

User's Guide for the COG/TPB Travel Forecasting Model, Version 2.3, Build 52

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Overview

- Structure of the new user's guide and its availability
- Updates to the user's guide
 - ▣ Chapters 1-10: Overview, background chapters
 - ▣ Chapters 11-23: Detailed modeling steps
- Conclusions



User's guide is now broken into two volumes

1. Main report
 - ▣ Including Appendix A (flowcharts)
2. Appendices
 - ▣ Appendix B (Batch Files)
 - ▣ Appendix C (Cube Voyager Scripts)
 - ▣ Appendix D (AEMS Control Files)



Availability

- Paper copies distributed at today's meeting
 - We have made 25 paper copies of the report and 5 copies of the appendices
- Electronic copies
 - The user's guide (both volumes) and other documents for the Ver. 2.3.52 model, such as the calibration report and validation memo, can be found on the "Model Documentation" page of COG's website, which was updated on 9/18/13 (<http://www.mwcog.org/transportation/activities/models/documentation.asp>)
 - Since the Ver. 2.3.52 model has already been transmitted to several parties prior to the availability of the user's guide, we will e-mail a link to the new user's guide to those who have already received the model



Website divided into 2 pages & updated:

www.mwcog.org/transportation/activities/models/documentation.asp

www.mwcog.org/transportation/activities/models/datarequests.asp

Model Documentation

Preface

COG/TPB staff develops and maintains, with some consultant assistance, a series of regional travel demand models that are used for the regional transportation planning process in the Washington, D.C. area. These regional travel demand models are developed under the guidance of the Travel Forecasting Subcommittee (TFS), which is a subcommittee of TPB's Technical Committee. At any given time, the COG/TPB staff maintains at least two regional travel demand models: an **adopted, production-use** model and a **developmental** model. The production-use model is the one that is used planning studies conducted by COG/TPB and is [made available to outside parties for their use](#). The developmental model is the one that is currently under development by COG/TPB staff, and is generally not made available to outside parties. Each major change or revision to the model is referred to as a "build"; and is often indicated as the third index in the model version number, e.g., build X of the Version 2.3 Travel Model can be called Version 2.3.X.

Currently Adopted Travel Model

The currently adopted, production-use regional travel model for the Washington, D.C. metropolitan area is the TPB Version 2.3 Travel Model, Build 52, also known as the Version 2.3.52 Travel Model. This model became the adopted travel model on July 17, 2013, when the TPB took the following two actions:

- [TPB Resolution R1-2014](#): Approved the air quality conformity (AQC) analysis of the 2013 Constrained Long-Range Transportation Plan (CLRP) and the FY 2013-2018 Transportation Improvement Plan (TIP)
- [TPB Resolution R2-2014](#): Approved the 2013 CLRP.

The TPB Version 2.3 Travel Model was calibrated to year-2007 conditions in 2012, and this work was documented in the following **calibration report**:

- [Calibration Report for the TPB Travel Forecasting Model, Version 2.3, on the 3,722-Zone Area System](#). Final Report. Washington, D.C.: National Capital Region Transportation Planning Board, January 20, 2012.

In 2013, the Version 2.3 Travel Model was validated to year-2010 conditions. Updates to the model resulting from this validation work were part of Build 52. The **model validation** effort was documented in the following **memo**:

Data Requests

To request a copy of the regional [travel demand model](#), various data sets, and/or documentation not found on the MWCOC website, please submit either an e-mail or a signed letter to the departmental director:

[Ronald F. Kirby](#)

Director, Department of Transportation Planning
Metropolitan Washington Council of Governments
777 North Capitol Street, NE
Suite 300
Washington, DC 20002

The e-mail/letter should be as specific as possible regarding what model version, data, and/or documentation is requested. **The e-mail/letter should also indicate how you intend to use the data/model, naming the specific study or research project, if applicable.** This will help ensure that we give you the most appropriate model or data.

