Item #3

TPB staff review of six years of consultant recommendations from the ongoing consultant assistance project for models development

Presentation to the Travel Forecasting Subcommittee
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Metropolitan Washington Council of Governments (COG)

Introduction

- Since FY 2006, TPB staff has maintained a consultant-assisted project to evaluate the travel forecasting practices used by the TPB in the Metropolitan Washington region
- Objectives
  - To ensure that the TPB's modeling methods are in line with the practices of other MPOs;
  - To provide guidance and advice in the area of travel demand modeling

Introduction, 2

- Project contract designed to operate on a fiscal-year basis and to be renewable for up to two additional fiscal years
  - FY 2006-08: Vanasse Hangen Brustlin, Inc. (VHB)
  - FY 2009-11: Cambridge Systematics, Inc. (CS)
- Current consultant
  - FY 2012: AECOM

Introduction, 3

- Seven reports have been released during the first six years
  - Vanasse Hangen Brustlin, Inc. (VHB):
    - Results of FY 2006 Travel Forecasting Research (2006)
    - Results of FY 2007 Travel Forecasting Research (2007)
    - Expanded Evaluation of Peak Spreading (2008a)
    - Estimating the Impact of Exurban Commuters on Travel Demand (2008b)
  - Cambridge Systematics, Inc. (CS):
    - Fiscal Year 2009 Task Reports, Final Report (2009)
    - Fiscal Year 2010 Task Reports, Final Report (2010)
    - Fiscal Year 2011 Task Reports, Final Report (2011)
- Available at:
  - www.mwcog.org/transportation/activities/models/review.asp

Introduction, 4

- Findings and recommendations from these reports have been instrumental in guiding the TPB models development program
- In some cases, we have implemented the consultant recommendations; in other cases, we have not.
- However, **up to now, we have not issued a formal report documenting the TPB staff response** to the consultant recommendations
- **Hence, the new draft report being presented to you today**:
  - *TPB staff review of six years of consultant recommendations from the ongoing consultant assistance project for models development* (Draft report). May 17, 2012.

Introduction, 5

- This report will be used to refresh the TPB work program for models development
- Once the report has been finalized, we hope to bring an updated work program to the TFS including
  - Short-term plans
  - Long-term plans

Background

- Generally considered best practice for MPOs to seek independent evaluation of their travel demand modeling procedures on a regular, on-going basis
- Two most common forms of evaluation
  - Peer review
  - Consultant review

Background, 2

- Peer review
  - Typically conducted mostly or entirely with volunteers from agencies that are peers of the MPO
  - Best known example: TMIP Peer Review Program
- Consultant review
  - Conducted by non-MPO practitioners who are conversant with travel modeling practice, including consultants and/or members of the academic community

Background: TRB review

- In 2002, the TPB sought an independent assessment/review of its travel demand forecasting process
  - TPB chose to hire the TRB to conduct the review
  - TRB review could be seen as a "third way," since it is neither purely a peer review, nor a consultant review
  - TRB Committee for Review of Travel Demand Modeling
    - Included: Academics; consultants; practitioners

Background: TRB review, 2

- TRB review resulted in two letter reports to the TPB
- In response to the review, TPB staff made several updates to the travel model, e.g.,
  - TPB. (2003). *Descriptions of Proposed Work Elements for the TPB Models Development Program to a) Address Concerns Raised by the TRB Committee's First Letter Report b) Advance the State of Modeling Practice in the Metropolitan Washington Region*.
- At the time of the TRB review, it was expected that two other MPOs would also undergo a similar TRB review, but no other MPO chose to follow in the footsteps of the TPB

Background: TRB review, 3

- Following the TRB review, TPB staff chose to conduct future reviews of the travel modeling procedures using a consultant review
- Hence the current process, which began in FY 2006

Report organization

- Report is divided into three main chapters
  - Introduction
  - Modeling topics
  - Conclusions and next steps
- "Modeling topics" chapter is divided into four main sections
  - Input data
  - Improvements to the trip-based model
  - Software issues and reducing run times
  - Activity-based models

