The Travel Model Improvement Program

Summary Report

Bi-State Regional Commission
(Quad Cities MPO)

Travel Demand Model Peer Review

Rock Island, Illinois
October 2008

Helping Agencies Improve Their Planning Analysis Techniques

TMIP
Travel Model Improvement Program

DISCLAIMER

The views expressed in this document do not represent the opinions of FHWA and do not constitute an endorsement, recommendation or specification by FHWA. The document is based solely on the discussions that took place during the peer review sessions and supporting technical documentation provided by the peer review host agency.

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Introduction

Report Purpose

A travel demand model peer review is conducted at the request of the agency hosting the peer review panel as a means of soliciting:

- External guidance on addressing identified issues
- The identification of possible model deficiencies
- Recommendations for potential model enhancements
- Experienced advice on model development and application

Moreover, as noted on the Travel Model Improvement Program (TMIP) website, "few individuals have had the opportunity to develop and apply more than one travel demand forecasting procedure. No individual can foresee all the issues that may arise in developing or applying a new model set. One approach to improving travel forecasting procedures has been the use of peer review panels. These panels, composed of individuals who have "hands-on" experience with both developing and applying travel forecasting models, assist local agency staff in both identifying possible problems and in developing workable solutions".

After a peer review panel meeting has been conducted a summary report is prepared that documents the panel's findings, recommendations and suggested course of action. While this is the primary purpose of the report, a secondary purpose is equally valuable; to identify issues and workable solutions as a means of providing modeling practitioners with concepts and approaches to consider for incorporation into their own model set. Ideally these concepts and approaches should offer new perspectives to question our standard assumptions regarding model development.

Report Structure

To facilitate assessing whether any noted recommendation is worth implementing, the peer review summary report does not extensively document the reviewed model's current structure. Instead, a brief summary of the model component is offered to merely place the topic of discussion in context. The majority of discussion for a given topic will focus on summarizing the technical issue, its significance, and providing context for the recommended approach or solution. Thus, each topic of discussion will be structured as follows:

- Model Component
  - Issue Synopsis
  - Overview of Existing Model Structure
  - Issue Significance
  - Panel Recommendation

For the reader that desires a more comprehensive review of the existing model, Appendix A, Quad Cities Model Documentation lists relevant references that can be acquired.

Peer Review Panel Meeting and Recommendations

This report, *Summary Report Bi-State Regional Commission Travel Demand Model Peer Review,* documents the travel demand model peer review panel meeting held at the Bi-State Regional Planning Commission (the MPO for the Quad Cities region), hereafter referred to as "Bi-State", office in Rock Island, Illinois on October 23rd of 2008. The one-day peer review panel meeting was held as part of the TMIP that is sponsored by the Federal Highway Administration (FHWA). The Peer Review Panel consisted of four travel demand modeling experts (ref. Appendix B, List of Peer Review Panel Participants, for list of Panel members and meeting participants).

Appendix C, Peer Review Panel Meeting Agenda, provides the meeting agenda. The

meeting began with Bi-State staff providing an overview of the MPO's long-range transportation plan, socio-economic data and existing travel demand model. Peer Review Panel discussion was based on questions and answers occurring throughout staff presentations.

Apart from a brief model overview, the majority of this report summarizes the findings and recommendations of the Peer Review Panel. During the process of identifying issues and recommendations the Peer Review Panel was appreciative and complimentary of the effort involved in developing and calibrating the Quad Cities travel demand model.

The consensus of the Peer Review Panel was that the Quad Cities models were state-of-the practice in terms of their structure and application. However, the Panel also felt that, given the validation results that were presented, there were enough significant issues in the model that prevented the Panel from being able to consider the model "validated". These issues were such that the Panel felt that the Quad Cities model should not be used to directly develop travel forecasts to support Long Range Plan development or project analyses.

The Panel suggested that with additional documentation on the performance of the model, more concrete conclusions and recommendations could be offered. The Panel was able to make several recommendations to the Bi-State staff on aspects of the model that needed to be addressed. The Panel felt with a moderate level of effort in the short term, the model could be validated and able to be used to support long range transportation planning and project development efforts.

