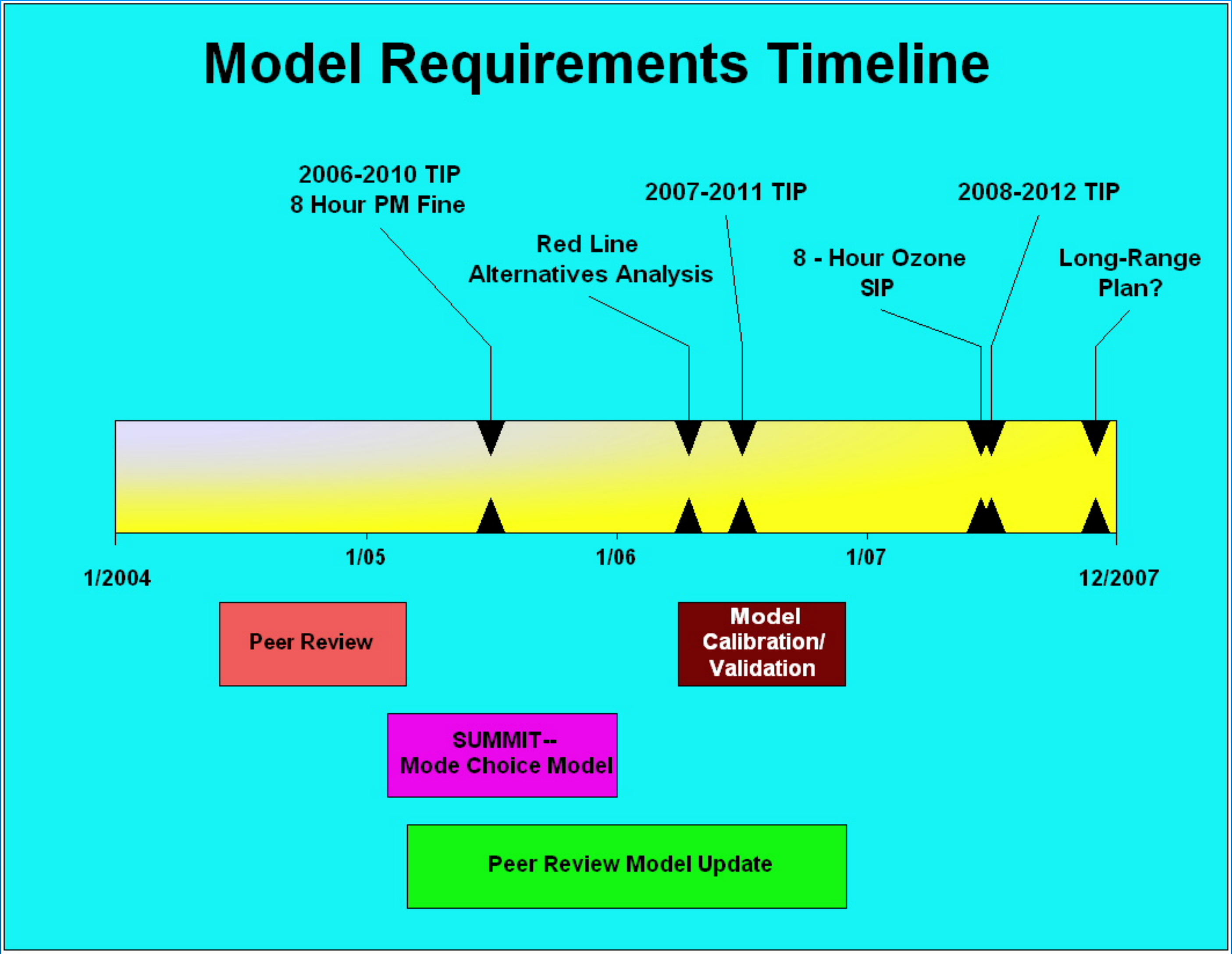
Baltimore Peer Review

Peer Panel Meeting

February 28, 2005

Baltimore Metropolitan Council

Timeline



Model Requirements Timeline
2006-2010 TIP
8 Hour PM Fine
Red Line
Alternatives Analysis
2007-2011 TIP
8 - Hour Ozone
SIP
2008-2012 TIP
Long-Range
Plan?
1/2004
1/05
1/06
1/07
12/2007
Peer Review
Model
Calibration/
Validation
SUMMIT--
Mode Choice Model
Peer Review Model Update

Demographics

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Population and Employment Forecasting

- **All recommendations along with BMC staff responses presented to BRTB at its December 2004 retreat**
- **Discussions on issues raised by Peer Review Panel were evaluated in a joint CFG/BRTB joint retreat in December 2003**

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Population and Employment Forecasting

- **BMC staff and BMC CFG had already implemented Peer Review Panel recommendation 2 beginning in the mid-1990's with Round 5-B**
- **BMC staff have worked collaboratively on Cooperative Forecasts with MWCOG since 1978 (Round 1)**
- **BMC and MWCOG have met in joint meetings on bi-regional forecasts since 1994**

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Population and Employment Forecasting

- **BMC CFG members already use MDP statewide employment forecasts with little variance**
- **BMC CFG members send initial jurisdiction population forecasts to BMC and MPD for cohort survival analysis, review and comment**
- **BMC CFG reviewed Peer Review and Smart Mobility comments in September 2004, November 2004 and January 2005 CFG and developed employment forecast review techniques**

Population and Employment Forecasting

- **BMC staff implemented components of techniques 3-5 in BRTB retreat Peer Review document (Woods and Poole state, regional and county forecast purchase)**
- **BMC and MWCOG senior transportation staff held joint meeting on Peer Review Panel recommendations January 6, 2005**
- **BMC/MWCOG transportation staff agree to joint meetings on development of bi-regional employment forecasts**

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Population and Employment Forecasting

- **BMC staff attends MWCOG Planning Directors Advisory Committee Meeting on the adoption of MWCOG Round 7 Cooperative Forecasts on February 11, 2005**
- **Next joint BMC/MWCOG meeting on Peer Review recommendations scheduled for March 3, 2005**
- **BMC CFG employment forecasting workshop scheduled for March 16, 2005**

Population and Employment Forecasting

- Baltimore region's commute shed is massive stretching across seven states
- Recent workforce statistics demonstrate that there is either no labor force/jobs imbalance or it is at best a slight imbalance
- The Baltimore region will continue to be a net exporter of labor for at least the next 15 years by our current forecasts