Report organization

- About 25 modeling topics are presented
- Within each modeling topic, there are two sub-sections
  - **Summary of the consultant findings and recommendations**
    - Emphasis is on the recommendations
    - Findings presented mainly for context
    - We have striven to include all the consultant recommendations (over 100), but only a subset of findings (about 50)
  - **Discussion and TPB staff response** to the consultant recommendations

Report organization: Topic areas

		VHB	VHB	VHB	CS	CS	CS
Section & Modeling Topic		**FY 2006**	**FY 2007**	**FY 2008**	**FY 2009**	**FY 2010**	**FY 2011**
Input data							
	Data collection and surveys				x		
	Inputs to the travel model				x		
	External and through travel	x		x			
	Socio-economic models				x		
	Fuel prices in travel models				x		
	Effects of an aging population on travel	x	x				
Improvements to the trip-based model							
	Trip generation				x		
	Trip distribution and destination choice				x		
	Mode choice				x	x	
	Modeling transit		x			x	x
	Time-of-day/peak spreading		x	x	x	x	
	Traffic assignment	x	x		x	x	
	Speed feedback in the travel model		x		x	x	
	Modeling HOT/managed lanes	x			x	x	x
	Special generators, including modeling airport access trips	x	x		x	x	
	Modeling non-motorized (walk and bike) trips				x		
	Model sensitivity to land use policies such as smart growth				x		
	Sensitivity testing of the regional travel model	x					
	Screenlines/cutlines		x				
	Value of time				x		
	Trip purposes					x	
Software issues and reducing run times							
	Reducing model run times				x		
	Review of travel demand forecasting software packages						x
	Review of TPB's travel modeling scripts						x
Activity-based models (ABMs)		x			x		

Note

- Report covers over 100 consultant recommendations in about 25 topic areas (over 60 pages), so this presentation
  - Extracts only a sample of consultant recommendations and TPB staff responses

Topic: Trip generation

- Recommendation 8
  - CS (2009) recommended that TPB staff "review and summarize findings of the 2008 household trip generation and attraction rates at the subregional level" (p. 2-19).
- TPB staff response
  - Staff supports this recommendation and has already presented such an analysis of trip rates by regional activity centers to the TFS
    - Milone, R. (2010). *2007/08 Household Travel Survey, Preliminary Trip Generation Analysis for the Region and at Activity Centers*. Presented at the January 22, 2010 meeting of the Travel Forecasting Subcommittee
  - Further work along this line is planned in the near-future
    - Geographically focused HTS

Topic: Trip distribution

- Recommendation 11
  - CS (2009): “Highway network speeds should be validated to observed speeds as they serve as a key input to trip distribution” (p. 2-19).
- TPB staff response
  - Staff does not agree that the speeds resulting from a static traffic assignment should be rigorously validated against observed speed, since it is well known that output link speeds do not explicitly represent intersection/signal delay and queue formation
    - See, for example, Miller, J., Fitch, G., Dougald, L., Kreissler, S., & Hill, D. (2005). Surprises from a Field Validation of Speed Estimation Techniques for Air Quality Conformity Analysis. *Transportation Research Record: Journal of the Transportation Research Board*, (1941), 72–80.
  - However staff maintains that link speeds should be checked to ensure that they
    - Fall within a reasonable range of observed speed values
    - Are appropriate and consistent with the simulated time period

Topic: Trip distribution, 2

- Recommendation 13
  - CS (2009) recommended that TPB staff "validate county-level average trip lengths and times for all trip types to the 2008 household survey and the 2000 work trip data from the Census" (p. 2-19).
- TPB staff response
  - Staff agrees with this recommendation and will follow through with this suggestion

Topic: Trip distribution, 3

- Recommendation 15
  - On the subject of destination choice models, CS (2009) stated, “Though there is little doubt that destination choice models are superior to gravity models, the value of migration may be limited if an activity-based model is planned within a few years because re-estimation would be necessary” (p. 2-20).
- TPB staff response
  - TPB staff will consider this recommendation. The decision on whether (and how) to implement an activity-based model has not yet been made.

