

Task 5. TRAVEL FORECASTING: TRIP ASSIGNMENT

Task 4 applied a trip distribution model to obtain trip tables for the three trip purposes of the trip generation models. Subsequent trip table adjustments included PA to OD conversion, factoring by time-of-day, and conversion of person to vehicle trips for highway assignment. In this task, interactions with the external area are introduced and the base year highway network is loaded.

5.1 External Station Trip Interchanges

All demand analysis completed thus far has pertained to the internal zones (TAZs) only. The Miasma Beach network contains two external zones (zones 7 and 8) which serve as control points for interaction across the study boundary. The modeling of external trips (trips crossing the boundary) has been completed based on O/D and Cordon Surveys. The results indicate: (a) a significant number of trips between the external stations; (b) significant interactions between external stations and internal zones (made by both residents and non-residents); (c) internal trips made by non-residents; and (d) internal trips made by trucks, taxis, and other non-personal vehicles. These trips are identified in Table 8 and correspond to total 1-hour **AM-peak hour (7-8 AM)** vehicle trips in O/D format.

Append External Station Trip Interchanges

Open the OD Matrix (o-dfinal.mtx). **Add** the external trips (see Table 8). These external trips represent all trip purposes combined. **Report** this final O-D matrix.

Table 8. 2020 External O-D Table (1-hour AM peak vehicle trips)*

ORIG\DEST	1	2	3	4	5	6	7	8
1	10	25	25	25	0	0	25	75
2	25	10	10	10	0	0	0	50
3	25	10	10	25	0	0	75	50
4	25	10	25	10	0	0	0	0
5	0	0	0	0	0	0	100	25
6	0	0	0	0	0	0	200	100
7	100	100	50	150	50	150	0	1100
8	150	200	50	200	50	150	900	0

* For 1-hour AM peak hour (7-8 am) (combined trip purposes)

5.2 User Equilibrium Assignment

Assign the base O-D matrix to the network via User Equilibrium Assignment (UE). This matrix now reflects internal vehicle trips generated, distributed, and factored in prior model steps, as well as IE, EI, and EE trips appended in Task 5.1, producing the full **AM-peak hour (7-8 AM)** vehicle trip O-D matrix. **Report** this final matrix.

5.2.1 Perform Trip Assignment

Determine the User Equilibrium (UE) solution using iterative trip assignment. The default method is the N-Conjugate Modification of the Frank-Wolfe (FW) algorithm, which starts with an initial All-or-Nothing (AON) Assignment using initial minimum path skim trees. The solution procedure iteratively applies: (a) link performance functions (to update link travel times), (b) a minimum path algorithm (to update network paths), and (c) an All-or-Nothing (A-o-N) Assignment (to compute a new assignment). A line search using the current AoN loadings and the prior assignment is used to determine the weight by which to combine these two sets of link flows into a new solution for the next iteration. While a variety of convergence indices can be applied, use Relative Gap (RG). The default RG is 0.01 but you should evaluate the results using a 0.001 RG value. **Discuss** the convergence process.

Assign the final **AM-peak** hour (7-8 AM) vehicle-trip O-D matrix to the base Miasma Beach highway network using **User Equilibrium Assignment**.

HELP: Executing UE Trip Assignment

If assistance is needed in executing trip assignment, then **Click**:

<http://www.its.uci.edu/~mmcnally/cee/cee123/project/mbt5-tass.html>

5.2.2 Evaluating the Assignment Results

Trip Assignment provides the flows (volume and travel time) for each direction of a link. A link's A-node and B-node must be identified to distinguish between AB_Flow and BA_Flow. This node information is associated with links in the **Highways/Streets** layer.

HELP: Appending Direction Information to Links

Open the **Highways/Streets** layer and Click on the [New Dataview] button to open its dataview table. Go to **Dataview / Formula Fields**. Click Node Fields to display the Node Formula Fields dialog box. Select ID under node fields and "From and To" under Options; click OK. The "to" and "from" nodes should appear in the dataview. Save the joined dataview of Highways/Streets + TASSIGN as *baseasgn.dvw*.

Summary Statistics. The *tcw_rep.txt* contains summary results for the assignment, including the Total VHT (Vehicle-Hours-Traveled) and Total VMT (Vehicle-Miles-Traveled) that are important performance measures for the Highways/Streets network. Save this file *tcw_rep.txt* to the work directory. In each required report, **include** these

trip assignment outputs. Theme maps should also be created to graphically display network flows and to identify congested links.

HELP: Displaying Theme Maps

If assistance is needed in creating and displaying theme maps, then **Click:**

<http://www.its.uci.edu/~mmcally/cee/cee123/project/mbt5-tmap.html>

5.2.3 Report the Assignment Results

Report and **discuss** the assignment results, including appropriate network maps, tables (always appropriately sorted), and summary statistics.

- a. **Tabulate** link volumes, resultant travel times, and volume/capacity (V/C) ratios [as always, **sort** by facility type]
- b. **Plot** link volumes, final travel times, and V/C ratios [optionally, color-code V/C]
- c. **Tabulate** network summary statistics (e.g., VMT, VHT, average speeds)
- d. **Discuss** model convergence (relative gap, number of iterations, etc.)

5.3 Validation of Network Performance

Compare your base assignment with the observed network flow pattern displayed in **Figure 5** (volumes in vph). Compute and tabulate **GEH** statistics for all links. There are several levels at which model validation should be assessed:

1. **System-level Measures**

System-level measures include outputs such as total vehicle miles traveled (VMT), total vehicle hours traveled (VHT), or average travel time or speed. Travel time and speed results can be presented by link-types, mode-types, or even for selected O-D pairs. These measures begin to get at impacts on overall network delay (e.g., changes in travel time, changes in average speed, or estimated versus free flow travel times, on a link-type or network level). Also, summaries of total, interzonal, and intrazonal trips can be provided, by purpose, mode, and time-of-day.

