

Task 3. TRAVEL FORECASTING: TRIP GENERATION

The first two tasks have focused on the development of the road network that represents the Transportation System of Miasma Beach. Task 3 develops the specifications for the Activity System. The area has been divided into six Traffic Analysis Zones (1 through 6), with two external stations (7 and 8) that serve as control points with locations not directly part of the study area. The modeling approach is to calibrate and validate trip generation and distribution models for the six internal zones only. Interactions with the external area (via the external stations) have been modeled independently and these results will be provided in Task 5.

3.1 Description of the Activity System Zoning

Figure 2 depicts the approximate delineation for TAZs superimposed on the corrected Miasma Beach 2020 base transportation network (verify that all network edits (Tasks 1 and 2) have been made before proceeding with Task 3).

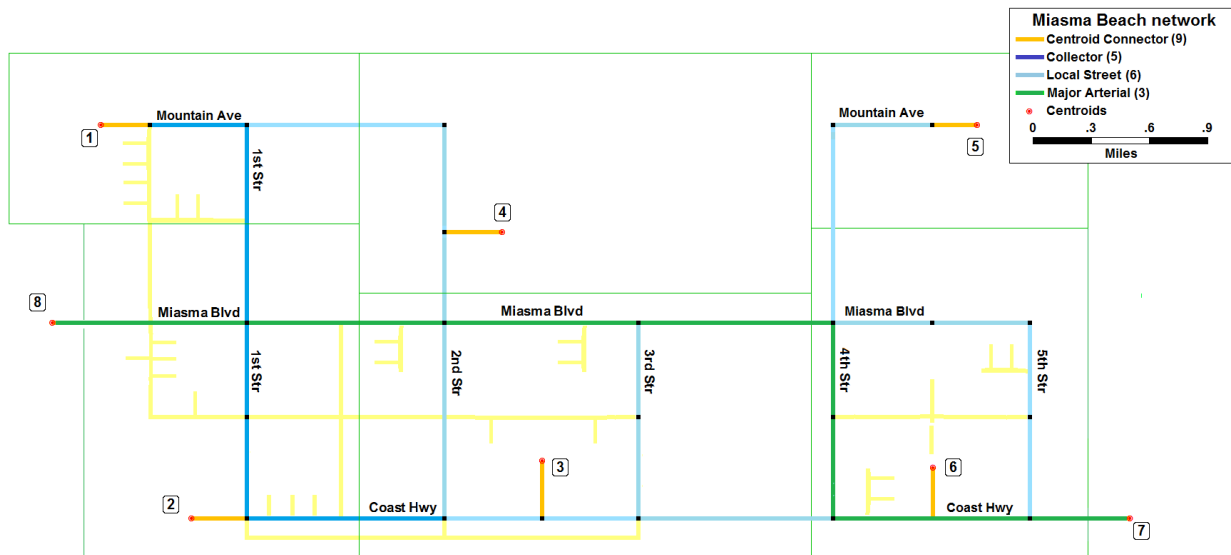


Figure 2. 2020 Miasma Beach Transportation Network (corrected) [Spring 2024]

Zone 1 forms the Old Town Central Business District (CBD) and contain much of the total employment in the City. Zones 2 and 3 form a beachside community, a residential area with some retail activity along Coast Highway. Zone 4 is an agricultural area, with packing and processing industries, east of the CBD and north of Zone 3. Zones 5 and 6 are developing residential zones located east of the Miasma wetlands. Zone 6 is older and more developed than Zone 5. Similar to Zone 3, Zone 6 is oriented toward the beach. Zones 7 and 8 are External Stations: Zone 7 is at the eastern edge where Coast Highway heads toward the City of Miasma; Zone 8 is at western end of Miasma Blvd where SR-1 heads into the Miasma Mountains toward Port Miasma. A variety of demographic characteristics have been assembled for the six TAZs (data are provided in **Table 2**).

Table 2a. 2020 Miasma Beach Demographic Data

ZONE	POP	LABF	CARS	HINC	HH	EIND	ERET	EOTH	ETOT	AREA
1	3000	1100	900	29850	700	400	150	1000	1550	1.56
2	1550	1300	600	44850	800	300	225	1300	1825	2.53
3	3500	1200	2500	83100	1000	0	350	250	600	3.10
4	0	0	0	0	0	1400	150	200	1750	2.83
5	2450	1400	2000	49500	950	0	100	50	150	1.27
6	5000	1800	2250	57000	1550	0	425	500	925	3.09
Tot	15500	6800	8250		5000	2100	1400	3300	6800	14.38
Mean	2583	1133	1375	55050	833	350	233	550	1133	2.40

Note: Weighted mean used for income.