For purposes of documenting and summarizing the Peer Review of the Quad Cities model, it is assumed that the typical reader is more interested in identified issues and model nuances that required thoughtful consideration and that more can be learned from discussing aspects of a model with potential for enhancement, as opposed to reviewing existing model structure and what works. To that end, Bi-State staff has been gracious enough to openly share their model's inner workings. Following the model overview the remainder of the report documents the identified issues and Peer Review Panel recommendations.

Model Overview

This section of the report offers a brief overview of the Quad Cities model components to provide some context for the discussion comprising the remainder of the report. The Bi-State staff is responsible for the development and maintenance of the travel models for the Quad Cities MPO.

Data

Demographics
The year 2000 population and household traffic analysis zone (TAZ) estimates are based on 2000 Census data. Estimates of employment were derived from Bureau of Labor Statistics (BLS) ES-202 data obtained from the Iowa Departments of Employment Services and the Illinois Department of Employment Security. The employer data was then geo-coded to TAZs.

Year 2035 population forecasts were developed using a calculated linear trend line based on year 1950 through year 2000 Census data. The year 2035 MPO region control total for employment was developed based on the ratio of 2000 labor force to 2000 Census population. Allocation of the labor force forecasts were developed based on discussion with local agencies and business/economic development groups. The year 2000 and 2035 socio-economic totals for the model study area are presented in Table 1 - Year 2000 Demographic Data and Table 2 - Year 2035 Demographic Data.

Table 1 – Year 2000 Demographic Data

Demographic Data	Total
Population	292,577
Households	117,756
Persons per Household	2.48
Employment	143,755

Source: Slides from Peer Review Panel Meeting, October 2008

Table 2 – Year 2035 Demographic Data

Demographic Data	Total
Population	353,869
Households	140,352
Persons per Household	2.52
Employment	173,870

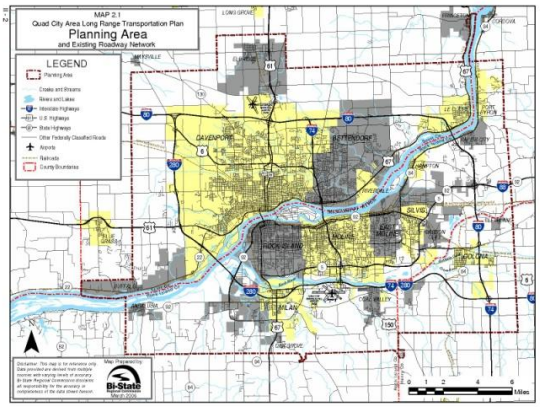
Source: Slides from Peer Review Panel Meeting, October 2008

Household Travel Survey
The Quad Cities MPO uses trip generation rates largely developed for the Des Moines travel model. These rates are based on the Des Moines MPO 2001 National Household Travel Survey (NHTS). Some modifications to the Des Moines rates were made as part of model changes in support of a local corridor study.

Study Area

The Quad Cities Area MPO study area includes portions of two states – Iowa and Illinois. The largest cities in the study area are Rock Island, Moline and East Moline in Illinois, and Davenport and Bettendorf in Iowa, with no one dominant city. The study area is bisected by the Mississippi River and is shown in Figure 1 – Quad Cities MPO Study Area

Figure 1 – Quad Cities MPO Study Area



Source: Quad Cities MPO

Trip Generation

The travel model estimates trips for four internal trip purposes:

- Home-based work (HBW)
- Home-based other (HBO)
- Non-home-based (NHB)
- Commercial Vehicle (CV)

And two external trip purposes:

- Internal-external (IE)
- External-external (EE)

The trip production model for the home-based and non-home-based trip purposes is a two-way cross-classification model stratified by household size (1 to 3+) and number of autos owned (1 to 3+). This results in a cross-classification table of three vehicle ownership categories and three household size categories.

The trip attraction rates model for home-based trips is based on trips per employee stratified by four employment categories (total, retail, school and other). Non-home-based attractions are estimated based on a regression model using population and total employment along with household size and auto-ownership as additional variables. For commercial vehicles, a similar model is used, but with rates based upon dwelling units and two employment types (retail and other).

