Transportation Model Improvement Program (TMIP)
Report On Findings Of The Peer Review Panel Of The Anchorage Metropolitan Area Transportation Study (AMATS)

Location:	Anchorage, Alaska
Date:	May 24-25, 2004
Peer Review	
Host Agency Contact:	Jon Spring, *Anchorage Metropolitan Area Transportation Study (AMATS)*
Peer Review Panelists:	Andrew S. Gunning*, Pima Association of Governments, Tucson, Arizona* Dick Walker*, Portland METRO, Portland, Oregon* Sherwin "Bud" Reiff*, Lane Council of Governments, Eugene, Oregon* Gregory D. Erhardt*, Denver Regional Council of Governments (DRCOG)*

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EXECUTIVE SUMMARY

The following report summarizes the results of a Peer Review Panel held through the Travel Model Improvement Program (TMIP), which is sponsored by the Federal Highway Administration (FHWA). The Anchorage Metropolitan Area Transportation Study (AMATS) hosted the two-day Peer Review. The primary focus of the Peer Review was to review the current status of the AMATS travel model improvement process and to provide guidance and near-term and future model development.

The Peer Review covered a variety of topics, including:

- Purpose of model in decision-making
- Land use allocation

- Data quality
- Tour-based modeling/microsimulation
- Status of the current four step process: trip generation, trip distribution, mode choice, and assignment

After preparing the recommendations in a closed session, the Peer Panelists presented their feedback to the group for clarification and discussion. The findings of both the intermediary discussions and final recommendations are summarized within this report.

Participants in the Peer Review included transportation model experts from the Pima Association of Governments, Portland Metro, Lane Council of Governments, and the Denver Regional Council of Governments (DRCOG). The Peer Review was held May 24-25, 2004 in Anchorage, Alaska.

BACKGROUND

The Anchorage Metropolitan Area Transportation Study (AMATS) is the designated Metropolitan Planning Organization for the Municipality of Anchorage. The overall objective of the peer review is to seek assistance from knowledgeable transportation modeling practitioners on how to improve the AMATS transportation demand model and associated land use allocation model.

AMATS is currently engaged in an update of its Long-Range Transportation Plan (LRTP). The new LRTP will be the first to be produced that fully takes into account the new direction provided by Anchorage 2020, the Comprehensive Plan adopted by the Municipal Assembly in February 2001. The new Comprehensive Plan incorporates a variety of land use concepts that are designed to encourage compact, mixed use development with the expectation that it will have a positive effect on mode share and vehicle miles traveled. As a result, it is important that the model update have the capability to properly analyze changes in land use density, design, and diversity.

The Existing AMATS Model

The existing AMATS transportation model is composed of two interrelated models, i.e., the land use allocation model and the travel demand forecasting model.

The land use allocation model is a parcel based spreadsheet model that allocated regional growth forecasts to individual parcels based on five broad categories of data:

- The availability of the parcel for development or redevelopment
- The suitability of land for development
- The type and amount of development allowed under zoning ordinances
- The accessibility of the location of the parcel
- Growth in the pipeline

The existing daily travel demand forecasting model utilizes TransCAD software and consists of four steps: (1) trip generation, (2) trip distribution, (3) mode share, and (4) trip assignment. A separate truck model has also been incorporated into the structure of the model for freight movement.

Some of the additional characteristics of Anchorage's travel demand forecasting model include:

- A cross-classification trip generation model, which generates home-based work, home-based other and non-home based work trips.
- A gravity model-based trip distribution system.
- A multinomial logit mode choice model that provides estimates for travel for five separate modes (drive alone, HOV 2, HOV 3+, bus transit, and non-motorized modes.
- A static user equilibrium highway assignment system.

The Refreshed Model: Expectations For the Updated Model

The existing AMATS Transportation Demand Model was validated to a 1994 base year. Air quality conformity regulations (40CFR 93.122 (b)(1)(i)) require that network-based models in serious carbon monoxide non-attainment areas such as Anchorage must be validated against observed counts for a base year that is not more than 10 years prior to the date of the conformity determination. As a result, the model needs to be revalidated by 2004. Towards this end the Municipality of Anchorage completed a new Household Travel Survey in August 2002.

Renewing the model also offers an opportunity to revisit the original decisions about how to represent travel in the Anchorage and to consider how the process can be improved to reflect best modeling practices.

CH2M Hill, a nationwide consulting firm, has been hired by AMATS to update the model as well as complete the LRTP update. Based on their extensive reviews of the information available to support the renewal process, the following major updates, additions and enhancements are being implemented:

1. Reestimation of household and employment characteristics and totals for traffic analysis zones based on a number of sources;
2. Refinement of the Anchorage Household Travel Survey to better represent travel for purposes of model development and estimation;
3. Restructuring and refinement of the highway network representation;
4. Restructuring and refinement of the transit network representation including development of ridership catchment areas for the traffic analysis zones;
5. Reestimation and extension of all household disaggregation models based on 2000 US Census data;
6. Reestimation and recategorization of all trip generation and attraction models including expanding the number of individual trip purposes;

7. Reestimation of trip distribution models based on the new trip purposes using information about trip lengths obtained from the 2002 Household Survey as a basis;
8. Calculation of new proportional factors to estimate trips by trip purpose and time-of-day;
9. Reestimation of mode choice models based on household survey data including addition of separate out of pocket cost parameter including parking costs.
10. A complete review of the renewed model's ability to predict current conditions based on comparisons to field data and independently collected information;
11. Development of an extensive library of post processing routines and procedures designed to support supplemental analysis of impacts of transportation demand management policies and intelligent transportation system measures; and, impact evaluation of localized (mainly intersection) level of service outcomes and cost/benefit tradeoffs of specific projects;
12. An overhaul of the current travel model's operation to improve user understanding and increase flexibility in its application to specific planning problems.

