As of
24-Jun-03

PUBLIC TRANSPORTATION IN BOSTON
Cambridge, Massachusetts
June 11-17, 2003

All meetings are in MIT Room 3-270 except as noted

Day	Time	Subject	Lecturer(s)
Monday June 9 and Tuesday June 10		**Introduction to Tren Urbano and San Juan, @ Tren Urbano Offices**	
Wednesday June 11			
	approx. 3pm	Arrival, Introduction to Boston, scavenger hunt hosted by MIT students (start at McCormick Hall)	
	6:30-10:00 PM	**Boston Harbor Dinner Cruise (Long Wharf, Boston)**	
Thursday June 12			
	9:00-10:00	Introduction to Course and Research Projects	Nigel Wilson, Ken Kruckemeyer
	10:00-10:15	**BREAK, Room 1-236**	
	10:15-12:30	Boston History	Fred Salvucci
		Boston Transportation History	Ken Kruckemeyer
	12:30-1:30	**Lunch at MIT**	
	1:30-2:30	Presentation: MBTA, Orange Line/Red Line/Urban Ring	Ken Kruckemeyer
	2:30-6:00	Field Trip: CT1 or CT2 Bus/Silver Line/Orange Line	Ken Kruckemeyer
	evening	**Free**	
Friday June 13			
	8:00-11:00 AM	Field Trip: Red Line (meet at Alewife Station at 8 AM)	Ken Kruckemeyer
	11:00-12:00 PM	MIT Student Research Presentations	Jordan Karp: Joint Development of Mixed-Use Transit Facilities
			Jing Su: Reclaiming Residual Spaces From Elevated Transport Infrastructure
			Demian Raspall Galli: Privately Provided Transit Services: A Contracts Approach
			Alex Cohen: This Train is Not Going to Work (Tren Urbano and Non-Work Travel)
	12:00-1:00	**Lunch at MIT**	
	1:00-2:30	Transportation Planning and Modeling	Mikel Murga
	2:30-2:45	**BREAK, Room 1-236**	
	2:45-4:00	Traffic Engineering and Transit Priority	Peter Furth (Chair, Dept. of Civil & Env. Engineering, Northeastern University)
	5:00	Pick up @ dorms, leave for Talbot House	
	7:00	**Dinner in Concord, NH**	
	10:00	Arrival at Talbot House	

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Day	Time	Subject	Lecturer(s)
Saturday June 14		**Day spent in Vermont**	
Sunday June 15		**Return to Boston by early afternoon, rest of day open**	
Monday June 16			
	9:00-10:00 AM	CTA and Transport Visualization Methods	Mike Shiffer (VP for Planning, Chicago Transit Authority)
	10:00-10:15	**BREAK, Room 1-350**	
	10:15-11:15	Silver Line and High-Quality Bus Service	Mike Mulhern (General Manager, MBTA)
	11:15-12:00 PM	The Vision for Urban Transportation in Puerto Rico	Jack Allison, Executive Director, Puerto Rico Highway and Transportation Authority
	12:00-1:00	**Lunch at MIT**	
	1:00-2:00	Student Presentations	Selman Altun: Designing and Managing Transit Operations To Take Advantage of Transit
			Miguel Vescovacci: Junction Capacity and Performance in Rail Transit
			Bassel Younan: Applying Operations Planning and Operations Control Strategies to Improve Transit Service Connectivity
			Jeff Busby: Accessibility Based Transit Planning
	2:00-3:00	Public Transportation Introduction	Nigel Wilson
	3:00-6:00	Field Trip: Transitway/Operations Center (Dave Carney)	Nigel Wilson
	evening	**Free**	
Tuesday June 17			
	9:00-10:30 AM	Discussion of Student Research Topics -- small groups	Faculty/students in small groups, in Rooms 1-236, 1-238, 1-350, and 1-375
	10:30-10:45	**BREAK, Room 1-236**	
	10:45-11:45	Lessons learned from Boston for Tren Urbano	Nigel Wilson, Fred Salvucci, and Ken Kruckemeyer
	11:45-12:45 PM	Course Evaluation and discussion, conclusion & future	Nigel Wilson, Fred Salvucci, and Ken Kruckemeyer
	1:00 PM	**Final lunch at MIT (Religious Activities Dining Room, Bldg W-11)**	
Wednesday June 18		**Day for exploring Boston**	

Caliper Travel Demand Forecasting Workshop

Caliper Corporation
1172 Beacon Street • Newton, Massachusetts 02461 • www.caliper.com

Contents

Caliper Introductory Travel Demand Forecasting Workshop Software

The Caliper Travel Demand Forecasting Workshop (TDFW) software is a Windows-based program developed to help students learn the basics about travel demand forecasting and modeling. Caliper Corporation developed this program for the FHWA under a contract with the Volpe National Transportation Systems Center.

This documentation explains how to use the TDFW software.

Installation

The Caliper Introductory Travel Demand Forecasting Workshop (TDFW) software runs as a stand-alone program.

◆ To Install the TDFW Software

1. Start Windows.
2. Put the installation disk into your CD-ROM drive. In a moment, the installation program will appear on your screen. If not, click the Start button in your Windows desktop and choose the Run command from the menu. Type *x*:setup (where *x* is the drive letter of the CD-ROM) and press Enter. The installation program will appear on your screen.
3. Click the Yes button to begin installation.
4. Input the directory where you want to install the program and click Next.

The installation program copies the program and data files into your input directory and creates a new entry in your Windows Start Menu. The program also will create a shortcut Icon on your desktop screen.

◆ To Uninstall the TDFW Software

1. Click the Start button, select Settings, and then select Control Panel.
2. Double-click "Add/Remove Programs." In the Add/Remove Program Properties dialog box, scroll down and select Caliper Travel Demand Forecasting Workshop. Click the "Add/Remove" button.
3. Click the "Yes" button to confirm that you want to remove the program and continue clicking the "Yes" button when asked by the computer to remove the files. When the computer is finished uninstalling the program, close the dialog box and the Control Panel window.

Overview

The TDFW program simulates a typical four-step travel demand model for a relatively small urban area. The program presents the model in an easy-to-use GIS-based interface. Using this interface, students can:

- view all GIS and data input files used in the model;
- modify input data;
- run each model component separately or together;
- show the results in graphical format;
- produce summary statistics to analyze the results; and
- print the results.

The steps performed in this program consist of:

- Trip Generation;
- Creating a Travel Time Matrix;
- Trip Distribution;
- Modal Split;
- Converting Productions and Attractions to Origins and Destinations; and
- Trip Assignment.

1.0 Starting TDFW

The TDFW software is run as a stand-alone Windows program and can be run from the desktop screen or the Windows Start menu.

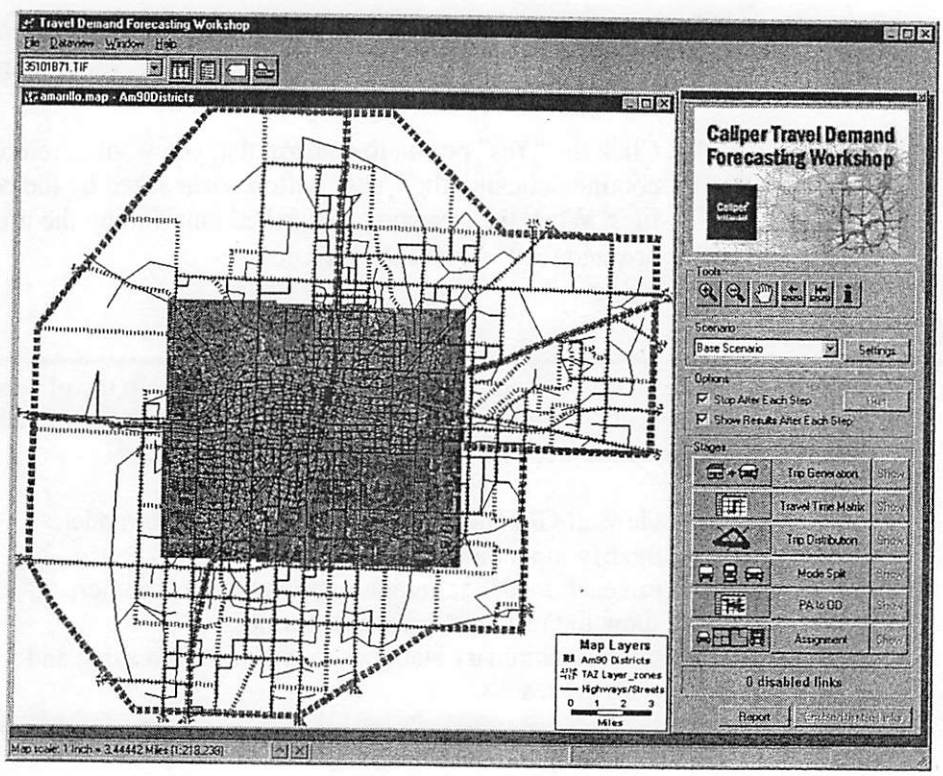
◆ To Run the Program

1. Double-click the Caliper TDFW Icon on the desktop screen, or click the Start button from the Windows Start menu located on the bottom left hand corner of Windows.
2. Choose Programs>Caliper Travel Demand Forecasting Workshop>Caliper Travel Demand Forecasting Workshop.

The program will start and is ready for use.

2.0 Working With TDFW

When the user initially runs TDFW, a map window and floating dialog box will be shown. There will also be buttons at the top of the program. The following graphic illustrates all parts of the program:

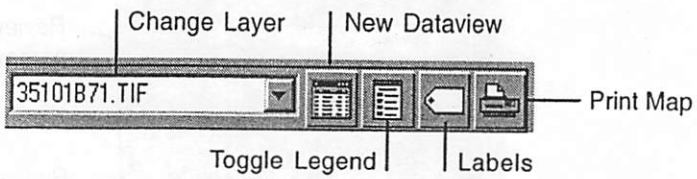


The map window includes several layers of information for the model. The layers include:

- aerial photo images displayed in the background;
- district layer shown in dotted green;
- TAZ zonal layer shown in dotted brown;
- highway network line layer shown in black; and
- background city street layer shown in gray.

The Top Program Buttons

The drop-down menu and buttons at the top part of the map window allows the user to change the current layer, show data for a current layer, show or hide the legend, add a label, or print the map to a printer:



◆ To Show Data for Any Layer

1. Click the Change Layer drop-down menu at the top of the map window and select a layer to show the desired data.

2. Click the button next to the Change Layer drop-down menu.

The TDFW program will display all data for that layer. The aerial photograph TIF layers are only images, so there is no associated data for the aerial photograph layers.

2.1 Example: Showing Data for the TAZ Layer

1. Click the Change Layer drop-down menu at the top of the map window and select the TAZ Layer_zones layer.

2. Click the button next to the Change Layer drop-down menu.

3. Click the map layers menu to return to the opening screen.

The TDFW program will display all data for the TAZ layer.

3.0 The TDFW Main Toolbox

The TDFW main toolbox is used to perform many functions. The toolbox allows the user to:

Control scale

Change the scenario to model

Review and show input and output files and model parameters at all stages of the model process

Run each model

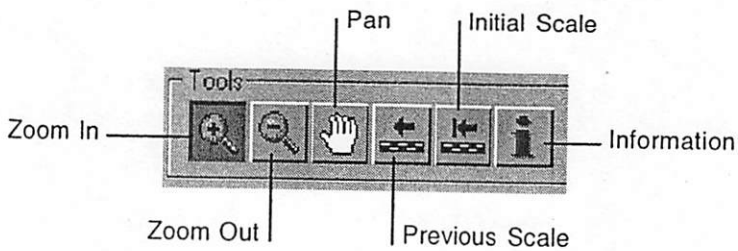
Graphically display model results

Show input files for model steps

Enable and disable network links and view the effects on the model

Controlling What is Shown on the Map

The Tools part of the TDFW toolbox allows the user to zoom in and out of the map, pan around the map, display previous and initial scales, and obtain information on any part of the map.



If the current window is not a map, these tools will be disabled. The following table describes how to use these tools:

Tool	Description	How to Use
Zoom In	Zooms in on the map	Click the button. Then click on the map and drag a rectangle.
Zoom Out	Zooms out on the map	Click the button. Then click on the map.
Pan	Move around the map	Click the button. Then click on the map and drag the picture.
Previous Scale	Go back one zoom scale	Click the button to return to the previous scale.
Initial Scale	Go back to initial zoom scale	Click the button to return to the initial scale.
Information	Get information for an item on the map	Click the button. Then click on the item on the map to show information about that item.

3.1 Example: To Zoom In on the Map

1. Click on the Zoom In button.
2. Click on the map and drag a rectangle.

The TDFW program will zoom in on the map based on the rectangle the user dragged.

3.2 Example: To Show Information for an Item on the Map

1. Click the Change Layer drop-down menu located at the top of the map window and set the layer to show the desired information.
2. Click the information tool on the TDFW toolbox.
3. Click on the item on the map to show information about that item.