Table 2b. Definition of Variables in Table 2

POP = zone population	EIND = basic employment
LABF = labor force (by residence)	ERET = retail employment
CARS = total cars in zone	EOTH = other employment
HINC = median zone household income	ETOT = total zone employment
HH = number of households in zone	Area = zone area (sq.mi.)

Note: basic employment includes agricultural and industrial

3.2 Development of Trip Production and Attraction Models

As part of the development of the Miasma Beach Transportation Model, a formal home interview survey was conducted. Travel diaries were collected for all members of approximately 1000 households in the six internal zones. An extensive Cordon Survey also was conducted to develop estimates of traffic entering and exiting the area at the defined external stations (see Task 5). Preliminary analysis of survey data produced population-level estimates of trip productions and attractions for the study area. Total trips were segmented into Home Based Work (HBW), Home Based Other (HBO), and Non-Home Based (NHB) trips.

An estimate of 60,000 daily person trips were generated by Miasma Beach residents in the base year; **Table 3** presents base year trip productions and attractions. Estimated trips were split 20 percent HBW, 50 percent HBO, and 30 percent NHB. These trip types are fundamentally different based on such attributes as time-of-day, mean trip length, and vehicle occupancy.

The tabulated demographic and trip end data provided may be used to develop and/or apply zonal production and attraction trip generation models for Home-Based Work (HBW), Home-Based Other (HBO), and Non home-Based (NHB) trips.

Table 3. 2020 Miasma Beach Productions and Attractions

ZONE	TOT/P	TOT/A	HBW/P	HBW/A	HBO/P	HBO/A	NHB/P	NHB/A
1	11550	10300	1800	3200	5500	4800	4250	2300
2	11800	11800	1800	2800	5500	6000	4500	3000
3	12050	12300	2700	1100	6600	6900	2750	4300
4	1500	5600	0	3100	0	1800	1500	700
5	8850	4800	2200	300	5400	1800	1250	2700
6	14250	15200	3500	1500	7000	8700	3750	5000
Tot	60000	60000	12000	12000	30000	30000	18000	18000
Mean	10000	10000	2000	2000	5000	5000	3000	3000

3.2.1 Model Specification for Trip Generation

Previous year (2000) production and attraction models are provided for some of the trip types (these are summarized in **Table 4a** and **4b**). Consulting teams must develop and estimate models for one selected trip purpose but only need to verify the other models.

Spring 2022: General Instructions:

Each project Consulting Team will estimate and/or apply different combinations of the HBW, HBO, and NHB trip production models. For Spring 2022 instructions, click:

<http://www.its.uci.edu/~mmcally/cee/cee123/project/mbt3-modsel-HBW.html>

Each team will estimate a set of **HBW** production and attraction models based on specified explanatory variables in **Table 4c** but are encouraged to estimate other potentially better models. Each team is assigned prior year **HBO** and **NHB** production and attraction models from **Tables 4a** and **4b**. You must verify (re-estimate) these models using Excel or TransCAD. Provide a summary table of estimation results for all required models as well as for any proposed alternative models.

3.2.2 Preparation of Input Data

The Miasma Beach trip production and attraction models will be estimated using regression analysis, with the dependent variable being zonal productions or attractions, respectively (from **Table 3**). Explanatory variables are demographic variables (from **Table 2**). The demographic variables for each TAZ are included in the TAZ Geographic file. Open the TAZ Geographic file and click the New Dataview button to open the TAZ dataview. Sort by ascending order of ID to compare the dataview with **Table 2**.

HELP:

Productions and attractions are not included in the original TAZ file so these fields from **Table 3** must be appended to the TAZ dataview. For assistance, click:

<http://www.its.uci.edu/~mmcally/cee/cee123/project/mbt3-ipa.html>

Table 4a. Estimated Trip Production Models (2000) [coef (t)]

Variable	NHB#1	NHB#2	HBO#1	HBO#2
HH	-	-	4.60 (4.45)	-
POP	0.32 (3.87)	0.21 (2.33)	-	1.29 (3.51)
ERET	-	2.15 (1.81)	-	-
EOTH	2.54 (8.88)	2.53 (11.73)	-	-
Const.	770.99	572.50	1169.51	1666.83
Obser.	6	6	6	6
R-sq	0.97	0.99	0.83	0.76
F-ratio	46.85	56.23	19.77	12.33
OLS coef (t-stat)				