PRESENTATIONS/DISCUSSION

Andrew Gunning, Pima Association of Governments
Tucson, AZ

Tucson is located south of Phoenix and north of Mexico. With a current population of 900,000, the area has experienced a 2.5% growth rate steadily over the last few years. Tucson has a population of 500,000. A population of approximately 300,000 resides in unincorporated areas. However, the unincorporated areas receive urban services. Because the population usually moves out towards the desert and mountains, the communities tend to remain low in density. The Pima Association of Governments (PAG) is a single county MPO with 5 cities and towns. The urban/suburban portion of the MPO covers an area of 4,000 square miles.

Mr. Gunning shared three key issues that PAG is currently confronting. First, a recent bill was passed by the Arizona State legislature to enable PAG to become a regional transportation authority. Transition from a planning agency to a regional transportation authority would allow PAG to exercise taxation authority and have a funding mechanism available as an additional resource. Second, the Senora Desert Conservation plan has been developed by Pima County to facilitate further compliance with the Endangered Species Act. A countywide bond was recently passed to set aside specific funding for this endeavor in the future. Finally, Mr. Gunning mentioned that concern over the limited developable land available for private developers. Much of the land within the Pima region is public land; only 1/3 of all land is under private ownership.

PAG does not yet have a formal socioeconomic or land use model completed. The current strength of PAG is its parcel-level GIS data and other data development capabilities. Access to data includes address-based building permits and the non-residential square footage of development within the region. PAG is currently working with the University of Arizona to create its own control totals for population and employment. The travel demand forecast

scenario generated by PAG is based upon a single land use assumption. Although PAG has strong regional data available, the organization does not yet have good tools for determining different development impacts, thus the agency's desire to implement a land use model.

The 2030 forecast series covers 860 TAZs over a 4,000 square mile area. The forecasts are updated once every three years for each revised LRTP. The PAG forecasts have experienced difficulties with their model updates in jurisdictions with faster growth rates and the consequent rezoning activity. Increased outreach and dialogue is being used to address these issues. Mr. Gunning recommended that MPOs conduct early outreach with its jurisdictions to facilitate the ease of data collection and quality of data.

PAG continues to make progress in its land use modeling capabilities. After conducting a peer exchange through the Metropolitan Capacity Building Program (now the Transportation Capacity Building Program) to investigate land use options for their model, PAG has increased its coordination with the Maricopa Association of Governments (MAG). Currently, MAG and PAG are designing a multi-county model to serve both regions. MAG and PAG created a Memorandum of Agreement to create a full model requirements document to fulfill this need.

PAG utilizes a traditional four step model with TP+ for its travel demand forecasts. The daily model is based on a 2000 household survey. Trip purposes include home based work, home based school, home based shop, and home based other. Mode choices include drive alone, shared ride 2 and 3+, transit, bike, walk, school bus. Seasonal differentiation is not considered within the model. Much of the data is collected within the spring and winter. Trip attractions include retail, wholesale, FIRE, service, industrial, public service, and other special generators.

Cambridge Systematics conducted a model improvement and enhancement program analysis for PAG. Recommendations included:

- Create a visitor model to account for trips generated by the retired population. PAG believes there may be a 15% fluctuation in trips between winter/spring vs. the summer. Seasonal variation is difficult to grasp because of the difficulty in capturing data.
- Enhance the transit model. For mode choice, it was recommended that PAG update its multinomial logit model to a nested logit model and conduct an on-board survey. Tucson is potentially interested in a FTA New Start Project (e.g., light rail, bus rapid transit).
- Enhance data collection by developing an external origin-destination survey.

Mr. Gunning concluded his presentation by addressing the issues that AMAT had requested peer panelists to specifically consider prior to the meeting:

- Accessibility – PAG does not include accessibility in their model
- Neo-traditional land use – PAG does not include neo-traditional land use within their modeling structure. Land use variables are considered within the trip generation equations using the socioeconomic datasets.
- Induced demand – The PAG model does not specifically address induced demand.

- Volume delay functions – PAG uses Bureau of Public Road (BPR) types that are modified for different functional classifications.
- Intersection delay – PAG does not incorporate intersection delay within the model.
- Trip chaining – PAG considers trip chaining during the statistical analysis and trip generation development from household surveys.
- Post-processors – PAG conducts some post-processing for air quality. PAG will also be using REMI in the future for economic impacts of proposed transportation solutions.

AMATS raised the question of how impacts on Indian reservations are considered within the PAG modeling process. Mr. Gunning responded that while two tribes have representatives on the PAG council, the agency is developing a process to estimate tribal populations.

Greg Erhardt, Denver Regional Council of Governments
Denver, Colorado

Denver has a population of 2.5 million, with an additional growth of 1 million people expected over the next twenty years. The Denver Regional Council of Governments (DRCOG) serves as the MPO for the Denver area.

Mr. Erhardt identified some major issues that DRCOG currently faces. One significant challenge is achieving funding equity with the state DOT. DRCOG's share of the transportation funds has decreased over the years. Additionally, toll roads are becoming a more important consideration for transportation projects. Recently, the Colorado Tolling Enterprise was created to plan and manage a proposed network of toll facilities. Under state regulations, existing capacity can not be tolled. However, new hot lanes, express lanes and other new roads can be turned into toll roadways. Given the significance of this issue, DRCOG hopes to enhance the ability of its travel model to forecast the impacts of tolls.

