Highlights of the TPB Travel Forecasting Subcommittee Meeting
Held on July 18, 2008

Item 1: Approval of May 23, 2008 Meeting Highlights

The highlights were approved as written.

Item 2: Version 2.3 Travel Demand Model Draft Report

Mr. Milone distributed a handout entitled, 'TPB Travel Forecasting Model, Version 2.3: Specification, Validation, and User's Guide', and the draft Version 2.3 report. He announced that the TPB's Version 2.3 model remains in development and is now available as a 'draft release' upon request to anyone wishing to test it. The Version 2.3 model is an incremental update of the currently adopted Version 2.2 model and contains two key refinements: 1) a Nested Logit mode choice model (NL MC) which replaces the sequential multinomial mode choice model that is utilized in the Version 2.2 model, and 2) updated medium and heavy truck models. Mr. Milone stated that the Version 2.3 model will continue to be tested and refined until the end of calendar year 2008, at which time a determination will be made about adopting Version 2.3 as the official production model. Mr. Milone stated that the Version 2.3 documentation consists of three sections addressing the model specification/validation, a user's guide, and technical appendices. He added that the report, like the model itself, is a work in progress. While some of the sections are incomplete, the report provides sufficient information for understanding and executing the model.

Mr. Milone presented some background on the revised truck models that are used in Version 2.3 regarding the data used, the model calibration approach, and the model specification. He added that the consultant supporting the truck modeling work, William Allen, would describe the truck models in greater detail (see Item 3, below).

Mr. Moran presented the NL MC model featured in the Version 2.3 model. The NL model considers an expanded choice set in comparison with the existing mode choice model (15 choices as opposed to 5). The NL choice set includes three auto modes (SOV, HOV 2-occ., and HOV 3+ occ.) and four transit modes (commuter rail, bus only, Metrorail only, and bus-Metrorail), each distinguished by three access types (walk, PNR, and KNR). Mr. Moran reviewed the history of the TPB's NL MC model development. He pointed out that the TPB's development effort took advantage of earlier project planning work originally undertaken by AECOM Consult, Inc., and he addressed how the TPB adaption of the NL model varied with the initial NL model application in detail.

Mr. Moran indicated that the existing mode choice model and the NL MC model were developed with differing sources of information. While the existing mode choice model was calibrated to the 1994 Household Travel Survey and validated to the 2000 CTPP, the NL MC model was primarily calibrated to 2002 on-board survey data and ridership

counts. As a result, the transit results of the two models (i.e., the number of transit trips and the distribution of transit trips by purpose) are somewhat inconsistent. The NL MC model simulates approximately 1.5% more total transit trips (in 2002) for the region in comparison with the existing mode choice model (1,064,000 vs. 1,049,000). Furthermore, Version 2.3 work transit trips are higher than those of Version 2.2 in 2002 by about 19% (695,000 vs. 585,000).

Mr. Moran finally reviewed numerous transit network refinements that support the NL MC model, including changes to the rail station/PNR file, transit-related network link files (access links, sidewalk links, and transfer links), and the zonal transit walk shed files.

In closing, Mr. Milone added that the Version 2.3 model currently appears to over simulate observed vehicle miles of travel by about 3% (more detailed performance statistics are provided in the Version 2.3 report). Further refinements and evaluation will occur in the coming months. He invited the subcommittee to contribute ideas regarding sensitivity testing of the Version 2.3 model. He indicated that TPB plans to upgrade the Cube/TP+ Version from 4.1.1 to 5.1 (5.1 was recently released by Citilabs). Finally, the evaluation of HOT lane forecasts produced by the Version 2.3 model is another important area that the TPB intends to investigate.

Questions and Comments

A question was asked if TPB has considered studying the effect of altering the maximum drive-access distances to terminal rail stations (e.g., Shady Grove). Mr. Moran stated that this experiment has not been undertaken, but investigating the effect of expanding the drive access market shed at selected rail stations is an interesting idea and will be considered as part of the upcoming sensitivity tests of the Version 2.3 model. TPB has recently explored transit fare sensitivity tests which will be presented in the future.

A concern was expressed that pedestrian walk and bicycle modes were not included in the choice set of the NL MC model. Mr. Moran stated that HBW non-motorized travel is calculated at the traffic zone level as part of the trip generation step, but is not carried forward into trip distribution and beyond. The inclusion of a 'walk mode' in a regional mode choice model is a subject of debate. No clear consensus on this issue exists in the profession. Travel analysis zones employed in regional travel demand modeling are presently too coarse to meaningfully represent walking times, relative to motorized choices.