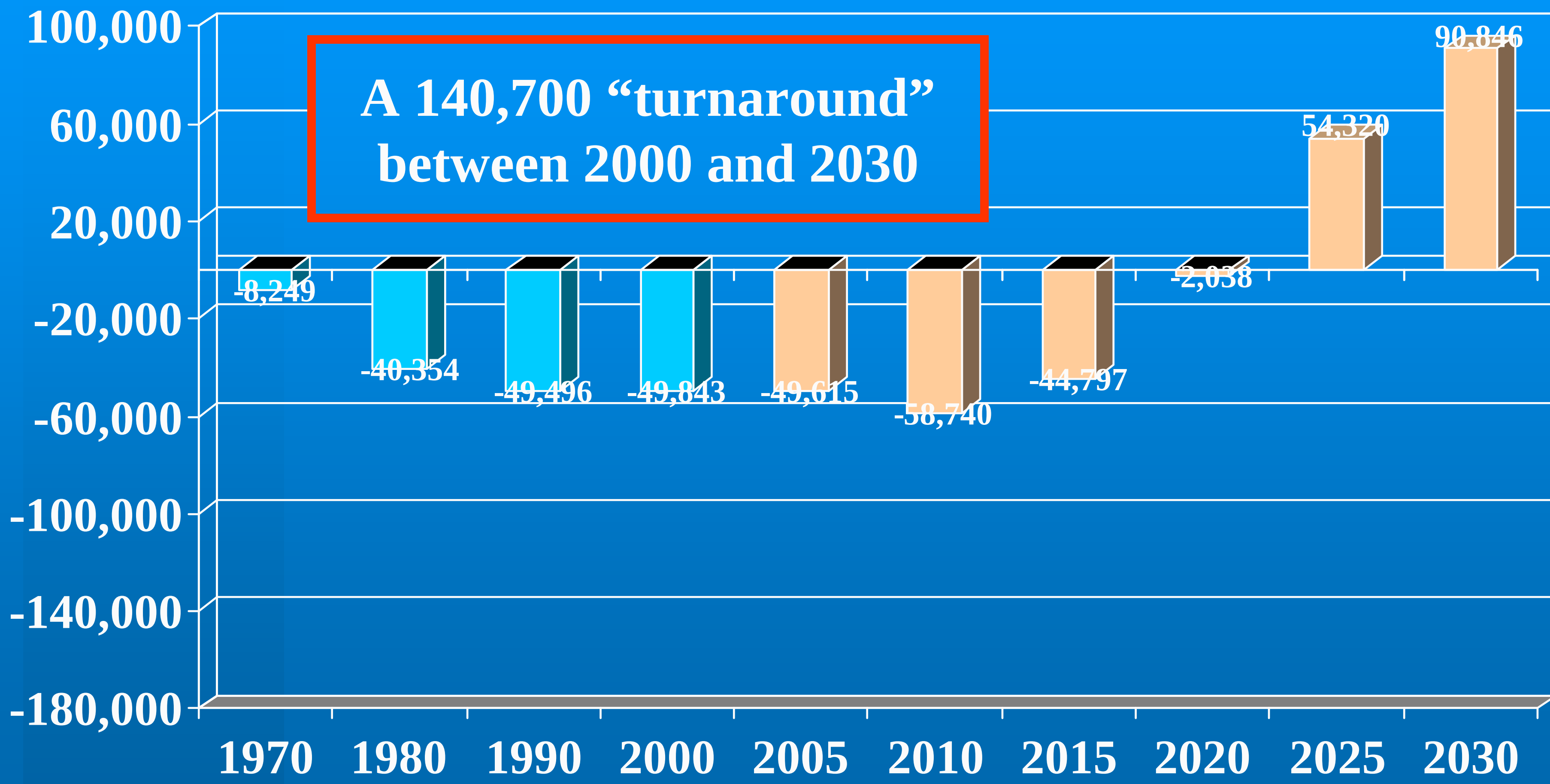
Population and Employment Forecasting

- **If the Washington COG region's employment forecasts are to be realized they cannot be sustained by drawing the needed workers from the Baltimore region: *the expected Washington COG region's employment growth is 84% of the entire 30-year total population growth of the Baltimore region.***
- ***In 2000, 48% of commuters to the Washington COG region came from the Baltimore region.***

Population and Employment Forecasting

- **If the 2000 bi-regional ratio continued in 2030 then over 217,000 Baltimore region workers would travel south to work. That figure would represent a 70% increase over today's commuters from Baltimore to Washington.**

Net Commutation for the Baltimore Region



Source: U.S. Census, U.S. BEA and the Maryland Department of Planning

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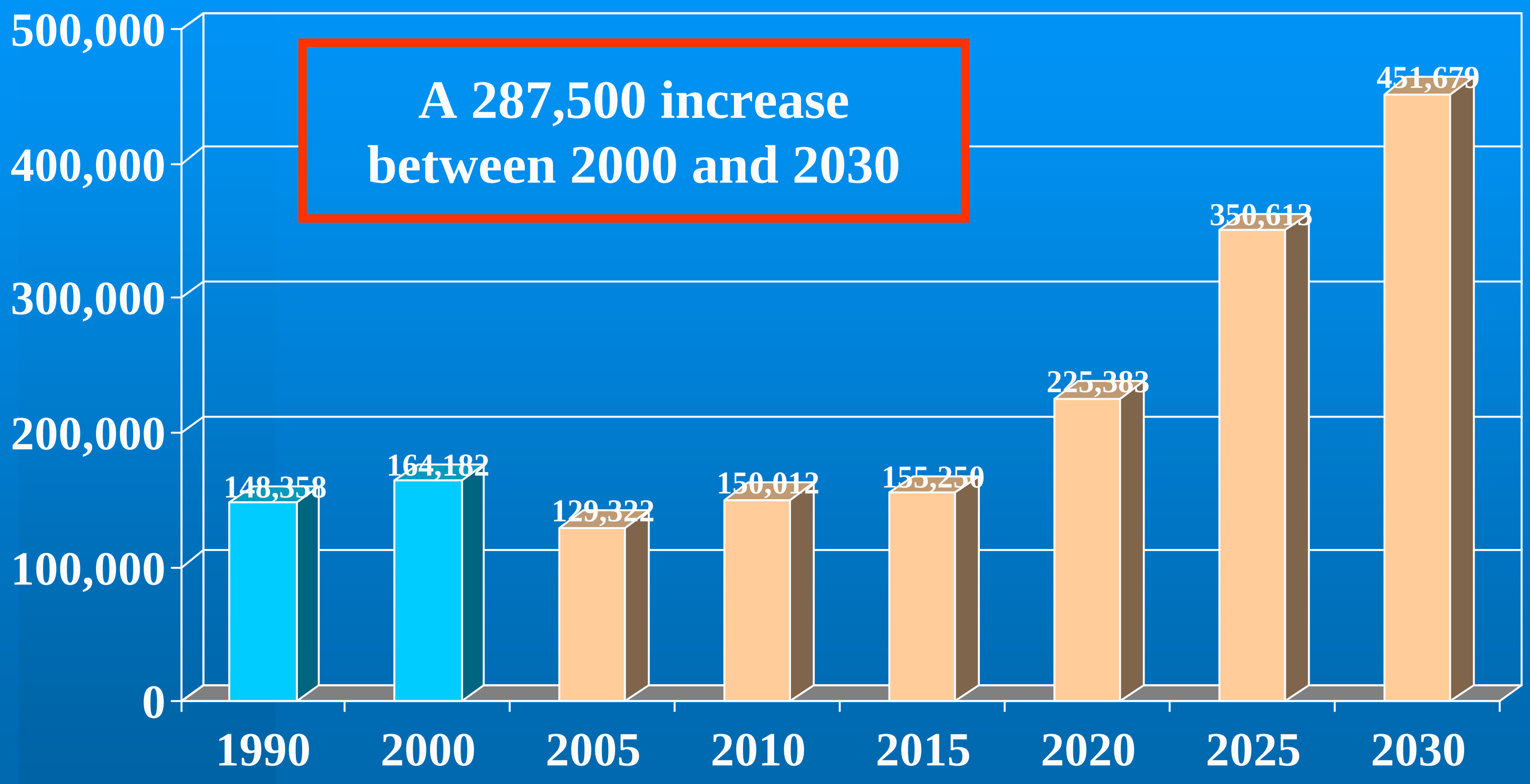
Net Commutation for the Washington COG Region