For the travel demand model, DRCOG uses the basic four step transportation model, with ten periods for highway assignments and use of BPR curves. The recent modeling effort included a model refresh (stage 1), model vision (stage 2), model updates (stage 3) and public involvement processes, including a peer review panel. The public involvement process was comprised of three different meetings to involve interested parties in the model process, to solicit input and critiques, and to attain guidance. One meeting was conducted with the local transportation planners, one meeting with policy level personnel, and one meeting with an expert peer panel.

DRCOG continues to make progress in its consideration of land use within the model, even though a regional planning organization has no authority to regulate local land use policies. In 1997, the Denver region approved the Metro Vision Plan, which concentrates development on the nodes and centers of cities and includes regional urban growth boundaries. DRCOG's member governments have established an intergovernmental agreement to abide by the designated urban growth boundaries. Currently 37 out of 50 governments have signed the agreement. DRCOG has been asked to evaluate Vehicle Miles Traveled (VMT) shares and other benefits associated with limiting development to stay within urban growth boundaries.

The DRCOG land use model is a "homegrown" version of DRAM-EMPAL. DRCOG uses a baseline forecast for air quality conformity analysis. Variations on the model are used to evaluate alternatives and examine impacts for design. For example, different land-use scenarios are developed to reflect the impacts of major transportation projects such as new freeways or rapid transit lines.

DRCOG is moving towards the use of Urban Sim for land use modeling. An issue under debate between DRCOG and the Urban Sim developer, Paul Waddell at the University of Washington, is what level of data to use. DRCOG prefers not to create a model based on the parcel level of detail because they do not yet have strong parcel data. The use of grid cells are a possibility, but DRCOG's preference is tending towards the TAZ and neighborhood level. The question of how redevelopable land is incorporated into the model arose from the peer panelists. DRCOG uses an open land variable within the allocation model to incorporate developable land within the model.

Dick Walker, Portland Metro
Portland, Oregon

Portland's urban growth boundary (UGB) must be revisited every 5 years. Any transportation plan must accommodate 20 years worth of growth within the UGBs. Consequently, all modeling endeavors must reflect the interaction of the transportation infrastructure and the household/employment allocation.

Portland continues to use trip-based models for most of the travel forecasting work in the region, however, Metro has used tour-based/activity modeling techniques in the past. Metro is extensively involved in the development of the TRANSIMS modeling tools. Eventually, many of the elements found in that software will be used at Metro.

The Portland model maintains three different income strata throughout the model chain. For the destination choice model, each strata is uniquely linked with different employment types. The use of the income stratification has illustrated the different trip lengths that occur within each strata. Lower income households tend to have shorter trip lengths because they often find jobs at retail locations within the vicinity. Higher income households tend to have longer trip lengths because they often hold specialized jobs in areas further from their homes. The mode choice model also maintains income stratification. The stratification is useful for embodying the sensitivity to various pricing techniques (e.g., toll, parking costs, auto operating costs, transit fares) into the mode choice. No income stratification is used for non home-based trips.

The Portland land use allocation model is called Metroscope, and works in tandem with the transportation model. The process of coordinating feedback through both the land use allocation and transport model is slightly cumbersome because the model must be run in 5 year increments. Conducting a model run usually requires a month to complete. Often, however, policy questions are asked to be answered within a week. Thus, Portland is intending to go through a simplification of the Metroscope-transport model this summer. The simplified model should result in a three to four day turnaround when modeling a policy scenario. The simplified model will operate at a larger zone size (census tract level), and will reduce the number of trip purposes from six to three. In addition, Metroscope will be recoded into the same language (R) as the

transport model to facilitate easier information exchange between the two models. The simplified model will be run extensively as Metro reaffirms and updates the Portland Region 2040 policies.

Portland conducted its most recent household survey in 1994. Now that it is time to conduct a new household survey, Portland would like to follow Seattle's example by conducting part of its survey through a longitudinal panel and the other part as a cross-sectional survey. A longitudinal panel would follow the same household over a three to four year cycle in order to capture some of the effects of major life transition (e.g., a young family who has a child, retirement) on an individual's travel behavior. Data for the survey may be collected through the use of GPS units (potentially attached to the person instead of the vehicle), personal travel diaries, and follow-up phone calls. A pilot study will be conducted in the fall of 2004 to provide information as to which technique provides the optimum data capture.

In Portland, public outreach efforts target representatives of the federal government, local agencies and the general public. The education strategy is tailored to each audience. Detailed model documentation has been an important activity for Portland. A "Reader's digest" version of the model process highlights the key features of the modeling process (2-3 pages). Planning staff at Metro (i.e., non-modelers) often make generalized model presentations to the public. These presentations highlight the key assumptions and explain how the model reacts to each factor.

