 will contain three parts:

1. Supplemental examples that are too detailed to include in the procedural chapters of Volumes 2 and 3. Many of these examples will demonstrate the use of simulation tools to overcome limitations of the HCM procedures.
2. The case studies currently presented in the Highway Capacity Manual Applications Guide (HCMAG), supplemented by a simulation based case study prepared by NCHRP Project 3-85.
3. A reference library containing works related to the general subject of highway capacity analysis. The final report for NCHRP Project 3-85 will be included in the reference library.



**Attachment 1: NCHRP Project 3-85 alternative tool guidance in the 2010 HCM**