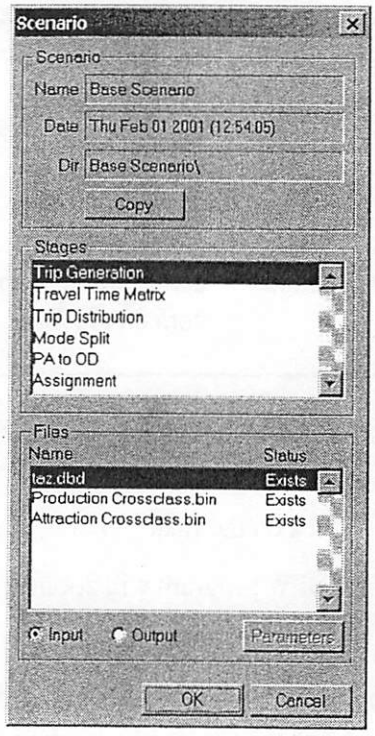
The TDFW program will display all information for the selected item in the chosen layer in a separate window.

Changing Scenarios

The TDFW program allows the user to change the scenario to forecast. The base scenario describes the base case. All other scenarios represent changes to the base case. By clicking on the Scenario drop-down list, the user can change the scenario the user wishes to run. During later exercises (sensitivity analysis section for example), the user will need to change scenarios from the base scenario.

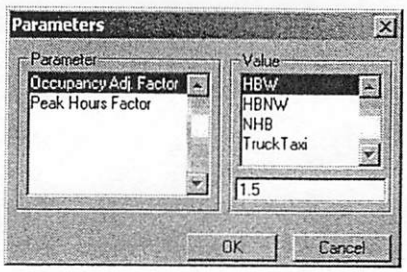
Reviewing and Showing Input and Output Filenames

The user can display all input and output files and parameters used for the models for a scenario by clicking on the Settings button in the TDFW toolbox. Clicking on this button will display the Scenario dialog box:



The Scenario dialog box displays the input and output file names used for the scenario. The top frame describes the name of the scenario, the date it was last updated and the directory where input and output files are located. The middle frame lets the user set the forecast stage to view input files and parameters and output files. The bottom frame lets the user see the names of input and output files for the selected forecast stage. By double-clicking on any of the files, the file will be opened and displayed by the program. The user can then view or edit the file. Methods to edit data are described in the Editing Data section of this guide.

If there are editable parameters available for a forecast stage, the Parameters button will become enabled. Clicking on the Parameters button will allow the user to view and edit parameters for any model:



The user can also view input files by clicking on the graphic for each model stage. For example, by clicking the  button, the program will open a map of the TAZ layer with the input demographics for each zone. In addition, the program will open both production and attraction classification rate tables. In general, all input files necessary for a model stage will be opened if the user clicks on the picture of the model stage. Appendix B describes each of the inputs and output files and their parameters.

The user can also copy a current scenario into a new scenario. Copying a scenario will copy all of the input and output files for a scenario into a new scenario directory. It is recommended that users copy a scenario first before performing a sensitivity analysis.

◆ To Copy a Scenario

1. Click the Settings button in the TDFW toolbox. Then click the Copy button in the Scenario dialog box.
2. Type in a new scenario name.

All scenario files will be copied into the new scenario directory.

Running Models

The user can run a model by simply clicking on a model button. Any open windows will be closed and the specific model will run. Clicking on a model button will only run one model at a time. If the user wishes, all models can be run in succession.

◆ Running All Models Separately

To run all models separately, click on each individual button in the TDFW toolbox (Trip Generation, Travel Time Matrix, Trip Distribution, Mode Split, PA to OD, and Assignment) to run the models. The program will run the models and produce the output files.

◆ To Run All Models in Order Without Stopping

To run all the models in order without stopping, uncheck the Stop After Each Step checkbox under the Options frame of the TDFW toolbox. Then click the Run button next to the checkbox.

The program will run all the models from Trip Generation to Trip Assignment and produce the output files.

Displaying Output

Once a model is run, the program can display all of the output files. The program also has tools enabling users to display the output graphically for some models. By checking the Show Results After Each Step checkbox, output will be displayed immediately after a model is run. If the checkbox is unchecked, no output will be displayed. Clicking on the Show button to the right of the model buttons will display output for the particular model. The program will only show output for the model steps already completed.

Each model step will create and display different output files. The following table describes the different outputs for each model step:

Model Step	Outputs
Trip Generation*	Production-Attraction table, TAZ area map with attached productions and attractions.
Travel Time Matrix	Travel time matrix.
Trip Distribution*	Travel time matrix, Production-Attraction matrix.
Mode Split*	Production-Attraction matrix divided into Auto and Transit trips. Trips are summarized in matrix by production and attraction. TAZ area map with attached total auto and transit trips summarized by production zone.
PA to OD*	Converted origin-destination matrix for auto trips. TAZ area map used to show desire lines.
Assignment	Flow table with estimated link flows, estimated congested link travel times, estimated link volume-to-capacity ratios, and estimated link travel speeds. Thematic flow map showing vehicle flows on links and color-coded levels of congestion.

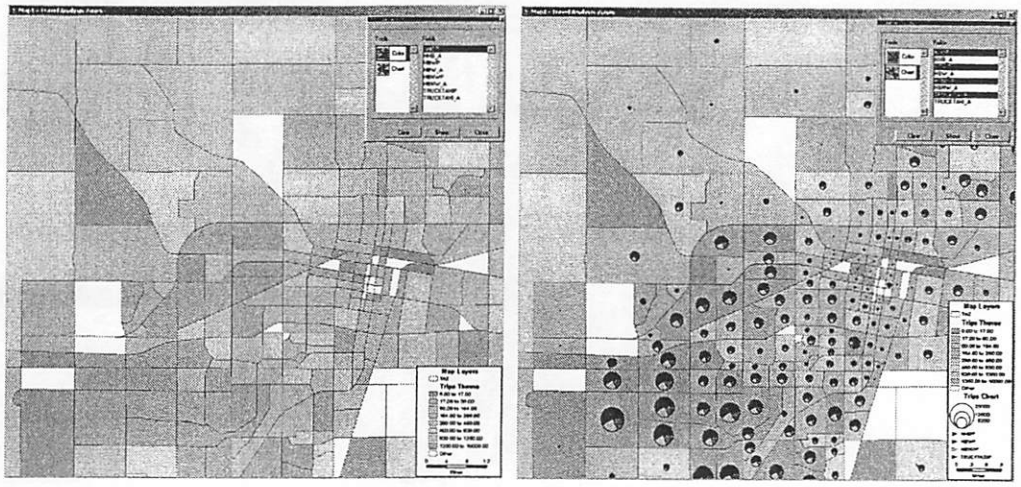
***Thematic maps are created for these model steps.**

For the model outputs that produce a map, use the Information tool to obtain information for a particular link or TAZ. This tool can be used after running the Trip Generation, Mode Split, and Trip Assignment models to obtain output results for a particular map item.

The model steps with an asterisk beside them allow users to create custom thematic maps. In each of these model steps, after the outputs are opened, special toolboxes are displayed that allow users to choose output fields and/or zones to display graphically. The following section describes how to create themes.

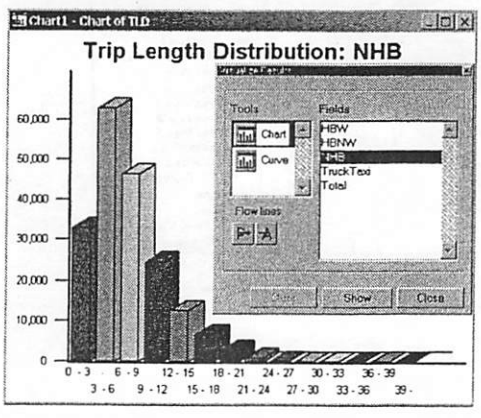
Creating Themes for Trip Generation

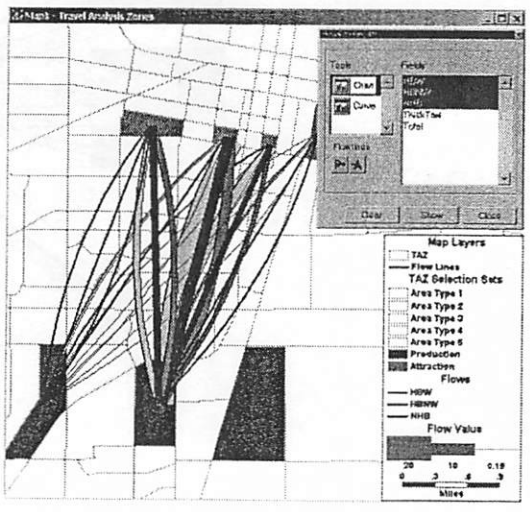
After running the Trip Generation model, a toolbox appears that allows users to create either color themes or pie chart themes on the TAZ area layer. Color themes show high production or attraction values in one color and low production or attraction values in another. Pie chart themes allow users to view the share of a production or attraction purpose in relation to the other purposes and the total for each zone.



Creating Themes for Trip Distribution

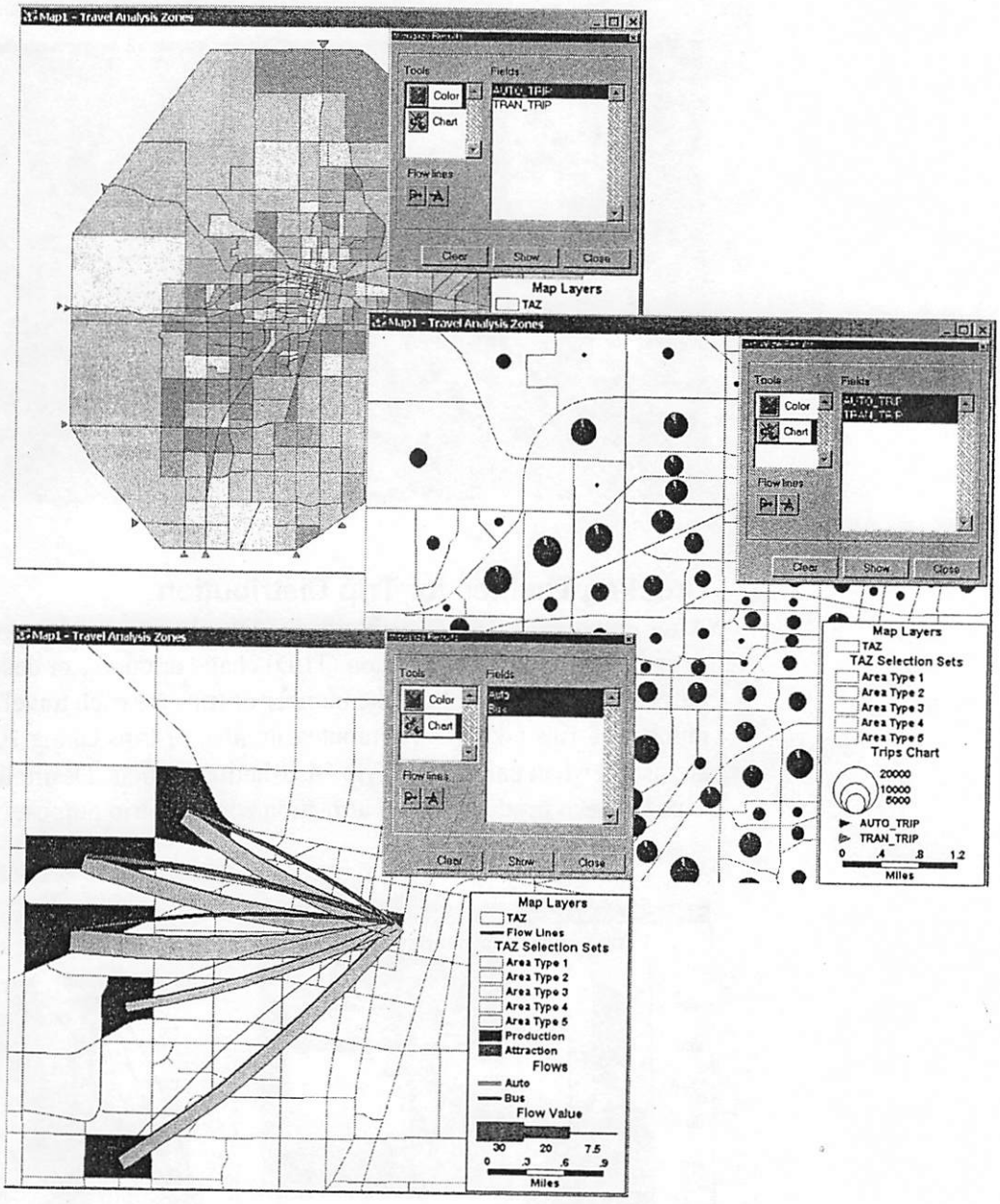
After running the Trip Distribution model, a toolbox will appear that allows the user to create trip length distribution (TLD) charts or curves or desire lines by trip purpose. TLD curves show the number of trips for each travel time range (e.g. number of trips taking 5-10 minutes, number of trips taking 10-15 minutes, etc.) and are useful when calibrating Trip Distribution models. Desire lines visually show the trips between production and attraction zones by trip purpose





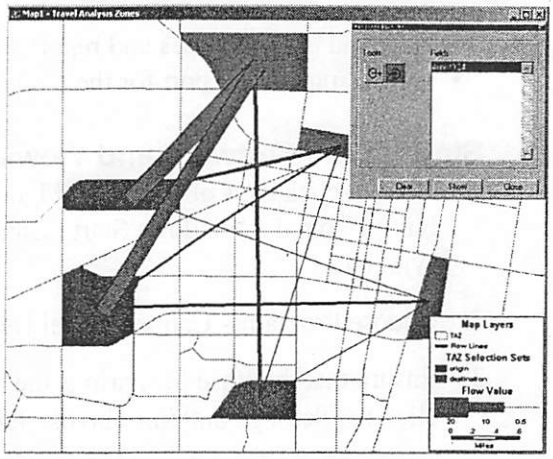
Creating Themes for Mode Split

After running the Mode Split model, a toolbox will appear that allows the user to display a color theme of total auto or transit trips by production TAZ, a pie chart theme that displays trips for both modes by production TAZ, or a desire line diagram of auto or transit trips on the TAZ layer.



