

**Columbia River Crossing**  
Travel Demand Model Review Panel Report

November 25, 2008

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The enclosed report presents the findings of the Columbia River Crossing Travel Demand Review Panel, which met October 13 and 14, 2008 to review the project analysis and methodology as requested by project sponsors and the Oregon and Washington Departments of Transportation.

We were asked to respond to seven specific questions about the model and project analysis completed in the Draft Environmental Impact Statement. Our report provides findings and recommendations for each specific question as well as some recommendations outside of the scope of the project. For the reasons we explain in our report, we strongly believe the travel demand model and project analysis are valid and comprehensive.

The Review Panel would like to express its appreciation to Metro, RTC and CRC staff for providing the information that allowed us to evaluate the seven questions we were asked to consider. We enjoyed our discussions and staff's willingness to openly debate the technical aspects of the travel demand model and its application to the CRC Project.

We appreciate the opportunity to provide you with our thoughts on the travel demand model and its application to the CRC Project.

A handwritten signature in black ink, appearing to read 'M Outwater', with a long horizontal flourish extending to the right.

Maren Outwater, Chair  
Bruce Griesenbeck  
Arash Mirzaei  
Guy Rousseau

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## **Introduction**

The Travel Demand Model Review Panel (Panel) was tasked with reviewing and evaluating the assumptions implicit in the travel demand model for the CRC project. This review was requested by partner agencies in July 2008, as part of the selection of a Locally Preferred Alternative for the project. Resolutions passed by partner agencies made the following recommendations related to review of the CRC travel modeling assumptions:

- Further analysis is required of the greenhouse gas and induced automobile demand forecasts for this project. The results of the analysis must be prominently displayed in the Final Environmental Impact Statement. The analysis should include comparisons related to the purpose and function of the so-called “auxiliary” lanes. A reduction in vehicle miles traveled should be pursued to support stated greenhouse gas reduction targets as expressed by legislation in Oregon and Washington and by the Governors. (Metro Council, Resolution 08-3960B, July 17, 2008).
- The CRC project shall contract for an independent analysis of the greenhouse gas and induced automobile travel demand forecasts for the project. (City of Portland Council, Resolution 36618, Exhibit A, July 9, 2008).
- The CRC project shall contribute to a reduction of vehicle miles traveled (VMT) per capita in the bi-state metropolitan area. (City of Portland Council, Resolution 36618, Exhibit A, July 9, 2008).
- Independent validation of the greenhouse gas and climate change analysis conducted in the Draft Environmental Impact Statement to determine the project’s effects on air quality, carbon emissions and vehicle miles traveled per capita (CRC Task Force, Resolution Recommendations, June 24, 2008).

The Panel met on October 13 and 14, 2008 to provide an independent review of the key travel demand modeling inputs and results related to regional modeling and the CRC project. Review of the greenhouse gas analysis requested in the resolution recommendations will be conducted as part of a separate process. This will occur after the travel demand model review process is complete.

## **Summary of Panel’s Findings Regarding the Travel Demand Model**

This report presents the conclusions and recommendations of the Travel Demand Model Review Panel prepared in response to seven specific questions. The panel’s findings and general observations are summarized below. This section includes a synopsis of the responses to each question along with an overall observation of the application of the Travel Demand Model to the CRC Project and the resulting outputs. A more complete discussion of each question, topic area and the panel’s discussion and conclusions is

provided in later sections of this report. Additional recommendations, outside the scope of the project, are included at the end of report.

Specifically, the Panel addressed the following questions related to the Locally Preferred Alternative resolutions:

- Are fuel price and vehicle operating cost assumptions used in the model reasonable?
- Are the tolling methods used in the model reasonable?
- Are the traffic projections for I-5 and I-205 from the model reasonable?
- Are the vehicle miles travelled results reasonable?
- Are the bridge auxiliary lanes modeled correctly?
- Was the approach used to estimate induced growth reasonable?
- Were the induced growth findings reasonable?

The Travel Demand Review Panel concluded that the Travel Demand Model used by the region is an advanced trip-based tool and that it represents a valid tool for a project of this type:

- The destination choice features of the trip distribution model used for all trip purposes is a positive and allows for fuller consideration of accessibility and policy variables in the analysis.
- The peak factors applied to skims is a better way to represent weighted averages than standard practice, which assumes peak conditions for work trips and off-peak conditions for non-work trips.
- The use of VISSIM offers a more rigorous evaluation of congestion than is possible with a regional planning model.
- The use of Metroscope as one method to evaluate induced growth is an advanced practice for a project evaluation. Normally this type of analysis is used for systemwide / regional transportation planning efforts and not specific project evaluations.