The vehicle trip rates are borrowed from rates developed for Des Moines using the 2001 Des Moines NHTS add-on. Some of the trip rates were modified as part of a corridor study.

Trip Distribution

The trip distribution model is a conventional gravity model. Friction factors are derived using a standard gamma function with values for a, b and c of 1.0, 0.3 and 0.01, respectively. A single feedback of peak travel times from the final iteration of the traffic assignment is performed as part of the trip distribution process.

Trip Assignment

The Quad Cities model assigns a 24-hour trip table to the network using a equilibrium procedure. Network travel times for each iteration of the traffic assignment are updated to reflect peak hour volume-to-capacity conditions. To accomplish this, peak hour volumes are derived by assigning the 24-hour trip table and then factoring the resulting 24-hour link volumes. A corresponding peak hour capacity is used in the development of peak hours travel times.

The standard BPR function is used along with “standard” alpha and beta values of 0.15 and 4.00, respectively. The final iteration peak travel times from the traffic assignment are fed back once to the trip distribution model.

Issues and Recommendations

The Issues and Recommendations chapter concentrates on examining each of the technical issues that arose during the peer review meeting, its significance, and providing context for the Peer Review Panel's recommendations.

Demographic Data

Base Regional Population Estimate

Issue Synopsis
The MPO estimates total study area population using data at the Census geography level. Census geography population is allocated to the MPO study area using a technique that proportionally assigns the population of census geographic areas split by the MPO boundary.

Overview
The model study area boundary does not align with any Census geography and splits the Census geography. In order to develop a total study area population estimate, the MPO uses an allocation tool to develop an estimate of the MPO study area population. The GIS-based allocation tool uses a measure of the center of the areas that reside inside and outside of the model study area boundary to assign the total census geography population to the study area.

Issue Significance
Completely assigning population to the model study area based on the location of the center of census geography can result in erroneous assignment of population to the model study area. This can lead to an incorrect estimate of study area population and can ultimately create problems in the estimation of travel demand for the region

Panel Recommendation
The Panel suggested that the MPO re-verify that there are no census geographies that are completely "nested" within the study area boundary such that census geography is not split by the study area boundary. Additionally, the Panel noted that the MPO could use its GIS tools to perform an allocation that is more geographically sensitive than the process that is currently being utilized.

Base Employment Data

Issue Synopsis
The ES-202-based employment data used to establish regional and TAZ-level employment is known to have issues related to the scope of employment covered as well as definition of work site employment. In addition, the MPO uses regional labor force data as a benchmark for regional employment totals.

Overview
Base year employment data used in the model calibration is based on BLS ES-202 employment data and employer record data from work force development agencies in Iowa and Illinois. ES-202 data is widely used in the development of employment estimates by those developing and applying travel demand models.

Once the employment data is geo-coded, the MPO reviews the TAZ employment estimates with local agencies and development experts. Adjustments to the TAZ-level employment data are made based on local knowledge and information from these other entities.

Nationally, several issues have been identified with ES-202 data by agencies using this database as a source for employment data. One significant issue with the ES-202 is the data may include many more employees at a particular employer headquarter office than actually work at the site (e.g., business

headquarters may represent the only location reported when, in fact, several locations exist in the study area).

The Bi-State staff indicated that the agency coordinates the development of the Base Year employment estimates with local cities and economic development agencies to improve the employment estimates of specific employers and TAZs.

As a matter of reference, the regions estimate of total employment is compared to an estimate of labor force for the region. The MPO seeks to have the ES-202 estimate of employment to be within 96% to 98% of the total labor force estimates for the region.

Issue Significance
The potential inclusion of headquarters employment data in the ES-202 data can lead to an overestimate of the zonal and study area employment. This could potentially impact trip generation through inaccurate estimates of total attractions as well as zonal locations of attractions. As a result, the trip distribution models may produce erroneous estimates of trip patterns.