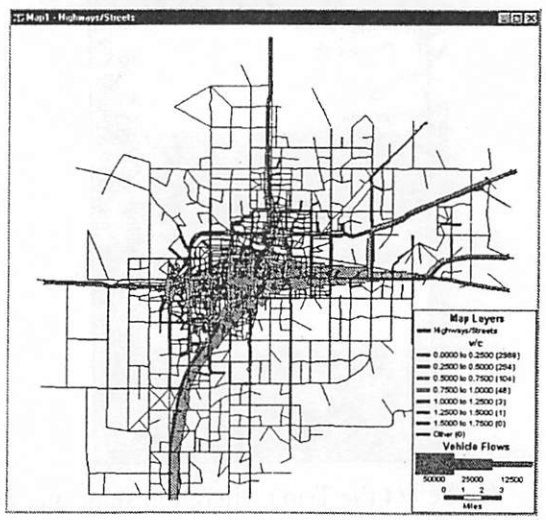
Creating Themes for PA to OD

After running the PA to OD model, a toolbox will appear that allows the user to display a desire line diagram on the TAZ area layer. A desire line diagram graphically displays the origin-to-destination trip output from PA to OD in the form of lines. The thickness of the line is proportional to the number of trips between the OD pair.



Trip Assignment Theme

After the Trip Assignment model runs, a thematic flow map is created that shows vehicle flows on links and color-coded levels of congestion. The model also produces flow tables with estimated link flows, estimated congested link travel times, estimated link volume-to-capacity ratios, and estimated link travel times.



Step By Step Tutorial

This section provides a step-by-step tutorial for using the TDFW software. The tutorial will provide steps to:

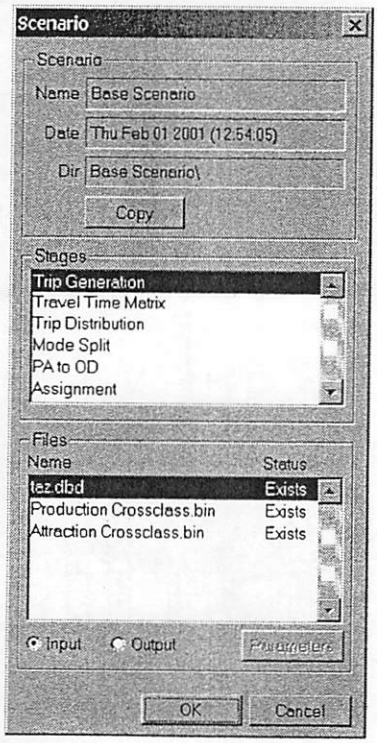
- view input files for a scenario;
- view input files for scenario steps;
- run scenario steps;
- view and create themes and reports for model step outputs; and
- view a summary report for the model outputs.

Starting the Software and Viewing Input Files

1. Double-click the Caliper TDFW Icon on the desktop screen, or click the Start button from the Windows Start menu located on the bottom left hand corner of Windows.

2. Choose Programs- Caliper Travel Demand Forecasting Workshop.

3. Ensure that the Base Scenario is the current scenario in the TDFW toolbox and click the Settings button to invoke the Scenario dialog box:



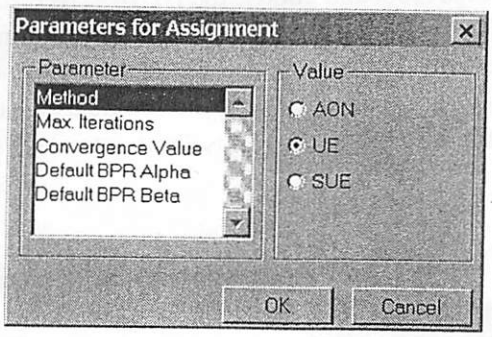
4. Select the Trip Generation stage and double-click on taz.dbd to view the geographic TAZ area layer on a map.

5. Double-click on Production Crossclass.bin to view the production cross classification table.

6. Double-click on Attraction Crossclass.bin to view the attraction cross classification table.

7. Click the Assignment stage to view input files for trip assignment and double-click on net.dbd to view the input highway network file.

8. Click the Parameters button to view parameters for trip assignment.



9. Click on all the parameters to view the parameters. Click on OK to return to the Scenario dialog box.

10. Click on OK to return to the TDFW Toolbox.

Running the Trip Generation Model

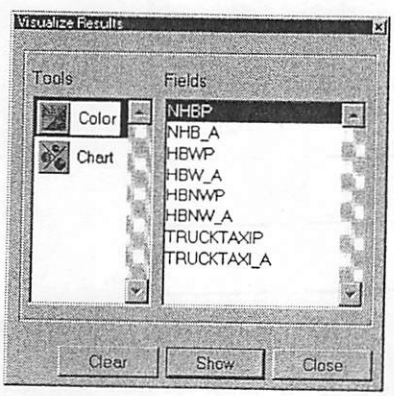
1. Click the button to display all input data for the trip generation model. Review all the input data by clicking on the Windows menu and choosing a window.

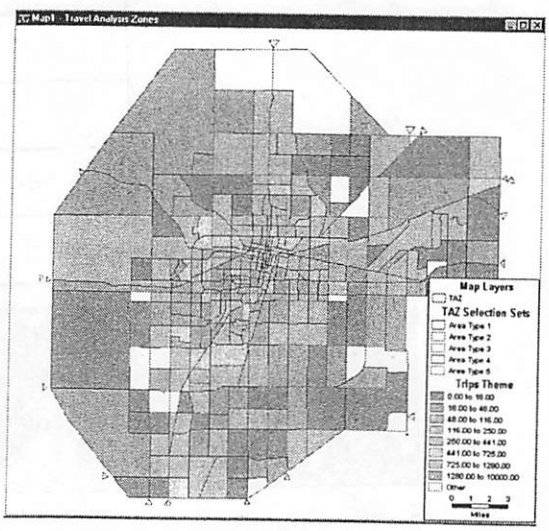
2. Ensure that the options Stop After Each Step and Show Results After Each Step are both checked and run the Trip Generation model by clicking on the Trip Generation button.

Creating Themes for Trip Generation

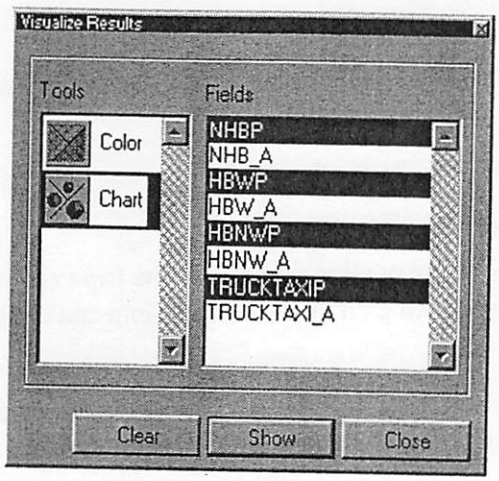
3. After running the Trip Generation model, a Visualize Results dialog box appears that allows users to create either color themes or pie chart themes on the TAZ area layer. Color themes show high production or attraction values in one color and low production or attraction values in another. Pie chart themes allow users to view the share of a production or attraction purpose in relation to the other purposes and the total for each zone.

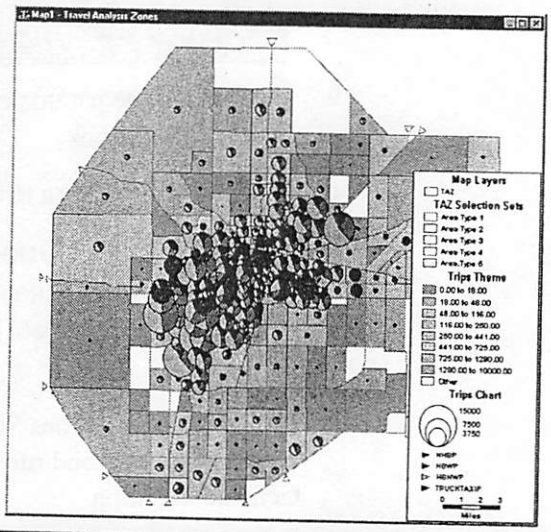
4. In the Visualize Results dialog box select the Color tool and NHBP as the field to view and click the Show button. The software will display a color theme for Non-Home Based Production trips.





5. Choose the Chart tool and choose the NHBP, HBWP, HBNWP, and TRUCKTAXIP fields. Select multiple fields by holding down the CTRL key while selecting the fields with the mouse. Click the Show button. The software will display a chart theme of all trip production fields. Use the zoom function to zoom in on the CBD. Click the Close button to close the Visualize Results dialog box.





Question 1:
Which trip purpose has a high proportion of productions in the CBD?

6. Choose Window-Dataview2-TAZ+PA_Table from the menu to display the TAZ table with balanced production and attraction results. From the top drop-down menu, choose Area Type 3 to display all TAZs of Area Type 3. Area type classifications are shown in the table below.

Area Type Classifications

1	CBD
2	CBD Fringe
3	Urban
4	Suburban
5	Rural

Question 2:
Scroll to the right until the productions and attractions by purpose are visible. Click on the NHBP field. Click the right mouse button and select Sort Decreasing. Which TAZ has the most NHB productions?

7. Click Report.

Question 3:
Calculate the following reasonableness checks:

- **Persons/HH _____**
- **Employment/HH _____**

Question 4:
What is the percent difference between total person trip productions and attractions after adding the special generators?

$$\left(\frac{\text{productions - attractions}}{\text{productions}}\right) \text{ X } 100$$

Running the Travel Time Matrix Model

1. Click the  button to display the highway database for the Travel Time Matrix model.
2. Click the Travel Time Matrix button to run the travel time matrix model. The resulting window will display the travel time matrix.

Question 5:
Select the data view window titled "Intrazonal." This includes the intrazonal travel time for all the zones. Right click on the travel time field and click on "Sort Decreasing." Which zone has the longest intra-zonal travel time?

Question 6:
Using the Travel Time Matrix, determine how intrazonal travel times were calculated. (Hint: nearest zone in travel time to Zone 1 is Zone 2)

Running the Trip Distribution Model

1. Click the  button to display the friction factor table input for the Trip Distribution model.
2. Ensure that the options Stop After Each Step and Show Results After Each Step are both checked and run the Trip Distribution model by clicking on the Trip Distribution button.

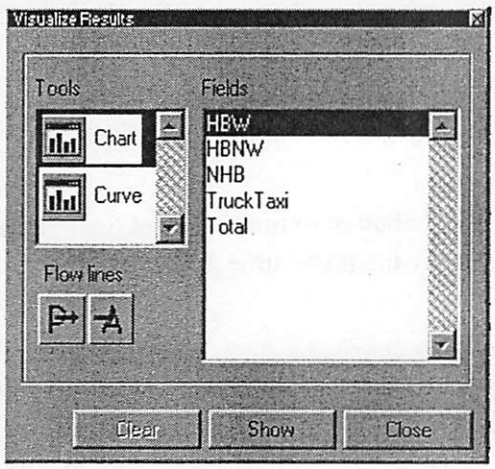
   After running the model, the Visualize Results dialog box will be displayed that allows users to create trip length distribution (TLD) charts or curves or desire lines by trip purpose. TLD curves show the number of trips for each travel time range (e.g. number of trips taking 5-10 minutes, number of trips taking 10-15 minutes, etc.) and are useful when calibrating Trip Distribution models. Desire lines visually show the trips between production and attraction zones by trip purpose.

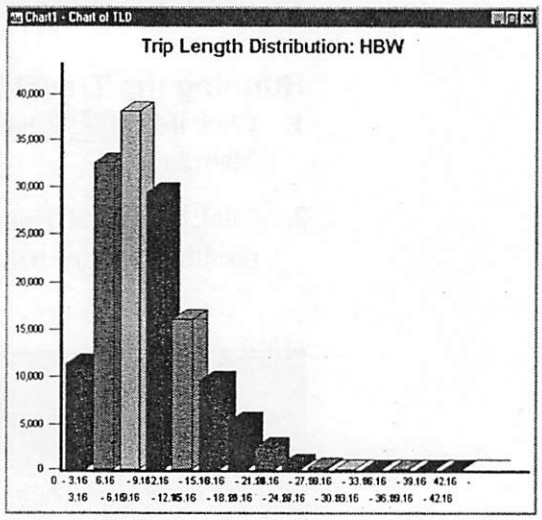
Creating a Trip Length Distribution Chart

3. In the Visualize Results dialog box, click the Chart tool, select the HBW field, and click the Show button to display a TLD chart of the HBW purpose.