The panel also provided long-term recommendations for the Portland Metro regional travel demand and land use forecasting models, but these long-term recommendations were beyond the scope of the CRC project and were not considered to impact the outcome of the project findings. The long-term recommendations were intended to inform the next generation of models for the Portland Metro region.

***Question 1 - Are fuel price and vehicle operating cost assumptions used in the model reasonable?***

The Panel concluded that the vehicle operating cost assumptions, of which fuel costs are a component, used in the model for the primary travel demand forecasts were reasonable. The Panel confirmed that vehicle operating costs (which consists of gasoline and oil, tire, and general maintenance costs on a per mile basis) is the appropriate measure to use as it reflects the long-term relationship between fuel price and vehicle fleet fuel efficiency. In the Panel's opinion there was an adequate stratification of fuel cost, other costs and buildup of auto operating costs in the modeling process.

***Question 2 - Are the tolling methods used in the model reasonable?***

The Panel concluded that the overall approach to the tolling analysis employed by the CRC Project is within standard practice. The resulting volumes on the I-5 Bridge with tolls compared to No-Build volumes demonstrate that the tolling methods are reasonable.

***Question 3 - Are the traffic projections for I-5 and I-205 from the model reasonable?***

The Panel concluded that model results that indicated that the Build Alternative (LPA) volume difference relative to the No-Build Alternative (6,000 fewer vehicles per day / 3 percent reduction on I-5 and 3,000 additional vehicles per day / 1 percent increase on I-205) are reasonable, due to the fact that:

- There is a higher level of transit service and a resulting higher transit share in the Build alternative which reduces auto volumes on I-5;
- There are tolls on I-5 in the Build alternative versus no tolls in the No-Build alternative which also reduces auto volumes on I-5 and increases volumes on parallel facilities, like I-205;
- There is no added highway capacity north of or south of the project limits; and
- There are changes to trip distribution resulting in a decrease of discretionary trips crossing the river because of the toll.

***Question 4 - Are the vehicle miles traveled (VMT) results reasonable?***

The Panel concluded that the results showing a decrease in auto VMT on I-5 and a net regional increase (small) overall is reasonable because:

- There is a higher level of transit service and a resulting higher transit share in the Build alternative, which results in lower auto VMT on I-5; and
- There are tolls on I-5 in the Build alternative versus no tolls in No-Build alternative which results in diversion and higher regional VMT.

***Question 5 - Are the bridge auxiliary lanes modeled correctly?***

The Panel concluded that while the coding of a four-mile continuous auxiliary lane may be unusual in some urban areas, there are local examples of long auxiliary lanes that currently operate and are modeled similarly in the Metro region. Since this length of an auxiliary lane is consistent with regional coding (modeling) practices, this is a reasonable assumption for this project.

***Question 6 - Was the approach used to estimate induced growth reasonable?***

The Panel concluded that the use of Metroscope and the travel demand model results supported the national research findings. They felt that the use of multiple methods (i.e., case studies, Metroscope, national research) to evaluate induced growth was helpful. The evaluation of a worst case scenario in Metroscope (it assumed a larger build project than the LPA and no tolling) was useful and appropriate.

***Question 7 - Were the induced growth findings reasonable?***

The Panel agreed that the conclusion of the CRC project that the highway capacity improvement would have a low impact to induce growth was reasonable for this corridor because the project is located in a mature urban area/built corridor.

## **Panel Members**

Four experts, each with substantial experience in travel demand modeling in large metropolitan areas, served on the Panel. Each expert is currently in charge of travel demand modeling for a metropolitan planning organization.

### **Maren Outwater, Chair**

Maren Outwater is the Director of Data Systems and Analysis at the Puget Sound Regional Council (PSRC). She specializes in the planning, evaluation, and modeling of land use, transportation and air quality systems. She has 23 years of experience in developing passenger forecast models for transit and highway systems, forecast models of goods movements, and land use forecasts for regional and state governments. She also has 18 years of progressive experience in managing complex multi-modal development efforts. At PSRC, she is leading the current efforts to integrate land use, travel, and air quality modeling to improve the agency's ability to model climate change and address pricing studies. Prior to working at PSRC, Outwater was a Principal at Cambridge Systematics. She has a Masters of Urban Planning in Transportation Planning and a Bachelors of Science in Civil Engineering from the University of Michigan.