Mr. Walker concluded his presentation by addressing the issues that AMATS had requested peer panelists to consider prior to the meeting:

- Accessibility – Accessibility indices are used extensively in destination choice and mode choice in the Metro model. Accessibility is not a factor in the generation of person trips.
- Neo-traditional land use concepts – Portland created a mixed use variable that is used in the model. Portland has found that mixed use development demonstrates a significant effect on the transportation system (e.g., increase in transit ridership) only after a certain threshold of mixed use development has occurred.
- Volume delay functions – In the past, Portland has used a conical delay function. Simply stated, the uncongested travel time is multiplied by a delay factor that is related to the volume to capacity ratio:

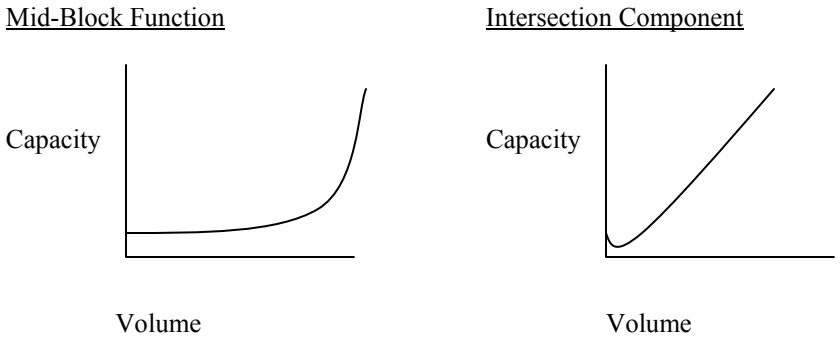
  $$\text{delay function} = T_0 * \text{delay factor}$$

  As a result of a previous bus rapid transit study, Portland found that the delay function needed to be revamped for greater detail/resolution/accuracy. The new delay function now has a mid block component (MB) and an intersection control component (IC). The new delay factor is calculated as:

  $$MB_{time} + IC_{time} = \text{total time}$$

  The typical mid-block function uses a high capacity and a low delay rate. Thus, the resulting low volume-capacity ratio does not produce much delay. The intersection component, however, is influenced by the lower

approach capacity and a high rate of delay is applied. This concept is graphed in the following:



Bud Reiff, Lane Council of Governments
Eugene, Oregon

The Eugene-Springfield (Oregon) metropolitan area is similar in size to that of Anchorage and located 120 miles south of Portland. Eugene has a population of 240,000, of which 16,000 consists of the university population. 60% of the population lives in Eugene, 30% reside in the adjoining city of Springfield, and 10% live in the unincorporated area.

Eugene has estimated a four step model. Consultants were retained to develop the logit mode choice model. The mode-specific constants were calibrated to match the survey results for each mode, and the other coefficients were borrowed from other models. Eugene uses EMME2 for its traffic assignment software. Eugene currently experiences approximately a 1.8% transit mode share and 3.6% bicycle mode share. The city is currently in the process of adapting Portland Metro's model to Eugene.

Eugene uses a rule-based method for their land use allocation model. Eugene was involved in the proof of concept for the Urban Sim model. Eugene's extensive GIS and parcel database was intended for longitudinal validation, but served instead as longitudinal calibration for Urban Sim. Allocating for growth has been a challenge. Eugene has historically maintained a slow growth approach to development and is not currently supporting many major transportation projects.

Mr. Reiff described some of the strengths and weaknesses of the Lane COG's modeling program:

- The transportation modeler has cross functional duties, which allows him to be involved in land use allocations and socioeconomic factors
- Lane COG models nonmotorized trips, which has been useful in determining the demand for new bike paths
- The current model needs to have increased zone detail to improve assignments and capture more intrazonal movements.
- The current model area needs to be expanded. Many trips are made between Eugene and four satellite communities located within15 miles of

the metro area. Currently, these movements are only captured within the external model.
- The model needs to incorporate freight, especially trucks. The current freight model is an adaptation of the University of Tennessee's research to Eugene's conditions.
- Estimation of travel times does not work very well; freeway travel times are realistic, but congested intersections result in some arterial delay estimations that are much too low.

Mr. Reiff concluded his presentation by giving an overview of a research report conducted by the Oregon Department of Transportation and the city of Portland. The study divides urban design variables into environmental variables and accessibility variables. While the research team could not test and quantify many of the environmental variables, they were able to test accessibility variables and produce a single urban accessibility variable that incorporates several aspects of accessibility, but avoids the colinearity problems inherent in using multiple variables. A key finding of the report was that it appears to take major increases in business and household densities and in neighborhood connectivity to have any significant effect on non-automobile travel.

AMATS Organization
Craig Lyons, AMATS Coordinator

Mr Granzow and members of AMATS provided an overview of the current conditions faced by AMATS and the status of their model improvement process. AMATS is the MPO for the Anchorage region, and was formed in 1976. With only one government in its jurisdiction, the municipality of Anchorage is responsible for operating the MPO in coordination with the state department of transportation. The organization of AMATS consists of a Technical Advisory Committee and Policy Committee, The Technical Advisory Committee consists of eleven voting members: the Directors of the Municipal Departments of Health and Human Services, Planning Department, Port of Anchorage, Project Management and Engineering, Public Transportation, and Traffic; The Alaska Department of Transportation (ADOT) Chief of Central Region Planning and Administrative Services, ADOT Regional Pre-Construction Engineer, the Alaska Department of Environmental Conservation Manager of the South-central Region Air Quality Program, a representative from the Alaska Railroad Corporation ,and a member of the AMATS Air Quality Advisory Group. The AMATS Policy Committee consists of five equal voting members: two municipal Assembly members, the Mayor of Anchorage, the Commissioner of the Alaska Department of Transportation and Public Facilities, and the Commissioner of the Alaska Department of Environmental Conservation or their designees. AMATS is also considering the formation of a freight committee.

Land Use Policy Plan
Jon Spring, Senior Transportation Planner

The Municipality of Anchorage region has a population of about 270,000, with an additional 66,000 persons living in the adjacent Matanuska-Susitna Borough.

