

TTCI TRAVEL DEMAND FORECAST MODEL (TDFM) RESULTS

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April, 10th 2025 – TTCI Technical Advisory Committee

What is a Travel Demand Model?

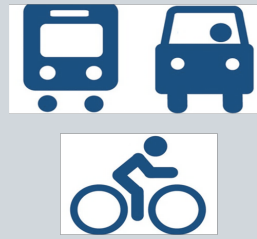
- A series of mathematical relationships used to estimate travel patterns
- Based on household travel characteristics



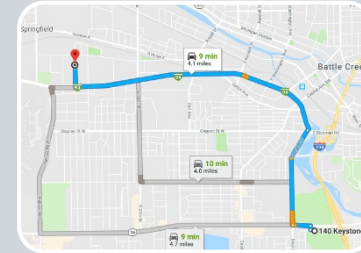
How much
travel
occurs, by
whom,
and why



Where
travel
occurs,

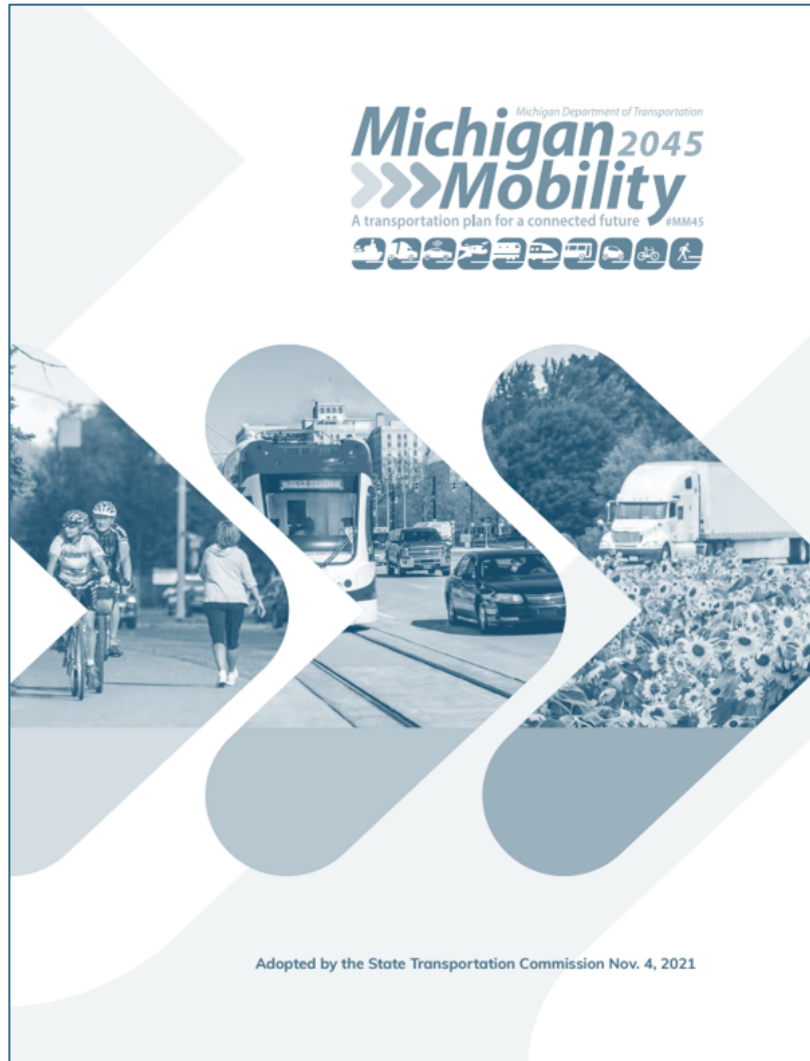


How
people
travel, and



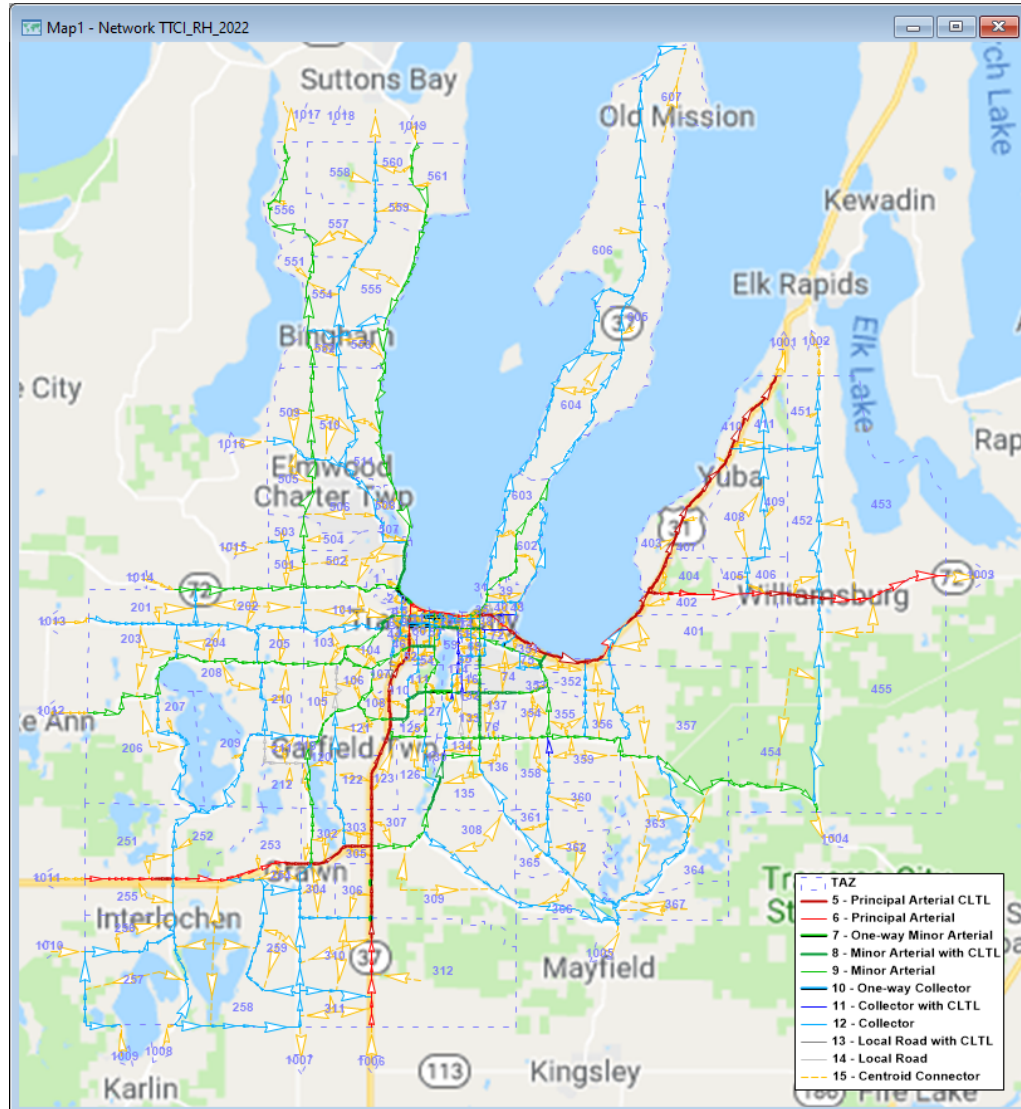
Which
roads are
used?

Why do we use the Travel Demand Model?