### **Bruce Griesenbeck**

Currently Bruce Griesenbeck is the Principal Transportation Analyst for the Sacramento Council of Governments (SACOG). He serves as the team leader for the forecasting, model operations, and model development teams. Primary areas of work for model development have been managing the development of an activity-based tour regional travel demand model, and supervision of the land use and travel network data inputs of this model. He managed the development of a "shortcut" version of the four- step travel demand model for use in modeling citizen-defined transportation alternative in a series of 13 public workshops for the 2007 Metropolitan Plan. Prior to SACOG, Griesenbeck was the project manager for various transportation and analysis and planning projects including light rail extension feasibility studies. Griesenbeck holds a Bachelors of Arts in Sociology and Psychology from Swarthmore College and a Masters of Science in Civil Engineering and Master of City Planning, both from the University of California at Berkeley.

### **Arash Mirzaei**

Arash Mirzaei is the Travel Model Development Program Manager for the North-Central Texas Council of Governments (NCTCOG) in the Dallas/Fort Worth area, where he has worked for more than ten years. Arash Mirzaei is responsible for travel model development, data collection and analysis activities, and transportation application projects that involve traffic and revenue analysis, preparation of environmental documents, air quality and conformity applications, roadway corridor studies, transit alternative analysis, combined land use and transportation applications, environmental justice analysis and activity-based modeling examinations. Mirzaei has a Bachelors of Science and Masters of Science in Civil Engineering from Sharif University of



Technology in Tehran, Iran, and a Masters of Science in Computer Science and Engineering from the University of Texas at Arlington.

**Guy Rousseau**

Guy Rousseau has over 20 years of experience working with and managing modeling and traffic engineering teams. He currently works as the Modeling Manager for the Atlanta Regional Commission (ARC). In this position, he oversees modeling of the long range transportation plan updates. This process involves network coding, trip generation, trip distribution, modal split, and traffic assignment and emissions analysis for a variety of network year analyses, as well as base year calibrations and validations involving the population synthesizer. Rousseau also manages the traffic modeling efforts feeding into air quality modeling and related emissions analysis, as well as some post-processing methodology and traffic micro-simulations. Rousseau has a Bachelors of Science. in Civil Engineering from the University of Montreal, a Masters of Science in Civil Engineering from Laval University in Quebec, and has finished all coursework at Tulane/ University of New Orleans towards a doctoral degree in civil engineering and transportation planning, with a dissertation remaining.

## **Peer Review Process**

The Travel Demand Model Review Panel met on two consecutive days (October 13 and 14, 2008) to review and consider the seven specific questions. Background material in the form of a Travel Demand Model Review notebook was provided to each Panel member in advance of the meeting. Information included in the notebook provided background on the CRC project and the LPA as well as technical documentation and context related to the model and its assumptions.

During the Panel sessions, technical presentations from Metro, RTC and CRC staff were provided as background to each question and the Panel asked questions of staff during and following each presentation. Following the presentations, the four Panel members adjourned to a separate room to consider the information presented and to address the seven questions. Two staff members representing the CRC project were in the room with the Panel members to record the discussion and findings. They did not participate in the technical review or the formation of recommendations. The findings presented below represent the conclusions reached exclusively and by consensus by the members of the Travel Demand Model Review Panel.

At the end of the second day the review Panel members verbally presented preliminary findings and recommendations to an audience of agency staff and interested parties. The findings presented in this report represent the final conclusions of the Travel Demand Model Review Panel related to the seven specific questions asked of them.

## **Panel Response to Questions**

The following presents the Panel's discussion on each specific question. Panel discussion on each question was preceded by a presentation by staff on the specific topic. The panel then discussed the question and asked questions of staff when necessary. The Panel's findings and / or recommendations are presented at the end of each question.

### ***Question 1:***

### ***Are fuel price and vehicle operating cost assumptions used in the model reasonable?***

#### **Staff Presentations**

Staff provided a PowerPoint presentation ("Metro Modeling Efforts – Fuel and Auto Operating Costs") that discussed the fuel and auto operating cost assumptions included in the Metro model and the research that supported the assumptions. Staff noted that the recent spike in fuel prices has lead some parties to question the fuel price assumptions, particularly in relation to the auto operating cost assumptions contained in the model.