Topic: Modeling transit

- Recommendation 21
  - CS (2010) recommended that "TPB consider establishing an explicit relationship between bus speed and highway speed, along with bus delay" (p. 4-20).
- TPB staff response
  - Beyond the simple bus-speed degradation factors used in the Version 2.3 Travel Model, TPB staff has not yet acted upon this recommendation, but recent advances in GIS-aided transit network development, such as GTFS data for local transit routes, should allow for detailed bus speed relationships to be studied in the near future.

Topic: Modeling transit, 2

- Recommendation 28
  - CS (2011) recommended that TPB make the transition from the TRNBUILD transit path builder to the Public Transport (PT) path builder and found that "a step-by-step migration to PT seems to be the most reasonable path" (p. 3-18).
- TPB staff response
  - Staff is currently working with its current task-order consultant, AECOM, to make this transition.
    - Preliminary work should be done this fiscal year
    - Completion of the work is expected in FY 2013

Topic: Time-of-day/peak spreading

- Recommendation 32
  - CS (2009) recommended that TPB and its member governments should be working to get better time-of-day traffic count data (p. 2-23).
- TPB staff response
  - TPB staff agrees with this sentiment and continues to work with state and local agencies on this matter

Topic: Time-of-day/peak spreading, 2

- Recommendation 34
  - CS (2010) recommended that TPB staff divide its trip tables into "at least four or preferably five large time periods," including breaking the off-peak period into midday and night periods (p. 3-5).
- TPB staff response
  - TPB staff has followed this recommendation. Staff increased the number of time-of-day periods in the travel model from three (in Ver. 2.2) to four.

Topic: Traffic assignment

- Recommendation 41
  - VHB (2007) recommended that TPB staff begin testing some of the new traffic assignment algorithms that were being introduced in Cube Voyager (p. 66).
- TPB staff response
  - TPB staff tested
    - link-based algorithms (conjugate Frank-Wolfe and bi-conjugate Frank-Wolfe)
    - path-based algorithm (gradient projection algorithm).
  - GP algorithm was much slower than the existing FW algorithm, so staff discontinued testing it.
  - TPB staff, did, however, select the new bi-conjugate Frank-Wolfe for use in the Version 2.3 Travel Model

Topic: Traffic assignment, 2

- Recommendation 42
  - VHB (2007) recommended that TPB staff begin using Cube Cluster to shorten model run times (p. 66).
- TPB staff response
  - TPB staff has followed this recommendation
  - Version 2.3 Travel Model uses Cube Cluster in a number of steps
  - Staff is now working with AECOM to consider further "parallelizing" of other model steps to further shorten model run times

Topic: Activity-based models

- Recommendation 94
  - VHB (2006) advised TPB staff not to begin full-scale adoption of an activity-based model, since, according to VHB, the technique was “not yet widely accepted” and there were still “numerous issues to be resolved” (p. 63)
- TPB staff response
  - TPB staff agreed with this recommendation
  - Staff continued to review the state of the practice for ABMs, but did not proceed with any major ABM development.

Topic: Activity-based models, 2

- Recommendation 96
  - Despite VHB's recommendation not to move to an ABM at this time, VHB (2006) nonetheless recommended that TPB staff "ensure that current data collection efforts include data that will allow transition to a tour or activity-based framework" (p. 63)
- TPB staff response
  - TPB staff concurred with this recommendation and has followed this advice. For example, the 2007/2008 COG Household Travel Survey was designed to feed either a trip-based model or an activity-based model

Topic: Activity-based models, 3

- Recommendation 99
  - VHB (2006) indicated that TPB could participate in, and lead, if necessary, "a joint program with other MPOs that will keep abreast of the current status of activity-based models" (p. 64)
- TPB staff response
  - TPB staff concurred
  - Ron Kirby collaborated with AMPO to form a steering group for the AMPO Advanced Model Study
    - Phase 1
      - Pooled research group consisted of 11 MPOs and the AMPO staff
      - Released report dated July 2011:
        - » VHB, RSG, Shapiro Transportation Consulting, LLC, & Urban Analytics. *Advanced Travel Modeling Study* (Final Report). Association of Metropolitan Planning Organizations.
    - Phase 2: Funded primarily by FHWA, is currently underway