2. **Corridor-level Measures**

Screen lines provide a validation of overall travel in the study area. Application of screen lines in key corridor locations provides an assessment the ability of the model to replicate aggregate flows. Total observed flows across screen lines in both directions are compared with corresponding volumes estimated by the model system. It is still necessary to assess the overall performance of the network with system-level measures.

3. **Link-level Measures**

These measure are developed for selected sets of links or link-types (e.g., all links in a specific area, all arterial links). Measure involve speed and travel time results, as well as volume capacity ratios. Theme maps can display links with travel times, speeds, or VC ratios over certain thresholds. Intersection turning movement can also be estimated (these estimates in turn can be used to assess intersection

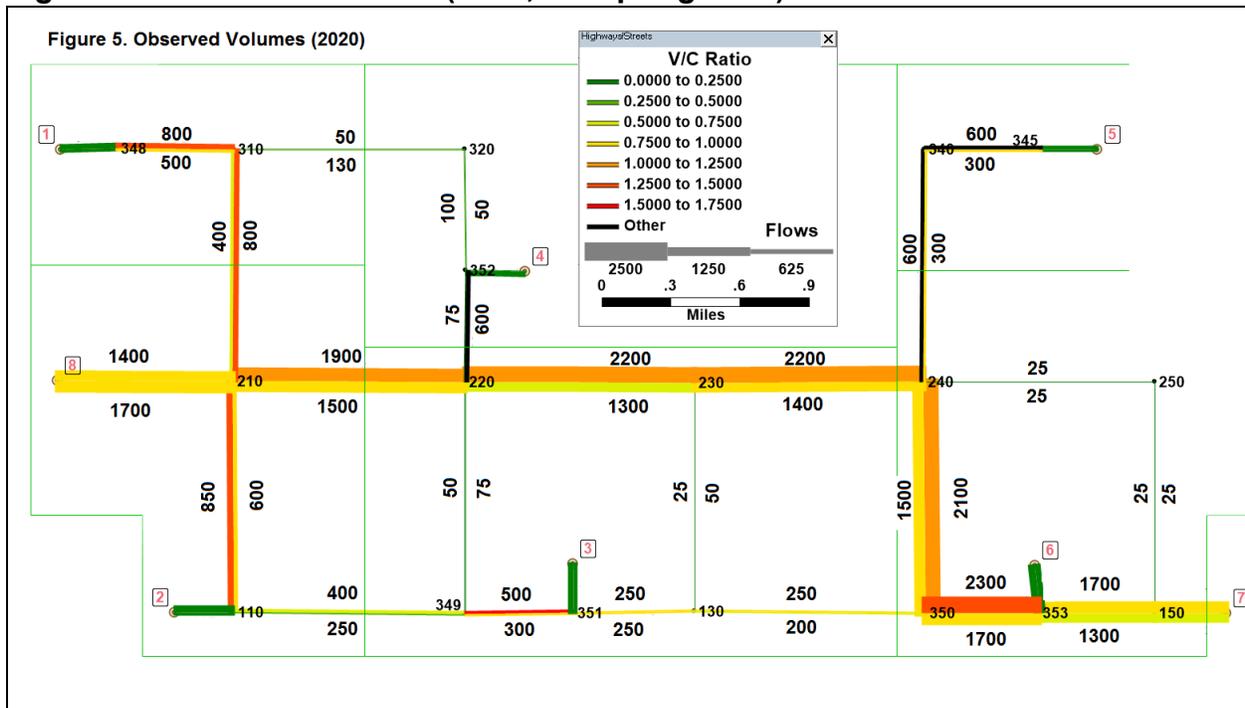
performance using Highway Capacity Manual techniques and/or software). Turning movement analysis may be done for selected intersections. **These Link-level Measures are optional for Miasma Beach.**

Include the following items in your validation analysis:

- Report** and **compare** system-level summary statistics for observed flows and the estimated model results, including GEH statistics.
- Construct** a minimum of three screen lines across which total flows are measured and compared. These screen lines, for example, might capture all flow across the network from east to west, or all flows into the downtown zones (1 and 2). **Justify** your choice of screen lines. Provide screen line summary maps and tables, clearly identifying the screen lines and the associated traffic volumes, By direction. Report deviations between observed and estimated volumes, by direction. Include goodness of fit measures (such as GEH).
- Discuss** the accuracy of the overall model system: Is the model system validated? Justify.

HELP: Creating and Report Screen Lines
 If assistance is needed in creating and reporting screenlines, then **Click:**
<http://www.its.uci.edu/~mmcally/cee/cee123/project/mbt5-scrn.html>

Figure 5. Observed Volumes (2020, for Spring 2024)



5.4 Prepare Task 5 Documentation

Prepare Task 5 documentation, including all TransCAD maps, dataviews, and layouts. Follow all Project Report Format [Guidelines](#) in the preparation of this documentation. This material will be submitted as part of the second **Interim Report** (see Task 5.5).

5.5 Model Validation Interim Report 2

Submit **Project Interim Report 2** containing reports for Tasks 3 through 5 reporting model development and validation results. This information should be presented in graphical, tabular, and text format. **Clearly** identify current network supply deficiencies that may have to be remedied. You will base decisions on the generation of Alternate Solutions on future (2030) network performance (see Task 6).