Staff discussed that in the Metro model, fuel costs are considered as part of auto operating cost, which consists of gasoline and oil, tires, and general vehicle maintenance

costs on a per mile basis. Auto operating cost is used instead of fuel prices because it reflects the long-term relationship between fuel price and automobile fleet fuel efficiency (through technological changes, consumer preferences, and government regulations). Metro assumes the historical trend of relatively stable auto operating costs will continue into the future, as it has in the past.

Staff noted that the current fuel cost assumptions relied on national trends and averages prepared by AAA. Future fuel price assumptions relied upon the “worst-case”, or highest, year 2030 forecasts provided by the Energy Information Administration (EIA), the statistical agency of the U.S. Department of Energy. Auto operating costs, which include fuel costs, are a factor in the mode choice model.

### **Panel Discussion**

A panel member noted that his experience with the travel demand model in Sacramento indicated that the traditional four-step modeling process was not very sensitive to changes in fuel prices. It was noted that the transit model is very sensitive to fuel price. The Panel asked what impact a change in fuel pricing would have on VMT and transit use. Staff indicated that Metro tested a range (\$0.05 to \$0.13 per mile) and the impact on both categories was minimal.

The Panel asked if the destination choice model was based on income and, if so, what were the results? Staff indicated that this model did include income factors and the result was that the longer trip lengths were typically associated with specialty/higher income jobs. Lower income jobs tended to be associated with shorter trip lengths. Staff noted that the land use model used travel time to forecast behavior, not auto operating costs.

The Panel asked staff if you change the vehicle operating costs, what changes result in the model? Staff response was that mode share changes, transit ridership increased, but destination choices do not change.

The Panel did note that overall economic conditions are more of a factor, particularly for discretionary trips. The Panel also noted that statewide or regional (i.e., West Coast) fuel prices would probably be a better source when fuel price assumptions for the Metro area. These tend to be a little higher than the national average prices.

### **Panel’s Findings and/or Recommendations**

The Panel concluded that the vehicle operating cost assumptions, of which fuel costs are a component, used in the model for the primary travel demand forecasts were reasonable. The Panel confirmed that vehicle operating costs (which consists of gasoline and oil, tire, and general maintenance costs on a per mile basis) is the appropriate measure to use as it reflects the long-term relationship between fuel price and vehicle fleet fuel efficiency. In the Panel’s opinion there was an adequate stratification of fuel cost, other costs and buildup of auto operating costs in the modeling process.

The Panel requested staff to look at alternative reasonable VMT / price elasticity relationships. The results of staff's analysis were that regional VMT could vary by minus six percent to plus six percent if fuel prices were at the lower or higher range of forecasts for 2030 as provided by the independent Energy Information Administration.

Please see "Additional Panel Findings and/or Recommendations" for long-term recommendations – beyond the scope of the CRC project – for the region to consider.

## ***Question 2:***

### ***Are the tolling methods used in the model reasonable?***

#### **Staff Presentation**

Staff provided a PowerPoint presentation ("Metro Modeling Efforts – Tolling Methodology") that discussed how tolling costs were implemented in Metro's model. Staff noted that there has been no single best-practice method identified for implementing tolls within travel demand models. Staff's research indicates that each region and project is unique and, therefore, the approaches to tolling tend to differ widely across the nation. Staff described the unique character of the CRC corridor and the lack of alternative routes. Staff noted that the model assumed peak and non-peak tolling costs and did not assume a toll on I-205. Tolling is reflected in the model as a time penalty assigned to categories of travel (auto peak/non-peak, medium trucks peak/non-peak and heavy trucks peak/non-peak).

Staff described how the tolling methodology and assumptions and how they affected destination choice, mode choice and final assignments in the model. Staff concluded with a discussion of the impacts of tolling on these three categories:

- Destination Choice: 7 percent fewer Washington-Oregon crossings and 11 percent fewer Oregon-Washington crossings;
- Mode choice: Increase in mode split from 9 percent to 11 percent; and
- Final Assignment: During the AM 4-hour southbound period with No Toll there was a 53 percent/47 percent split between traffic on I-5 versus I-205 (62,000 total trips) and with an I-5 Toll there was a 43 percent/57 percent split between I-5; and
- I-205 (59,000 total trips).

#### **Panel Discussion**

A panel member asked at what point do tolling costs come into play in the model? Staff indicated at all steps, except trip generation. Staff noted that in the model assignment

there was no differentiation between income groups, but for revenue forecasting income differentiation will be a part of the revenue assessments.