In 2001, the Municipality of Anchorage adopted a new Comprehensive Plan incorporating a number of smart growth concepts including town centers, transit corridors, and employment centers. The majority of future employment growth is expected to occur in three major employment centers: downtown, midtown, and university-medical areas. While the Anchorage Bowl will continue to experience infill development along with the additional growth forecast for the suburban community of Chugiak-Eagle River. The greater Anchorage region is also currently experiencing a growing trend for new residential development to occur outside of the Municipality of Anchorage in the Matanuska-Susitna (Mat-Su) Borough, about 40 miles northeast of the downtown area. The Mat-Su Borough currently has limited zoning and subdivision regulations in place.

The Glenn Highway connects the Chugiak-Eagle River and Mat-Su Borough areas to downtown Anchorage and is becoming an increasingly congested corridor. AMATS is investigating congestion mitigation strategies, including high occupancy vehicle (HOV) lanes, and potentially a commuter rail service for the Glenn Highway corridor. In addition, a freeway to freeway connection between the Seward Highway and the Glenn Highway is being considered along the eastern edge of the downtown area. The Anchorage bus system will probably be the primary mode of transit for the city over the next 20 years. AMATS is investigating bus rapid transit (BRT) options for the future.

Model Structure and Data Development
Ed Granzow, CH2MHILL Engineers

The Anchorage Bowl has only two significant surface transportation routes into and out of the area. There are two major corridors. The Glenn Highway corridor is located to the north and the Seward Highway is located to the south. The Mat-Su valley region has a population of 65,000. The areas to the south of Anchorage are regions with heavy summer tourism. The major trip generators within Anchorage itself are two major military bases to the north, Ted Stevens International Airport to the west, and the university-medical area southeast of downtown.

The travel demand model currently in use is a standard four step model which includes trip generation, distribution, mode choice, and highway assignment. Trip generation utilizes household size, workers per household, autos per household and household income by zone. Trip generation is estimated directly by times of day for the morning peak (7-9 AM), afternoon peak (3-6PM), off peak periods and total daily. The lack of success in application of the time of day features in the model has constrained its use almost exclusively to predicting total daily traffic. Trip distribution is based on the gravity model. The three trip purposes are home based work, home based other, and nonhome based work. Mode choice is based on a multinomial logit model. The mode choice uses five modes (walk, bike (home based work only), drive alone, shared ride (2 pass), shared ride (3 or more pass), and bus. Assignment is based on equilibrium.

An extensive update of the model and its parameters is currently being undertaken as part of area Long Range Transportation Plan development. The key objectives of the model update are to:

- Improve model sensitivity to key variables and model ability to forecast multimodal travel and related policy impacts

- Better represent travel impacts of land use and development policies of the Anchorage 2020 Comprehensive Plan
- Incorporate updated travel behavior and population characteristics data from the 2002 household travel survey and 2000 census into model formulations and assumptions
- Develop and incorporate post-processors to improve model output

Additionally, a major objective of the current modeling effort is to update and improve model procedures, and to demonstrate consistency of results with other independent activity measures (i.e., traffic counts, transit rider counts).

A variety of resources are available to AMATS for data. Data sources include:

- 2000 Census for updated household characteristics
- 2002 Household Travel Survey with detailed weekday travel information for 1,293 households, 3,029 travelers, and 12,092 trips; includes information on type of trip, origin and destination, time of trip, and mode of trip
- Corridor Travel Time Surveys for 12 corridors, based on GPS data collection
- 2002 Employment Data Inventory by employer identity and location
- 2002 Traffic/Transit Rider Counts, including 800 count stations

The breadth of current data is an asset of the AMATS model improvement efforts.

Mr. Granzow proceeded to give an overview of key findings of a previous model review, and the model update strategy. See attached document for more details

The ensuing discussion focused on components of the four step process, as follows:

Improvements to Trip Generation
AMATS has built new models for income and auto ownership and has reestimated household size and workers per household models; as well as received updated and more accurate data on employment data, population, and trip-making. The peer panelists advised AMATS to carefully review the need for special generators, particularly to represent major retail and commercial centers. Instead of a gravity model, Portland uses a destination choice model, which accounts for many special generators.

Improvements to Trip Distribution
AMATS increased the number of trip purposes from three to six, and now has a more accurate definition of destination types. The model update also improved representation of differences between peak and off-peak trip patterns. The new school trip model will recognize school service areas. The city of Eugene considers a household lifecycle variable and creates a child model to generate school trips at the production end of the model.

Improvements to Mode Choice
The new transit networks describe operation by type of service (i.e., local versus express). AM, PM and off peak demand and conditions are modeled both for transit and highway. Parking costs are explicitly considered within the mode choice model. Area density and diversity is

represented equitably for all areas. The definition of walk accessibility to transit has also been improved.

The coefficients for certain variables were found to be unusually large. For example, the in-vehicle time coefficient is -.08 (a typical value is about -.03). The CH2Mhill model assigned a constant to the income categories. This is typically not the case. Portland does not look at income as a constant, but uses a unique coefficient for each income bin. The coefficient is applied to all cost variables.

The peer panelists provided a series of suggestions on the transit model, which follow:

- Disincentives (i.e., limiting parking spaces, higher parking costs, location of parking lots on the periphery of the city) Can be used to promote transit ridership. For example, the Portland passport program provides employers with 50+ employees with a free bus pass. The ability to test the effectiveness of some of these disincentives can be built into the model.
- IDAS/ITS software might be useful because the output of the regional model can be used as a direct input into IDAS for intelligent transportation systems analysis purposes.
- Consider how the wait-time function for transit is incorporated into the model to account for the low frequency of the bus service.
- Analyze and compare the trade-off between the utility of car use and the utility of transit use

AMATS responded that because the largest employers of the region are the hospital and the airport which have unique travel needs, travel demand management (TDM) strategies are difficult to implement.