A question was asked about how gas prices are represented in the model (which is of immediate concern given the recent spikes in oil and gas prices in the area, and across the U.S.). Mr. Milone responded that there is a parameter in the NL MC program which is used to reflect per-mile auto operating costs (these are direct travel related costs including gas, oil, tire wear, and maintenance). The existing parameter value is 10 cents/mile (in 1994 cents). This value may be altered to reflect a gas price that outpaces the inflation rate.

A comment was made regarding modeling work under development for Stafford County, with a suggestion that TPB consider the use of trip generation rates by dwelling unit type. TPB is willing to consider this idea. However, the Cooperative Forecasting process does not furnish this information presently, although it has been discussed by COG's Metropolitan Development Policy Committee.

Item 3: New Truck Models Developed as a Component of Version 2.3 Travel Demand Model

Mr. Allen, an independent transportation consultant, presented this item (during FY-2008 he was under contract to the TPB to direct the truck modeling work). He stated that TPB initiated a project 4 years ago to develop a new commercial vehicle model and to revise the existing TPB truck models. The TPB model distinguishes between two truck types: medium trucks (2-axle, 6-tire) and heavy trucks (3+ axles). The commercial vehicles include light-duty trucks. Both the commercial model and truck models were formulated using a similar innovative modeling approach that makes exclusive use of classification counts and obviates the need for truck operator surveys. While it would be desirable to develop truck models using driver-reported (O-D) surveys, such surveys are difficult, if not impossible, to conduct.

The modeling approach Mr. Allen used was one that has been applied previously in Baltimore, Atlanta, and Ohio. It is an innovative approach that involves the use of a 'starting' generation and distribution model that is refined based on the traffic assignment results. Coded traffic counts on the highway network links are a critical component of the model development. Mr. Allen worked with DDOT, MDOT, and VDOT in obtaining available classification counts. He also used special TPB counts, including 2003 external truck data. These data, collectively amounted to about 500 locations. It was necessary for Mr. Allen to expand this relatively small sample of observed counts to several thousand using a traffic count model. The model estimated the percentage of medium and heavy trucks based on several link attributes. The percentage was applied to the total daily count to arrive at synthetic truck counts.

Mr. Allen reviewed the model calibration process. The process began with a 'starting' generation/distribution model comprised of borrowed parameters. The resulting truck trip tables were then assigned to the highway network. Subsequently, the estimated truck link volumes and observed truck counts where 'skimmed' and compared. This comparison was used to modify the starting truck trip tables on an i/j basis and the modified trip table was, again, assigned to the network. Mr. Allen applied this procedure (or 'Adaptable Assignment') iteratively until 'final' truck trip tables resulting from the assignment matched the observed trip table within a reasonable margin of error. Next, the zonal trip-ends summarized from the final trip table were evaluated against the variables used in trip generation to determine if any systematic biases existed. This evaluation led to adjustments in the trip generation coefficients, which, in turn, changed the starting model. Thus, the calibration process can be thought of as two loops, an

'outer loop' in which the starting model is adjusted based on the final traffic assignment, and an 'inner loop' in which the estimated trip table is modified using the adaptable assignment procedure. This trial-and-error process was computationally intensive and required a great deal of professional judgment.

The revised truck models consist of generation, distribution, and time-of-day components. The model also includes an additive adjustment (or 'delta') matrix which is used to correct for small random differences between estimated and observed truck trip flows. The model also considers 'truck zones', special TAZs that are known *a priori* to be associated with especially intensive truck activity. There are currently 35 truck zones. The model also considers whether a given zone is accessible by trucks (some zones are connected exclusively to truck-prohibited links). Truck trip generation is disabled for any TAZ that is inaccessible by trucks.

Mr. Allen felt he successfully accomplished the TPB's request for a cost-effective and practical truck model using locally-collected truck counts. He cautioned that truck travel is complex and subject to many variables that are not considered in conventional travel models. He also recommended that the TPB truck models should be revisited every five to ten years. He added that TPB should keep abreast of emerging commodity flow–based approaches which may be considered for the next modeling update.