COG/TPB staff will respond to your request detailing what can be provided, on what timeline and at what cost. Items that are deemed "off-the-shelf" will be sent at a minimal charge to cover shipping and handling. Custom requests will be priced according to staff time needed for preparation of the data or model.

Notes:

1. Running the travel demand model requires the use a proprietary software package that is produced, licensed, and marketed by Citilabs (e.g., TP+, Cube Voyager, and/or Cube Base). COG/TPB staff cannot provide this software.
2. We do not have the resources to staff a "help desk" for the regional travel model, so it is expected that requesters of the travel model will have the knowledge and skills to use the model with minimal assistance from the TPB staff.
3. It is the TPB staff policy to transmit only adopted travel models and adopted land activity forecasts, i.e., which have been used in a regional Air Quality Conformity Determination that has been approved by the TPB. Thus, we do not transmit developmental travel models or land activity forecasts.
4. The latest travel model that is available for release to the public is [Build 52 of the TPB Version 2.3 Travel Model](#). The latest model inputs that are available for release to the public are the Round 8.2 Cooperative Forecasts and



Updates to the new user's guide

- 23 chapters (vs. 14, before)
- New guide is more straightforward and more complete
- Chapter 1: Introduction
 - Includes a history of the Ver. 2.3 model (from 2008 to 2013)
 - Includes list of recent changes to the Ver. 2.3 model (from Build 39 to Build 52)
 - Changes related to model validation
 - Changes related to parallelization
 - Misc. changes, such as more consistent naming of output files, which saves disk space by facilitating the cleanup of “temp” files



Updates to the new user's guide

- Chapter 2: Overview of the model
 - ▣ Added discussion of differences between microscopic, mesoscopic, and macroscopic traffic assignment
 - Although our model uses and has always used a macroscopic traffic assignment process, we often get questions about this issue
 - ▣ Added a conceptual figure showing major inputs and outputs to the model (Figure 1), which differentiates between
 - Fine-grained output from the model that has not been validated (e.g., link-level volumes)
 - Aggregations of the output that have been validated (e.g., screenline volumes)



Updates to the new user's guide

- Chapter 2: Overview of the model
 - Added a description about land use forecasts done at COG, including why COG does not use a land use model
 - Added a description about the CTPP-based employment adjustment, which ensures that a consistent employment definition is used by all counties and jurisdictions in the modeled area
 - Building upon the figure mentioned earlier, added a section about model outputs, including advice about which outputs can be used with confidence, and which output should not be used or used only with caution



Updates to the new user's guide

- Chapter 2: Overview of the model
 - ▣ Diagram of the major steps of the Ver. 2.3 model has been revised to show transit assignment
 - Although transit assignment was part of the earlier Ver. 2.3 model, this step had been mistakenly left out of the figure
 - ▣ Added a discussion about the new “progressive” relative gap stopping criterion for user equilibrium traffic assignment
 - ▣ Revised the section dealing with “special modeling procedures”
 - Transit (Metrorail) constraint through the regional core
 - Modeling HOT lanes



Updates to the new user's guide

- Chapter 3: Hardware and software requirements
 - ▣ Revised and updated
- Chapter 4: Mechanics of the model application process
 - ▣ Revised and updated, including new table of input files (Table 6)
 - ▣ Updated tables listing batch files that comprise the model
- Chapter 5: Preparing to run the model
 - ▣ Discusses how to install all needed software, including updating Windows PATH environment variable



Updates to the new user's guide

- Chapter 6: Running the model
 - Completely revised and simplified
 - Includes a table (Table 10) showing which environment variables are used for various modeling steps, such as the transit constraint and HOV3+ skim substitution (for modeling HOT lanes)
 - Includes examples of the “run model steps” batch files, including highlighting places where changes occur in each batch file