Source: U.S. Census, U.S. BEA and the Maryland Department of Planning

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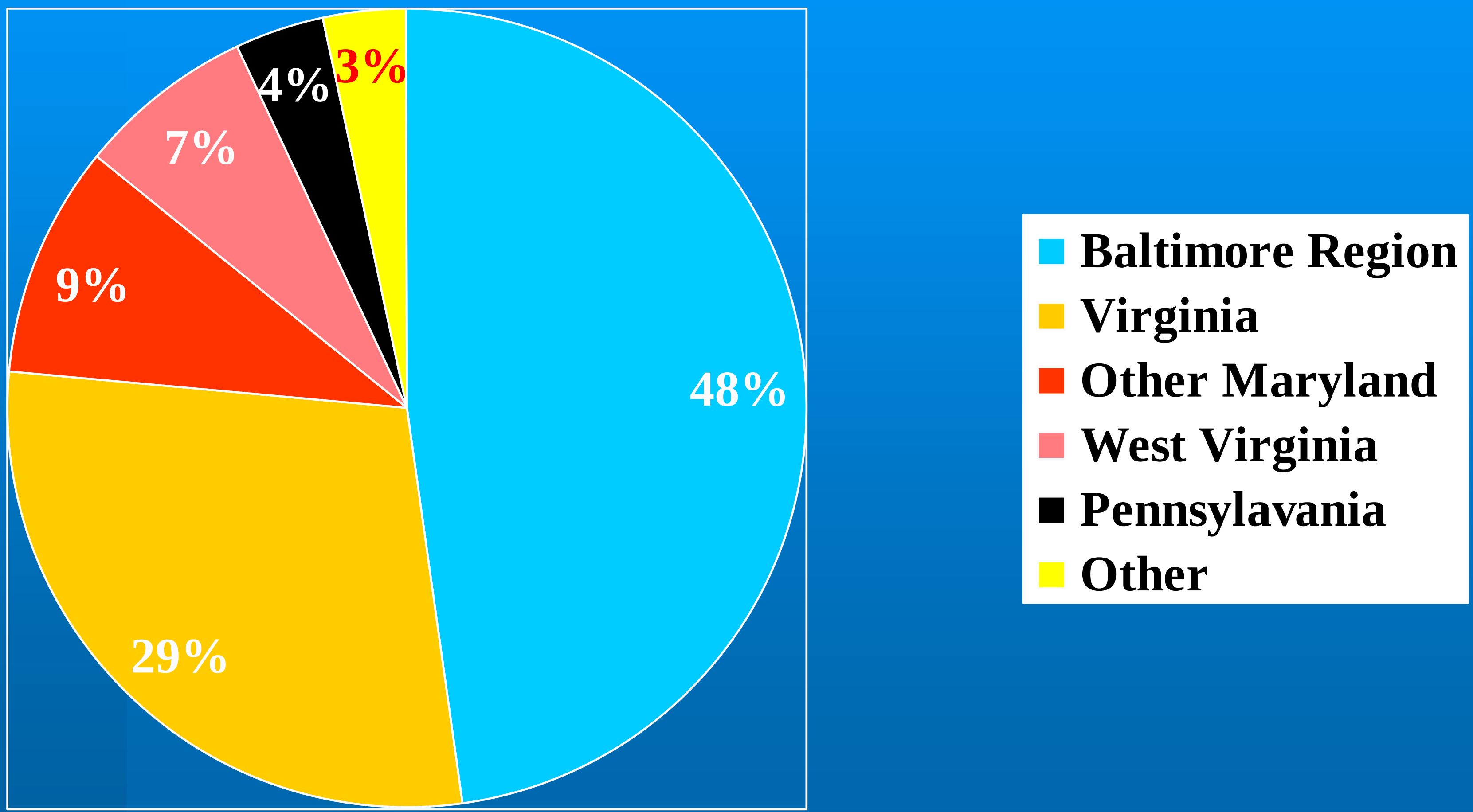
Percent of Net Commuters into Washington COG Region in 2000



Source: The MNCPPC from U.S. Census,

Mode Choice

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Transfer Mode Choice Model

- **New Orleans Model**
- **Add Commuter Rail**
- **Ascertain That It Meets New Starts Requirements**
- **Write TP+ Code**
- **Develop Target Trip Totals**
- **Calibrate Model**

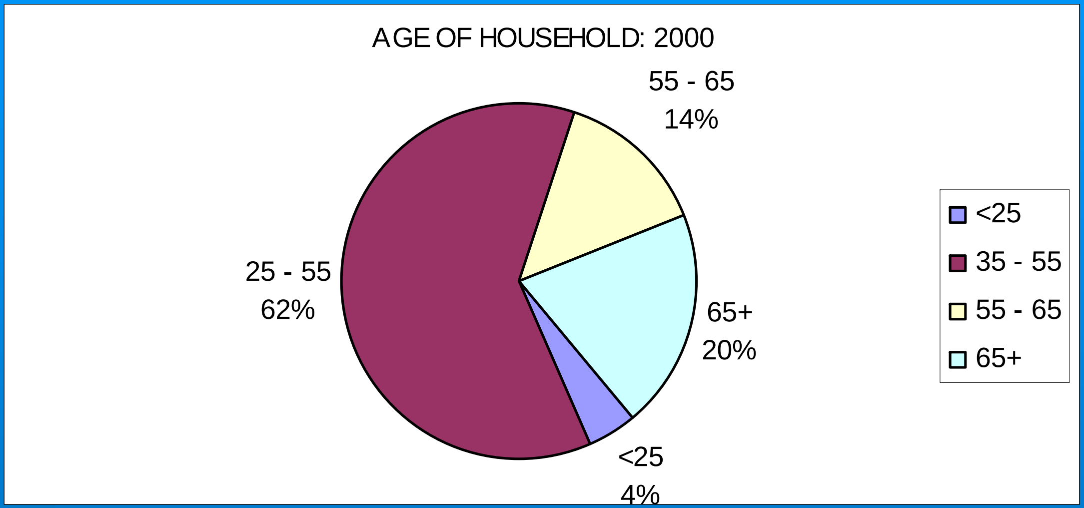
Proposed New Purposes

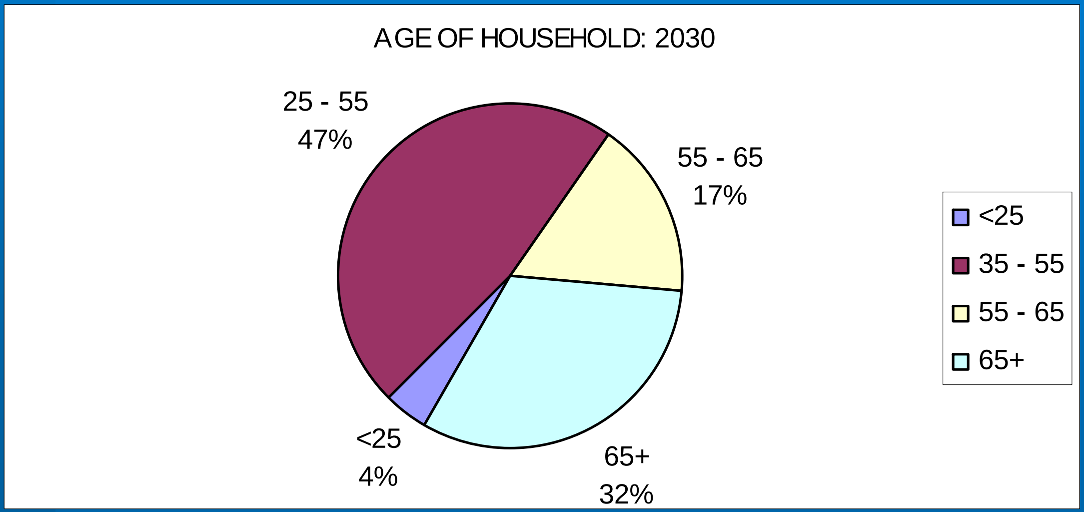
- University Trips
  - Rates Transferred from Other Region
  - Attraction Based on College/University Enrollment
- Non-Home Based
  - BMC currently has WBO and OBO
  - WBO divided into JTW – Journey To Work and JAW – Journey At Work
- External Stations Method
  - I/E Trips Based on Distance from External Station

Market Segmentation

- **Demographic Variables Considered for Stratification**
  - **Household Size**
  - **Household Income**
  - **Labor Force**
  - **Auto Availability**
  - **Age Head of Household**
  - **Life Cycle**