Questions and Comments

Mr. Allen was asked to comment on the effect of using additional special-generator truck zones with respect to VMT and trip length. More truck zones will emerge with future development and these should be reflected in the truck model. Additional truck trips will be generated as a result. However, there is no way to tell what effect this will have on truck trip lengths. A comment was made that many of the industrial areas in Prince William's outlying areas are changing into new developments and, as a result, new industrial locations are being established in other outlying counties. This type of phenomenon will likely cause truck VMT to grow.

A question was raised whether the 'delta' matrix application includes a check for negative trips that could potentially result. Mr. Allen said that the delta matrix application includes a provision to ensure that the minimum trip value is not less than zero.

Another question was raised regarding how the model addresses through truck traffic at external stations. Mr. Allen replied that since there is no comprehensive data on through truck traffic, the through truck trip table was synthesized based on patterns reflected in the 2003 External Survey data (reflecting a limited number of surveyed locations), counts at external stations, and professional judgment. It was noted that VDOT has a statewide model that addresses freight flows, and MDSHA is currently developing a similar model. Since these models have the benefit of a larger geographic scope, it was suggested that the TPB might consider the results of these types of models to inform external and

through truck flows. Mr. Allen agreed that the statewide models could potentially prove useful in this regard.

Another question was posed regarding how the 35 truck zones were identified, with a follow-on suggestion that the model could possibly include a function to relate warehouse employment density to TAZs with intensive truck generation. Mr. Allen responded that the use of such a density function may not fully reflect intensive truck activity locations, particularly in the case of large TAZs. He felt that truck zones are best identified through expert knowledge of a particular area. The truck models developed in Baltimore included truck zones that were identified by the BMC's Freight Committee which included individuals who were familiar with the major generators of the region.

Item 4: Update on Air Systems Planning Activities

Mr. Canan presented an overview of COG's Continuous Airport Systems Planning (CASP) process and highlighted three major efforts of the program. He noted that COG has conducted air systems planning through the CASP program for more than 30 years through an iterative process that includes conducting and processing an air passenger survey, preparing ground access forecasts based on survey findings, and using the forecasts to update the Ground Access Element. Three of the products highlighted during the briefing included (1) the 2007 Washington-Baltimore Regional Air Passenger Survey, (2) the Washington-Baltimore Origin-Destination (O-D) Forecasts, and (3) the 2008 Washington-Baltimore Regional Air Cargo Study. Mr. Canan noted that the air passenger survey and the O-D forecast projects were managed and completed by Mr. Abdul Mohammed who was currently on travel.

The 2007 Washington-Baltimore Regional Air Passenger Survey was completed during October of that year. More than 19,000 survey responses were obtained, accounting for more than 27,000 passengers on 685 flights. This resulted in a very favorable 49 percent response rate. Final reports documenting the findings of this effort are anticipated in fall of 2008. The O-D forecasts recently completed were based on factors derived from the 2005 air passenger survey applied to enplanement forecasts provided by the three major airports in the region as well as to the latest land use forecasts prepared by MWCOG (Round 7.1) and the Baltimore Metropolitan Council (BMC) (Round 7). Mr. Canan explained that the percentages of local originating trips and *internal* local originating trips from the 2005 air passenger survey were applied to enplanement forecasts to calculate internal local originating trips from the total enplanement forecast. Next, home-based vs. non home-based trips were estimated by applying the home-based/non home-based factors from the 2005 survey to the internal local originating trips. Using this information, home-based and non home-based trip rates from each Aviation Analysis Zone (AAZ) to each airport were estimated using 2005 AAZ-level trip data and respective land use data. These rates were then used to generate annual trip tables from each AAZ to each airport for each of the forecast years.

Mr. Canan concluded his presentation with an overview of the recently-completed 2008 air cargo study. He indicated that this study, which was last conducted in 1997, focused only on Baltimore Washington International (BWI) and Washington-Dulles International (IAD) Airports. It did not consider air cargo at Ronald Reagan-Washington National Airport (DCA) because of DCA's substantially low level of and future capacity for air cargo operations. The analysis included three principal analyses: (1) demand analysis, (2) facilities analysis, and (3) an accessibility analysis.