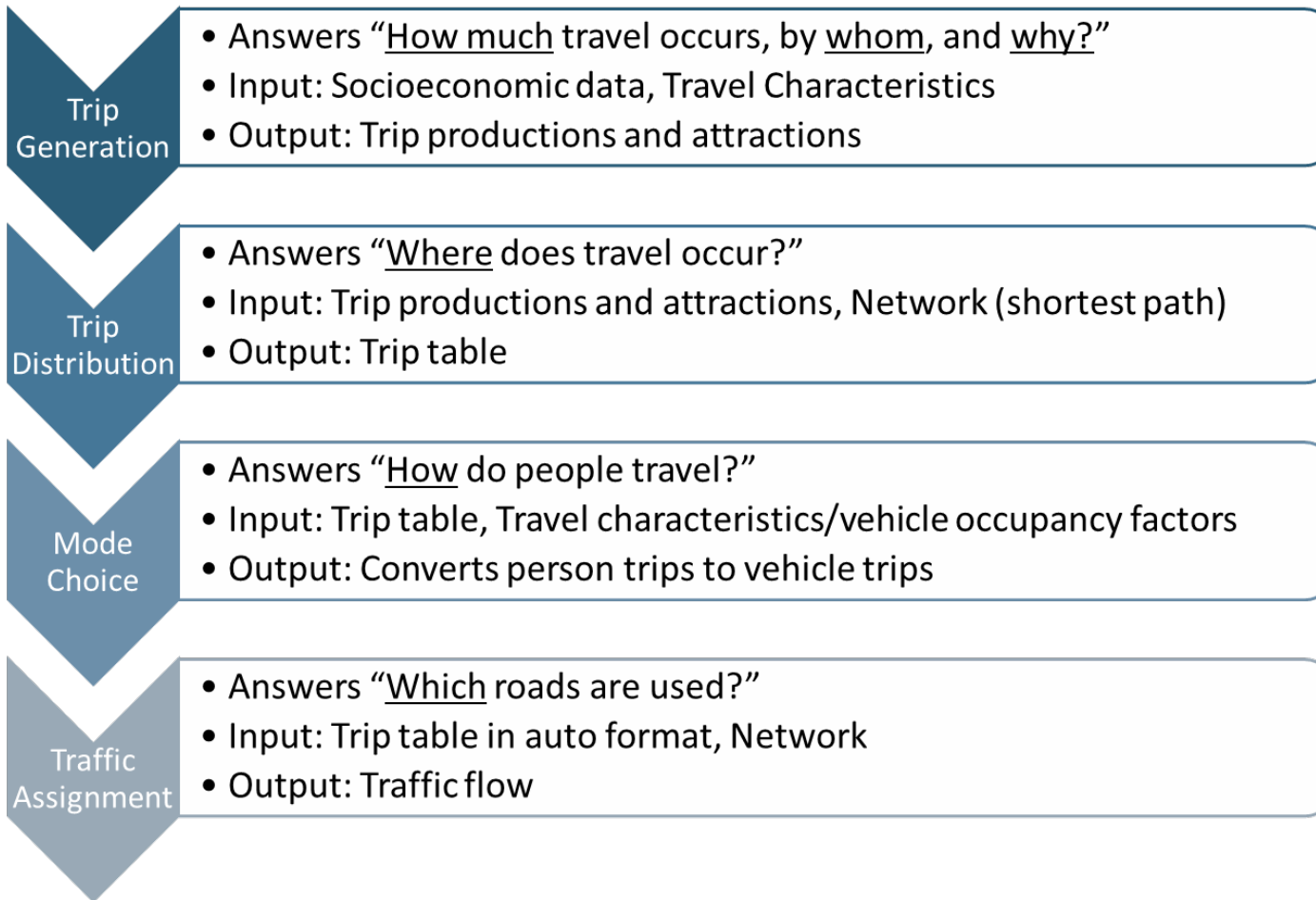
- Objective method to evaluate the federal aid road system
- Metropolitan Transportation Plan (MTP) requirement
- Model updated for each MTP

2022-2050 TTCI Travel Demand Model Development



- Base Year: 2022
- Horizon Year: 2050
- Tasks requiring MPO/local participation:
 - Base year
 - Road network attribute
 - Socioeconomic data
 - Employment data
 - Traffic count data
 - Future year
 - Road network attribute - Capacity project list
 - Socioeconomic Data - Forecast
 - Employment Data - Forecast