Age Head of Household – Baltimore Region





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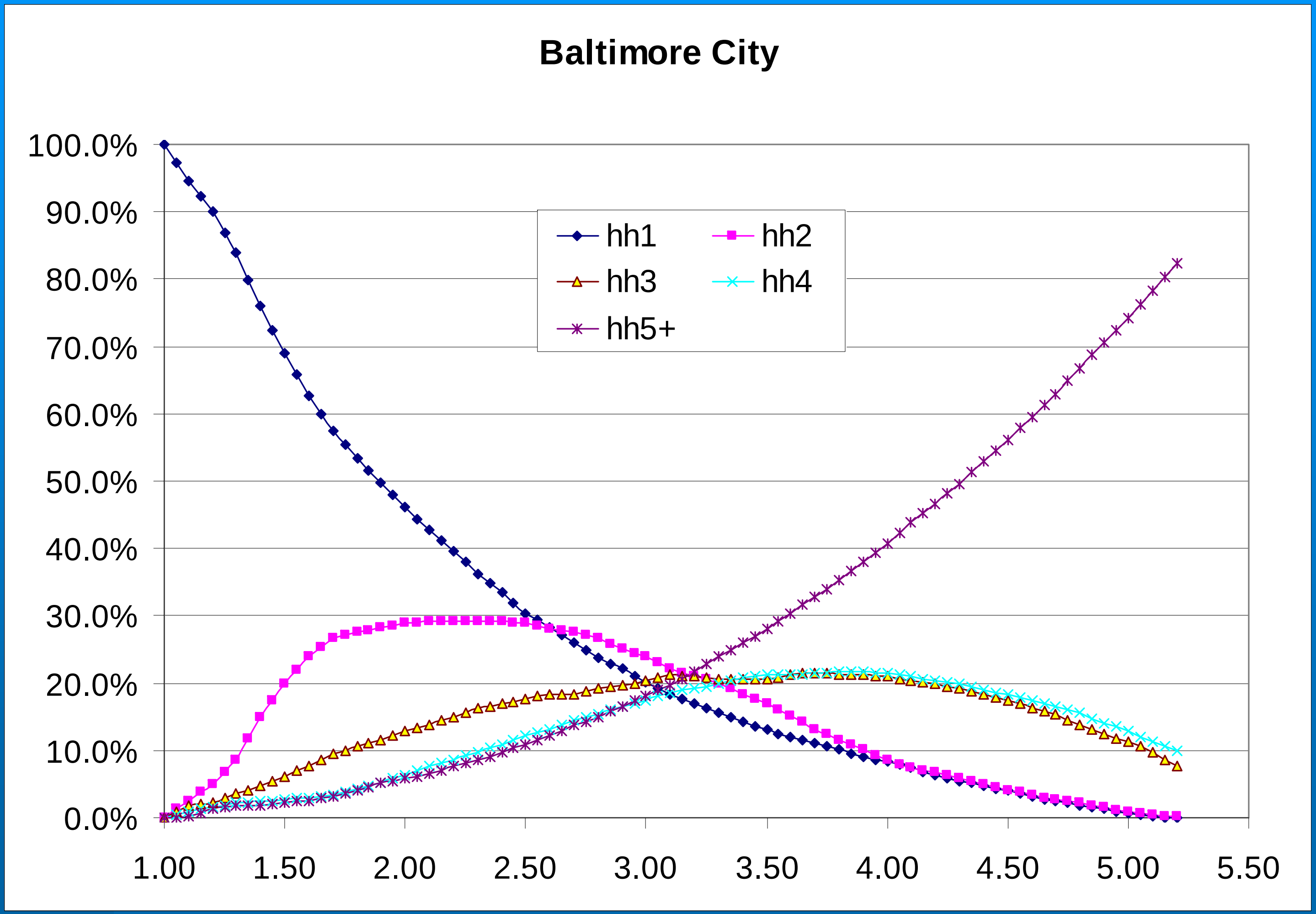
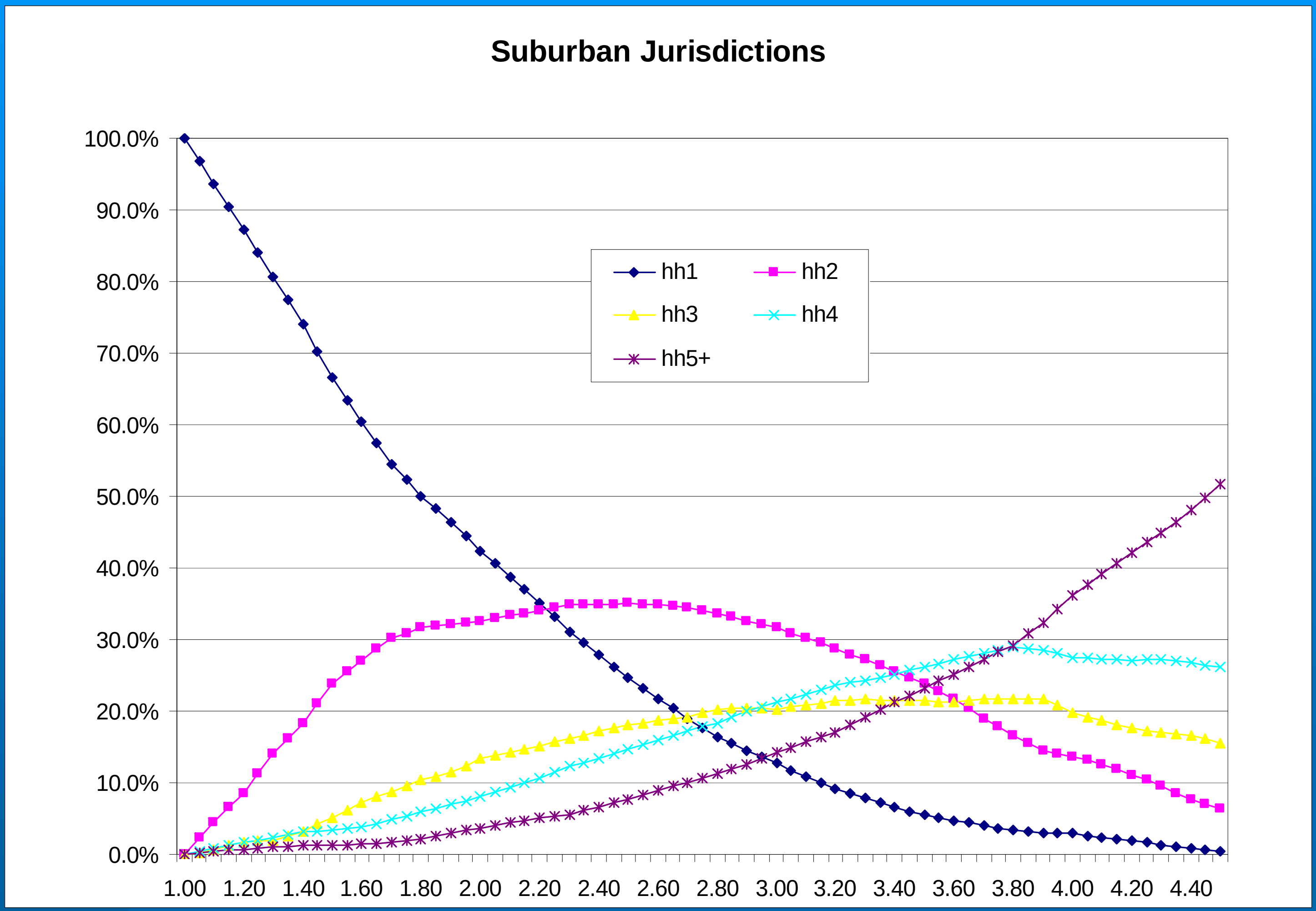
Market Segmentation – Household Size

- Share Models
  - Three Tests
    - Smooth Curves
    - Shares Add to 100%
    - Average Household Size is Correct
- Two sets of Curves – Baltimore City & Suburban Jurisdictions
- Household Size – 1, 2, 3, 4, 5+

Market Segmentation – Household Size



Market Segmentation – Household Size



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Market Segmentation – Household Size