Questions and Comments

A question was asked if COG has coordinated its air passenger survey effort with BMC. After confirmation from Mr. Canan that BMC does participate in bi-monthly COG Aviation Technical Subcommittee meetings, it was then noted that the BMC's model applies generation, distribution, time of day and mode choice from its air passenger survey, which should be able to be readily applied in the TPB model. Staff noted, however, that the BMC model applies to BWI only, and that it may be more of a challenge to reflect airport choice in the model since there are three major commercial airports considered in this region.

Item 5: Geocoding of the 2007 Metrorail Survey

Ms. Reschovsky reported that the 2007 WMATA Metrorail Survey was conducted between April 17 and June 22, 2007. The survey questionnaire was distributed to 1 in 3 riders and the response rate was 25 percent. 66,321 completed questionnaires were returned. 84 percent of trips either started or ended at home making them home-based trips. Twelve data items were collected and they include: station receiving card, origin/destination trip purpose, mode of access/egress, fare type, exit station, home jurisdiction, home address, home zip code, vehicles available, federal government employee, and transit benefits.

Of the 66,321 questionnaires returned, 49,473 (69 percent) had some home geographic information filled in. The data inputs used for geocoding the home addresses were: structure number, street name, zip code, and jurisdiction of residence. The addresses were batch matched against Navteq and about half auto-matched. The primary reasons for addresses not matching were, missing structure numbers, missing street types, and misspellings. A temporary geocoding clerk was hired to fix misspellings, use zip codes and jurisdiction of residence to narrow search area, use internet mapping services to hunt for unmatched addresses, and add missing street types, directionals, and quadrants. The final step was to use the jurisdiction of residence for a quality control check on matched records. Ultimately, an additional 21,262 records were matched or marked as out of the region.

The allocation process has three steps. The first step is to create a variable for the home station and mode of access to home station. The home station is generated off of trip purpose. If a respondent is coming from home, then the station they boarded is designated

as their home station. Likewise, if the respondent is going home, their exit station is their home station. Similarly, the mode of access to home station is determined by mode of access or egress to/from their home station. Step two is an attempt to match the ungeocoded records that contained some geographic information. The variables used for this match include: entire street name, the first four characters of the street name, residential zip code, mode of access to home station, home Metrorail station, and jurisdiction of residence. 2,367 records were matched in this process. Step three allocated the remaining 18,527 records that did not contain any geographic information. The allocation used mode of access to home station, home Metrorail station, and jurisdiction of residence to assign a TAZ to these records.

Some preliminary results include intensity of use of Metrorail by TAZ. Not surprisingly much of the high usage is along the metro lines, particularly in NW DC and the Rosslyn-Ballston corridor. The same map was shown for riders who access their home stations by walking. There are more opportunities for development near stations along the New Carrollton and Largo lines in Prince George's County. There are some specific TAZs that still need to be reexamined and then the final file will be ready.

Questions and Comments

A question was raised whether the bigger zones on the map presented by Ms. Reschovsky had more geocoded Metrorail trips because they were larger in geographic area. Mr. Griffiths replied that the color coding scheme on the map normalized the number of geocoded Metrorail home addresses to the size of the population in each TAZ. Thus, the red zones represent 100 Metrorail trips per 100 population whereas the brown zones represent 50 Metrorail trips per 100 population. Another question was whether the number of zones with people walking to their home metro station is high. Ms. Reschovsky replied that staff intends to look more closely at that data to ensure that it is correct. Mr. Griffiths added that there may be a small number of people who erroneously checked boxes indicating a home-to-home trip. There was a question regarding the date when the final file will be released. Mr. Griffiths replied that the file will be available in a few weeks once we have completed the final checks on the data.

Item 6: Household Travel Survey and On-Board Bus Survey

Regional Bus Survey

Mr. Griffiths reported that data collection for the regional bus survey is complete! Most of the region's bus systems were surveyed with a few exceptions. Fairfax Connector conducted a separate survey. However, the surveys were coordinated so that the information collected was consistent. Loudoun County did not participate because of concerns about room on the buses for the interviewers to stand on the bus. However, Loudoun also had the necessary information on hand. WMATA paid for about 75% of the survey. WMATA's primary goal is to get home jurisdiction counts for the subsidy allocation. Therefore, they had very strict requirements about how the survey was to be

conducted. 4,829 of trips were surveyed, with the vast majority on WMATA bus routes. The different bus systems being surveyed were split out in order to encourage the interviewers to get better response rates and coverage.