Table 4b. Estimated Attraction Models (2000) [coef (t)]

Variable	NHB	HBO
HH	2.09 (4.91)	-
ERET	4.40 (2.64)	19.70 (8.36)
EOTH	-	2.01 (3.31)
ETOT	-	-
Const.	233.22	-705.37
Obser.	6	6
R-sq	0.97	0.96
F-ratio	46.48	41.13

3.2.3 Estimate HBW Trip Generation Models

Using current Miasma Beach activity system data and expanded trip data from **Tables 2** and **3**, develop and estimate trip generation models for **HBW** trip productions and trip attractions. You must estimate the production model identified in Table 4c; you must estimate the attraction model in Table 4c. Develop and estimate other potential models for **HBW** productions and attractions. Compare estimated models and select a set of final models. As a rough guide, the final R-squared value should be 0.70 or better for the selected model. Tabulate ALL estimated models and supporting statistics.

CEE223 Teams must also estimate zonal rate models for HBW productions.

HELP:
 To estimate new models, you may utilize Excel (or TransCAD's Model Estimation procedure). For TransCAD assistance, click:
<http://www.its.uci.edu/~mmcally/cee/cee123/project/mbt3-modest.html>

3.2.4 Create Model Files of HBO and NHB Productions and Attractions

Trip generation models estimated in a prior year are summarized in **Table 4a** and **4b**. Test to see if these models are still valid by re-estimating the models specified in **Table 4c** (you do not need to estimate alternative models for these trip purposes). Create TransCAD production and attraction model files (*.mod) to apply your final models. The report must provide a table summarizing all models, including all summary statistics.

HELP:

A Model File stores the variables and parameters for a TransCAD model. For help in creating a file for an existing mode, click:

<http://www.its.uci.edu/~mmcnally/cee/cee123/project/mbt3-modinp.html>

3.2.5 Applying Model Files of All Three Trip Purposes

Once model files are created for productions and attractions of all three trip purposes, apply them to estimate base year trip ends for Miasma Beach.

HELP:

To Apply a model, select Planning / Trip Production / Apply a Model. For help, click:

<http://www.its.uci.edu/~mmcnally/cee/cee123/project/mbt3-modapp.html>

3.3 Trip Balancing

In trip generation, trip productions and trip attractions are estimated separately. The total number of trip productions, therefore, will typically not equal the total number of attractions. Any difference will violate the requirements for trip distribution analysis (and subsequent stages). The trip ends must be "balanced" so that the total number of productions equals the total number of attractions for each trip purpose (HBW, HBO, and NHB).

In practice, it is standard practice to hold trip productions constant, rather than attractions, when balancing trip ends. Trip productions are usually strongly related to zonal demographics, thus, the resulting production models are usually effective in replicating actual productions. On the other hand, there can be many factors that affect the number of trips attracted to a TAZ, thus, estimated attraction models often do not replicate attractions that well. For this reason, trip production estimates are typically considered more valid and thus are held constant. Conventionally, internal and external trip ends are combined prior to balancing. For Miasma Beach, external trips are already balanced, thus, only internal trips need be balanced at this point.

3.3.1 Balance (Normalize) Trip Attractions

Normalize zonal trip ends for HBW, HBO, and NHB trips for Miasma Beach, holding productions constant (or providing justification for not doing so). Tabulate productions including both initial and normalized attractions

HELP:

For trip balancing, with TAZ as the working layer, go to Planning / Balance. click:

<http://www.its.uci.edu/~mmcally/cee/cee123/project/mbt3-balanc.html>

3.3.2 Re-Allocate NHB Trip Attractions

While total NHB trip productions provide a reasonable estimate of total trips, and thus serves as the normalization factor for total trip attractions, the actual zone by zone distribution of (normalized) trip attractions provides a better estimate of the zone-by-zone distribution of trip productions for NHB trips. Re-allocate zonal NHB trip productions to be equal to zonal NHB trip attractions.

3.3.3 Summary of Trip Production and Attraction Models

Provide a summary table comparing the estimated values of all three trip purposes. Compute a "goodness-of-fit" measure to show how close the estimated trip ends are to the "observed" values in **Table 3**.

3.4 Prepare Task 3 Documentation

Include all relevant layouts, outputs, and model files. Since each consultant uses a different set of generation models, final results will vary from those of other consultants. Include regression analysis results for all attempted models in an appendix. Follow Project Format Guidelines in the preparation of this report. This report will be submitted as part of Interim Report 2 with the results of **Tasks 4** and **5**.