For the Land Use model, AMATS is tracking new development through permitting activity. The Municipality of Anchorage is currently in the process of revising its zoning code. One of the proposals is to create mixed use districts with residential, retail or office categories with a menu of options for a specific district. The initiative may be fairly controversial.

Improvements to Assignment

The morning, afternoon and off peak periods are assigned separately, instead of all the daily trips being assigned in one group. Panelists agreed that the output of period specific traffic will provide better estimates of network congestion and improve quality of inputs to air emissions modeling.

Improvements to Post-Processing

The purpose of the post-processing activity is to improve output reporting and improve modeling beyond the traditional four step process. Peer panelists suggested that supplemental software/databases would provide estimates of travel demand management, and show the effects of ITS deployment. They also suggested that, project/scenario cost-benefit procedures would help prioritize projects. Finally, peer panelists pointed out that a level of service analysis tools would provide better information on traffic operations impacts.

PEER PANEL CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Purpose of the Model

AMATS intends to use the model as a way to guide where to build and how to make future infrastructure investments. Peer panelists cautioned that the model should be used only as a tool to model the outcomes of "what if" scenarios. Panelists further advised that the scenarios to be tested should be developed by policy makers working with planners. By developing a spectrum of scenarios, the outcomes of various policy choices can be demonstrated. The first step is to determine an upper, lower and middle bounds as scenarios to act as reference points, then refine the bounds to create the most feasible and realistic possibilities. Peer panelists recommended that one way to determine appropriate growth strategies would be to refer to four or five cities that currently exhibit characteristics of what Anchorage will be in 20 years. The panel suggested that a "do-nothing" scenario be included in the spectrum of scenarios to be tested. The "do-nothing" scenario could be a powerful tool to show a municipality that if it does not make the right kinds of land use decisions, the transportation system will not be effective.

The peer panel also suggested that AMATS should attempt to keep the model simple enough to produce fast results to address policy questions/concerns in a timely manner. Furthermore, the panel suggested that evaluation mechanisms be determined to check the model. By comparing what is actually occurring with the model output, the model process can be further improved.

Tour-Based Models/Microsimulation

The four step trip-based model differs from a tour-based model in that travel is analyzed in terms of tours. A tour usually begins at home, makes several stops throughout the day, and then returns home. A single tour may be comprised of several trips. For example, a tour from home to work to the grocery store and back home counts as three trips in a trip-based model but as one tour in a tour-based model).

Tour-based models may be a more useful tool for complicated policy issues. The tour-based model considers the designation of household income and prior trip mode decisions when evaluating the individual travel choices on each of the trip legs. Alternatively, in trip based models, very little is known about non-home based trips.

Tour-based models are typically implemented using household microsimulation techniques (sometimes called pseudo-sample enumeration). Microsimulation models simulate a "synthetic" population of households and persons for the entire region. For each person, they use Monte Carlo techniques to select a single outcome from a list of probabilities. For example, consider a mode choice model that predicts a traveler has a 80% chance of choosing auto and a 20% chance of choosing transit. The model would "roll the dice" and eight times out of ten, the outcome would be one auto trip. If the same probabilities are applied to 100 trips, about 80 would be auto trips.

A traditional model (sometimes called the fractional probabilities approach) operates on TAZs rather than a "synthetic" population. Consider a zone pair with 100 trips going from zone A to zone B. The mode choice model predicts that travelers between that zone pair have an 80% chance of choosing auto and a 20% chance of choosing transit. The model multiples the probability times the member of trips in the zone pair, and the result is 80 auto trips and 20 transit trips from zone A to zone B.

The results of a household microsimulation model can often look like a travel survey. Therefore, many consider the technique to be useful for analyzing environmental justice issues because they can account for effects on various subpopulations.

Household microsimulation methods should be distinguished from traffic simulation. Whereas household microsimulation simulates the behavior of individual households and person, traffic microsimulation simulates the behavior of individual vehicles on the road. Household microsimulation can be implemented without traffic microsimulation and vice versa.

Panelists agreed that in the long-term, the modeling industry is most likely headed in the direction of tour-based models. The question of when it will become the standard, however, is undetermined. Only 4-6 agencies across the US have experimented with tour-based models. Of those, none of the agencies rely upon the microsimulation for all of its forecasts.

Panelists pointed out other challenges to consider:

- The traditional model will always produce the exact outcome for the same input data. The household microsimulation model could produce a slightly different outcome due to randomness in the Monte Carlo simulation. Thus, each analysis would require several model runs to find the "average" conditions.
- The FTA New Starts Summit modeling software is not compatible with the tour-based microsimulation models. Thus, if an agency is interested in applying for New Starts funding in the near future, a separate trip-based model would need to be developed.
- EPA may not accept the air quality analysis resulting from microsimulation.
- Microsimulation may be very difficult to calibrate. The model runs might behave very differently than what is expected. It might be very difficult to reconcile the results of a trip-based model with that of microsimulation.
- Tour-based models are more tricky and complex to run with more sophisticated statistics.

There is a tension over the need to improve tools to use on a day to day basis versus creating the most sophisticated tool that will accurately represent travel behavior. Panelists suggested that small and medium-sized MPOs interested in tour-based modeling should use an existing tour-based model that has already been completed by another MPO to serve as a base. Then, modify the parameters for the specific characteristics of the region. Panelists recommended that

determination of the best model should be made on the basis of which tool best addresses the region's needs (e.g., air conformity analysis, New Starts funding). Modeling should not merely be an academic exercise but a useful tool that best stewards tax dollars.