   Note: Stretch the chart window to the right to make the text on the X-axis more legible.

Question 7:
What time increment has the highest number of HBW trips?

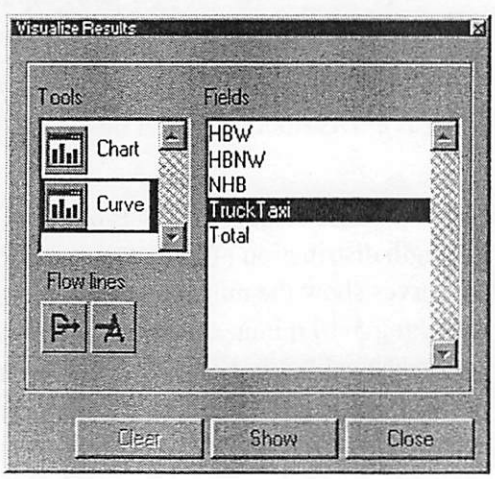


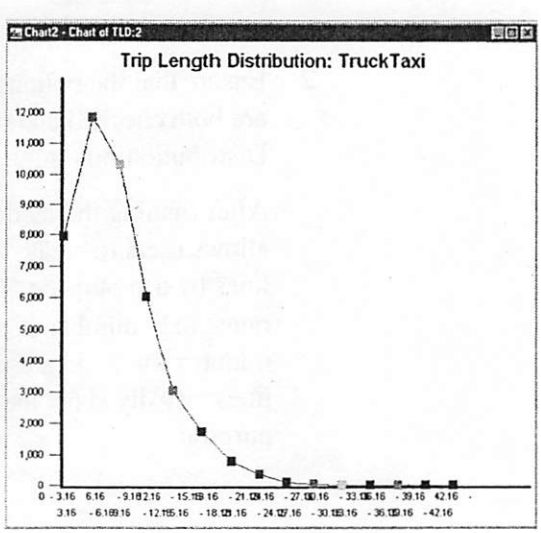


Creating a Trip Distribution Curve

4. In the Visualize Results dialog box, click the Curve tool, select the TruckTaxi field, and click the Show button to display a TLD curve of the TruckTaxi purpose.

   Note: Stretch the chart window to the right to make the text on the X-axis more legible.





Question 8:
What time increment has the highest number of TruckTaxi trips?

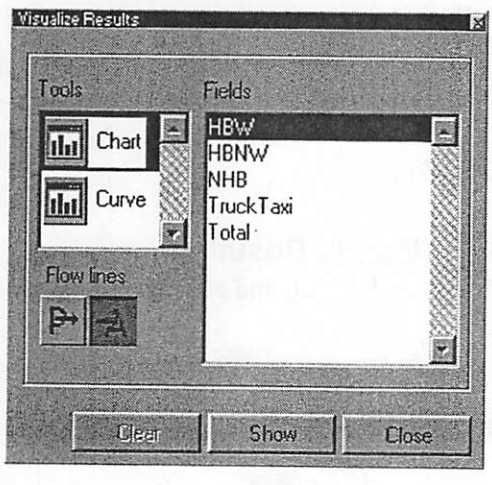
Creating a Desire Line Diagram

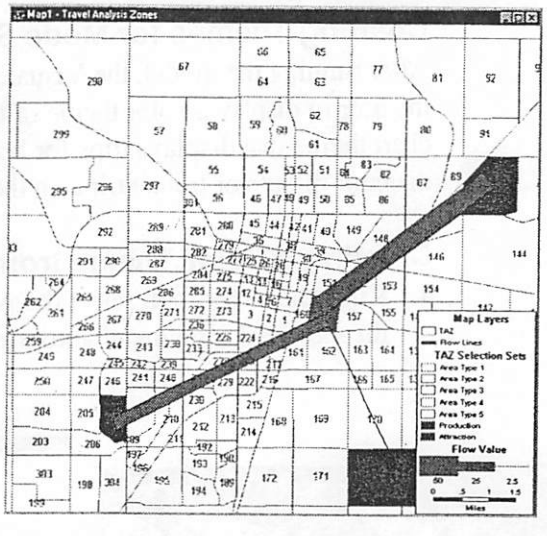
5. Click on the Travel Analysis Zone map window. Click the button at the top part of the map window. Select "TAZ" as the field to be labeled. Click OK.

   Select the "Zoom In" function. Define a window bounded by TAZ 298 (upper left) and TAZ 127 (lower right).

   Click the tool in the Visualize Results dialog box. On the map, click on the following zones, holding down the shift key: 207 (lower left), 131 (lower right) and 90 (upper right). Next, click the tool in the Visual Results dialog box. On the map, click on TAZ 157 (center right).

   Click on HBW in the Visualize Results dialog box and then click the "Show" button. The flow of trips from the production zones to the attraction zones should appear. Click the close button to close the dialog box.





Question 9:
Which of the selected zones appears to produce more trips attracted to Zone 157? Place the production zones in order from highest to lowest.

Running the Mode Split Model

1. Click the button to display the input transit routes and model table for the mode split model. Click on the map window "Highways and Streets." Ensure that "Amarillo Transit" is the current layer in the top drop down menu of the map window. Click on the button and the attributes for the bus system should appear.

Question 10:
Which bus route has the most frequent service?

2. Click on the Window menu at the top of the map window and select "Mode Split Definition" and review the utility functions:

   Utility (auto) = -0.05 -0.08 (auto travel time) -0.105 (parking cost) +0.00001 (HH income)
   Utility (bus) = -0.68 (bus fare) - 0.08 (bus in-vehicle travel time)

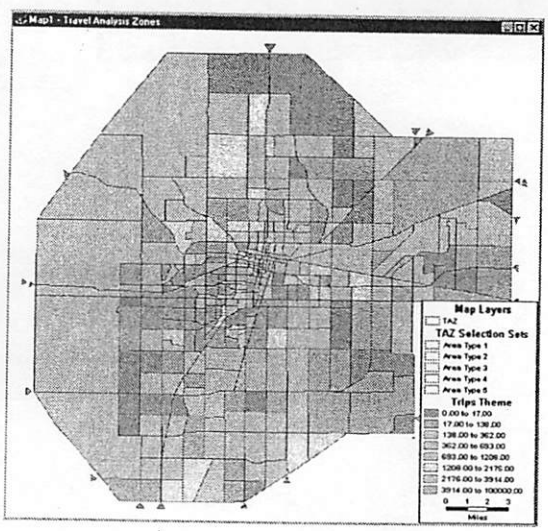
3. Ensure that the options Stop After Each Step and Show Results After Each Step are both checked and run the Mode Split model by clicking on the Mode Split button.

Creating Themes for Mode Split

After running the model, the Visualize Results dialog box will be displayed allowing the user to display a color theme of total auto or transit trips by production, a pie chart theme that displays trips for both modes by production TAZ, or a desire line diagram of auto or transit trips on the TAZ layer.

Creating a Color Theme from Mode Split Results

4. Click the Color tool, select the AUTO_TRIP field, and click the Show button to display a color theme of auto trips.

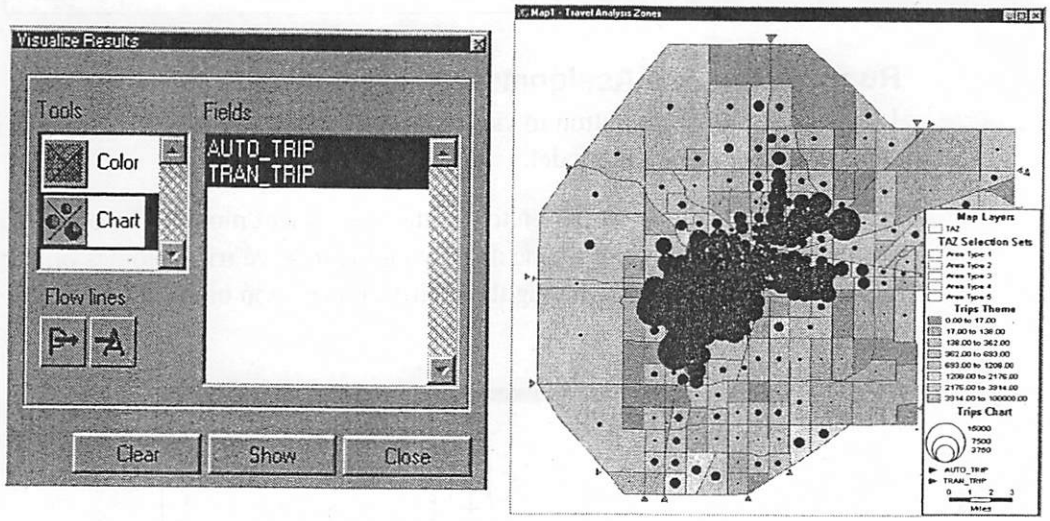


Go to the "Trip Matrix" window. In the upper left-hand corner, select the bus matrix as the current layer. Notice the sums of the rows and columns are displayed. Keep in mind that the Production end is along the vertical axis and the Attraction end is along the horizontal axis.

Question 11:
How many total bus trips are produced from Zone 68?

Creating a Chart Theme from Mode Split Results

5. Click the Chart tool, select both the AUTO_TRIP and TRAN_TRIP fields, and click the Show button to display a pie chart theme of both auto and transit trips.



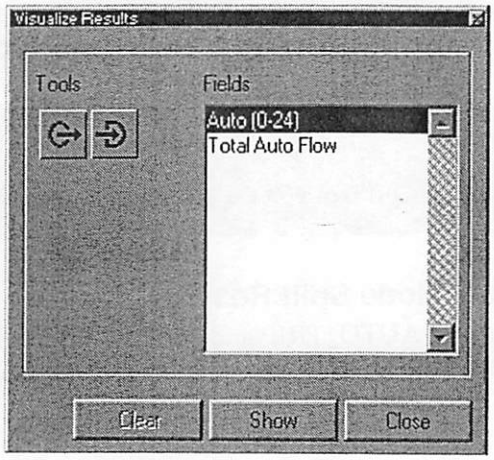
Running the PA to OD Model

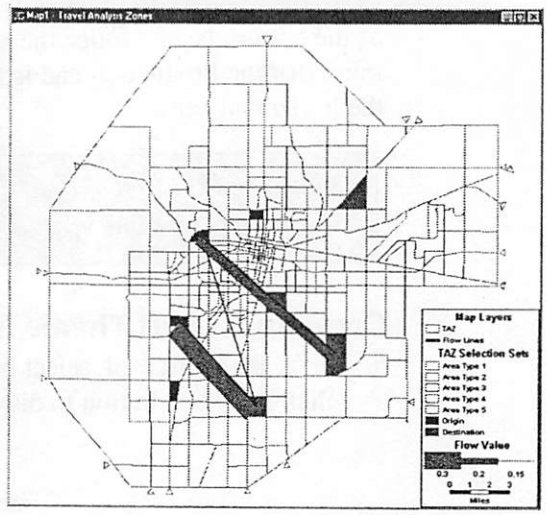
1. Click the button to display the PA matrix and external trip matrix inputs for the PA to OD model.

2. Ensure that the options Stop After Each Step and Show Results After Each Step are both checked, and run the PA to OD model by clicking on the PA to OD button.

Creating a Desire Line Diagram From PA to OD Results

3. After the PA to OD model runs, the Visualize Results dialog box will be displayed allowing the user to display a desire line diagram on the TAZ area layer. A desire line diagram graphically displays the origin-to-destination output from PA to OD in the form of lines. The thickness of the line is proportional to the number of trips between the OD pair. To create a desire line diagram from PA to OD results, click the tool and click on one or several origin TAZs on the map. Click the tool and click on one or several destination TAZs on the map. Select the Auto (0-24) field and click the Show button to display a desire line diagram on the map. Click the Close button to close the dialog box.

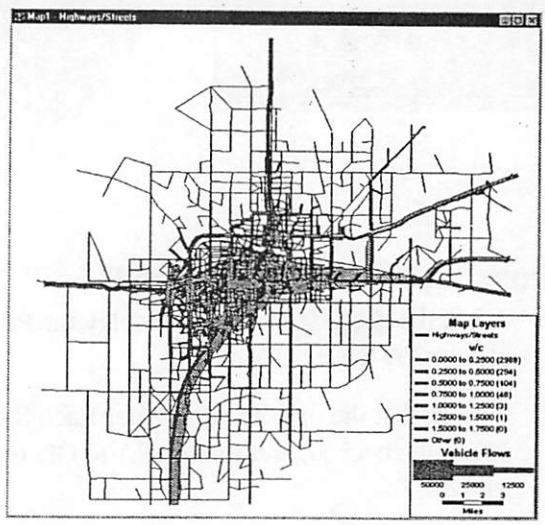




Running the Trip Assignment Model

1. Click the button to view the highway database and OD matrix inputs for the Trip Assignment model.

2. Click the Assignment button to run the assignment model. The outputs include a map with a bandwidth theme displaying the relative trip volumes on each link and a color theme displaying the relative congestion on each link.