The Panel asked - what is the effective Value of Time (VOT)? The Metro model uses a value of time of \$13 per hour in 2005 dollars. For a \$2 toll, this translates into 9.23 minutes of additional time impedance. The destination choice model uses 25% of the toll cost and the mode choice model uses 75% of the toll cost. The panel noted that research shows that VOT does vary by income group and also other factors such as purpose of trip. A panel member noted that tolling costs do not effect distribution at all in the Atlanta regional model. It was also noted that in Dallas-Fort Worth, tolling doesn't affect their model.

The Panel asked – how many “feedbacks” (iterations) are there in the modeling process and when are tolling costs included? Staff indicated that there were six to seven “feedback iterations” for the base scenario and basically the same for each alternative. Normally two to three iterations are acceptable when running the regional model, but additional iterations were tested because this is such a saturated corridor. Staff noted that they did not see much difference in the model results between the alternatives and that transit ridership was the main difference. Staff noted that tolling costs were implemented in the “final iteration” of each alternative.

The Panel was informed that there would be tolls on I-5 at river crossing with this project and that not tolling was not an option. Bikes and pedestrians would not be subject to the toll. It was noted that there are currently tolled facilities in the State of Washington – Tacoma Narrows and a pilot HOT project.

The Panel discussion then focused on some of the technical details of tolling and the modeling process including: weighting factors, stopping criteria, speeds, micro-simulation and model assumptions related to capacity and auxiliary lanes. Staff addressed each issue in their comments.

### **Panel's Findings and/or Recommendations**

The Panel concluded that the overall approach to the tolling analysis employed by the CRC Project is within standard practice (given the current range of limitations for modeling tolls). The treatment of tolls in destination choice (i.e., partial cost included) is an appropriate methodology. The resulting volumes on the I-5 Bridge with tolls compared to No-Build volumes demonstrate that the tolling methods are reasonable. The Please see “Additional Panel Findings and/or Recommendations” for long-term recommendations – beyond the scope of the CRC project – for the region to consider.

### **Question 3:**

#### ***Are the traffic projections for I-5 and I-205 from the model reasonable?***

##### **Staff Presentation**

Staff provided a PowerPoint presentation (“CRC Project Alternatives and Performance Results”) that provided a more detailed description of the corridor, Bridge Influence Area (BIA), travel characteristics within the corridor including travel patterns, crash data, transit ridership, and peaking characteristics. Staff then reviewed the results of the extensive analysis for the No-build and Bridge Replacement Alternatives. Staff described the components of the LPA including the replacement bridge, the auxiliary lanes, and light rail alignment. Finally, Staff provided an overview of existing travel conditions and congestion levels and the VISSIM model.

##### **Panel Discussion**

The Panel asked – how did the Metro model compare to the license plate data collection conducted by CRC? Staff responded that the results matched up fairly closely, but the regional model did have some minor inconsistencies associated with dealing with the super-saturated nature of the corridor. The Panel then asked – how did the overall model results compare to the data? Staff indicated that the results for the corridors mainline matched well and that some adjustments needed to occur on the ramps to I-5, but the project was able to accomplish this. The resulting travel times and speeds on the bridge were good. In terms of model “post-processing” staff indicated that they used the NCHRP 255 methodology, using the difference method. Four screen lines were used in this 23-mile long VISSIM model area.

The Panel asked - with congested traffic traveling at 30 mph, what’s your corresponding level of service (LOS) and what is the region’s standard? Staff responded that the resulting LOS was E/F, but noted that traffic demands are too high to build a feasible project that could meet peak period LOS standards. The Project is trying to improve mobility and safety conditions in the corridor and reduce the duration of congestion, among other things.

The Panel asked about the use of Park-and-Ride lots and how Metro models this type of access. Staff indicated that park-and-ride is one of the modes in the model. They don’t model kiss and ride directly, but from survey work staff knows that it constitutes about 15 percent. Staff also noted that the park-and-ride lots in Clark County are at capacity and identified their locations.

The Panel asked if HOV lanes across the I-5 Bridge had been considered. Staff indicated that yes they were considered during earlier screening, but because the project is only

five miles long, staff found no benefit without some larger HOV lane system. If there is future policy direction for a broader HOV lane implementation, that might be looked at. Also, with so many trips getting on and off I-5 in a short five-mile area, it becomes difficult to accommodate them with an HOV lane.