Four-Step Modeling Process



Volume

- Time of Day

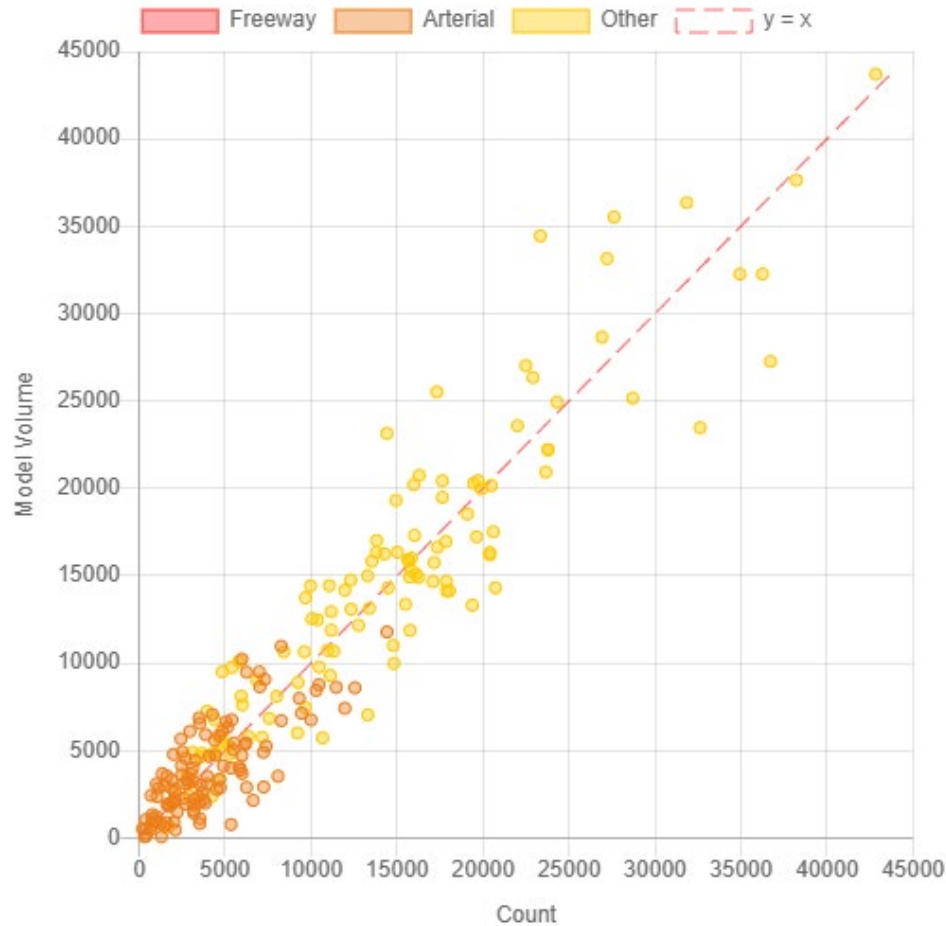
Vehicle Miles Traveled (VMT)

Vehicle Hours Traveled (VHT)