3. Click the tool in the TDFW toolbox and zoom in to the downtown area of the map. Click the tool and click on a link to view output data associated with that link. Scroll to the end of the dataview to view the AB and BA flow on the line segment.

4. Select Window-Traffic Flow from the menu to display the trip assignment output which indicates flows and congestion levels of every line segment.

5. Scroll to the right-most fields. Highlight the "MAX_VOC" (maiximum link Volume-to-Capacity ratio) field. Right click on the field and click on "Sort Decreasing."

Question 12:
What is its MAX_VOC?
What is the ID of the most congested link?
What is its Function Class (see functional classifications below)?

Functional Classifications

1	Interstate
2	Freeway
3	Expressway
4	Divided Primary Arterial
5	Undivided Primary Arterial
6	Divided Minor Arterial
7	Undivided Minor Arterial
8	Collector
10	One-Way CBD Primary Arterials
11	Centroid Connector

6. Go to the map view. Right click on the map and highlight "find and entity." Enter the ID number of the most congested link and click "Find." This function will zoom in on the link. The link is the only one colored dark orange. Click on the  button on the toolbox. Click on the link to view its attributes. Did you find the link?

7. Click Report.

Question 13:
Calculate the following reasonableness checks:
- **Total VMT/population** _____
- **Total VHT/population** _____

Creating the Summary Report

1. Click the Report button to create a summary report of the entire model run. The report is displayed on the Internet browser software.
2. Select File-Save As from the Internet browser menu and type in a name to permanently save the report file.
3. Review each line of the report and ensure that you understand how each value was calculated.

Sensitivity Analysis Tutorial

This section illustrates how sensitivity analysis can be performed with the model. By changing certain model inputs and/or parameters, the user can see how the model output changes. This section is useful for understanding how travel models work.

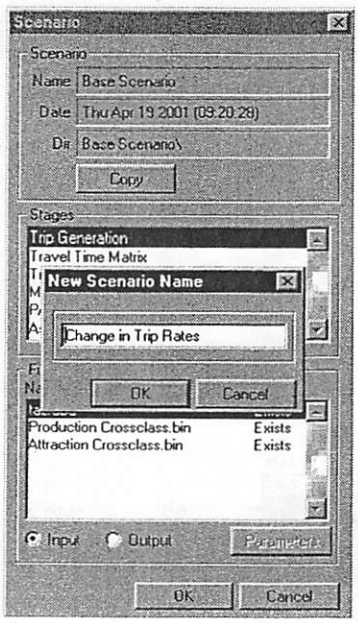
This tutorial will show how to set up and run these scenarios and report the results. Before running this tutorial, review the previous step-by-step tutorial and produce and take note of the report outputs to compare them with the report output for each scenario.

Sensitivity Test #1: A 20% Increase in Trip Production Rates for the Highest Income Group and a 20% Decrease in Trip Production Rates for the Lowest Income Group

1. If not already started, start the Caliper Travel Demand Forecasting Workshop software.

2. Before making any changes, **copy the Base Scenario to another scenario name**. Ensure that the Base Scenario is the current scenario and click the Settings button to invoke the Scenario dialog box.

3. Click the Copy button and type in Change in Trip Rates as the new scenario name. The Base Scenario is copied and the current scenario is changed to Change in Trip Rates.



4. Click the OK button to return to the TDFW toolbox.

5. Click the button to display all input data for the Trip Generation model.

6. Choose Window-Dataview1-Production Crossclass to make the production cross classification table the current window.

7. Highlight values in the R_NHBP field for the low income group to select them, then right-click on the mouse, select Multiply By, and enter in 0.8 to

multiply all these trip rates values by 0.8. Perform a similar operation for the R_HBWP, R_HBNWP and R_TRUCKTAXIP fields.

Dataview1 - Production Crossclass

INCOME	[Household Size]	R_NHBP	R_HBWP	R_HBNWP	R_TRUCKTAXIP
5000.00	1.00	0.827	0.198	1.297	2.100
5000.00	2.00	1.423	0.443	2.283	3.200
5000.00	3.00	1.250	0.658	2.922	4.000
5000.00	4.00	1.383	0.712	4.375	5.160
5000.00	99.00	1.456	0.767	5.104	6.360
10000.00	1.00	1.149	0.459	1.617	2.940
10000.00	2.00	1.567	0.873	2.593	4.450
10000.00	3.00	1.712	1.185	3.232	5.360
10000.00	4.00	1.893	1.237	4.593	6.810
10000.00	99.00	2.093	1.381	5.576	8.010
20000.00	1.00	1.504	0.803	1.766	3.650
20000.00	2.00	2.092	1.260	2.643	5.350
20000.00	3.00	2.292	1.605	3.235	6.290
20000.00	4.00	2.546	1.652	4.610	7.790
20000.00	99.00	2.865	1.784	5.713	9.080
35000.00	1.00	1.846	1.106	1.919	4.370
35000.00	2.00	2.604	1.867	2.826	6.610
35000.00	3.00	2.860	2.413	3.436	7.820
35000.00	4.00	3.186	2.534	4.629	9.230
35000.00	99.00	3.620	2.775	5.849	11.030
999999.00	1.00	2.420	1.380	2.398	5.460
999999.00	2.00	3.467	2.312	3.420	8.320
999999.00	3.00	3.840	2.973	4.117	9.800
999999.00	4.00	4.393	3.130	5.442	11.420
999999.00	99.00	4.915	3.420	6.692	13.710

8. Highlight values in the R_NHBP field for the high income group to select them, then right-click on the mouse, select Multiply By, and enter in 1.2 to multiply all these trip rates values by 1.2. Perform a similar operation for the R_HBWP, R_HBNWP and R_TRUCKTAXIP fields.

Dataview1 - Production Crossclass

INCOME	[Household Size]	R_NHBP	R_HBWP	R_HBNWP	R_TRUCKTAXIP
5000.00	1.00	0.827	0.198	1.297	2.100
5000.00	2.00	1.423	0.443	2.283	3.200
5000.00	3.00	1.250	0.658	2.922	4.000
5000.00	4.00	1.383	0.712	4.375	5.160
5000.00	99.00	1.456	0.767	5.104	6.360
10000.00	1.00	1.149	0.459	1.617	2.940
10000.00	2.00	1.567	0.873	2.593	4.450
10000.00	3.00	1.712	1.185	3.232	5.360
10000.00	4.00	1.893	1.237	4.593	6.810
10000.00	99.00	2.093	1.381	5.576	8.010
20000.00	1.00	1.504	0.803	1.766	3.650
20000.00	2.00	2.092	1.260	2.643	5.350
20000.00	3.00	2.292	1.605	3.235	6.290
20000.00	4.00	2.546	1.652	4.610	7.790
20000.00	99.00	2.865	1.784	5.713	9.080
35000.00	1.00	1.846	1.106	1.919	4.370
35000.00	2.00	2.604	1.867	2.826	6.610
35000.00	3.00	2.860	2.413	3.436	7.820
35000.00	4.00	3.186	2.534	4.629	9.230
35000.00	99.00	3.620	2.775	5.849	11.030
999999.00	1.00	2.420	1.380	2.398	5.460
999999.00	2.00	3.467	2.312	3.420	8.320
999999.00	3.00	3.840	2.973	4.117	9.800
999999.00	4.00	4.393	3.130	5.442	11.420
999999.00	99.00	4.915	3.420	6.692	13.710

9. Uncheck the Stop After Each Step and Show Results After Each Step checkboxes and click the Run button to run all the models.

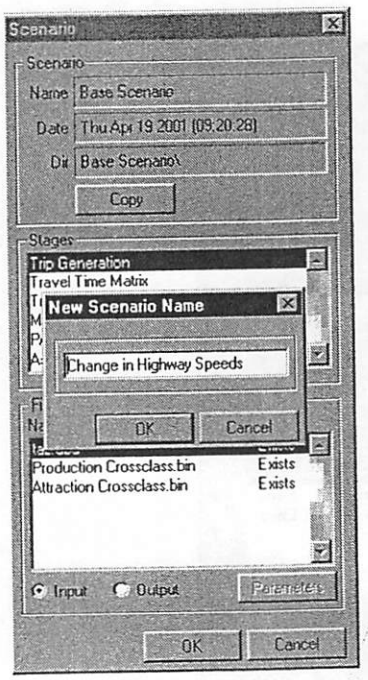
10. Click the Report button to create a summary report of the entire model run. The report is displayed on the Internet browser software. Compare this report to the one generated by the Base Scenario.

Sensitivity Test #2: An Increase in Observed Speeds for all Highways by 15%

1. If not already started, start the Caliper Travel Demand Forecasting Workshop software.

2. Before making any changes, **copy the Base Scenario to another scenario name**. Ensure that the Base Scenario is the current scenario and click the Settings button to invoke the Scenario dialog box.

3. Click the Copy button and type in Change in Highway Speeds as the new scenario name. The Base Scenario is copied and the current scenario is changed to Change in Highway Speeds.



4. Click the OK button to return to the TDFW toolbox.

5. Click the  button to display the highway network input for the Travel Time Matrix model.

6.. Click the  button to open a dataview for the street network.

7. Click on the top drop-down list and change the streets set from All Records to Highways.

8. Highlight the SPEED field to select the data, then right-click on the mouse, select Multiply By, and enter in 1.15 to increase all observed Highway speeds by 15%.

9. Uncheck the Stop After Each Step and Show Results After Each Step checkboxes and click the Run button to run all the models.

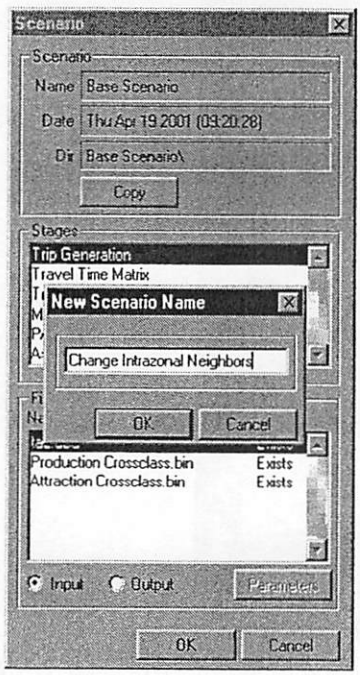
10. Click the Report button to create a summary report of the entire model run. The report is displayed on the Internet browser software. Compare this report to the one generated by the Base Scenario.

Sensitivity Test #3: Calculating Intrazonal Travel Times Based Upon the Nearest Two Zones

1. If not already started, start the Caliper Travel Demand Forecasting Workshop software.

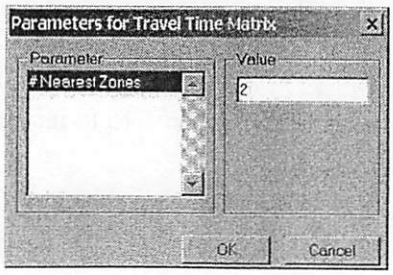
2. Before making any changes, **copy the Base Scenario to another scenario name**. Ensure that the Base Scenario is the current scenario and click the Settings button to invoke the Scenario dialog box.

3. Click the Copy button and type in Change Intrazonal Neighbors as the new scenario name. The Base Scenario is copied and the current scenario is changed to Change Intrazonal Neighbors.



4. Click the  button to display the highway network input for the Travel Time Matrix model.

5. Click the Parameters button to open the Parameters for Travel Time Matrix dialog box.



6. Enter "10" for the value and click OK to return to the Scenario dialog box. Click OK again to return to the Caliper toolbox.

7. Uncheck the Stop After Each Step and Show Results After Each Step checkboxes and click the Run button to run all the models.

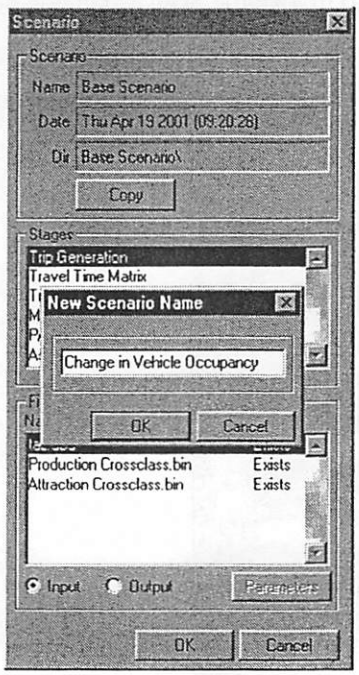
8. Click the Report button to create a summary report of the entire model run. The report is displayed on your Internet browser software. Compare this report to the one generated by the Base Scenario.