The Panel asked - what's your definition of no-build? Staff indicated that they assumed all the financially constrained projects in the RTP and MTP. Staff noted that there was just one project (SR-502 Interchange) upstream from the project in the I-5 corridor.

### **Panel's Findings and/or Recommendations**

The Panel concluded that model results that indicated that the Build Alternative (LPA) volume difference relative to the No-Build Alternative (6,000 fewer vehicles per day / 3 percent reduction on I-5 and 3,000 additional vehicles per day / 1 percent increase on I-205) are reasonable, due to the fact that:

- There is a higher level of transit service and a resulting higher transit share in the Build alternative;
- There are tolls on I-5 in the Build alternative versus no tolls in the No-Build alternative;
- There is no added highway capacity north of or south of the project limits; and
- There are changes to trip distribution resulting in a decrease of discretionary trips crossing the river because of the toll.

Please see "Additional Panel Findings and/or Recommendations" for long-term recommendations – beyond the scope of the CRC project – for the region to consider.

### ***Question 4:***

#### ***Are the vehicle miles traveled (VMT) results reasonable?***

### **Staff Presentation**

Staff's PowerPoint presentation ("CRC Project Alternatives and Performance Results") introducing Question 3 also included information on Vehicle Miles Traveled (VMT) related to Question 4. Staff reviewed the VMT results with the No-Build and Build Alternatives. These results indicate lower VMT in both the I-5 Bridge Influence Area and the I-5 Corridor with the Replacement Bridge compared to the No-Build Alternative.

## **Panel Discussion**

There was little discussion on the part of the Panel on this question because it was closely related to Question 3. Please see the discussion details above.

## **Panel's Findings and/or Recommendations**

The Panel concluded that the results showing a decrease in VMT on I-5 and a net regional increase (small) overall is reasonable because:

- There is a higher level of transit service and a resulting higher transit share in the Build alternative; and
- There are tolls on I-5 in the Build alternative versus no tolls in No-Build alternative.

Please see “Additional Panel Findings and/or Recommendations” for long-term recommendations – beyond the scope of the CRC project – for the region to consider.

## ***Question 5:***

### ***Are the bridge auxiliary lanes modeled correctly?***

#### **Staff Presentation**

Staff's PowerPoint presentation (“CRC Project Alternatives and Performance Results”) introducing Question 3 also included information on Auxiliary Lanes related to Question 5. Staff reviewed the purposes of and the need for auxiliary lanes in this project. Staff described how they were designed into the No-Build and Replacement Bridge Alternatives and discussed the lane capacities that were assigned to these lanes. Staff also presented various examples of existing auxiliary lanes in the Metro Region.

#### **Panel Discussion**

The Panel asked for clarification on the length of the auxiliary lanes and capacities assigned to each lane. A panel member noted that in the Sacramento region, they are having discussions about the meaning of auxiliary lanes, which sometimes mean different things to different people. Some concern was expressed about the length (four miles) of the auxiliary lanes, but it was understood that the region has examples of existing auxiliary lanes of this length. Also, the Panel was assured the coding practice was consistent throughout the regional model network.

The Panel asked - did you look at different combinations of auxiliary lanes fewer than three? Staff indicated that there is testing going on right now along those lines. Three lanes were chosen to accomplish lane balance and safety improvements.



The Panel asked if staff made use of collector/distributor roads in the project area? Staff noted that they have a limited set of collector/distributor roads within the project area, but the auxiliary lanes that are shown are part of the I-5 mainline.

The Panel asked if the land use assumptions were the same for all alternatives. Staff indicated that the land use assumptions were the same.

### **Panel Findings and/or Recommendations**

The Panel concluded that while the coding of a four- mile continuous auxiliary lane may be unusual in some urban areas, they were presented with local examples of long auxiliary lanes that currently operate in the Metro region. Since this length of an auxiliary lane is consistent with regional coding practices, this is a reasonable assumption for this project.

The Panel also noted that the project's assignment of reduced lane capacity to the auxiliary lanes is reasonable.

Please see "Additional Panel Findings and/or Recommendations" for long-term recommendations – beyond the scope of the CRC project – for the region to consider.

### ***Question 6:***

### ***Was the approach used to estimate induced growth reasonable?***

#### **Staff Presentation**

Staff provided a PowerPoint presentation ("Induced Growth") that described the topic within the context of NEPA and the CRC Project. Staff began by defining what induced effects were and how they were evaluated in the Draft Environmental Impact Statement. Staff noted that the CRC staff conducted national research on induced effects, including reviewing case studies. Staff then discussed the conclusions of the national case studies. Staff discussed the variety of factors the national research identified as particularly relevant to induced growth, including new access to previously unserved areas, significant improvement to highway travel times, reductions in auto-operating costs, and local regulations that don't manage growth.