The MPO's coordination efforts may eliminate some of the headquarters issues inherent within ES-202 data. However, without a comparative data source, some uncertainty exists.

The use of labor force, even as simply as a benchmark total, can be problematic. Labor force is an estimate of persons of working age that live in a region, not a measure of workers employed. Because labor force does not account for resident workers who work outside the region and workers that do not live in the region and also includes unemployed persons living in the region, the relationship between labor force and actual employed persons can be uncertain. Therefore, the comparative process employed by the MPO to match unadjusted ES-202 data estimates within certain tolerances of labor force estimates without corresponding quantitative data to support this assumption can be problematic. The end result is that there is some uncertainty in the employment data provided to the travel demand model.

Panel Recommendation
Given the importance that accurate demographic data has in model development and its impact on model performance, the Panel recommended that the MPO look into acquiring, either directly, or in conjunction with the Iowa DOT, a second source of employment data.

The Panel also cautioned the MPO about the use of labor force data in the estimation of regional employment totals.

Forecast of Future Population

Issue Synopsis
The MPO develops two future population forecasts – one based on a third-party forecast and one based on historical population. The resulting population data is not compared to growth rates or total projected growth for the state of Iowa or other urban areas outside the Quad Cities region.

Overview
The MPO develops two future population forecasts – one based on a third-party forecast and one based on trends. The forecast selected for use by the MPO technical and policy boards represented a decision to develop transportation plans assuming a "worst-case" scenario in terms of congestion and travel. The MPO compares the procedures for developing the regional population forecasts with procedures used in areas of similar size and location as the Quad Cities region. The MPO determined that

the procedures used are similar to those used in other areas.

Issue Significance
Comparison of forecast methodology to other areas is useful for determining the defensibility of the methodology and can also reveal methods and/or data sources that may be used to improve the forecast methodology. Comparison of growth rates and forecast totals to other areas in the region or the state as a whole allows for the determination of the reasonableness of a forecast. The MPO does not conduct a comparison of growth totals or growth rates to other cities in Iowa or Illinois or a larger geographic area encompassing other urban areas around the Quad Cities region or the state of Iowa

By not conducting a comparison of growth rates or growth totals, there is no sense of the reasonableness of the forecast other than opinions of those from the Quad Cities region. This may somewhat reduce the credibility of the demographic forecasts.

Panel Recommendation
The Panel agreed that the MPO's comparison of procedures for developing demographic forecasts to those from other urban areas is valuable and represents good practice. The Panel recommended that the MPO should also compare the forecasted growth rates and demographic totals to those for other urban areas in the state and the state as a whole. The Panel also suggested that the MPO consider using a "Delphi" process to supplement the development of the demographic forecasts. In this way, the forecasts would benefit from a wider range of informed opinion and consensus building regarding the future growth of the region.

Forecast of Future Employment

Issue Synopsis
The MPO develops a forecast year employment regional control by using the ratio between the Base Year regional labor force and the Base Year regional population.

Overview
In order to develop an estimate of future year employment for the Quad Cities region, the MPO calculates the ratio of Base Year labor force to Base Year population and then applies this ratio to forecast year population. The MPO then consults staff of local agencies consisting of development experts for information and knowledge about future employment growth at the TAZ-level. The MPO compiles the TAZ employment information and compares the total employment to the calculated estimate of future labor force.

The MPO seeks an outcome such that the sum of the TAZ-level employment is between 96% and 98% of calculated labor force. The TAZ-level employment is adjusted based on the comparison of the sum of TAZ-level employment to the calculated estimate of future year labor force.

Issues Significance
Because of the differences between labor force and employment, any methodology that uses labor force as a surrogate to develop forecast employment control figures for the region can be problematic. As noted by the Panel, calculating a base year ratio of labor force to population and applying this constant to the forecast population to determine the regions forecast employment total can result in a suspect forecast of employment. By using this process, adjustments to other model parameters in potential non-standard ways to obtain reasonable performance of the travel models may be needed.

