

# Status of the TPB Regional Travel Model, Version 2.1 D, Draft #50

Presented to the Travel Forecasting Subcommittee on  
September 17, 2004

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# Model release dates

| <b>Model version</b>     | <b>Release date</b>    |
|--------------------------|------------------------|
| Version 2.1 C            | December 2002          |
| Version 2.1 D, Draft #16 | March 2004             |
| Version 2.1 D, Draft #18 | May 2004               |
| Version 2.1 D, Draft #28 | July 2004              |
| Version 2.1 D, Draft #50 | Sept. 17, 2004 (Today) |

# Draft #50 vs. Draft #28 of Ver 2.1D

- Full mode choice model is run in each of the six speed feedback iterations; MSA procedure updated accordingly
- Eight K-factors have been dampened
- Modified freeway volume-delay function

# TRB review: Modeling topics

1. Model validation;
2. Travel estimation for trucks and commercial vehicles;
3. Bus network characterization;
4. Use of adjustment factors;
5. Speed feedback incorporating mode choice; and
6. Traffic speed and volume estimation for air pollution emissions estimation.

# Ver 2.1D Draft #50 vs. Ver 2.1C

- Traffic assignment:
  - Free-flow speeds and capacities have been updated.
  - Freeway VDF: Made steeper and the speed floor has been raised from 7 mph to 12 mph.
  - Equilibrium assignment process: changed from a *maximum* of 10 iterations to a *fixed number* of 20 iterations. Gap tolerance is checked.
- Toll modeling capability has been added to the model so that monetary values are considered in the trip distribution and traffic assignment steps.
- All cost components in the model previously developed in constant 1980 dollars are now developed in 1994 dollars.