Volume/Capacity Ratio

BASE YEAR (2022) MODEL RESULTS

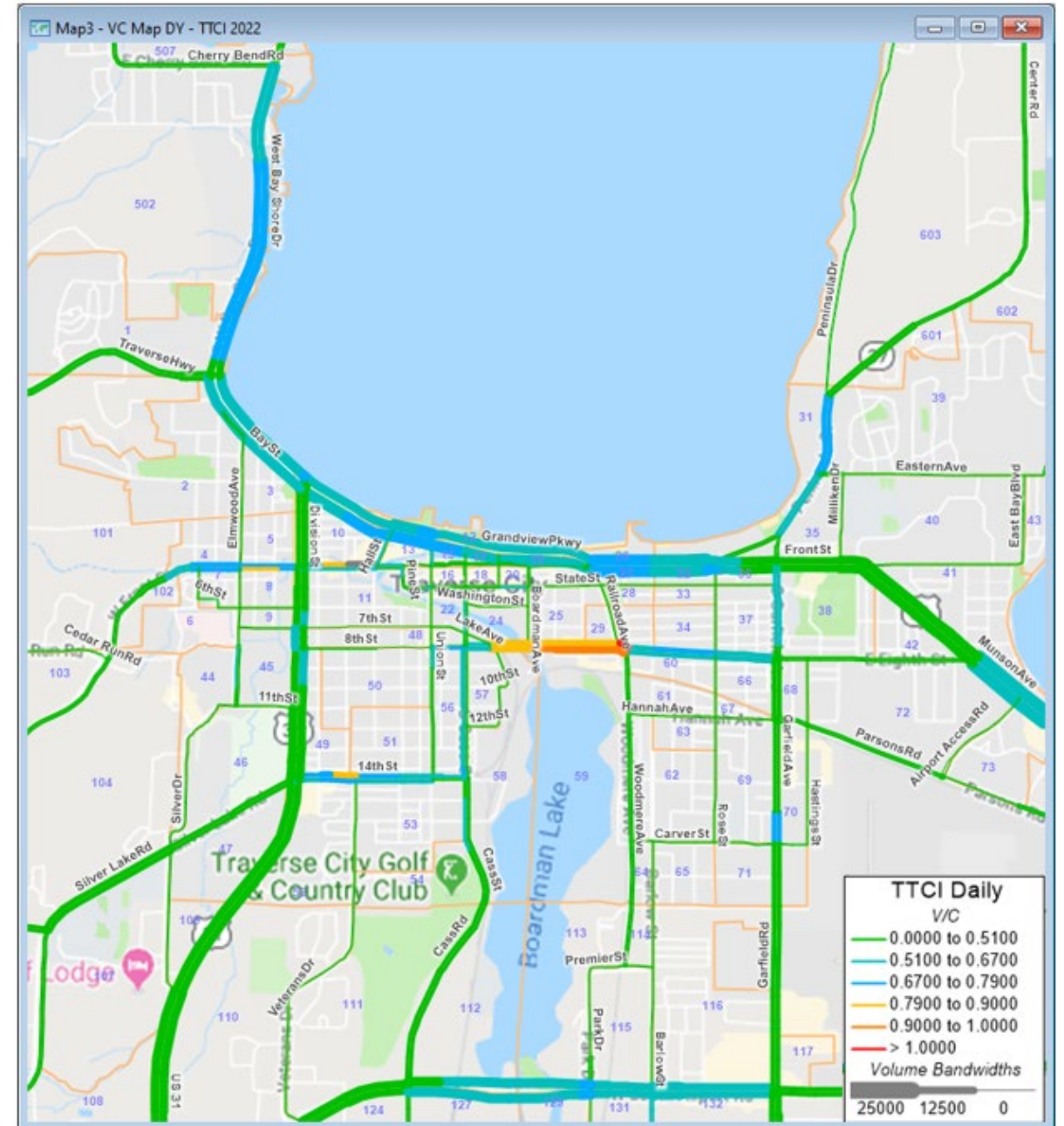
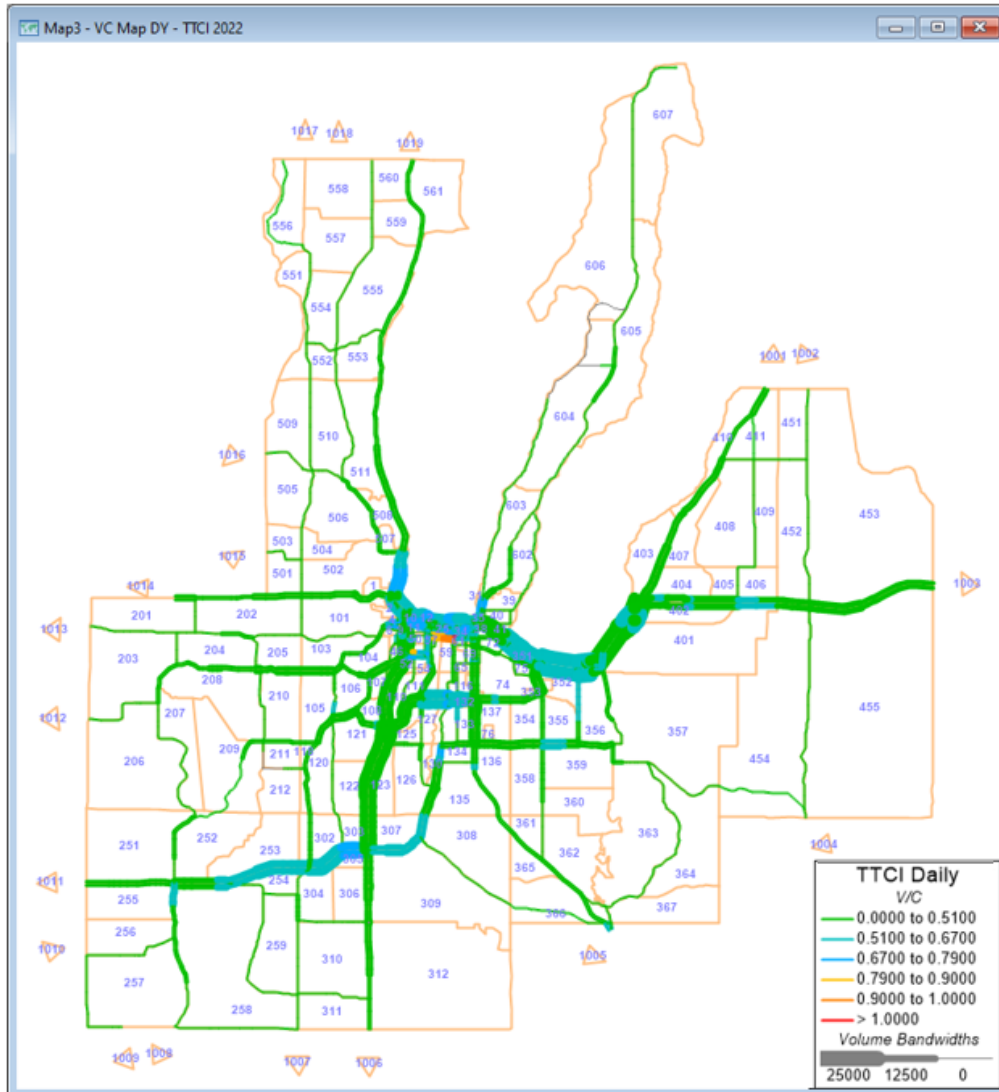
Model Calibration Results