Panel Recommendation
The Panel was concerned about the use of labor force as a measure of employment. The Panel felt strongly that the MPO should discontinue this practice and find a source of data that measures jobs, not workers. Additionally, it was noted by the panel that the MPO had examined using Woods and Poole data for both their population and employment projections. The MPO felt that both the population and employment forecasts were low, and did not represent a "worst case scenario" for developing future plans. Nevertheless, the panel felt that the MPO should examine other third party demographic databases for forecasting future population and employment, even if a third party database was used in combination with the existing methodologies. The Panel felt that these issues needed to be dealt with immediately by the MPO.

Networks

Network Coding Detail

Issue Synopsis
The MPO codes freeway links a a single non-directional link. Freeway interchanges result as simple four-way intersections.

Overview
The Quad Cities modeling networks currently have freeway mainlanes and freeway-to-freeway interchanges coded as non-directional links. For example, the mainlanes are coded as a single two-way link representing both directions. With respect to freeway interchanges, the network coding does not include links for individual ramp movements.

Issue Significance
The coding of freeway mainlanes by direction and freeway-to-freeway interchanges in detail allows for superior depiction of travel time and network connectivity in travel models. With the advent of GIS, and increased capabilities of modeling software, modeling networks are able to be coded in a fairly detailed manner. Individual directional links as well as freeway-to-freeway interchanges can be coded with relative ease.

If simplified techniques are used, the fidelity of travel times can affect path choice and traffic assignment results as well as vehicle miles of travel (VMT) and vehicle hours of travel (VHT).

Panel Recommendation
The Panel recommended that the MPO immediately move toward detail coding of freeway mainlanes and freeway-to-freeway interchanges. The MPO staff indicated that they were moving in that direction.

Trip Generation

Trip Generation Rates

Issue Synopsis
As part of the model calibration, modifications were made to the trip production and attraction rates borrowed from the Des Moines region. The MPO does not have documentation stating that the rates have been modified or explaining the rationale behind the adjustments. The attraction rates for two purposes appear to be higher than is typical.

Overview
As part of a recently-conducted local corridor study, several modifications to the trip production and attraction rates from the Des Moines 2001 NHTS add-on were made. The trip rate documentation that was provided to the Peer Review Panel does not note how the rates were modified or even that the rates have

been changed. The Panel specifically noted rates for two trip purposes during the review. The HBW trip attraction rate of 1.18 trips per employee appears rather high, and a NHB attraction rate of 5.96 trips for 3+/1-car households appears to be very high.

Issue Significance
The modification of the trip production and attraction may be legitimate and defensible as part of the model calibration. However, without acknowledgement that the rates were modified in existing documentation and additional documentation explaining the reasons for and methods for changing the rates, it is difficult to judge the reasonableness of the rates.

Although attractions are scaled to match productions, attraction rates that are two high can affect trip distribution results and complicate efforts to match observed trip lengths.

Panel Recommendation
The Panel strongly suggested that the MPO acquire or develop documentation on the modifications to the trip production and attraction rates. The Panel considered the development of documentation a priority of the highest order.

The Panel also suggested that the MPO gather data from peer cities and/or review data sources such as NCHRP 365 to determine reasonableness of the HBW attraction and NHB production rates.

Stratification of Rates by Auto Ownership

Issue Synopsis
Trip productions for zero-car households are not estimated.

Overview
The trip production rates used in the trip generation model are stratified by household size (1 to 3+) and auto ownership (1 to 3+). The stratification of the production rates does not include rates for households that do not own a car.

Issue Significance
Households that do not own vehicles make few auto vehicle trips. Survey data from other regions, though, has shown that vehicle trips do occur from these households. Although the proportion of households in the Quad Cities region that do not own a vehicle is very small, the number of trip productions is probably underestimated slightly by not including a trip rate for zero-car households.

Panel Recommendation
The Panel recommended that the MPO modify the trip production models to include trip production rates for zero-car households in order to capture trips made by such households.

Special Generators

Issue Synopsis
The Quad Cities model includes a single special generator – a casino. The region includes other sites that could be considered special generators.

Overview
Currently, the Quad Cities model classifies one site as a special generator. Given the size of the Quad Cities region, it seems likely that there may be several additional sites that might be considered as special generator candidates.