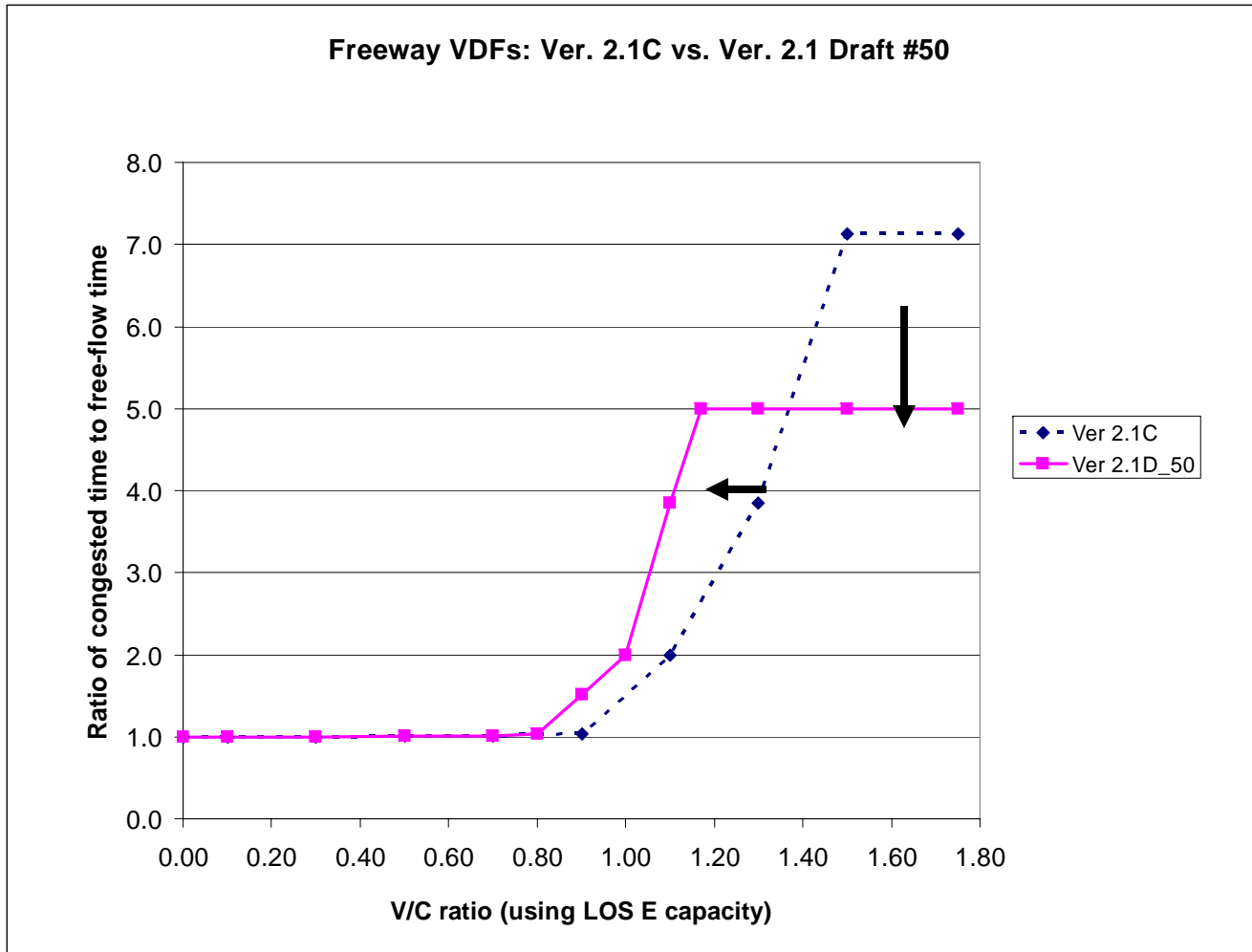
## Ver 2.1D Draft #50 vs. Ver 2.1C

- Zonal area type designations normally developed as a function of land activity density may now be optionally assigned an override value.
- Model is now applied as a series of six iterations and the full mode choice model is applied in each iteration.
- The NHB F-factors have been updated.