2000 Census	1 Person Household	2 Person Household	3 Person Household	4 Person Household	5+ Person Household	Total Household
Baltimore City	90,124	72,158	41,203	27,857	26,654	257,996
Anne Arundel County	38,109	60,129	33,465	29,151	17,816	178,670
Baltimore County	81,863	101,341	51,299	40,943	24,431	299,877
Carroll County	9,209	17,122	9,950	9,984	6,238	52,503
Harford County	15,726	25,851	15,068	14,471	8,551	79,667
Howard County	18,767	28,547	16,618	16,601	9,510	90,043
	253,798	305,148	167,603	139,007	93,200	958,756

Model Estimate	1 Person Household	2 Person Household	3 Person Household	4 Person Household	5+ Person Household	Total Household
Baltimore City	89,264	69,932	42,002	29,248	27,550	257,996
Anne Arundel County	38,805	59,405	33,021	29,634	17,805	178,670
Baltimore County	81,206	101,769	51,548	42,267	23,087	299,877
Carroll County	9,200	17,127	10,247	9,773	6,156	52,503
Harford County	15,683	26,299	15,142	13,954	8,589	79,667
Howard County	18,730	29,093	16,785	15,547	9,889	90,043
	252,888	303,625	168,743	140,424	93,076	958,756

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Market Segmentation – Household Size

	1 Person Household	2 Person Household	3 Person Household	4 Person Household	5+ Person Household
RMSE	15.57%	15.96%	14.15%	16.80%	17.40%
R2	0.98	0.95	0.97	0.95	0.96

Market Segmentation – Household Income

- **Share Models**
  - **Two Tests**
    - **Smooth Curves**
    - **Shares Add to 100%**
- **Two Sets of Curves – Baltimore City & Suburban Jurisdictions**
- **Two Sets of Curves – 1 Person Households & 2+ Person Households**
- **Income - <$13,000; < $27,000; <$45,000; & $45,000+**

Market Segmentation – Household Income

- **Total Household Model**

	Income Group 1	Income Group 2	Income Group 3	Income Group 4	Total Housheold
2000 Census					
Baltimore City	59,578	59,959	53,815	81,903	255,255
Anne Arundel County	9,662	18,866	29,582	118,681	176,791
Baltimore County	23,114	46,099	59,601	166,304	295,118
Carroll County	2,800	6,178	8,355	34,423	51,756
Harford County	4,594	9,694	14,044	50,151	78,483
Howard County	3,558	6,595	11,814	66,856	88,823
	103,306	147,391	177,211	518,318	946,226
Household Model					
Baltimore City	58,674	60,428	54,334	81,819	255,255
Anne Arundel County	9,538	19,888	29,371	117,994	176,791
Baltimore County	21,669	44,134	56,499	172,816	295,118
Carroll County	3,006	6,238	8,890	33,622	51,756
Harford County	4,960	10,218	14,003	49,301	78,483
Howard County	3,308	7,117	12,716	65,682	88,823
	101,156	148,022	175,814	521,234	946,226

Market Segmentation – Household Income

- 1 Person/2+ Person Model

	Income Group 1	Income Group 2	Income Group 3	Income Group 4	Total Housheolds
2000 Census					
Baltimore City	64,592	60,156	57,005	73,502	255,255
Anne Arundel County	10,428	20,150	34,034	112,179	176,791
Baltimore County	25,272	48,769	65,732	155,345	295,118
Carroll County	3,175	6,497	9,886	32,198	51,756
Harford County	5,101	10,223	16,430	46,729	78,483
Howard County	3,869	7,059	13,402	64,493	88,823
	112,437	152,854	196,489	484,446	946,226
Household Model					
Baltimore City	58,674	60,428	54,334	81,819	255,255
Anne Arundel County	10,380	19,835	29,241	117,335	176,791
Baltimore County	22,477	44,074	56,378	172,189	295,118
Carroll County	3,241	6,221	8,853	33,441	51,756
Harford County	5,275	10,200	13,957	49,051	78,483
Howard County	3,828	7,089	12,642	65,265	88,823
	103,875	147,846	175,405	519,099	946,226

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Market Segmentation – Household Income

			Income Group 1	Income Group 2	Income Group 3	Income Group 4
Household Model	Region	RMSE	50.56%	30.29%	29.77%	11.38%
		R2	0.90	0.93	0.91	0.97
	1 Person	RMSE	56.18%	32.56%	32.71%	11.73%
	2+ Persons	RMSE	87.29%	44.82%	36.01%	14.61%
1 Person/2+	Region	RMSE	40.27%	32.78%	28.55%	14.50%
		R2	0.94	0.92	0.91	0.96
	1 Person	RMSE	47.04%	45.50%	47.51%	56.34%
	2+ Persons	RMSE	60.75%	38.99%	32.65%	12.72%

Trip Distribution Enhancements

- **Calibrate Highway Time Models**
- **Re-calibrate Models with Composite Time (Harmonic Mean of Highway and Transit Time)**
- **May Consider Effect of Tolls on Distribution If Time Permits**
- **Review Truck and Through Trip Distribution**
- **Write TP+ Code**

Time of Day Model

- TOD model is basically sound
- TOD periods and trip proportions will be reviewed

Trip Assignment

- **Transit Assignment**
- **Highway Assignment**
  - **Review volume-delay functions**
  - **Impedance (including toll) for pathbuilding**
  - **Consider weighted iteration method based on equilibrium assignment**
- **Speed Feedback**
  - **Consider new methods of speed feedback consistent with EPA requirements**

PECAS

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PECAS – Land Use Model

- PECAS – Production, Exchange and Consumption Allocation System
- Developed by JD Hunt and JE Abraham, University of Calgary
- PECAS is the upgrade and refinement to the TRANUS model developed by Tomas de la Barr, Modelistica
- BMC obtained TRANUS in 1998

PECAS – Land Use Model

- **BMC developed land use inputs and sketch plan network between 1999 and 2002**
- **TRANUS preliminary calibration completed in 2003 and results presented to BMC Planning Directors**
- **Planning Directors raised concerns about accuracy of state produced land use holding capacity information and halted further development of TRANUS model**

PECAS – Land Use Model

- BMC and local planning agencies (CFG) developed "white paper" on accuracy, content and techniques used by local governments to develop capacity inventories
- BMC CFG published "white paper" on acceptable techniques and data content for land use inventories
- BRTB altered 2-year UPWP to develop locally produced holding capacity data

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PECAS – Land Use Model

- **Maryland Home Builders petitioned Maryland Governor to develop statewide land use capacity inventory**
- **Governor Ehrlich established Development Capacity Task Force to make recommendations and develop pilot local programs to standardize land use capacity data**
- **Development Capacity Task Force report released in 2004 and Maryland Department of Planning works with local planning agencies**

PECAS – Land Use Model

- BMC member jurisdictions nearing completion of baseline capacity database development
- JD Hunt retained by BMC as consultant to begin conversion of TRANUS inputs into PECAS structure
- JD Hunt retained by BMC to integrate BMC transport model with PECAS
- BMC employs new staff for activity data development and PECAS model implementation

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PECAS – Land Use Model

- **Maryland Department of Planning is partnering with BMC to help implement conversion and use of PECAS**

MANAGED LANES

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Managed Lanes

- Various Types of Management Strategies
- Express Toll Lanes Seen as Most Likely Implementation
  - Toll Lanes Alongside Free Lanes
  - Fixed Toll (Peak and Off-Peak) Regardless of Occupancy Level

Existing Model

- Time Penalty on Harbor Crossings
- Cost Penalty on Links Used in Mode Choice
- Toll is Double Counted as Time and Cost Penalty during Mode Choice

Model Enhancements

- **Time Penalty for Trip Distribution and Trip Assignment**
- **Cost Penalty for Mode Choice**
- **Peak/Off Peak Tolls and Value of Time as Parameters**

Assumptions

- 10¢/mile Peak, 5¢/mile Off-peak Toll
- $14/hour Value of Time
- Tested Against No Toll and 25¢/10¢ Toll
- Utilized 2030 Preferred Alternative Network
  - I-695 between I-95 interchanges (N&W)
  - I-95 between I-695 and I-495
  - US 50 between I-95 and Bay Bridge