Updates to the new user's guide

- Chapter 7: Summarizing model output and other utilities
 - ▣ No major updates, but there was one oversight in this chapter we hope to include in a future update to the guide
 - We had meant to include two new summary scripts developed by Dusan Vuksan and Feng Xie:
 - COMPARE_NL_MC_Expanded_Alt_minus_Base_V23_52.S
 - Compares two scenarios developed with V2.3.52
 - COMPARE_NL_MC_Expanded_Alt_V23_52_minus_Base_V23_39.S
 - Compares alternative developed with V2.3.52 and base developed with V.2.3.39



Updates to the new user's guide

- Chapter 8: Use of parallel processing to reduce model run times
 - This is a new chapter discussing the three ways that parallelization is now used in the model to reduce run times
 - Includes a section describing terminology used with parallel processing and distributed processing (Sec. 8.2.1)
 - Discusses the effect of Cube Cluster on modeled results



Updates to the new user's guide

- Chapter 8: Use of parallel processing to reduce model run times
 - Includes a new table showing the number of cores used in each parallelized model step
 - Includes a new table showing how to change batch files to run on **computers with fewer than 8 cores**
 - Added detailed description of how Cube Cluster (both IDP and MDP) are used in highway assignment



Updates to the new user's guide

- Chapter 9: Debugging cases where the model run stops prematurely or crashes
- Chapter 10: Known issues related to running the model
- Chapters 11 – 23 cover the various modeling steps, from network building through transit assignment
 - Updated all relevant tables with new convention for consistent output file names
 - Other more specific updates to these chapters are discussed on the next slides



Chapter 12: Highway Skim File Development

- Clarified how tolls on variably priced highway facilities are treated in mode choice and trip distribution
 - Due to the potential for future-year tolls on variably priced highway facilities to be overly large, these tolls are not considered by the mode choice model as a monetary value
 - Instead, tolls on variably priced facilities are expressed as equivalent minutes that are added to the highway time
 - Consequently, two sets of SOV and HOV skim files are created
 - One in which all toll facility costs are skimmed (<ITER>_AM_SOV.SKM) and
 - One in which the toll skims reflect base-year toll facilities only, and the time skims reflect highway times and tolls converted to equivalent time (<ITER>_AM_SOV_MC.SKM).
 - The former is used as an input to the trip distribution model and the latter is used as an input to mode choice



Chapters 15-18

- Chapter 15: Transit Skim File Development
 - ▣ Added a section discussing how local bus speeds are degraded over time, based on future road congestion, including the rationale for doing this adjustment on a regional level, not a link level.
- Chapter 16: Transit Fare Development
 - ▣ The “application details” section now includes more information
- Chapters 17 (“Demographic Submodels”), 18 (“Trip Generation”), & 19 (“Trip Distribution”) have been described in greater detail than before



Chapter 20: Mode choice

- A new section (20.4) has been added discussing market segmentation:
 - ▣ Household income
 - ▣ Geography
 - ▣ Access to transit
- Although the first two categories are discussed in the calibration report, the third category (“access to transit”) has never been discussed in previous COG/TPB model documentation
- It includes a discussion of
 - ▣ FTA’s “can walk,” “must drive,” and “no transit” access segment
 - ▣ The seven transit access markets used in the Ver. 2.3 model



Chapter 22: Traffic assignment

- Chapter has been completely revised, discussing
 - ▣ Progressive relative gap
 - ▣ Two-step assignment to address HOV modeling
- The chapter on parallelization (Chapter 8) also discusses traffic assignment



Transit assignment and summary

- Chap. 23: Transit assignment
 - ▣ Completely revised, including two new figures (Figs 27 & 28) which help one understand naming conventions used for transit volumes (also useful for reading LineSum reports)
- Chapter 24: Transit assignment summary (LineSum)
 - ▣ Revised to deal with new version of LineSum
 - Was Ver. 1.8
 - Now Ver. 5.0.7 (based on TRANSIMS libraries)



Conclusion

- The new user's guide includes more information than the previous user's guide
- But we believe it is presented in a more straightforward manner, which should facilitate the use of the travel model
- We welcome your feedback, so that future releases will be even better



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 - ▣ Mark Moran, mmoran@mwkog.org
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