Staff noted two key findings particularly relevant to the CRC project and the conclusion that first, the project is unlikely to induce substantial auto travel demand or incur consequential auto-oriented land use changes and second, the project is likely to promote increased densities around new high capacity transit stations.

- Adding highway capacity in a well-planned urban area with a full range of infrastructure and services is unlikely to have substantial indirect effect on land use patterns.
- Improving high capacity transit in a location with supportive land use regulations and markets is likely to promote higher density and TOD, and improve transit mode share.

Staff provided a discussion on the land use regulatory context in Oregon and Washington that will influence the project. Staff then talked about the travel demand model results that related to factors potentially associated with induced growth. A discussion on Metroscope and its application to the project followed. Staff noted that the Metroscope analysis conducted for the project was a “worst-case” scenario – it assumed more new highway lane miles than all of the DEIS alternatives and did not assume a toll on the bridge. The key finding of Metroscope was that there was a potential for a small job growth shift (one percent) from other areas of the region into the I-5 Corridor area as a result of the CRC improvements, and a potential minor increase (less than three percent) in housing prices/demand in Clark County, Vancouver, and north Portland around the I-5 corridor.

## **Panel Discussion**

The Panel asked - how many regional centers are included in Metro’s 2040 Regional Growth Concept and how was the Urban Growth Boundary addressed in the model? Staff indicated 10 to 12 centers (combination of regional and town centers). Staff further noted that the UGB identified where the region’s buildable land was and, therefore, where future growth would occur. Staff noted that the UGB is reviewed and updated every five years so the Metro region can maintain a 20-year supply of buildable land.

The Panel wanted to know if Metroscope was used for project-level evaluations. Staff indicated that Metroscope was not typically used for project-level evaluation, that it is normally used for the RTP and system-wide analyses.

The technical aspects of Metroscope and the travel demand model were explored by the Panel. They discussed the census tract level analysis Metroscope operates on the relationship of Metroscope results to VISSIM. The Panel asked for additional information on VMT and person trips (this information was provided to the Panel).

Panel discussion then focused on the likelihood for City of Vancouver support for high-capacity transit. How likely is it that the LRT portion within downtown Vancouver would be highly used and see a lot of transit-oriented development? How much support for the intra-Vancouver portion of LRT is there? Staff thought there was increased support for LRT in Vancouver. Staff indicated that given the length of the line, it’s likely they’ll see more of a reverse commute on LRT from North Portland than from farther north in Clark County. It will function more as a commuter route and for shorter distance intra-

downtown trips. Staff felt there was a strong potential for increased TOD development in Vancouver and noted recent higher density projects that have been built in Vancouver.

The follow-through on the stated intent by Vancouver and Clark County to focus development in the station areas will be critical to the overall success of the LRT portion of the project and the panel findings on induced growth.

Panel discussion then focused on the minor reallocation of jobs into the I-5 Corridor. The Panel wanted to know where the jobs relocated from, which areas of the region contributed to the shift of jobs to the corridor and whether, as a consequence of the shift, was the resulting shift more or less VMT-efficient. Staff indicated that the reallocation didn't come from one specific area, that it was widespread, throughout the region. Staff did note again that the potential shift was minor.

### **Panel's Findings and/or Recommendations**

The Panel concluded that the Metroscope and the travel demand model results appeared to support the national research findings. They felt that the use of multiple methods (case studies, Metroscope, national research) to evaluate induced growth was very helpful. The evaluation of a worst case scenario in Metroscope (it assumed no toll, more new highway lane miles and more auto trips than the LPA) is useful and appropriate. The use of the year 2020 for Metroscope analysis was reasonable at the time it was conducted. The Panel felt that the overall evaluation of induced growth impacts was thorough and robust.

Please see "Additional Panel Findings and/or Recommendations" for long-term recommendations – beyond the scope of the CRC project – for the region to consider.

### ***Question 7:***

### ***Were the induced growth findings reasonable?***

#### **Panel Discussion**

The Panel discussion that occurred on this specific question occurred during the discussion on Question 6.