Results

I-695 Between I-83s 2030 A.M Peak	Lanes	No Toll		10¢/Mile Peak		25¢/Mile Peak	
		Volume	V/C	Volume	V/C	Volume	V/C
IL General	5	24,600	0.76	29,000	0.88	28,600	0.87
IL Managed	1	7,100	1.00	1,400	0.20	900	0.12
OL Managed	1	8,600	1.20	3,500	0.49	3,400	0.48
OL General	5	31,700	0.96	34,400	1.04	33,800	1.02
Total	12	72,000		68,300		66,700	

Results

I-95 S MD 32 2030 A.M Peak	Lanes	No Toll		10¢/Mile Peak		25¢/Mile Peak	
		Volume	V/C	Volume	V/C	Volume	V/C
NB General	4	20,300	0.84	23,300	0.95	22,900	0.93
NB Managed	1	5,600	0.79	800	0.11	0	0.00
SB Managed	1	7,700	1.08	6,800	0.96	2,600	0.36
SB General	4	30,200	1.16	29,400	1.13	29,900	1.14
Total	10	63,800		60,400		55,300	

Next Steps

- Develop Managed Lanes on I-95 (JFK)
- Fix Some Network Problems and Make Managed Links More Consistent with Free Links
- Run Managed Lanes for TIP Conformity Work

Peak Period Analysis

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Peak Period Overview

- Current peak periods in model are 6-10 AM and 3-7 PM
- Peer panel identified need to shorten peak periods
  - Better Time of Day modeling
  - Transit assignments
  - Managed lanes

Peak Period Research

- **Obtained Traffic Count Data From:**
  - **Maryland SHA website**
  - **BMC**
  - **University of Maryland CATT website**
- **Subjective review of traffic counts illustrates that existing peak periods are 7-9 AM and 4-7 PM**
- **Capacity wasn’t a problem at any of observed count locations**

Upcoming Tasks

- **Summarize existing peak periods in detail**
  - **Develop relationships between peak hours and hours adjacent to peak hour**
- **Summarize trip purposes in peak periods**

Upcoming Tasks (continued)

- **Request historical 24 hour count data at capacity constrained locations:**
  - **I-695 near I-95 northeast of Baltimore**
  - **I-695 near I-95 southwest of Baltimore**
  - **I-495**
  - **I-270**
- **Review and summarize historical peak period volumes with respect to capacity**
  - **Conduct statistical tests on historical trends**

Upcoming Tasks (continued)

- **Using historical data trends, calculate peak period assignment threshold that will trigger peak spreading assignment script, for example, if peak period v/c > 0.85; then start peak spreading script**
- **Develop job script for peak spreading**
  - **Preliminary thoughts are incremental assignment approach where higher %'s of total future peak period demand are assigned to hours adjacent to peak hour**

BPR Curve Update and Junction Delay Estimation in Speed-Flow Relationships

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Delay

- **One of the critical measures used to describe flow on interrupted and uninterrupted-flow facilities**

- **Its measurement is important to determine**

  - shortest paths in the networks

  - spatial distribution of trips and

  - relative advantages of one alternative option over another

Volume-Delay Relationships

- **Express delay in terms of travel time or travel cost on a given road link as a function of the traffic volume on that link**
- **Related to Volume to Capacity (V/C) ratios**
- **Predict how travel time increases as the assigned volume increases up to and beyond the capacity of the road segment**

- **Traditional HCM delay equations too complex to handle and sometimes not consistent with existing theories and algorithms particularly on arterials and collectors (due to vehicle interactions or queuing considerations)**
- **Need unique volume-delay function for each set of classification of roadways**
- **Data constraints and limitations for coding all network details accurately**

Default BPR Equation

- Congested Speed = $\frac{\text{Free Flow Speed}}{\left(1 + b\left[\frac{\text{Volume}}{\text{Capacity}}\right]^a\right)}$
  a= 4
  b= 0.15

- **Drawbacks**
  - Congestion effects become more and more pronounced as value of a increases and the capacity is reached i.e., V/C > 1

  - Not able to accommodate different causes of delay on different kinds of facilities and area types

  - Capacity here is entered at LOS C and can be affected by grade, environmental, traffic and control conditions apart from area types and facility types

  - Some professionals prefer using LOS E rather than LOS C

- **Advantages**
  -Simple to use and can cover a wide range of values of parameter a

Modified BPR equations used by BMC

- **For Freeways/Expressways**

$$t_c = \min[20t_0, t_0(1 + 0.2\left(V/C\right)^{10})]$$

- **For Non-Freeways**

$$t_c = \min[20t_0, t_0(1 + 0.05\left(V/C\right)^{10})]$$

where tc= Congested travel time
t0= Free flow travel time
v/c= Volume to Capacity ratio

- **LOS is E for both cases**

Other Volume Delay Functions

- **Conical Function**
- **Akcelik Formula**
- **Exponential Function**
- **Overgaard's Function**
- **Intersection Based Function**
- **Others…**

Conical Function

$$F_c(X) = 2 + [a^2(1-X)^2 + b^2]^{1/2} - a(1-X) - b$$

Where b = (2a-1)/(2a-2)

And a is a parameter

X= Volume to capacity ratio

- **Helps to overcome some of the drawbacks of the traditional BPR curves**

Akcelik Formula

$$t = t_0 + [0.25T\{(x-1) + ((x-1)^2 + (8J_a x / QT))^{1/2}\}]$$

Where:

- t= average travel time per unit distance (hours/mile)
- t0= free-flow travel time per unit distance (hours/mile)
- T= flow period, i.e., the time interval in hours, during which an average arrival (demand) flow rate, v, persists
- Q= Capacity (veh/hour)
- X= the degree of saturation i.e., v/Q
- Ja= the delay parameter

Intersection Based VDFs

- **For Example-**

  The Portland, OR Metro uses-

$$f_d = \left(\frac{ab + cx^d}{b + x^d}\right)$$

where x= Volume/Capacity and

a, b, c, d are different parameters.

Exponential Function

$$\text{Delay}(\text{daily},\text{hourly}) = \min\{\text{Ae}^{\frac{\text{BxHourlyVolume}}{\text{HourlyCapacity}}},\text{C})$$

Where- A, B and C are different parameters and have different values for freeways and non-freeways

Overgaard's Equation

$$t = t_0 \left[\frac{S_0}{S_c} \right] X^a$$

where

- t0= free travel time
- S0= free speed
- Sc= speed at capacity
- X= volume to capacity ratio
- a= parameter

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Determination of Unconstrained Speeds

- **BMC uses a highway speed lookup table based on the functional classification and the land use density of the link**
- **The speeds in turn give initial travel time to start the iteration process**
- **Highway capacities also determined using lookup table based on area types and roadway types**

- Regional networks lack accuracy in modeling the delay at intersections on arterials and collectors

- Usually intersection represented as a node having no time penalty associated with it and in many instances the road geometry and layout are omitted

- In reality, the presence of traffic control devices and other conditions introduces delay

Determination of Speeds on Arterials and Collectors

- **Speeds vary depending on area type and percentage of green time at intersections**
- **Applying turn penalties manually to each intersection in the networks or editing networks for this purpose is difficult and complicated**
- **Time and data constraints for linking signals with network elements**
- **Limited accuracy**

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Junction Delay

- **<u>Why to model Junction Delay?</u>**

  - Inclusion of junction delay would account for intersection delays and therefore improve speed and volume estimates on lower class facilities

  - Affects travel time and consequently choice of routes

  - Modified Equations used do not account for junction delay

- **<u>Depends upon</u> –**

  - Control type (Stop, Signalized, Yield)

  - Turn geometry, grade, approach

  - Signal cycle, signal phasing and signal progression

  - No. of through lanes

  - Cross Street Friction

  - Bus-stops, pedestrian flows, parking movements etc.

=>Large amount of data required to model junction delay at regional level because of too much details involved!

What kind of methodology/approach should be used to estimate Junction Delay??