Sensitivity Test #4: Increasing Work Trip Vehicle Occupancy from 1.11 to 1.38

1. If not already started, start the Caliper Travel Demand Forecasting Workshop software.

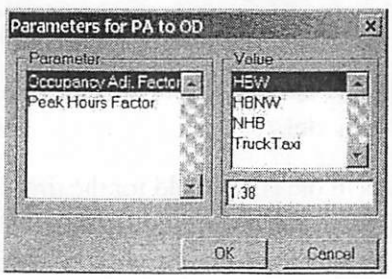
2. Before making any changes, **copy the Base Scenario to another scenario name**. Ensure that the Base Scenario is the current scenario and click the Settings button to invoke the Scenario dialog box.

3. Click the Copy button and type in Change in Vehicle Occupancy as the new scenario name. The Base Scenario is copied and the current scenario is changed to Change in Vehicle Occupancy.



4. Click on the  button to display the PA matrix and external trip matrix inputs of the PA to OD model.

5. Click the Parameters button to open the Parameters for PA to OD dialog box.



6. Ensure that the Occupancy Adj. Factor is selected as the parameter and HBW is selected as the purpose. Change the value from 1.11 to 1.38 and click OK to return to the Scenario dialog box. Click OK again to return to the Caliper toolbox.

7. Uncheck the Stop After Each Step and Show Results After Each Step checkboxes and click the Run button to run all the models.

8. Click the Report button to create a summary report of the entire model run. The report is displayed on the Internet browser software. Compare this report to the one generated by the Base Scenario.

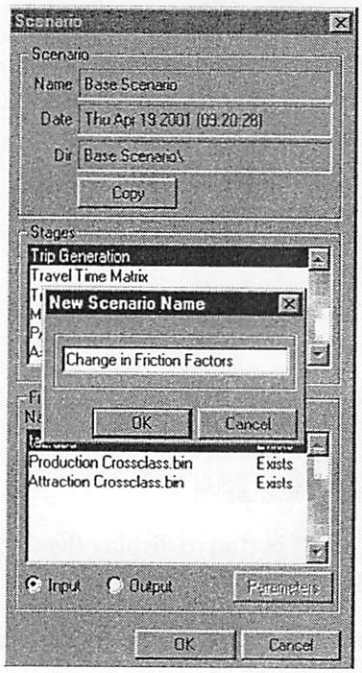
Sensitivity Test #5: Doubling Friction Factors for the First 10 Minutes of Travel Time

1. If not already started, start the Caliper Travel Demand Forecasting Workshop software.

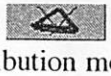
2. Ensure that the Base Scenario is the current scenario

3. Before making any changes, **copy the Base Scenario to another scenario name**. Ensure that the Base Scenario is the current scenario and click the Settings button to invoke the Scenario dialog box.

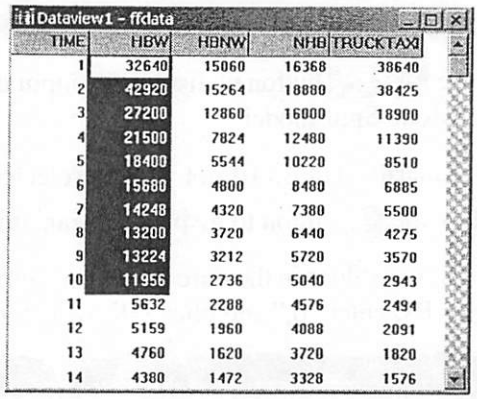
4. Click the Copy button and type in Change in Friction Factors as the new scenario name. The Base Scenario is copied and the current scenario is changed to Change in Friction Factors.



5. Click the OK button to return to the TDFW toolbox.

6. Click the  button to display the friction factor table input form the trip distribution model.

7. Highlight values in the HBW field for the first 10 minutes, then right-click on the mouse, select Multiply By, enter "2," and click OK to double the friction factor values. Perform a similar operation for the HBNW, NHB, and TRUCKTAXI fields.



Dataview1 - ffdata

TIME	HBW	HBNW	NHB	TRUCKTAXI
1	32640	15060	16368	38640
2	42920	15264	18880	38425
3	27200	12860	16000	18900
4	21500	7824	12480	11390
5	18400	5544	10220	8510
6	15680	4800	8480	6885
7	14248	4320	7380	5500
8	13200	3720	6440	4275
9	13224	3212	5720	3570
10	11956	2736	5040	2943
11	5632	2288	4576	2494
12	5159	1960	4088	2091
13	4760	1620	3720	1820
14	4380	1472	3328	1576

8. Uncheck the Stop After Each Step and Show Results After Each Step checkboxes and click the Run button to run all the models.

9. Click the Report button to create a summary report of the entire model run. The report is displayed on the Internet browser software. Compare this report to the one generated by the Base Scenario.

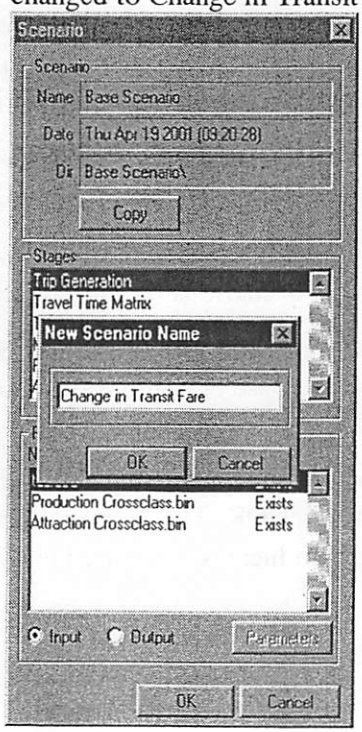
Sensitivity Test #6:Changing the Transit Fare to Zero

1. If not already started, start the Caliper Travel Demand Forecasting Workshop software.

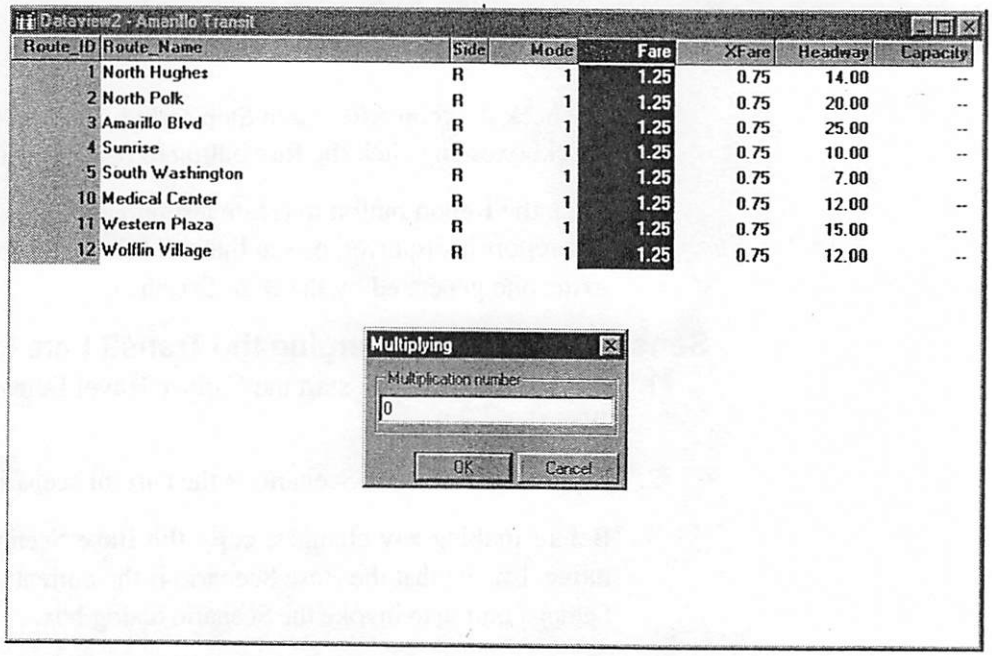
2. Ensure that the Base Scenario is the current scenario.

3. Before making any changes, **copy the Base Scenario to another scenario name**. Ensure that the Base Scenario is the current scenario and click the Settings button to invoke the Scenario dialog box.

4. Click the Copy button and type in Change in Transit Fare as the new scenario name. The Base Scenario is copied and the current scenario is changed to Change in Transit Fare.



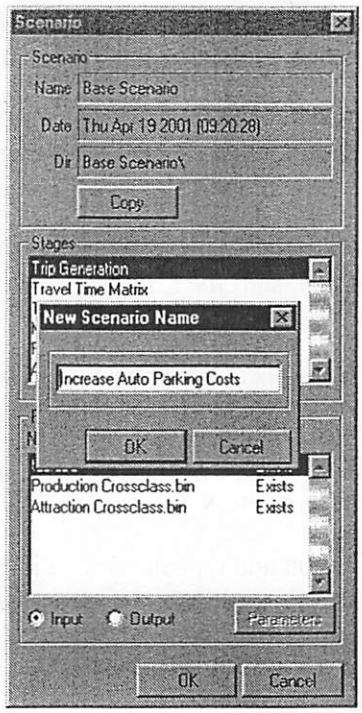
5. Click the OK button to return to the TDFW toolbox.
6. Click the button to display the input transit routes and model table for the Mode Split model.
7. Select Amarillo Transit (if not already selected) from the top window box and click the button to display the transit information.
8. Highlight the values in the Fare field, then right-click on the mouse, select Multiply By, enter "0," and click OK to change the transit fare to zero.



9. Uncheck the Stop After Each Step and Show Results After Each Step checkboxes and click the Run button to run all the models.
10. Click the Report button to create a summary report of the entire model run. The report is displayed on the Internet browser software. Compare this report to the one generated by the Base Scenario.

Sensitivity Test #7: Doubling Auto Parking Costs

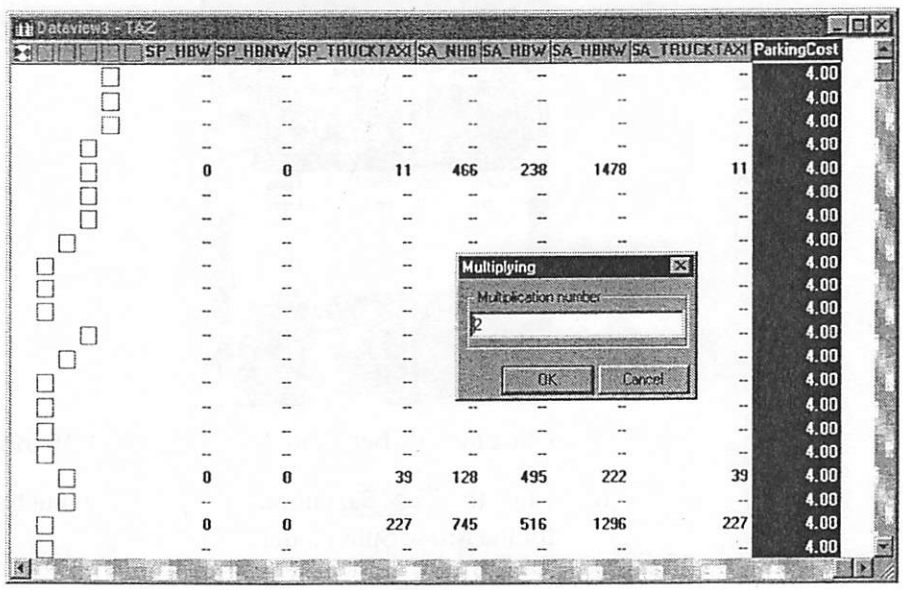
1. If not already started, start the Caliper Travel Demand Forecasting Workshop software.
2. Ensure that the Base Scenario is the current scenario.
3. Before making any changes, **copy the Base Scenario to another scenario name**. Ensure that the Base Scenario is the current scenario and click the Settings button to invoke the Scenario dialog box.
4. Click the Copy button and type in Increase Auto Parking Costs as the new scenario name and click OK. The Base Scenario is copied and the current scenario is changed to Increase Auto Parking Costs.



5. Click the OK button to return to the TDFW toolbox.

6. Click the  button to display all input data for the Trip Generation model.

7. Click the  button to display the TAZ information. Scroll all the way to the right-hand side of the table to the ParkingCost field.



8. Highlight the values in the ParkingCost field, then right-click on the mouse, select Multiply By, enter "2," and click OK to double the auto parking costs.

9. Uncheck the Stop After Each Step and Show Results After Each Step checkboxes and click the Run button to run all the models.

10. Click the Report button to create a summary report of the entire model run. The report is displayed on the Internet browser software. Compare this report to the one generated by the Base Scenario.

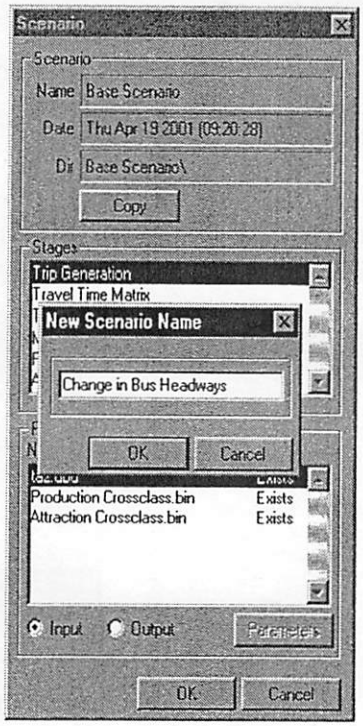
Sensitivity Test #8: Doubling the Headways for Each Bus Route

1. If not already started, start the Caliper Travel Demand Forecasting Workshop software.

2 Ensure that the Base Scenario is the current scenario.

3. Before making any changes, **copy the Base Scenario to another scenario name**. Ensure that the Base Scenario is the current scenario and click the Settings button to invoke the Scenario dialog box.