Designation of a site as a special generator should only be done after verifying that the general trip production and/or attraction rates do not estimate the appropriate number (either high or low) number of trips.

Assuming the variable measuring the size of the site (i.e. households, employment) is accurate, developing and applying a different trip rate to the site is frequently the most appropriate way to accurately account for travel to and from the site.

The degree to which the model estimates volumes on adjacent roadways as well as overall travel demand can provide an indication as to whether the site should be considered for special generator status.

Issue Significance
Designating sites as special generators in order to apply more appropriate trip rates and improve model estimates of trip demand relative to observed trip demand can be an important part of improving model accuracy.

Locations which produce or attract trips in a manner which is atypical of the trip production or attraction rates in the Quad Cities model should be candidates for being designated as a special generator. Therefore, the review of sites that may be special generators is an important aspect of model calibration.

Panel Recommendation
The Panel recommended that the MPO examine adding special generators to the Quad Cities model for the International Airport and major regional malls.

Trip Distribution

Friction Factors/Trip Length

Issue Synopsis
Base Year trip length distributions by trip purpose are produced and reviewed by the MPO for reasonableness. The MPO revised the friction factors by trip purpose to improve overall model performance.

The resulting HBW trip length appears to be much shorter than should reasonably be expected. No documentation was presented or appears to be available documenting the process for revising the friction factors.

Overview
The MPO uses a trip distribution model with a standard gravity formulation. The friction factors were initially developed using the standard gamma function formulation from NCHRP 365.

Changes were made to the friction factors to improve performance of the model set. The MPO modified friction factors based on socioeconomic data and local knowledge regarding origin-destination pair trip interchanges. The resulting average trip lengths are checked against recommended ranges for average trip lengths by trip purpose. Resulting average trip lengths are presented in Table 3 – Year 2000 Average Trip Lengths.

Table 3 – Year 2000 Avg. Trip Lengths

Home-Based Work	9.534
Home-Based Other	7.464
Non-Home-Based	6.771
Commercial Vehicle	8.204
External-Internal	19.545

Source: Slides from Peer Review Panel Meeting, October 2008

The average trip length for all internal trip purposes appears low. The average trip length for home-based work trips appears to be significantly underestimated.

Issue Significance
Calibration of trip length distribution and average trip length are critical aspects of travel model development and calibration. Verification that trip length distributions and average trip lengths match local or comparable region trip length data is important to establishing the validity of travel models.

Manual modification of friction factors is acceptable if improvement against observed, peer region or established guideline average trip length is achieved. Trip lengths that are not calibrated properly can lead to problems in traffic assignment.

The fact that trip lengths for the internal trip purposes appear to be low, especially home-based work trip length, and the lack of documentation on adjustments to the friction factors results in serious concern regarding the validity of the friction factors.

Panel Recommendation
The Panel was concerned that the resulting HBW average trip length was substantially shorter than it should be. The Panel also noted that the trip lengths for all trip purposes were substantially lower than those reported in the neighboring Dubuque travel model. The Panel indicated that they expected the average trip lengths in the Quad Cities model to be fairly similar to those of the Dubuque model.

The Panel recommended that the MPO perform some analysis and comparison of the trip length frequency and average trip lengths against other sources, such as the Census Transportation Planning Package (CTPP) data or peer cities. The Panel also suggested that the MPO perform select link analysis of work trips crossing the bridge to the Rock Island Arsenal to determine if they might be contributing to the trip length problem.

The consensus of the Panel was that this issue represented a serious issue and needed to be addressed immediately.

Documentation of Development of External Travel

Issue Synopsis
E-mail correspondence represents the only documentation of the automated portion of the technique used to develop external-internal and external-external demand for the Base Year based on traffic counts.

Overview
Estimates of Base Year external-internal and external-external travel for the Quad Cities region are developed using traffic counts collected by the Iowa and Illinois DOT's. Data from a supplemental O/D survey collected for an IH-74 corridor study is also used during the development of external travel. The O/D survey data was used by the IH-74 corridor study consultant to develop a procedure to estimate external-internal and external-external trips. The procedure uses volume and proximity to other external stations to develop estimates of external-external traffic.