Other Approaches/Methodologies

- **Example- "Control Device Model"**
  Study: Harrisonburg Area Transportation Study (1991)

  "Development and Validation of the Travel Demand Models", Technical Memorandum No. 6, Harrisonburg Area Transportation Study, Prepared by Frederick R. Harris, Inc., May 1991

  Allen, Bill (1989), "Simulating Traffic Control Devices in a Sub-Area Network", Paper presented in 69th Annual Meeting, Transportation Research Board, Washington D.C., 1990

  Uses theoretically derived Speed and Capacity Relationships/HCM lookup table to adjust initial free-flow speed and capacity of the link, based on its distance and the presence of a control device at its B node.

- Approach is useful to simulate the effects of control devices and thus obtaining more realistic paths and traffic assignments particularly for subregional networks

Drawbacks

- Delay caused due to cross-street traffic and opposing turns may not be accounted for
- Only one G/C ratio is used for all intersections
- Needs identification of the control device for every approach leg
- Additional set-ups may be required
- May not be applicable at the regional level due to amount of data required

- **Example-Calibration/Validation of the Traffic Forecasting Model for the Cedar Rapids Metropolitan Area to 1994/1993 Traffic Counts and Travel Surveys** **(Prepared by Sam Granato, Transportation Coordinator, Linn County Regional Planning Commission)**

- **Modeling is based on the integration/iteration of traditional forecasting processes with intersection traffic control analysis based on HCM methods**

- **Capacity at intersections based on traffic control type and traffic conditions by hour of day and varies with modeled volumes and intersection turn movements after each iteration**

- **Difficult to depict turn penalties for several cases based on type of movements and turns at intersection, type of section of streets, signalized or unsignalized, area type, presence of railroad crossings, ramps etc.**

- **Example: Wenatchee Area Transportation Planning Model Report**
- Models delay at critical points on the network to reflect the impacts of congestion
- Capacity here-

$$\text{Capacity} = K_1 + K_2(\text{No.ofLanes}) + K_3(\text{No.ofLanes})^{E_3} + K_4(\text{Entr.Cap.}) + K_5(\text{Entr.Cap.})^{E_5}$$

where-
Cap.= Intersection Capacity
Ki= A Constant
Ei= Exponent

No. of Lanes= Number of Entering Lanes from all links entering the node

Entr. Cap.= Sum of Entering Capacities from all links entering the node

K4 used to simulate the effect of green time-to-cycle length (G/C) ratio at an intersection

G/C ratio fairly even when like classes meet but increases on the major facility when the roadway meets lesser class facilities

- This TMODEL approach here assigns a capacity to the total node and then apportion the delays to individual approaches

- Intersections under STOP or YIELD control are modeled using special delay links (SDLs) and node delay coefficients

- Base delay is added at an intersection if known conditions exist like all red phase, pedestrian phase or railroad crossing at a node etc.

- Exclusive turn penalties used to restrict certain movements

- Also research has been going on regarding new methodologies to <u>measure delay at signalized intersections using GPS receivers and GIS dynamic segmentation tools</u>

Quiroga, C.A., and Bullock, D., 1998, "Measuring Control Delay at Signalized Intersections", Submitted to ASCE Journal of Transportation Engineering, 1998

- Here the analysis of distance-time, speed-time, and acceleration-time diagrams of a travel time run gives the delay components (stopped delay, acceleration delay, deceleration delay etc.)

•A comprehensive and more rigorous approach is to run HCM methodology analysis during the assignment so it includes intersection geometry and signal timings but there are certain constraints to it

•Or to prepare a lookup table by facility and area type and expected conditions and estimate corresponding values of speeds and capacities bases on collected GPS data observations

•Then recalculate the values at an intersection based on existing conditions

Some Questions…

- **Is the task worthwhile being it time and resource intensive?**
- **If, yes, then how to estimate junction delay for arterials and collectors and how to handle it for our travel demand modeling tasks?**
- **Can it be considered insignificant at regional level?**
- **What simple methodology/approach to use?**
- **Time constraints and data requirements and additional data analysis?**

Upcoming Tasks

- **Identify the current needs for modeling the intersections on non-freeways at regional level**
- **Identify appropriate methodology given the time and data constraints**
- **GPS data analysis and developing link travel speed and capacity estimates**

Freight – MDOT Port of Baltimore Study

Peer Panel Meeting

February 28, 2005

Baltimore Metropolitan Council

Freight Travel

- **Peer Review Recommendations**
- **MDOT Port of Baltimore Study**

Baltimore Metropolitan Council

Peer Review Recommendation

- Truck surveys are needed to better model commercial truck & freight movement
- Develop a “Ports” Model based on a Commercial Vehicle Survey
- Partner with the Port of Baltimore to obtain data

Regional Landside Access Study for the Port of Baltimore – MDOT

- **Collect traffic counts**
- **Conduct origin destination studies for truck traffic**
- **Identify current critical needs and planned improvements**
- **Determine future highway and rail needs**