### **Panel's Findings and/or Recommendations**

The Panel did conclude that the CRC project finding would have a low impact to induce growth is reasonable for this corridor because the project is located in a mature urban area. Insofar as the Metroscope analysis indicates that the project contributes to a better jobs housing balance in Clark County, the Panel believes that this is a positive outcome of the project.

Please see “Additional Panel Findings and/or Recommendations” for long-term recommendations – beyond the scope of the CRC project – for the region to consider.

## **Additional Panel Findings and/or Recommendations**

The Panel also identified a series of long-term regional model improvements. These were not considered as significant to project outcomes at this time and are presented for information only for consideration by Portland Metro in their future enhancements of the regional land use and travel demand forecasting models:

- The Panel noted that the 1994 household survey is 14 years old and suggested that the region consider conducting a new survey soon. Typically, household surveys are conducted every ten years for regional planning purposes.
- The region should consider using the North American Industrial Classification System (NAICS) rather than the Standard Industrial Classification (SIC) codes for employment. NAICS is the standard used by Federal statistical agencies in classifying business establishments for the purpose of collecting, analyzing, and publishing statistical data related to the U.S. business economy. NAICS was developed under the auspices of the Office of Management and Budget (OMB), and adopted in 1997 to replace the Standard Industrial Classification (SIC) system.
- Multinomial mode choice factors in the model limits consideration compared to the use of a fully nested mode choice. Nested logit models can provide a more accurate representation of tradeoffs between modes that are similar (like rail and bus) compared to modes that are more different (like auto and transit).
- Destination choice should consider a Central Business District dummy variable instead of deleting the full cost from destination choice. This was a tradeoff identified by Portland Metro staff during the calibration of the model. The inclusion of full costs in destination choice will provide a more accurate picture of the impacts of tolls, parking costs, operating costs, and fares on traveler’s decisions to make a trip across the river or not. This change will require a recalibration of the destination choice models.
- The use of fixed-time factors are a limitation for the evaluation of variable pricing. Variable pricing is designed to shift travelers from congested periods to less congested periods and these shifts are not currently represented by the fixed time factors.
- Updating the future travel demand modeling efforts to redirect the feedback loop from trip distribution to trip generation and to show effects of accessibility on trip generation should be considered. This will involve revising the trip generation model to incorporate accessibility as an input and will provide changes in trip-making as a result of changes in accessibility.

- The incorporation of auto operating and other costs to the trip generation, destination, time of day, and assignment components of the travel demand model should be considered.
- The region should consider testing the use of the activity-based model for evaluation of tolls for future analysis. There is a growing body of research that shows that activity-based models can evaluate the effects of tolls more accurately than trip-based models. This is primarily because of the disaggregate nature of activity-based models, which can identify individual responses to tolls and the value of time.
- In future modeling efforts, the region should consider the inclusion of the full cost of tolls in destination choice. As well, introducing tolls after the last equilibration model loop should be fully tested and compared to full feedback with tolls.
- The Panel felt that the Value of Time (VOT) should be segmented in the model assignment by income and purpose, and an updated VOT should be explored in light of more recent revealed choice surveys and planned CRC stated preference surveys for revenue projections.
- The region should consider “splitting-out” the transit riders without a toll from all other trips with a toll during trip distribution so that transit trips do not divert due to a toll. There is a potential for an under-estimation of transit unless this is done. (However, the Panel concluded that the potential for underestimation of transit riders would not have a significant effect on highway volumes. Staff provided additional analysis that showed that cross river transit trips would increase by about 900 daily person trips (if park-and-ride lot capacity in Vancouver was expanded substantially beyond what has been agreed to as part of the LPA), which represents roughly three percent of total daily cross river transit trips, or less than one percent of cross river auto trips.)
- The region should consider coding auxiliary lanes with lower free flow speeds. For multiple auxiliary lane segments, staff should review the Highway Capacity Manual for less-than-1/2 lane capacity coding for additional auxiliary lanes.
- Future travel demand modeling could include sensitivity testing with Metroscope to evaluate the impacts of highway capacity on regional VMT and trips. This would provide an assessment of how sensitive Metroscope is to changes in highway capacity compared to other research in this area.

## Conclusion

This report presented the findings and recommendations of the Travel Demand Model Review Panel to the seven specific questions presented to them on October 13 and 14, 2008. Following the intensive two-day review session, panel members provided specific conclusions and recommendations that indicated overall agreement with the outcomes of the technical modeling process followed in the CRC Draft Environmental Impact Statement process. Specific recommendations intended to improve future travel demand modeling efforts were also provided by panel members.