142,680 passengers were on the surveyed bus routes and eligible (paying customer and at least 16 years of age) for the survey. 76,583 forms were distributed, reflecting a 54 percent distribution rate. This rate was somewhat lower than anticipated. For about a third of the WMATA routes which had particularly low distribution rates, the routes were resurveyed. Despite efforts by some of the top interviewers, some routes, particularly in DC, proved to be particularly challenging since respondents would not fill out the questionnaires even if the interviewers were able to get them into the respondent's hands. Passengers making longer trips, such as the express routes from the suburbs were more likely to fill out the questionnaires since they were on the bus longer. Overall 30,585 passengers completed and returned their forms, yielding a 21 percent completion rate. This is just above the minimum completion rate of 20 percent. Data collection was supposed to be complete by June 15 but ended up being extended to June 27.

The contractor is in the process of geocoding the respondents' addresses and has reported a 95 percent success rate. This number will drop a little bit, as the process moves forward, but it is still very good. Nonetheless, having about 30 thousand completed questionnaires as a supplement to the model will be very helpful. The survey also collects information from some people who are not normally picked up in transportation surveys such as household travel surveys and on-board surveys for other modes. Also, suburban-to-suburban trips are picked up which are not normally collected in other data collection efforts.

Questions and Comments

A question was asked regarding geographic areas in which the refusal rate was high. Mr. Griffiths replied that certain lines proved to be particularly difficult, including the Benning Road line. Some of the suburban express bus service where the trips are longer proved to have a higher response rate because of a captive audience with more time to fill out the questionnaire. Another question raised was whether a distinction between the types of buses was made. Mr. Griffiths replied that there was a distinction in order to encourage the interviewers to get a better response rate.

Household Travel Survey

Mr. Griffiths indicated staff is beginning to receive initial data and reports on the Household Travel Survey. We have counts for the number of households participating versus the number of households we wanted in each jurisdiction. Many of the household counts exceeded the original goal. The total for the modeled region exceeds 11,000. Once the other Baltimore jurisdictions (Baltimore City, Baltimore County, and Harford County) are added, the number jumps to about 14,000 completed households. To get the 11,578 completed households the contractor had to recruit 15,143 households. A

completed household means everybody in that household completed their travel diary and returned the information. We also have requested the information from the partial completes so we can take a look at their information as well.

There were two sample types, those with matched phone numbers to the household address, representing about 55 percent and those without. The households without phone numbers were contacted by mail and offered the $50 incentive, but they had to opt into the survey. About 23 percent of the households with phone numbers were recruited and 13 percent of the households without phone numbers were recruited. The combined recruitment rate was 21 percent. Among the households recruited, the unmatched households, who were also offered the incentive, had a higher completion rate. 85 percent of those households completed the survey while only 74 percent of the households with matched phone numbers completed the survey. This yielded an overall 76 percent completion or retrieval rate. The incentive offered helped get more households who do not traditionally participate in household travel surveys.

One of the primary reasons we switched to an address-based sample rather than random digit dialing was because an increasing number of households are forgoing the traditional landline. Additionally, households with landlines are harder to reach because of call screening and call blocking technologies. Households without landlines tend to be younger (and making more trips) than households with landlines. We have found that people who live in cell-phone only households tend to make 5 trips per person whereas people with landlines make 4 trips per person. We also had a GPS add-on for about 500 households. This serves as a check for the reported trips in the diaries. The GPS devices were left in the household vehicles for an additional day or two which will give us some additional data and an indication of daily variability. A non-respondent follow-up was conducted to try and get basic characteristics about the households. The follow up was conducted via phone and personal visit. For the households we could not contact, a Lexus-Nexus search was conducted to try and get the very basic characteristics about the household. During the summer, staff will be busy doing quality control checks and preliminary data checking of the data. During the fall, the files will be pulled together with the Metrorail survey, the Air Passenger Survey, the On-Board Bus Survey, and when completely checked and factored, the files will be provided to the models development staff.

Questions and Comments

A question was asked if the entire Baltimore Metropolitan Area had been included in the Household Travel Survey. Mr. Griffiths replied that it is included. The TPB modeled region already includes Anne Arundel County, Howard County, and Carroll County. BMC also surveyed Baltimore City, Baltimore County, and Harford County.