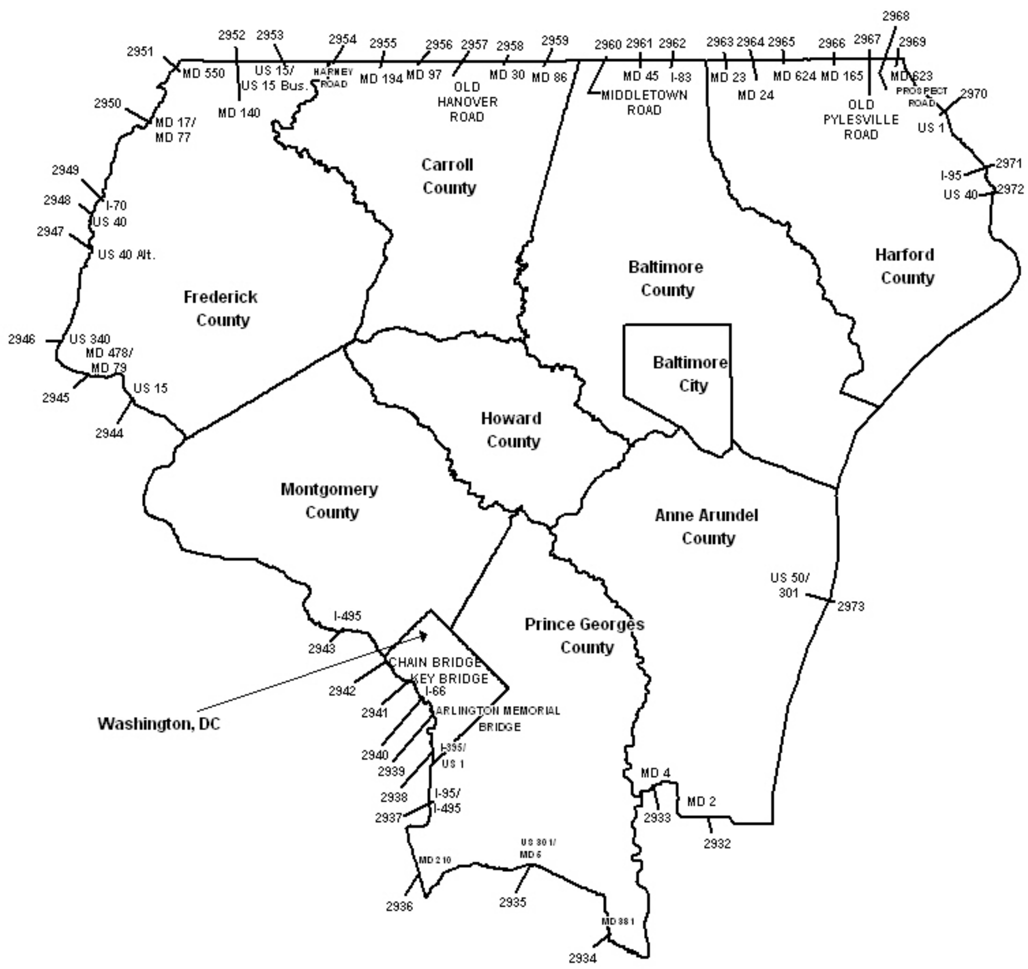
External Station Survey

Peer Panel Meeting

February 28, 2005

Baltimore Metropolitan Council

External Stations



42 External Stations

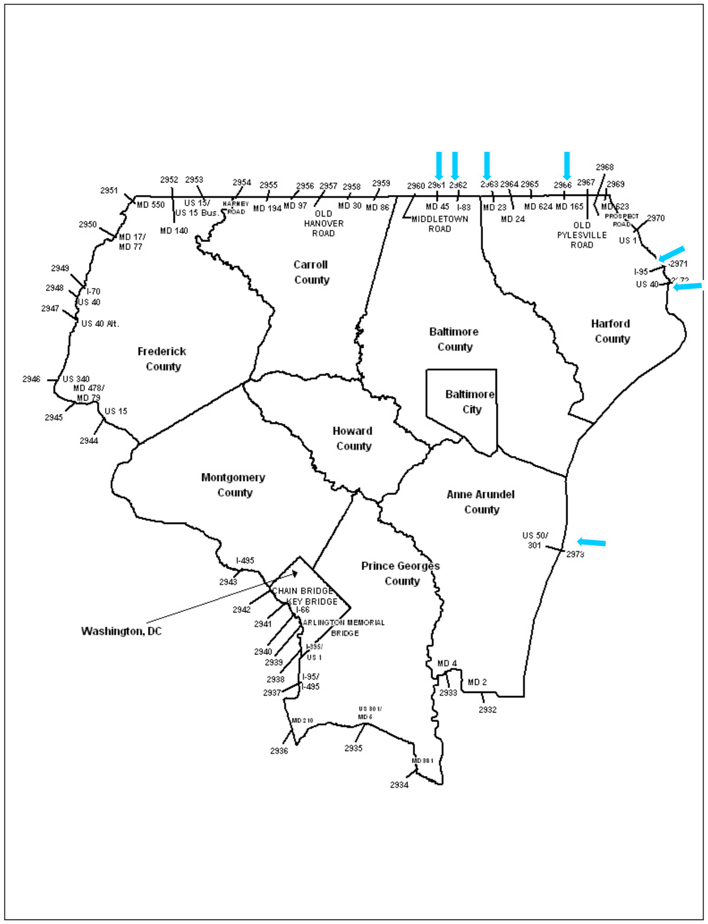
18 along MD/PA Line

7 along the Potomac River in the DC region

Several along freeway's and high speed arterials

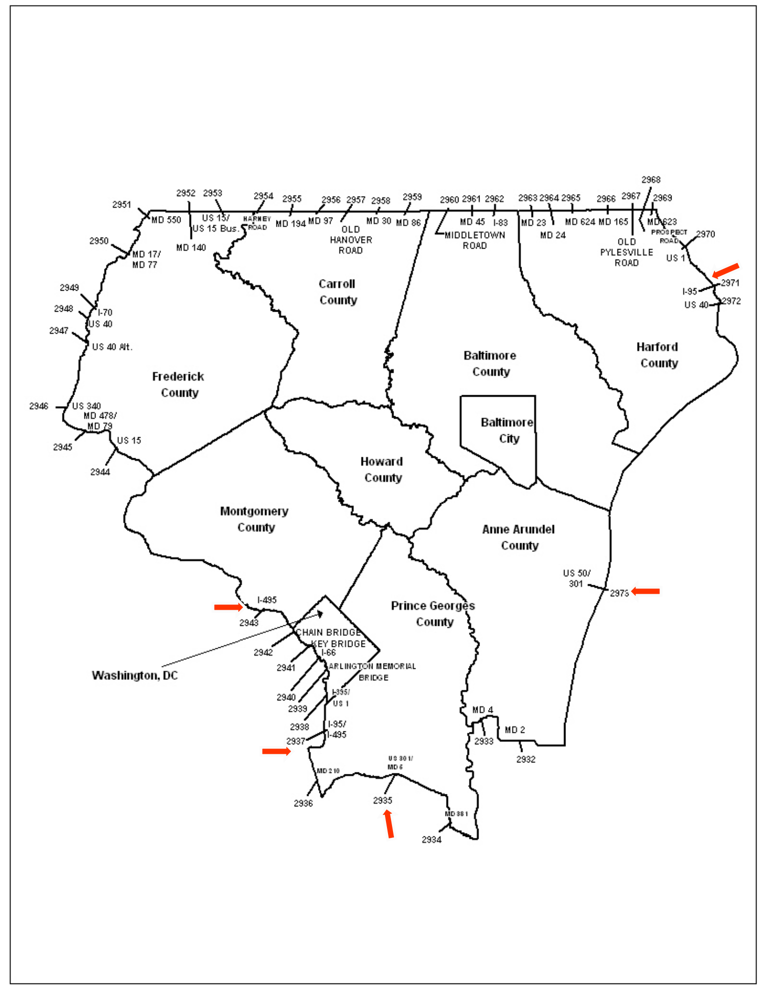
Previous Studies

- ***1985External O-D Survey* – I-95 and US 40 – Northeast Baltimore region boundary.**
- ***1993 PA Route 94 Travel Study* – York County Planning Commission**
- ***1994 - O-D surveys at five external stations along the Pennsylvania-Maryland border* (Skelly & Loy). The five locations are MD 45, PA 851 on ramp to I-83, MD 23, MD 165, and I-83.**
- ***1994 MWCOG external cordon survey* – MWCOG**
- ***1996 Baltimore Regional Transit Study* – comprehensive on-board survey of over 44,000 transit trips.**
- ***2001/2004 - MdTA survey* of vehicles crossing the Bay Bridge (US 50/MD 301).**



Top 5 Externals by Traffic Growth (2000 – 2030)

- **I-495 at the Virginia/Maryland Line**
- **I-495/I-95 at Virginia/Maryland Line**
- **MD 5/US 301 at Charles/Prince George's Line**
- **US 50/US 301 Bay Bridge**
- **I-95 at Cecil/Harford Line**



Survey Objectives

- Trip Type
  - External – Internal (X-I)
  - Internal – External (I-X)
  - External – External (X-X)
- Trip Purpose
- Frequency
- Vehicle Occupancy
- Vehicle Classification
- Time of Day Distribution

Survey Techniques

- **License Plate Surveys**
  - **Mail-back survey**
  - **LP Matches**

- **Personal Interview – preferred method**

Challenges

- Priority locations along high speed freeways
- Stopping vehicles not feasible
- License Plate recording and mail-back survey questionnaires – privacy issues and low response rates
- Sample Size/Survey Duration
- Cost

Next Steps

- Identify locations for survey
- Develop methodology
- Identify funding
- Develop RFP
- Coordinate with MWCOG and other MPO's in the region

Traffic Counts

Peer Panel Meeting

February 28, 2005

Baltimore Metropolitan Council

Screenline Locations
Local Responsibility

	FY04	FY05	FY06	Total
Anne Arundel County	4	4	4	12
Baltimore City*	0	45	50	95
Baltimore County	30	30	30	90
Carroll County	4	5	4	13
Harford County	7	6	5	18
Howard County*	0	29	0	29
Total	45	119	93	257

- * - Counts conducted by BMC

Screenline Locations
SHA Responsibility

	FY04	FY05	FY06	Total
Anne Arundel County	16	15	16	47
Baltimore City	3	3	3	9
Baltimore County	26	25	26	77
Carroll County	8	9	8	25
Harford County	14	15	14	43
Howard County	11	12	11	34
Total	78	79	78	235

Baltimore City Counts

- **SHA has over 200 permanent and other count locations in the City - map**
- **BMC to collect 48-hour volume/class counts at approximately 90 screenline locations in Spring 2005**
- **Coordination underway with Baltimore City to obtain additional counts**

Master Network

Peer Panel Meeting

February 28, 2005

Baltimore Metropolitan Council