Issue Significance
The lack of documentation regarding the procedures used to estimate external-internal and external-external trips is problematic. Without documentation the Panel cannot make a judgment about reasonableness or acceptability of the procedures used.

Panel Recommendation
The Panel strongly suggested that the MPO develop documentation of the procedure used to estimate external-internal and external-external travel. The Panel considered the development of this documentation a high priority.

Model Validation

Presentation of Results

Issue Synopsis
The MPO presented limited results for model validation. Comparisons of assigned and counted volumes for the region as a whole, average screenline match to counts and specific information regarding the Mississippi River screenline were presented. Root mean square error (RMSE) statistics were only presented for freeways and principal arterials.

Overview
The MPO developed estimates of Base Year average weekday traffic volumes by assigning the total daily vehicle trip tables to the Base Year network.

One of the determinants for a validated model lies in the comparison of the modeled volumes to observed traffic counts.

Commonly, comparisons of modeled volumes to observed traffic counts are presented by network facility type, area type, geography (i.e., county), volume groups, screenlines and cutlines and the region as a whole. The information presented by the MPO was limited to information on count to volume comparisons for the Quad Cities region, average of screenline match to counts and performance of one specific screenline (Mississippi River screenline). Results of RMSE for two network facility types and comparison to an un-cited standard were also presented.

Issue Significance
Without more detailed information on assignment results, it is impossible to determine exactly how well the model is performing. While information on region-wide performance of the model and summary of screenline performance is helpful in making a validation determination, it is not really possible to form a defensible opinion as to the validity of the model.

Without being able to definitively determine the validity of the model, questions arise as to whether the model can be used for developing forecasts of future travel demand. This limits the usefulness of the model in supporting transportation planning activities.

Panel Recommendation
The Panel recommended that the MPO perform more statistical analysis of the model validation results. In light of issues with regard to the use of labor force in demographic data development, modification of trip generation rates and average trip length, the Panel strongly encouraged the MPO to perform more rigorous analysis of the entire modeling process.

The Panel recommended that the MPO cite sources for validation statistics. Many of the slides presented did not include a source citing.

Validation Results

Issue Synopsis
The results of model validation presented to the Peer Review Panel indicate that improvement is needed in the matching of modeled travel to observed travel.

Overview
The model validation results presented show that the Quad Cities model estimated vehicle miles of travel (VMT) at 89% of counted VMT. The match to counted VMT across all screenlines and cutlines in the region was 105%. The Mississippi River screenline assigned VMT was 95% of counted VMT.

During discussion of model validation results, the MPO staff stated that model estimated VMT for interstate, principal

arterial and minor arterial facility types was between 96% and 102% of counted VMT.

Additional detailed model assignment summaries, such as detailed facility type, volume group, additional screenlines, cutlines or area type summaries were not presented.

Issue Significance
The degree to which model estimated travel demand matches observed travel demand is central to drawing a conclusion regarding model validity. The ability to declare a model valid directly affects the use of the model to support many MPO transportation planning activities.

Panel Recommendation
The Panel strongly recommended that the MPO revisit several aspects of the modeling process immediately so that the model could be more thoroughly evaluated for validity.

Conclusion of Model Validity

The Panel expressed concern about several aspects of the model. Specifically, the areas that caused the Panel concern were:

- The use of labor force in the development of demographic data inputs to the model
- The lack of documentation of the modification of trip generation rates
- The process for developing estimates of external-internal and external-external trip demand and lack of documentation regarding this process
- The resulting average trip lengths for all trip purposes.
- The lack of documentation on F-factors modifications.
- The paucity of traffic assignment results
- The comparison of model estimated VMT to observed VMT for the region was only 89% (it should be between 95% and 105%).

It was the consensus of the Panel, given the results that were presented during the meeting as well as responses to panel questions that the model, in its current form, has not been validated.

The Panel cautioned the MPO and DOT against using model forecasted travel demand to support regional and corridor transportation planning activities.