Recommendations

The peer panel convened a private discussion of the AMATS model presentations provided the previous day. The recommendations were then presented to AMATS staff, members of the Long-Range Transportation Plan Technical Oversight Committee, members of the AMATS Technical Advisory Committee, and members of the Long-Range Transportation Plan Roundtable Committee. The peer panel provided an opinion on the overall AMATS model update process, some "red flag' warnings to further study, and some suggestions on future development of the model.

In general, the peer panel agreed that the AMATS four step model design is adequate and appropriate for a metropolitan area the size of Anchorage. The initial steps for data collection and the model structure were considered to be on par with Eugene, a metropolitan area in Oregon that is similar to Anchorage. The peer panel stated that they had difficulty in conducting an overall assessment of the AMATS model technical details because the update is still being implemented. The panel did, however, identify specific elements of the model update process perceived as "red flags" for AMATS to consider as the model improvement process continues.

<u>Near Term Recommendations</u>
The peer panel identified some challenges with the mode choice model. The out of vehicle time coefficients appearing in some trip purposes appear to be too high, relative to in-vehicle time. Typically, the ratio is 2:1 compared to the current 5:1 ratio found in the home based work model and 8:1 ratio found in the nonhome based work model). The peer panel recommended that AMATS study the reasons behind the mode choice coefficients. Additional panel recommendations on the mode choice model include:

- Revisit estimation data. In estimation datasets, it is very important to replicate the conditions that the traveler actually faced (in terms of time and cost).
- Derive the variable elasticities and the model response to change .
- Transit trips - Check wait times, especially because of their potential effect on the out of vehicle time.
- Watch for outliers that may be potentially skewing the results.
- Separate out of vehicle time and cost.
- Rather than including income as a variable, segment cost parameters by income.

The peer panel also identified challenges with the auto ownership model. The peer panel recommended that consistency across income category ranges be checked. The panel suggested that AMATS attempt to parce the data more finely for income categories. For example, Portland has a <25K 1994 dollars category. Additionally, the panel asked why the mixed use variable does not appear for zero autos. The panel also questioned why intersection density does not

appear for two autos. Finally, the peer panel expressed concern over the HBS trip production model results. Although one would expect trip production rates to increase as household size increases, the current model does not demonstrate such results. Because the error is most likely due to sample size, AMATS should consider combining sample sizes. It was explained that this would be corrected in the final versions of the trip production models.

The peer panelists provided a series of recommendations for the AMATS model calibration, validation, and documentation efforts. They are listed in the following:

- Document what other models were tested in the model process, and why the current mode choice model was designated. Similarly, document the land use allocation process.
- Review model elasticities in order to better understand how the model will respond.
- Compare final trip generation rates with the survey results. Once the model is estimated, take the survey data and run it through the model, and see how well it matches. Once the model is finished and calibrated to the base year, apply to a future year and ask if results and elasticities are still reasonable. Check for consistency.
- If the model is run and results are not reasonable, then re-check specifications. Ask if the variables used in the choice process are logical and feasible, or if the model has been skewed. Sometimes the code needs to be adjusted.
- The panel asked what network was used in calculating the intersection and walk densities (i.e., GIS or model network). AMATS calibrated the results on the GIS network. The panelists recommended that the results be translated into a model network or an area characteristic variable.
- Need to include the high number of multi-use walk paths, as indicated in comprehensive plan, in the skims. It may be appropriate to have two walk connectors with different distances for walk mode and transit mode. Additional, AMATS may want to separate walk access to transit links from walk trips.

<u>Long Term Recommendations</u>
The peer panel provided recommendations to consider in the long term.

Land Use

- AMATS should consider expanding the model area to include Mat-Su Valley, especially since policy issues seem pending. Capture what are tradeoffs between accessibility and cost or lot size in the land use allocation model.
- Depending on data availability, AMATS could continue using the rule-based model for land use allocation rather than requiring immediate use of Urban Sim or other sophisticated land use modeling software. In order to better understand the economic relationships and the amount of development to take place in the Mat-Su Valley, relative to Anchorage,

AMATS should build some partnerships with neighboring jurisdictions to conduct basic data collection.

- Consider interviewing developers to understand their criteria for evaluating new developments. In the future, consider more sophisticated land use allocation software that can better identify the tradeoffs in land use.
- Consider conducting a Stated Preference Survey in the Mat-Su area. Pose what-if questions and couple with a Delphi method of polling real estate developers, etc. to provide residential preference information for a broad-based allocation model.
- For broad based urban development models, sketch planning models may be useful. WHAT IF is a fairly good model with GIS visualizations of what if scenarios, and is easy to get up and running with basic GIS data. PLACE3S (Sacramento), ME PLAN, and FACETS (Canada) are also useful models.

AMATS voiced that they would like to see an independent full time demographer in the planning department who could conduct the land allocation portion of the modeling.

Tour-based modeling

The peer panelists agreed that there was no need for AMATS to transfer to tour-based/activity-based model at this time. Although the modeling industry is probably headed in this direction, the panelists suggested that AMATS wait until the process has been more established.

Discussion with the Technical Oversight Committee

Members of the AMATS Technical Oversight Committee posed a variety of questions to the peer review panelists. Because many of the questions were outside the scope of what the peer review panel had originally been tasked to address, the ensuing section merely captures the topics informally discussed rather than conveying the formal opinions of the peer review panel.