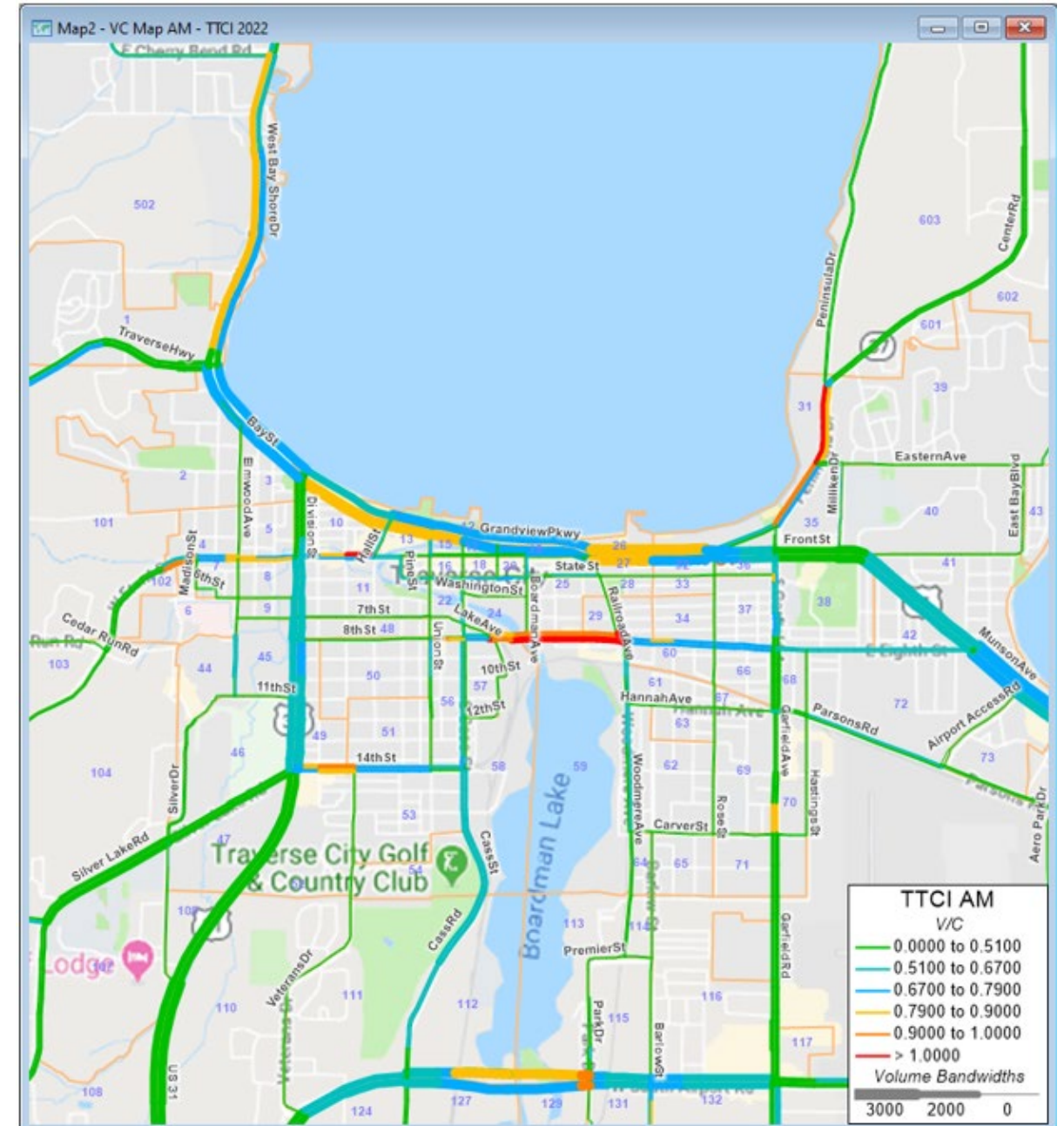