# Ver 2.1D Draft #50 vs. Ver 2.1C

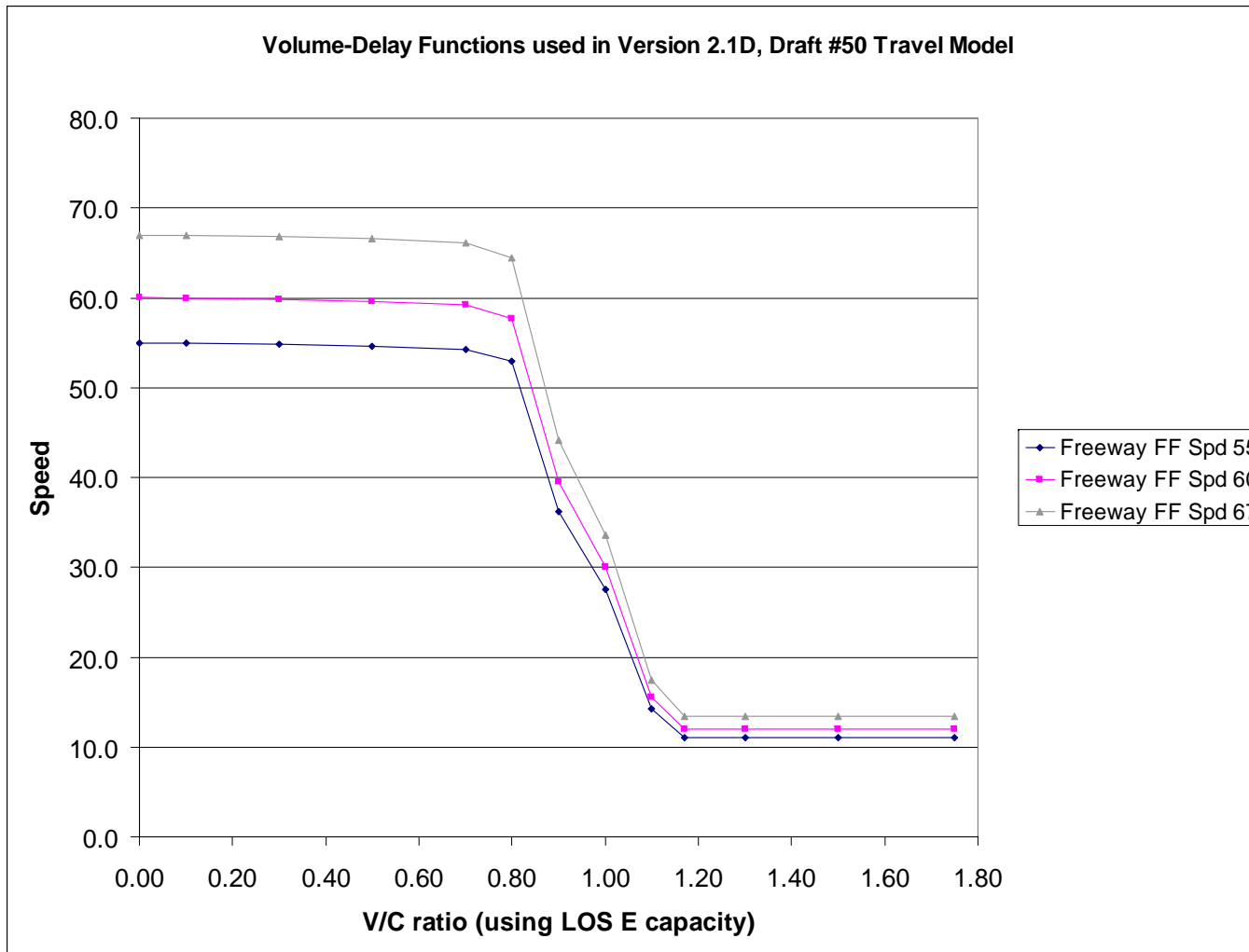
- Transit pathbuilding has been updated:
  - PATHSTYLE parameter in the transit network build program has been updated.
  - Development of walk links has been updated.
- Resulting from the above two transit pathbuilding updates, the mode choice model was re-estimated. The re-estimation also took into account recent FTA guidelines on ranges and characteristics of various mode choice coefficients.
- Added a bus speed model.
- K-factors: number and magnitude reduced.