Questions posed:

- What is the relationship between density and the impact on transit use? In response, Mr. Walker described the study conducted in Portland, as described in the first section of this report.
- How accurate is the model in capturing inter and intrastate freight movement? In response, the peer panelists stated that the freight model was not included within their review.
- How accurately does the model accurately reflect what is unique in the Anchorage area? This question was outside the scope of the peer review panel tasks.
- How robust and sensitive is the model? The peer panel pointed out that one of their recommendations was to conduct further sensitivity tests.
- How useful is the model for air quality? The peer panel thought that the model results should be readily translated into an emissions calculation.
- With models continually developing, at what point can AMATS just run the model? How close is Anchorage to be able to use the model? The peer panelists responded that the general model design is appropriate.

However, the consultant team has some work to do yet in finalizing the structure and to incorporate the peer panel's recommendations.

- Is there a possibility of utilizing existing rail tracks for future transit in Anchorage? The peer panel responded that the model would be able to answer the question of how many people would ride the train, given x stops along y corridor. The panel pointed out that citizens must feed the model with the vision while the model can provide outcomes of the scenarios.
- What is your local experience of the interaction between land use and transportation? The peer panelists pointed out that a desired land use and realistic land use, scenarios are not always the same.

APPENDICES

Participants

Jody Karcz, Transit Planner, Public Transportation Department
Greg Erhardt, DRCOG
Ed Granzow, CH2Mhill
Andy Gunning, PAG
Jennifer Hepner, CH2Mhill
Barbara Karl, AMATS Roundtable Member
Craig Lyon, MPO Coordinator for AMATS
Helen Nienhauser, AMATS Roundtable Member
Steve Noble, Dowl Engineers
Dave Post, Alaska DOT
Bud Reiff, Lane Council of Governments (Eugene, OR)
Cheryl Richardson, Anchorage Citizens Coalition
Jack Roderick AMATS Roundtable Members
Jon Spring, AMATS
John Tolley, Alaska DOT
Lance Wilber, Anchorage Municipality
Dick Walker, Portland Metro

Handouts

Anchorage Model Peer Review
May 24 and 25
Assembly Conference Room (Room 155) 1st Floor City Hall

Agenda

Monday May 24th	
9:00 am	Introductions of Peer Review Panel & NCDOT participants Expert Panelists- Where from? Experience in modeling
9:05 am	How We All Got Here & Our Panel Goals
9:15 am	How organization does modeling What works well in your modeling program/needs improvement
9:15 am - 9:45 am	Puget Sound Regional Council – Larry Blaine
9:45 am – 10:15 am	Andy Gunning –Tucson Arizona
10:15-10:30	Break
10:30 am – 11:00 am	Greg Erhardt – DRCOG
11:00 am – 11:30	Dick Walker – Portland Metro
11:30 am – 12:00 pm	Bud Reiff – Lane Council of Governments
12:00 pm-1:00 pm	Lunch
1:00 pm – 1:15 pm	AMATS Organization Structure
1:15 pm – 1:45 pm	Modeling Effort, Part 1-Overall Model Structure and Data Development
1:45 pm-2:45 pm	Modeling Effort Part 2-Trip Generation – Trip Generation Methodologies for models!
2:45 – 3:00	Break
3:00 pm- 4:00 pm	Modeling Effort, Part 3-Trip Distribution
4:00 pm-5:00 pm	Modeling Effort, Part 4-Mode Choice & Assignment
Tuesday May 25th	
8:00 am – 8:30 am	Panel Caucus-session to discuss previous day's information
8:30 am-10:00 am	Interactive Dialogue-All panel members
10:00 am – 10:15 am	Break
10:15 am – 11:00 am	Future Directions – Suggested next steps Activity Based Modeling, etc.
11:00 am – 12:00 pm	Panel Caucus-session to discuss recommendations
12:00 pm- 1:00 pm	Recommendations & Dialogue Session Panel presents recommendations

Issues for the Model Peer Review Panel to Address

At the start of the Anchorage Model Peer Review work sessions, panel members will be asked to present information on their modeling experience. In order to help panel members focus their discussion on topics that are of particular concern to Anchorage, the following list of issues of particular concern to Anchorage have been compiled.

Consideration of Accessibility – The consideration of accessibility is an emerging concern of modelers and planners. As suggested by Harvey and Deakin, accessibility influences the number of trips made in motorized vehicles through the decision to walk and to link trips into complex chains. Does your agency incorporate accessibility into trip generation? If so, how does it accomplish this?

Modeling Neo-Traditional Land Use Concepts - How does your MPO deal with land use variables in the model? For example, research has shown that design, density, diversity (mixed uses) have an effect on mode share and trip generation. If you incorporate land use variables in your model, how sensitive are the mode share results to changes in density and other land use factors?

Public Education – What efforts does your MPO make to educate the public about your model? Is there trust and support for the model? If so, how did you overcome the public perception that the model is a black box?

Induced Demand - Alternative- What techniques do you use to address questions surrounding induced demand? Does your model incorporate feedback loops between the travel demand model and land use allocation model?

Volume Delay Functions – Does your agency use alternative volume time functions (non BPR functions)? If so, what do you use (Akcelik/Davidson, Concial)? Do you use one delay function for the entire network or do you use different functions for different functional classifications?

Intersection Delay – Does your MPO incorporate intersection delay in the assignment model?

Trip Chaining – Does your MPO incorporate trip chaining in the model structure? If so, how?

Forecasting Household Variables – What demographic variables does your MPO forecast and how? In particular, does your agency utilize an auto availability model? If so, does it incorporate a transit accessibility variable?

Post Processors – What type of post-processors does your agency utilize to supplement the standard model? What type of evaluation tools (post processors) do you utilize to support analysis of model results?