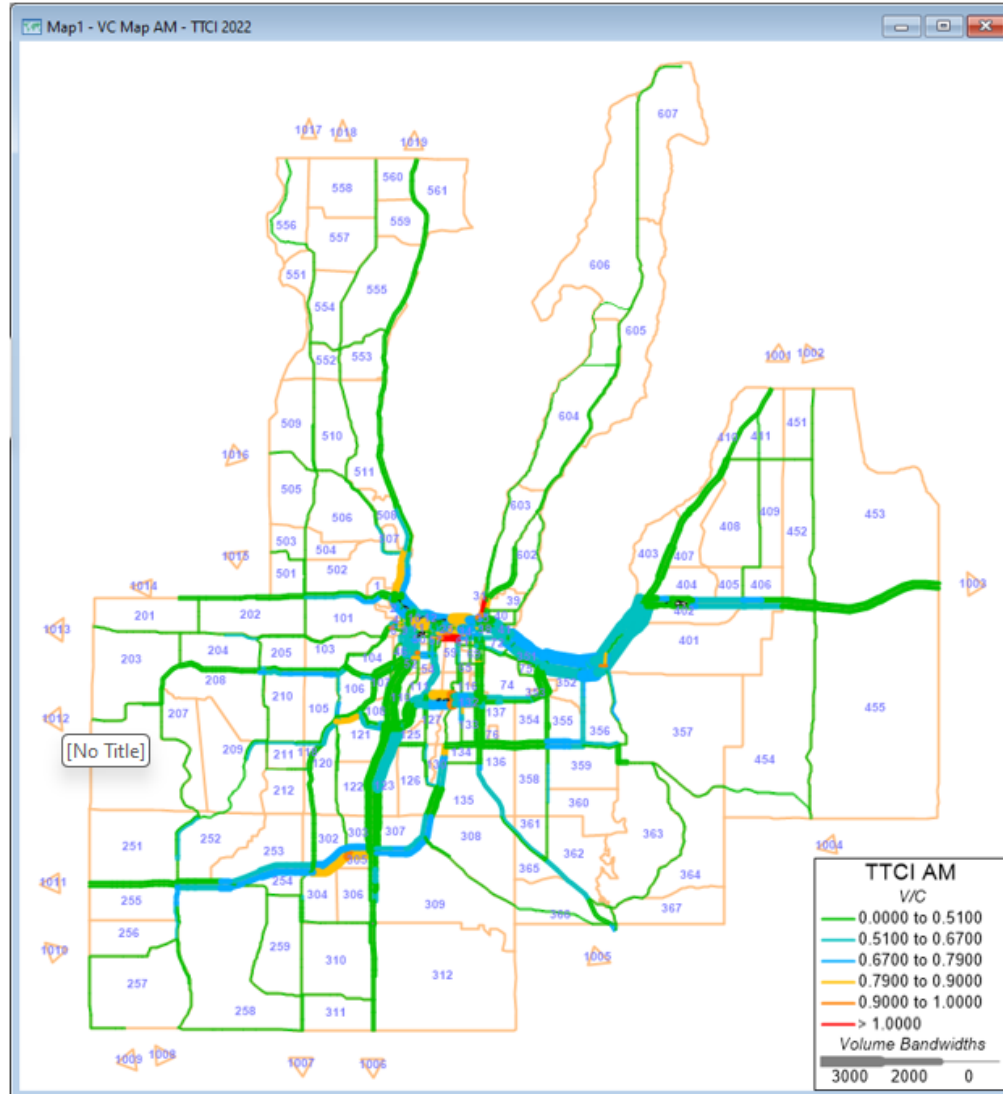
TPCI TDFM – 2022 Base year