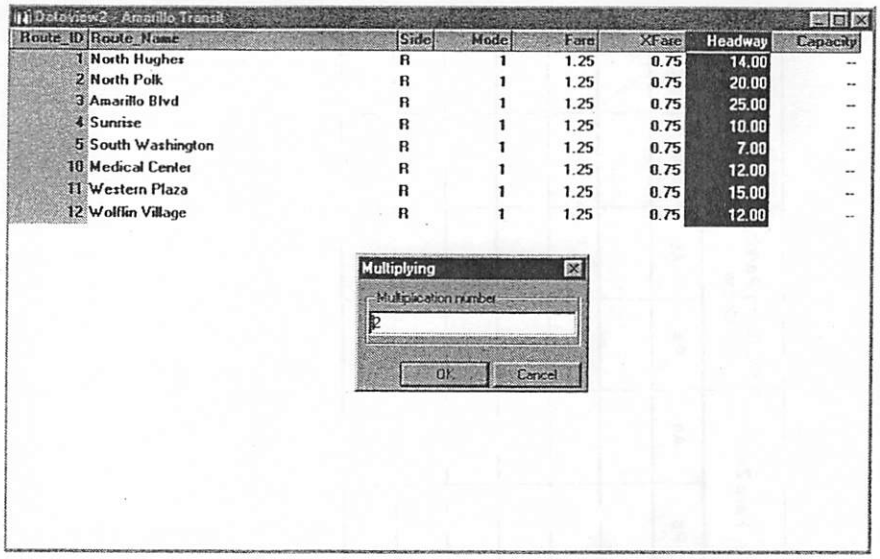
4. Click the Copy button and type in Change in Bus Headways as the new scenario name and click OK. The Base Scenario is copied and the current scenario is changed to Change in Bus Headways.



5. Click the OK button to return to the TDFW toolbox.

6. Click the button to display the input transit routes and model table for the Mode Split model.

7. Click the button to display the Dataview2 - Amarillo Transit table. Highlight the values in the Headway field, right-click on the mouse, select Multiply By, enter "2," and click OK to increase the bus headway for each route by a factor of two.



8. Uncheck the Stop After Each Step and Show Results After Each Step checkboxes and click the Run button to run all the models.

9. Click the Report button to create a summary report of the entire model run. The report is displayed on the Internet browser software. Compare this report to the one generated by the Base Scenario.

Trip Generation Before Balancing

	Base Scenario		Change in Production Rates		Change in Speed		Intrazonal Travel Times		Vehicle Occupancy		Friction Factors		Fare Zero		Doubling Parking Costs		Doubling Headways	
	Ps	As	Ps	As	Ps	As	Ps	As	Ps	As	Ps	As	Ps	As	Ps	As	Ps	As
HBW	149,086	82,322																
HBNW	241,184	189,293																
NHB	193,690	168,620																
T&T	39,115	39,584																
Total	623,075	479,819																
Total/HH	9.5	7.3																

Trip Generation After Adding Special Generators

	Base Scenario		Change in Production Rates		Change in Speed		Intrazonal Travel Times		Vehicle Occupancy		Friction Factors		Fare Zero		Doubling Parking Costs		Doubling Headways	
	Ps	As	Ps	As	Ps	As	Ps	As	Ps	As	Ps	As	Ps	As	Ps	As	Ps	As
HBW	149,150	98,932																
HBNW	241,418	222,541																
NHB	210,463	185,393																
T&T	41,716	42,185																
Total	642,747	549,051																
Total/HH	9.8	8.4																

Trip Generation After Balancing

	Base Scenario		Change in Production Rates		Change in Speed		Intrazonal Travel Times		Vehicle Occupancy		Friction Factors		Fare Zero		Doubling Parking Costs		Doubling Headways	
	Trips	%	Trips	%	Trips	%	Trips	%	Trips	%	Trips	%	Trips	%	Trips	%	Trips	%
HBW	149,150	23.2%																
HBNW	241,418	37.5%																
NHB	210,463	32.7%																
T&T	42,185	6.6%																
Total	643,216																	
Total/HH	9.8																	

Trip Distribution

	Base Scenario		Change in Production Rates		Change in Speed		Intrazonal Travel Times		Vehicle Occupancy		Friction Factors		Fare Zero		Doubling Parking Costs		Doubling Headways	
	Average Trip Length (Min)	Intra-zonal Trips	Average Trip Length (Min)	Intra-zonal Trips	Average Trip Length (Min)	Intra-zonal Trips	Average Trip Length (Min)	Intra-zonal Trips	Average Trip Length (Min)	Intra-zonal Trips	Average Trip Length (Min)	Intra-zonal Trips	Average Trip Length (Min)	Intra-zonal Trips	Average Trip Length (Min)	Intra-zonal Trips	Average Trip Length (Min)	Intra-zonal Trips
HBW	9.22	1,300																
HBNW	7.88	5,117																
NHB	7.33	4,003																
T&T	7.37	1,543																
Total		11,963																

Mode Split

	Base Scenario		Change in Production Rates		Change in Speed		Intrazonal Travel Times		Vehicle Occupancy		Friction Factors		Fare Zero		Doubling Parking Costs		Doubling Headways	
	Trips	%	Trips	%	Trips	%	Trips	%	Trips	%	Trips	%	Trips	%	Trips	%	Trips	%
Total Vehicle	621,380	96.6																
Total Transit	21,835	3.4																
Total	643,216																	

Conversion of P's & A's to O's & D's

	Base Scenario	Change in Production Rates	Change in Speed	Intrazonal Travel Times	Vehicle Occupancy	Friction Factors	Fare Zero	Doubling Parking Costs	Doubling Headways
Total Vehicle	501,271								

Assignment

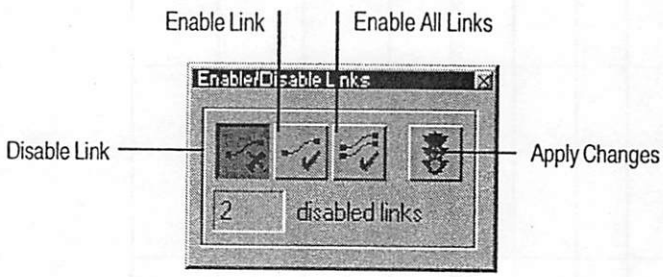
	Base Scenario	Change in Production Rates	Change in Speed	Intrazonal Travel Times	Vehicle Occupancy	Friction Factors	Fare Zero	Doubling Parking Costs	Doubling Headways
Total Vehicle	501,271								
Total VHT	84,950.59								
Total VMT	3,114,806.37								
Total Speed	36.67								
Centroid Cnntr. VHT	12,996.14								
Centroid Cnntr. VMT	269,481.38								
VHT w/o Centroid Cnntrs.	71,954.45								
VMT w/o Centroid Cnntrs.	2,845,324.99								
Speed w/o Centroid Cnntrs.	39.54								

Appendix A: Supplementary TDFW Functions

Enabling and Disabling Links

TDFW allows users to enable and disable network links and view the effects on traffic flows. When links are disabled, they are temporarily taken out of the network. Disabling links will affect the travel time matrix and assignment forecasting. This is a useful tool to examine the effects of incidents, such as road closures.

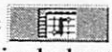
Enable and disable links through the enable/disable link toolbox:



This tool can be used only if the current window is on a map and the current layer is the highway network. To invoke this tool, click on the Enable/Disable Links button at the bottom of the TDFW main toolbox.

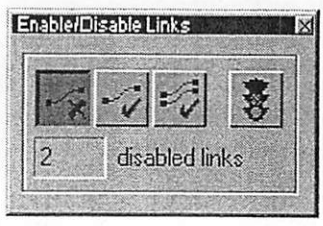
◆ To Disable Links

1. Ensure that the current window is a map window and the Highway/Streets network layer is the current layer. This can be accomplished by:

   a) ensuring that the Show Results After Each Step checkbox is checked and then click the  button to open the inputs for the travel time matrix model which includes the highway network; or

   b) clicking the Settings button, set the stage to Travel Time Matrix, double click on the .dbd extension file to open the geographic file, double click on the .net extension file to open the network and then click the OK button:

2. Click the Enable/Disable Links button to open the Enable/Disable Links toolbox:



3. Click the tool and then click on a link to disable it. Click on more links to disable them as well.
4. Click the button to apply the changes. The links will be disabled and the total number of disabled links will be shown in the TDFW main toolbox.
5. Click the Assignment button. TDFW will run the traffic assignment model using the disabled links. By zooming in on the map near the location of the disabled links, the user will be able to see no flow on them.

◆ **To Enable Links**

1. Click the button and click on a previously disabled link. TDFW will enable the link.

— OR —

1. Click the button to enable all previously disable links. TDFW will enable all links.
2. Click the button to apply the changes.

Viewing, Editing, and Reporting Data

The TDFW program gives users several options to view, edit, and report input and output information. Users can edit and view information for a particular item such as a TAZ zone or a link by using the information tool. Users can view, edit, and create summary reports on an entire database of information for all of the zones or links. Users can also view, edit, and create summary reports for selected zones or links. Finally, users can create an html web page report that summarizes vital model statistics such as total trip productions and attractions by purpose, average trip travel times, total auto versus total transit trips, and total vehicle miles and vehicles hours from assignment.

Viewing and Editing Using the Information Tool

Users can view and edit information for any item on the map by using the information tool located on the main TDFW toolbox. Users can only use the information tool while the current window is a map and the current layer is not a TIF image.

◆ **To Display and Edit Information for an Item on the Map**

1. Click the Change Layer drop-down menu located at the top of the program and set the layer to show the desired information.
2. Click the information tool on the TDFW toolbox.
3. Click on the item on the map to show information about the item. A new window will pop up displaying the information.
4. Double-click on any field in the new window and enter in a new value. The value in the field will be changed. Fields that are colored green are read-only and cannot be changed.

Viewing, Editing, and Reporting Using Dataviews

Users can also view, edit, and report input and output information using dataview windows. Dataview windows are created in several ways:

1. Click on the button while in a map window to display the dataview for the current layer.
2. Click the Settings button to view input and output files and double-click on one of the input or output data files or matrices. These are files that have a .BIN, .DBF, or .MTX extension.
3. View input files by clicking on the picture to the left of the model stage and then changing the window to a dataview window.
4. After running a model, show the results by clicking on the Show button and then changing the window to a database window.

◆ To Display Demographic Data for a TAZ layer

1. Click the button to display all input data for the trip generation model.
2. Ensure that the current window is the map window and that the current layer shown in the top drop-down list is TAZ and click the button. A dataview showing the demographics for the TAZ layer is shown.

◆ To Display Attraction Rates Data Using the Settings Button

1. Click the Settings button to display the scenario dialog box.
2. Click the Trip Generation stage and then double-click on Attraction Crossclass.bin. The attraction rates table will be shown in a new dataview. Click OK to exit the scenario dialog box.

◆ To Display Production Trip Rate Data for Trip Generation

1. Click the button to display all input data for the trip generation model.
2. Click on Window from the main menu and select the Production Crossclass dataview. A dataview of the production trip rates will be shown.

◆ To Display Production and Attraction Output for Trip Generation

1. Ensure that the Show Results After Each Step checkbox is checked and click the Trip Generation button to run the trip generation model.
2. Click on Window from the main menu and select the pa_table dataview. A dataview of total productions and attractions by TAZ will be shown.

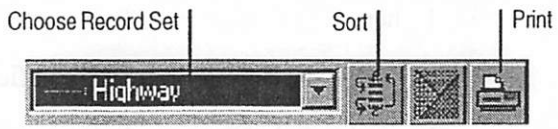
Once a dataview is displayed, there are various tools available to analyze data in the dataview:

- sort data for a field in increasing or decreasing order;
- create a color theme on a map for a field that is linked to geography;
- print a dataview;
- create summary statistical reports for a dataview;
- multiply a numeric field by a fixed number; and
- display a selected number of records in the dataview instead of all the records.

All of these analysis capabilities can be accessed in the menu, in the top toolbar, or by highlighting a field and right clicking on the mouse.

When a dataview becomes the current window versus a map, the options available in the top menu, in the toolbar, and in the main TDFW toolbox change:

- the options in the Dataview menu become active and allow the user to sort data and perform summary statistics;
- the buttons in the top toolbar change allowing the user to:
  - select records from the data to view;
  - sort the data by field; and
  - print the dataview.



- All the tools in the TDFW toolbox become disabled.