Topic: Activity-based models, 4

- Recommendation 100
  - CS (2009) indicated that TPB staff need to decide whether to devote resources to improving the current TBM or to developing an ABM, adding that, at a minimum, “an early step should be the development of a work program for movement to an activity-based model framework” (p. 2-29)
- TPB staff response
  - TPB staff concurs that it needs to develop a long-term work program for planned improvements to the regional travel model and that such a work program should possibly include an ABM.
  - However, staff is still not convinced that the benefits of moving to an ABM outweigh the costs.
  - There are also significant funding issues

Topic: Activity-based models, 5

- Recommendation 102
  - CS (2009): TPB has the option of developing an ABM either all at once ("big bang" approach) or as a phased approach.
  - CS recommended that TPB not use the phased approach, but conceded that it "may be a good option if sufficient funding is only available over time or if short-term products help get political support" (p. 2-32)

Topic: Activity-based models, 6

- TPB staff response to Recommendation 102
  - TPB staff does not currently have the funding to pursue a "big bang" approach, and may not even have the funding to pursue an incremental approach at this time.
  - Staff is awaiting reauthorization of the multi-year surface transportation act
    - Current act, SAFETEA-LU, expired in 2009
    - SAFETEA-LU has been extended nine times
      - which means funding levels are not increasing over time.
  - NCHRP Synthesis 406 suggested the benefits of using an incremental approach to developing an ABM (Donnelly et al., 2010, p. 55)
  - Several MPOs have developed a population synthesizer
    - Initially: Can feed the socio-economic models of the TBM
    - Later: Can be used as part of a full-scale ABM

Topic: Activity-based models, 7

- Further TPB staff response on funding issues
  - At one time, TPB had developed a fund of about $250k for the purpose of getting into the development of an ABM
  - Unfortunately, due to a funding rescission from the state of Maryland, this fund was “zeroed out” to make up for the loss in funding.
  - Similar funding cuts from Virginia have resulted in further belt tightening.
  - Perhaps, in the future, if a new surface transportation act is developed, these funds can be restored.

Conclusions

- TPB has maintained consultant-assisted project since FY 2006 to evaluate the travel demand forecasting practices used by the TPB in the Metropolitan Washington region
- Purpose of report presented today
  - Present TPB staff response to consultant recommendations received in the first six years of this “scanning” project
  - Update the TPB models development work plan

Conclusions, 2

- Over the first six years of the scanning project, there have been over 100 consultant recommendations
  - TPB staff has fully or partially implemented 30%
  - TPB staff agree with 15%
    - To be made part of an updated models development work program
  - TPB staff agrees with 22%
    - but feels more investigation is needed before committing to implementation
  - TPB staff has not yet acted upon 24%
  - TPB staff disagreed with 7%

Conclusions, 3

- One key observation
  - More attention and resources should be devoted to the collection of hourly traffic volumes
  - More time-of-day data is critical for supporting many of the recommendations that have not yet been addressed
  - In fact, an increased sample of hourly volume data would even benefit the validation of TPB's existing Version 2.3 Travel Model

Conclusions, 4

- One of the most turbulent areas of recommendations: ABMs
  - Some conflicting consultant recommendations
  - ABMs are still developing; the field is not mature yet
  - Staff remains unconvinced that the benefits outweigh the costs
  - A parallel models development track could allow development ABM while the production TBM continues to be maintained, but
    - Funding has been reduced and future prospects are uncertain
    - Staffing issues: Even with sufficient funding, can a dual track be supported with current staff?

Next steps

- TFS is asked to review report and send written comments to Mark Moran within 30 days
- Report will be finalized
- Develop short-term and long-term models development work plans
  - Complicated by funding uncertainties
  - Will seek TFS review
- Moving forward, TPB staff plans to prepare written responses to consultant recommendations from the scanning project on an annual or biannual basis

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