TPCI Base Year Model				Targets	
Selection Set	Count	RMSE	Observations	Count	RMSE
All Features	100.30%	28.70%	239	95% - 105%	37.56%
FT5 - Principal Arterial CLTL	98.70%	22.50%	20	93%-107%	-
FT6 - Principal Arterial	110.50%	18.80%	16	93%-107%	-
FT7 - One-way Minor Arterial	100.90%	20.70%	9	90% - 110%	-
FT8 - Minor Arterial with CLTL	102.40%	16.10%	19	90% - 110%	-
FT9 - Minor Arterial	102.00%	23.60%	49	90% - 110%	-
FT10 - One-way Collector	101.50%	33.60%	2	90% - 110%	-
FT11 - Collector with CLTL	86.00%	35.40%	12	80% - 120%	-
FT12 - Collector	97.90%	49.60%	108	80% - 120%	-
14 - Local Road	65.90%	59.70%	4	-	-
Vol < 1000	146.21%	112.30%	12	-	150.00
Vol 1000 - 5000	112.77%	53.30%	90	50% - 150%	65.00
Vol 5000 - 10000	98.83%	36.60%	49	75% - 125%	45.00
Vol 10000 - 20000	98.58%	20.90%	65	80% - 120%	35.00
Vol 20000 - 30000	102.35%	20.40%	16	80% - 120%	30.00
Vol 30000 - 50000	91.92%	16.60%	7	85% - 115%	25.00
AT1 - CBD	103.40%	30.16%	9	90% - 110%	-
AT2 - Urban	101.20%	26.78%	33	90% - 110%	-
AT3 - Suburban	97.80%	29.97%	81	90% - 110%	-
AT4 - Fringe	102.50%	25.88%	72	90% - 110%	-
AT5 - Rural	100.80%	29.63%	44	90% - 110%	-