# Freeway VDFs





# Freeway VDFs

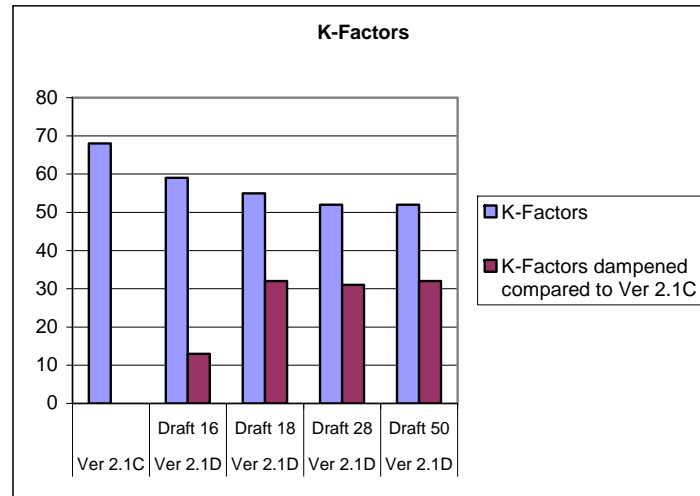
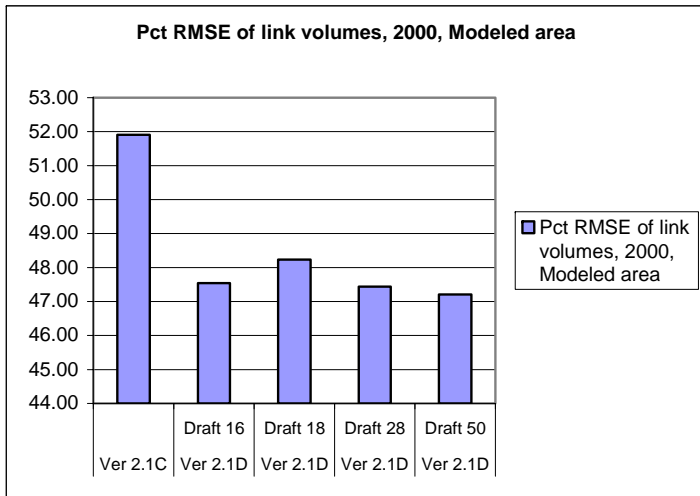
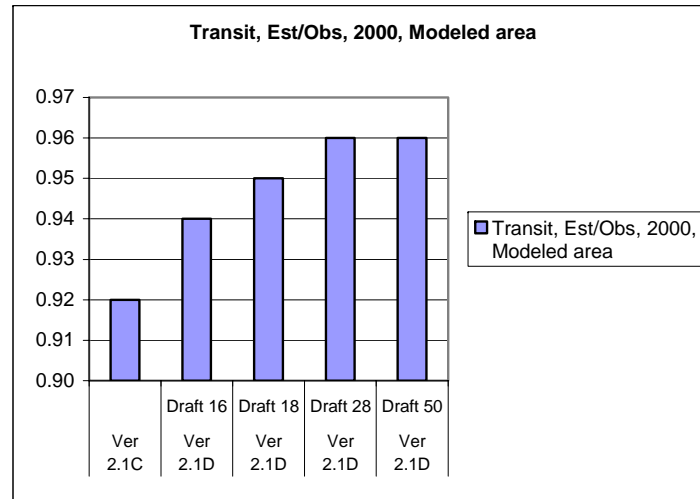
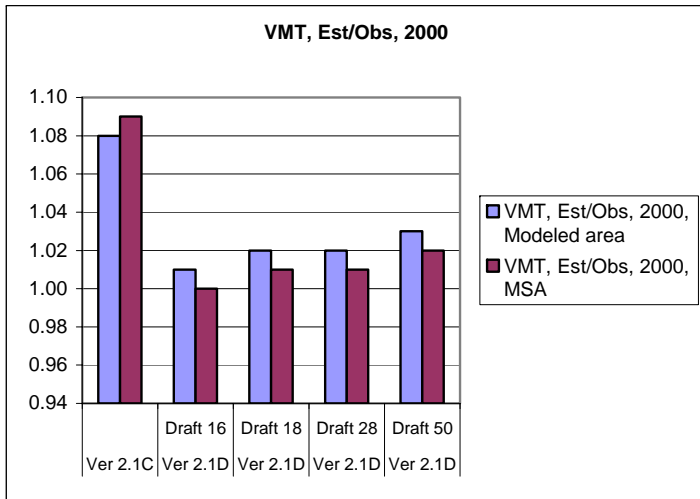


# Summary of changes to K factors

|  | Travel Model |             |             |             |             |
|--|--------------|-------------|-------------|-------------|-------------|
|  | 2.1C         | 2.1D<br>#16 | 2.1D<br>#18 | 2.1D<br>#28 | 2.1D<br>#50 |
| Number of K factors  | 68           | 59          | 55          | 52          | 52          |
| Number of K factors <b>removed</b>                                 | --           | 9           | 13          | 17          | 17          |
| Of the remaining K factors, the number <b>reduced in magnitude</b> | --           | 13          | 32          | 31          | 32          |
| Number of K factors <b>added</b>                                   | --           | 0           | 0           | 1*          | 1*          |

\* K factor added: Prince William Co. to DC core (value 2.8)