Choosing to View Selected Records

For TAZ and line network dataviews, the user can view and analyze only a selected set of records rather than all the records in the database. For example, the user may view only collector links rather than all the links in the network, or the user may choose to view only Area Type 1 TAZs rather than all the TAZ records. All subsequent analysis that is performed on the dataview will only be performed on the selected set rather than the entire database (e.g. summary statistics only on Area Type 1 TAZs).

◆ To View Area Type 1 TAZs

1. Click the button to display all input data for the trip generation model.
2. Ensure that the current window is the map window and that the current layer shown in the top drop-down list is TAZ and click the button. A dataview showing the demographics for the TAZ layer is shown. A color code of TAZs by area type is shown in the left hand portion of the dataview.
3. Select Area Type 1 from the drop-down list. Only Area Type 1 records are shown in the dataview.

◆ To View Only Collector Links

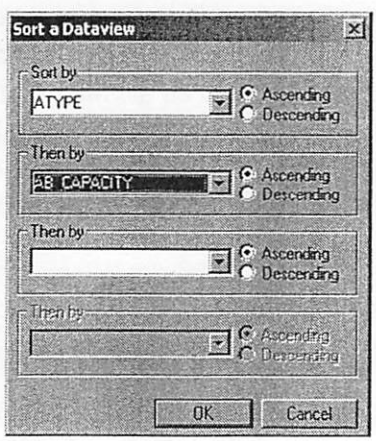
1. Click the button to display all input data for the travel time matrix model.
2. Ensure that the current window is the map window and that the current layer shown in the top drop-down list is Highway/Streets and click the button. A dataview showing the link attributes for the network shown. A color code of links by link type is shown in the left hand portion of the dataview.
3. Select Connectors from the drop-down list. Only connector links are shown in the dataview.

Sorting Data

Fields can be sorted in a dataview in either increasing or decreasing order. More than one field can be sorted at a time.

◆ To Sort Data for a Dataview

1. Ensure that the current window is a dataview window.
2. Select a field to sort by clicking on the field name.
3. Either:
   a. click the button to sort the field in increasing order or:
   b. right click the mouse key and select Sort by Increasing or Sort by Decreasing or:
   c. select Dataview-Sort from the menu to open the Sort Dataview dialog box. Choose a primary field to sort and then optionally choose secondary fields to sort. Additionally, choose the sort order for each field:



Creating Color Themes

Separate map color themes can be created from fields in the link or TAZ dataviews. Displaying a field as a color theme allows users to view input or output data from a geographic perspective:

◆ To Create a Color Theme for a TAZ Field

1. Click the  button to display all input data for the trip generation model.
2. Ensure that the current window is the map window and that the current layer shown in the top drop-down list is TAZ and click the  button. A dataview showing the demographics for the TAZ layer is shown.
3. Highlight a numeric field in the dataview by clicking on the field name and click the  button at the top. A new map is created showing a color theme for the field selected.

◆ To Create a Color Theme for a Network Link Field

1. Click the  button to display all input data for the travel time matrix model.
2. Ensure that the current window is the map window and that the current layer shown in the top drop-down list is Highway/Streets and click the  button. A dataview showing the link attributes for the network is shown.
3. Highlight a numeric field in the dataview by clicking on the field name and click the  button at the top. A new map is created showing a color theme for the field selected.

Creating Summary Statistics

Summary statistics can be calculated for all the fields in any dataview. Users can either calculate summary statistics for all the records in the dataview, or first choose to view only selected records and then calculate summary statistics for only the selected records. The summary statistics include for each field:

- a count of non-missing values;
- total sum of all values;
- minimum value;
- maximum value;
- average value; and
- standard deviation.

To calculate summary statistics, select the desired dataview, then select Dataview-Statistics from the menu. To calculate summary statistics for only a selected record, first select a TAZ or network links dataview, select the selection to view and then select Dataview-Statistics from the menu.

◆ To Calculate Summary Statistics for Area Type 1 TAZs

1. Click the  button to display all input data for the trip generation model.
2. Ensure that the current window is the map window and that the current layer shown in the top drop-down list is TAZ and click the  button. A dataview showing the demographics for the TAZ layer is shown. A color code of TAZs by area type is shown in the left hand portion of the dataview.

3. Select Area Type 1 from the drop-down list. Only Area Type 1 records are shown in the dataview.
4. Select ***Dataview-Statistics*** from the menu. A new window will display the calculated summary statistics for Area Type 1 TAZs.

◆ To View Only Collector Links

1. Click the  button to display all input data for the travel time matrix model.
2. Ensure that the current window is the map window and that the current layer shown in the top drop-down list is Highway/Streets and click the  button. A dataview showing the link attributes for the network shown. A color code of links by link type is shown in the left hand portion of the dataview.
3. Select Connectors from the drop-down list. Only connector links are shown in the dataview.
4. Select Dataview-Statistics from the menu. A new window will display the calculated summary statistics for only the collector links.

Editing Data

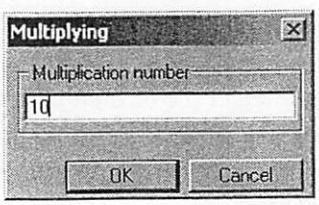
Data in a dataview can be edited in one of two ways:

- by double-clicking on a cell in the dataview and entering in the new value to edit one value at a time; or
- by highlighting an entire field in a dataview and multiplying all values in the field by a fixed number.

The second option can be used to fill all records in the field or only a selected number of records.

◆ To Multiply All Values in a Dataview Field by a Fixed Number

1. Ensure that the current window is a dataview
2. Highlight a numeric field in the dataview by clicking on the field name.
3. Right-click the mouse and choose Multiply By... to invoke the Multiply dialog box:



4. Enter in a number to multiply by and click OK. All values in the field will be multiplied by that amount.

Reports in HTML Format

Users can create an HTML report file that includes summary statistics for the entire model. The report statistics include:

- summaries of demographic variables;
- total trip productions and attractions by trip purpose;
- average and maximum travel times;
- average and maximum travel times by trip purpose;
- total automobile versus transit trips; and
- various auto assignment statistics including:
  - total demand;
  - relative assignment gap;
  - total vehicle-time; and
  - total vehicle-distance.

For a complete description of the report statistics, see Appendix B.

◆ To Generate an HTML Format Report

1. Click the Report button in the TDFW main toolbox. The software will create the HTML file and will display the resulting report using the Internet browser software (e.g. Internet Explorer or Netscape).

2. Select File-Save As from the Internet browser menu and type in a name to permanently save the report file.

Appendix B: Model Input and Output Files and Parameters

This appendix describes all of the input and output files and parameters for each of the model components.

Trip Generation Files

TAZ.DBD – TAZ Area Geography and Demographics

Field	Description
ID	Unique geographic ID
Area	TAZ area in square miles
AreaType	Type of area (urban, suburban, etc.)
TAZ	TAZ Number
Districtn	District Number
DistrictID	District ID
Acres	Number of Acres
Pop	Population
HH	Number of Households
HHSize	Average Household size
INC	Median income
Totemp	Total employment
Basic	Basic employment
Retail	Retail employment
Service	Service employment
Hhflag	Household flag
Basic_flag	Basic flag
Retail_flag	Retail flag
Service_flag	Service flag
Field_1	Not used
SP_NHB	Special additional non-home-based production trips
SP_HBW	Special additional home-based work production trips
SP_HBNW	Special additional home-based non-work production trips
SP_TRUCKTAXI	Special additional truck-taxi production trips
SA_NHB	Special additional non-home-based attraction trips
SA_HBW	Special additional home-based work attraction trips
SA_HBNW	Special additional home-based non-work attraction trips
SA_TRUCKTAXI	Special additional truck-taxi attraction trips
ParkingCost	TAZ average parking cost

Attraction Crossclass.bin – Attraction Classification Trip Rates

Field	Description
AreaType	Area Type
Da1field	Second classification field
R_NHBA	Non-home-based attraction rate
R_HBWA	Home-based work attraction rate
R_HBNWA	Home-base non-work attraction rate
R_TRUCKTAXIA	Truck-taxi attraction rate

Production Crossclass.bin – Production Classification Trip Rates

Field	Description
Income	Income classification
[Household Size]	Household size classification
R_NHBP	Non-home-based production rate
R_HBWP	Home-based work production rate
R_HBNWP	Home-base non-work production rate
R_TRUCKTAXIP	Truck-taxi production rate

Production.bin – Production Output Trips

Field	Description
ID	TAZ
NHB_P	Non-home-based production trips
HBW_P	Home-based work production trips
HBNW_P	Home-base non-work production trips
TRUCKTAXI_P	Truck-taxi production trips

Attraction.bin – Attraction Output Trips

Field	Description
ID	TAZ
NHB_A	Non-home-based attraction trips
HBW_A	Home-based work attraction trips
HBNW_A	Home-base non-work attraction trips
TRUCKTAXI_A	Truck-taxi attraction trips

Pa_table.bin – Balanced Production-Attraction Output Trip table

Travel Time Matrix Files

Net.dbd – Highway Network GIS Line Database Input

Field	Description
ID	Unique geographic ID
Length	Line length in miles
Dir	Line direction
H_DIST	Original calculated distance
Speed	Line speed in miles/hr
Funcl	Functional class
Atype	Area Type
Lanes	Number of lanes
AB_Capacity	Line capacity in the AB direction
BA_Capacity	Line capacity in the BA direction
TOT_Cap	Total two-way capacity
Count	Ground traffic count
Time	Calculated line free-flow travel time
Alpha	BPR function alpha value
Beta	BPR function beta value
TAZ	TAZ number
Screenline	Screenline number
Original	Flag for original link from original database
Type	Line type
Ccstyle	Style to use for line
IVTT	Transit in-vehicle travel time
Walk_time	Time to walk through line
Existing	Line is used by network
Connector	Line is a centroid connector

Net.net – Network file created from GIS line database

TT_matrix.mtx – Output travel time matrix

Trip Distribution Files and Parameters

Ffdata.dbf – Input Friction Factor Table

Field	Description
Time	Travel time
HBW	Home-based work friction factors
HBNW	Home-based non-work friction factors
NHB	Non-home-based friction factors
TRUCKTAXI	Truck-Taxi friction factors

Distribution.mtx – Output Production-Attraction Matrix

Trip Distribution Parameters

Parameter	Description
Number of Iteration	Maximum number of gravity iterations per trip purpose
Convergence Criteria	Convergence level per trip purpose

Mode Split Files

Mode Split Definition.bin – Mode Split Model Definition Table

Field	Description
Alternatives	Alternative Names
Asc_auto	Alternative specific constant for auto
Buscost	Source for bus fare data and coefficient
TT	Source for travel time data and coefficient
Parkcost	Source for parking cost data and coefficient
Income	Source for income data and coefficient

Amarillo.rts – Amarillo Route System Transit Database

Field	Description
Route_ID	Unique identifier assigned to each route
Route_name	Unique route name
Side	Route side
Mode	Route mode ID
Fare	Initial route fare
Xfare	Transfer route fare
Headway	Route headway in minutes
Capacity	Route capacity in passengers

Amarillo.tnw – Transit Network Created from Route System

TransitSkims.mtx – Output Transit Skim Matrix from Transit Network

ModeSplit.mtx – Output Mode Share Probabilities by Auto and Transit Mode

FlowByMode.mtx – Output Total Trips by Auto and Transit Mode

PA to OD Files and Parameters

Distribution.mtx – PA Matrix From the Output of Distribution

ExternalInternalTrips.mtx – Total External-to-Internal Trips Added to Total Trips

ExternalThroughTrips.mtx – Total External Through Trips Added to Total Trips

OD_matrix.mtx – Total Auto OD Trip Matrix Output

PA to OD Parameters

Parameter	Description
Occupancy Adj. Factor	Occupancy adjustment factor to factor person trips to vehicle trips by trip purpose
Peak Hours Factor	Peak hour factor adjustment by trip purpose

Assignment Files and Parameters

Net.dbd – Highway Network GIS Line Database Input – See Travel Time Matrix Files section for field descriptions

Net.net – Network file created from GIS line database

OD_matrix.mtx – Total Auto OD Trip Matrix output from PA to OD

Flow.bin – Output Flow Table

Field	Description
ID1	Link field to ID field in GIS line database Net.dbd
AB_Flow	Vehicle volume flow in the AB direction
BA_Flow	Vehicle volume flow in the BA direction
TOT_Flow	AB_Flow + BA_Flow
AB_Time	Congested travel time in the AB direction
BA_Time	Congested travel time in the BA direction
MAX_Time	Maximum of AB_Time and BA_Time
AB_Voc	Volume-to-Capacity ratio in the AB direction
BA_Voc	Volume-to-Capacity ratio in the BA direction
MAX_Voc	Maximum of AB_Voc and BA_Voc
AB_Speed	Congested speed in the AB direction
BA_Speed	Congested speed in the BA direction
Avg_Speed	Average of AB_Speed and BA_Speed

Assignment Parameters

Parameter	Description
Method	Assignment Method – All or Nothing, User Equilibrium or Stochastic User Equilibrium
Max. Iterations	Maximum number of assignment iterations
Convergence Value	Convergence value to use to stop iterations
Default BPR Alpha	Default value to use for BPR delay function alpha
Default BPR Beta	Default value to use for BPR delay function beta