Item 7: FY2008 Arterial Highway Congestion Monitoring Program Draft Report

Daivamani Sivasailam presented the findings of the FY 2008 Arterial Highway Congestion Monitoring Program. He gave a brief overview of the program, the methodology, and identified congested locations from the routes surveyed in FY 2008. He also discussed the changes to the performance of the routes by comparing the FY 2008 results with the FY 2005 and FY 2002 results. Performance of the routes during the peak hour, peak period and off-peak periods were presented.

Questions and Comments

A question was raised as to how levels of service (LOS) are estimated. Mr. Sivasailam responded that the highway capacity manual methodology dealing with highway speeds are used to estimate LOS. As a follow up question, are the peak hour and peak period levels of service different? Mr. Sivasailam responded that the congestion during the two time periods varies by location. Another question raised was why the off-peak direction experiences congestion during the peak hour. Mr. Sivasailam indicated that the most likely explanation is signal timing for the peak direction may be more favorable than for the off-peak direction, but this has not been verified . Suggestion was made that staff may want to look at traffic volumes by direction as a surrogate to signal timing.

Item 8: Adjourn

The meeting was adjourned at 11:54 A.M.

COG/TPB Travel Forecasting Subcommittee
Sign-In Sheet
Meeting of July 18, 2008

Name	Agency/Affiliation	Telephone Number	Email
David Kline	Fairfax County	703-324-1457	david.kline@fairfaxcounty.gov
Jim Hogan	TPB		
Bob Sneads	TPB	202962-3324	RSNEAD@MWCOG.ORG
Wanda Hamlin	COG/TPB	202962 3217	whamlin@mwcog.org
Joe Davis	COG/TPB	202.962.3337	Joe.Davis@MWCOG.org
Clara Reschovsky	COG/TPB	202 962 3332	creschovsky@mwcog.org
Gregg Steverson	Prince William Co.	703 792-4051	gsteverson@pwcgov.org
DAN Stevens	FFX Co.	703 324 1446	daniel.steven@fairfaxcounty.gov
David Lee	FAMPO	540-373-2890	lee@gwregion.org
G. Tom GIARDINI	TPB	(202) 962-3317	—
Meseret Seifu	COG/TPB	(202) 962-3372	mseifu@mwcog.org
Hamid Humeida	COG/TPB	202-962-3325	HHUMEIDA@MWCOG.ORG
Jane Posey	COG/TPB	202-962-3331	jposey@mwcog.org
Feng Liu	M. Dual Baker Jr.	410-689-3463	fliu@mbakercorp.com
Yuanjum Li	M-NCPPC. Montgomery	301-495-4519	Yuanjum.li@mncppc-mc.org
Arpita Chatterjee	Fairfax County	703-324-1437	arpita.chatterjee@fairfaxcounty.gov
Jinchul (JC) Park	COG/DTP	202-962-3320	jpark@mwcog.org
Michael Farrell	COG/DTP	202-962-3769	mfarrell@mwcog.org
Eric Graye	M-NCPPC-MC	301.495.4632	eric.graye@mncppc-mc.org
DUSAN VUKSAN	COG/TPB	202-962-3279	DVUKSAN@MWCOG.ORG
Bahram Jamei	VDOT-NOVA	703.383-2214	Bahram.Jamei@VDOT.Virginia.gov
SUBRAT MAHAPATRA	MD-SHA	410-545-5649	smahapatra@sha.state.md.us
Bill Mann	VDOT-NOVA	703 383 2211	Bill.Mann@VDOT.VIRGINIA.GOV
SEAN KENNEDY	WMATA	202.962.1575	skennedy@wmata.com
Dan Goldfarb	Cambridge Systm.	301-347-0100	dgoldfarb@camsys.com
John (Jay) Evans	CS	301-347-0100	jevans@camsys.com
Bill Allen	consultant	803-642-4489	WGALLEN@ISP.COM
MARK MORAN	COG/TPB	202-962-3392	mmoran@mwcog.org
SUDHAKAR ATHURU	PB	212-465-5110	athuru@pbworld.com
ERIC JENKINS	MNCPPC-MC	301-952-3680	—
Derek Gunn	MDSHA	410.545.5642	dgunn@sha.state.md.us
TIM CANAN	COG/TPB	202-962-3488	Tcanan@mwcog.org

COG/TPB Travel Forecasting Subcommittee
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Meeting of July 18, 2008

Name	Agency/Affiliation	Telephone Number	Email
Bob Griffiths	COG/TPB	202-962-3280	reg@mwcog.org