Additional Recommendations

In addition to the recommendations noted above the Peer Review Panel also offered the following comments:

Model Documentation

The Panel recommended that the MPO formally document its work with local agencies to develop comprehensive plans. By documenting these efforts, the Panel felt the MPO could demonstrate work done to link future land development and transportation improvements.

The Panel also recommended that the use of time penalties in the modeling network be documented.

Modeling of Person Trips

The Panel suggested that the MPO consider, as part of a future model update, generating and modeling person trips rather than vehicle trips. The Panel commented that the modeling of person trips would provide the MPO greater flexibility in analyzing modes of travel beyond highways as well as expanding the capability of policy analysis. The Panel explicitly indicated that modeling of person trips could be done without having to develop a mode-choice model. The Panel noted that there are several simplified non-model techniques to account for transit demand that would be appropriate for a region such as the Quad Cities region.

Use of Model in Developing Forecasted Travel Demand

In light of the Panel's recommendation that the Quad Cities model was not suitably validated, the MPO and DOT inquired of the Panel how the MPO could develop forecasts of future travel. The Panel suggested that the MPO and DOT could use either the volume difference or percent growth between the base year modeled volumes and the future modeled volumes, This volume or percentage increase could then be applied to the base year observed counts. In this way, characteristics of the model that are contributing to the problems with the model results are isolated or negated, thus allowing the MPO to use the model to calculate change in travel. This is a professionally accepted method from NCHRP Report 255.

Appendix A

Bi-State Regional Commission Model Documentation

The following link is to the Bi-State Commission website with links to the "2035 Quad City Area Long Range Transportation Plan – FINAL":

http://www.bistateonline.org/cgi-script/upload/upload/Transportation%2520%252d%25202035%2520LRT%2520Documents%252edb/chapter-II.pdf

Appendix B

List of Peer Review Panel Participants

Peer Review Panel Members:

Name	Affiliation
Karen Faussett	Michigan Department of Transportation
Dane Ismart	Louis-Berger Group
Paul Hershkowitz	Wilbur Smith Associates
Ed Christopher	Federal Highway Administration

Supporting Staff to Peer Review Panel Members:

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Andy Mullins	Texas Transportation Institute (TTI)

Local Agency Staff:

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Lalit Patel	Bi-State Regional Commission (Quad Cities MPO)
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Darin Nordahl	City of Davenport

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Name	Affiliation
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Jason Huddle	Iowa Department of Transportation
Sam Shea	Iowa Department of Transportation

Other Attendees

Name	Affiliation
Chandra Ravada	East Central Intergovernmental Association (Dubuque MPO)
Jake Ironside	East Central Intergovernmental Association (Dubuque MPO)

Appendix C

Peer Review Panel Meeting Agenda

Thursday, October 23, 2008
Quad City Area MPO
Bi-State Regional Commission
P.O. Box 3368
1504 Third Avenue
Rock Island, Illinois 61204-3368

9:00 – 10:00	Introductions, MPO Background and Overview of Long Range Planning, Including Travel Model Input – Socio-Economic Data
10:00 – 10:15	Break
10:15 – 12:00	Presentation of Existing Travel Forecasting Techniques: Three Step Process – Distribution, Assignment and Validation
12:00 – 12:15	Break and Distribute Lunches for Next Working Session
12:15 – 2:45	Proposed Efforts for Next Plan Update – Data Sources, Model Software & Other Tools
2:45 – 3:00	Break
3:00 – 4:00	Panel Caucus: Initial Review/Critique and Comment on Practices (Peer Review Panelists meet to discuss information)
4:00 – 5:00	Panel Initial Report and Discussion (Peer Review Panelists present to MPO and others initial observations)

Invitation of participation extended to Technical Committee members and/or other local officials as determined by the MPO, including Federal Highway Administration and state DOTs.

Post- Meeting Activities:
Each MPO to summarize meeting presentations and discussion and the Panel's initial findings or recommendations. Summary of each session will be sent to Peer Review Panel for additional remarks and comments. A final report will be prepared by the respective MPO and provided to the TMIP program.