# Progression of model performance



# Progression of model performance

|  | Ver 2.1C | Ver 2.1D<br>Draft 16 | Ver 2.1D<br>Draft 18 | Ver 2.1D<br>Draft 28 | Ver 2.1D<br>Draft 50 |
|--|----------|----------------------|----------------------|----------------------|----------------------|
| Release date                             | 12/23/02 | 03/19/04             | 05/21/04             | 07/23/04             | 09/17/04             |
| VMT, Est/Obs, 2000, Modeled area         | 1.08     | 1.01                 | 1.02                 | 1.02                 | 1.03                 |
| VMT, Est/Obs, 2000, MSA                  | 1.09     | 1.00                 | 1.01                 | 1.01                 | 1.02                 |
| Transit, Est/Obs, 2000, Modeled area*    | 0.92     | 0.94                 | 0.95                 | 0.96                 | 0.96                 |
| Link volume Pct RMSE, 2000, Modeled area | 51.91    | 47.54                | 48.23                | 47.44                | 47.21                |
| K-Factors                                | 68       | 59                   | 55                   | 52                   | 52                   |
| K-Factors dampened compared to Ver 2.1C  | 0        | 13                   | 32                   | 31                   | 32                   |
| Land use                                 | 6.3      | 6.3                  | 6.4 emp adj          | 6.4 emp adj          | 6.4 emp adj          |

\* Screened for missing values

Ref: modelCompar21c\_21d50\_2.xls

# Model results: 2000 VMT

| (Thousands)      | MSA Summary   |               |               |
|------------------|---------------|---------------|---------------|
|                  | Estimated     | Observed      | Est/Obs Ratio |
| DC               | 6,650         | 5,781         | 1.15          |
| MD               | 42,954        | 43,144        | 1.00          |
| VA               | 39,721        | 38,308        | 1.04          |
| <b>Total MSA</b> | <b>89,325</b> | <b>87,233</b> | <b>1.02</b>   |

The table reflects highway links with coded ground counts.

Source: i6\_highway\_assignment.rpt

9/13/2004

v2.1 D perf00.xls

# Model results: Mode choice, 1994

(screened)

| Purpose/Mode<br>===== | Est.<br>===== | Obs.<br>===== | Diff.<br>(E - O)<br>===== | Ratio<br>(E / O)<br>===== |
|-----------------------|---------------|---------------|---------------------------|---------------------------|
| HBW:                  | 432,732       | 457,306       | -24,574                   | 0.95                      |
| % Transit:            | 16.17         | 16.88         | -0.71                     | 0.96                      |
| Car Occ:              | 1.12          | 1.12          | 0.01                      | 1.01                      |
| HBS:                  | 25,792        | 27,825        | -2,033                    | 0.93                      |
| % Transit:            | 1.19          | 1.30          | -0.10                     | 0.92                      |
| Car Occ:              | 1.24          | 1.23          | 0.01                      | 1.00                      |
| HBO:                  | 142,610       | 139,367       | 3,243                     | 1.02                      |
| % Transit:            | 2.16          | 2.15          | 0.00                      | 1.00                      |
| Car Occ.:             | 1.43          | 1.44          | -0.01                     | 0.99                      |
| NHB:                  | 135,460       | 117,963       | 17,497                    | 1.15                      |
| % Transit:            | 2.80          | 2.50          | 0.29                      | 1.12                      |
| Car Occ.:             | 1.25          | 1.25          | 0.00                      | 1.00                      |
| ALL:                  | 736,594       | 742,461       | -5,867                    | 0.99                      |
| % Transit:            | 4.52          | 4.63          | -0.11                     | 0.98                      |
| Car Occ:              | 1.30          | 1.30          | 0.00                      | 1.00                      |

Ref: COMPARE\_MCEO\_SCR\_94.TXT

# Model results: Mode choice, 2000

(screened)

| <b>Purpose</b>      | <b>Est</b>     | <b>Obs</b>     | <b>Diff.<br/>(Est-Obs)</b> | <b>Ratio<br/>(Est/Obs)</b> |
|---------------------|----------------|----------------|----------------------------|----------------------------|
| HBW                 | 502,001        | 538,582        | -36,581                    | 0.93                       |
| <i>Pct. Transit</i> | <i>16.78%</i>  | <i>17.80%</i>  | <i>-1.02%</i>              | <i>0.94</i>                |
| HBS                 | 34,079         | 33,262         | 817                        | 1.02                       |
| <i>Pct. Transit</i> | <i>1.39%</i>   | <i>1.36%</i>   | <i>0.03%</i>               | <i>1.02</i>                |
| HBO                 | 163,864        | 151,645        | 12,219                     | 1.08                       |
| <i>Pct. Transit</i> | <i>2.24%</i>   | <i>2.07%</i>   | <i>0.16%</i>               | <i>1.08</i>                |
| NHB                 | 156,238        | 166,461        | -10,223                    | 0.94                       |
| <i>Pct. Transit</i> | <i>2.90%</i>   | <i>3.09%</i>   | <i>-0.18%</i>              | <i>0.94</i>                |
| <b>Total</b>        | <b>856,182</b> | <b>889,950</b> | <b>-33,768</b>             | <b>0.96</b>                |
| <i>Pct. Transit</i> | <i>4.72%</i>   | <i>4.89%</i>   | <i>-0.18%</i>              | <i>0.96</i>                |

Ref: compare\_mceo\_00\_uns\_scr.xls

# Comparison of regional demographic and travel trends over time

V2.1D #50

|                                   | 1994        | 2000        | 2030        | pct change |         |
|-----------------------------------|-------------|-------------|-------------|------------|---------|
|                                   |             |             |             | '94-'00    | '94-'30 |
| Households                        | 1,940,449   | 2,144,177   | 3,012,414   | 10.5%      | 55.2%   |
| Employment                        | 3,273,042   | 3,441,356   | 5,138,239   | 5.1%       | 57.0%   |
| Population                        | 5,245,630   | 5,746,025   | 7,783,770   | 9.5%       | 48.4%   |
| Total Motorized Person Trips      | 21,443,448  | 23,785,266  | 33,706,454  | 10.9%      | 57.2%   |
| Motorized Person Trips per HH     | 11.05       | 11.09       | 11.19       | 0.4%       | 1.3%    |
| Motorized Person Trips per Capita | 4.09        | 4.14        | 4.33        | 1.3%       | 5.9%    |
| Walk & Bike Trips, HBW only       | 167,136     | 180,539     | 282,383     | 8.0%       | 69.0%   |
| Auto Occupancies                  | 1.30        | 1.30        | 1.30        | 0.2%       | -0.2%   |
| Transit Person Trips, Internal    | 778,617     | 881,851     | 1,286,020   | 13.3%      | 65.2%   |
| Transit Percentage                | 3.63%       | 3.71%       | 3.82%       | 2.1%       | 5.1%    |
| Total Vehicle Trips               | 16,877,563  | 18,743,129  | 26,819,215  | 11.1%      | 58.9%   |
| Regional VMT                      | 127,859,959 | 143,644,783 | 209,151,179 | 12.3%      | 63.6%   |
| VMT per Capita                    | 24.37       | 25.00       | 26.87       | 2.6%       | 10.2%   |
| VMT per HH                        | 65.89       | 66.99       | 69.43       | 1.7%       | 5.4%    |

Notes:

Transit constraint is assumed for modeled years after 2005.  
2030 network does not include the Inter-County Connector

Ref: vfs\_ftpres2004-09.xls

9/17/04

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16



# Conclusion

- Performance of the Ver. 2.1D #50 model is superior to prior models
- Model adjustments are the least extensive to date
- Four of the six TRB topics have been addressed; Further enhancements will continue

# Next Steps

- Work on the mobile source emissions post processor
- Complete network coding for upcoming AQ conformity determination
- AQ conformity results to be released Oct.1; 30 day comment period to follow.
- Ver. 2.1D #50 model will be adopted when the TPB approves the TIP & CLRP based on the conformity determination