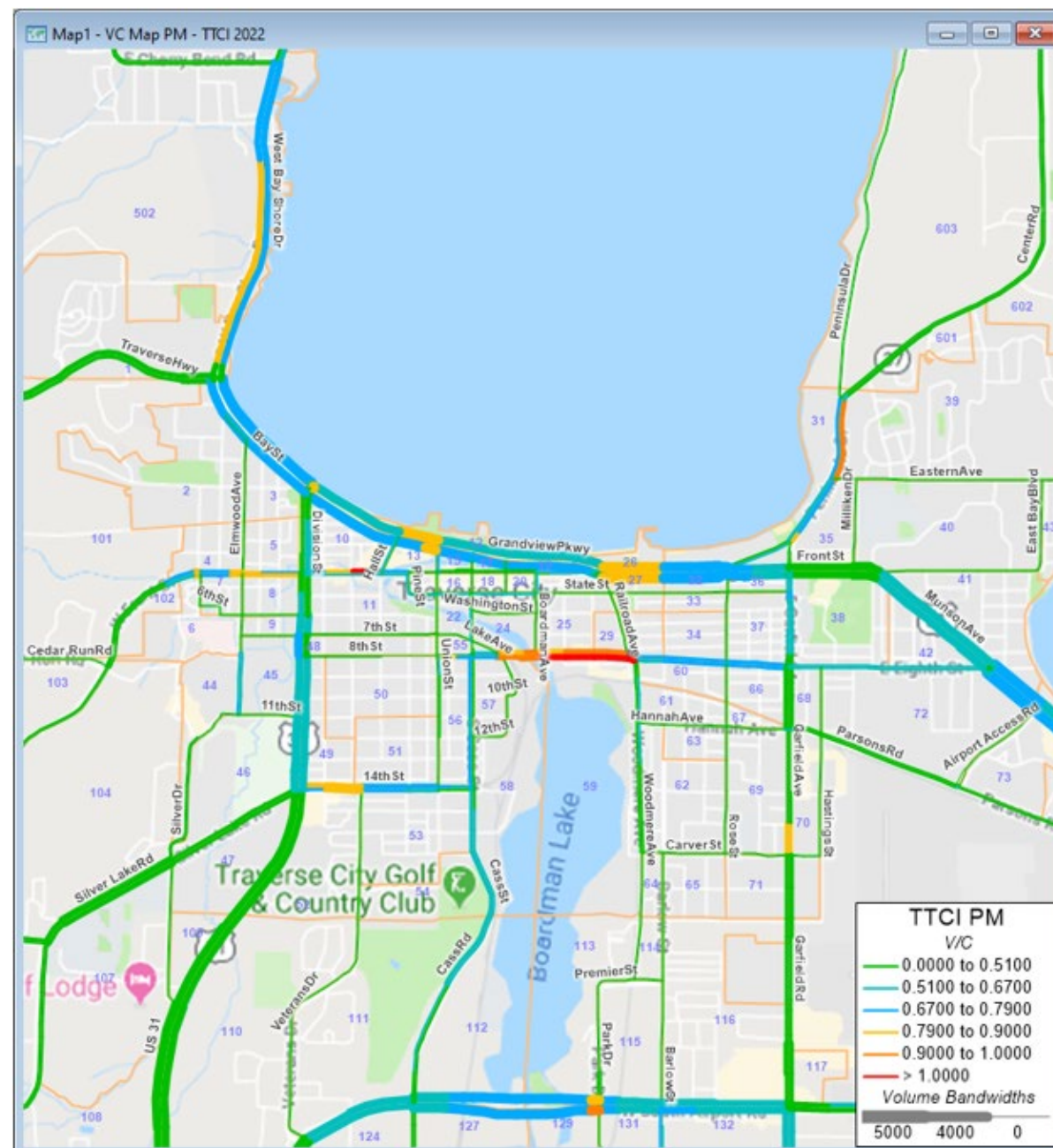
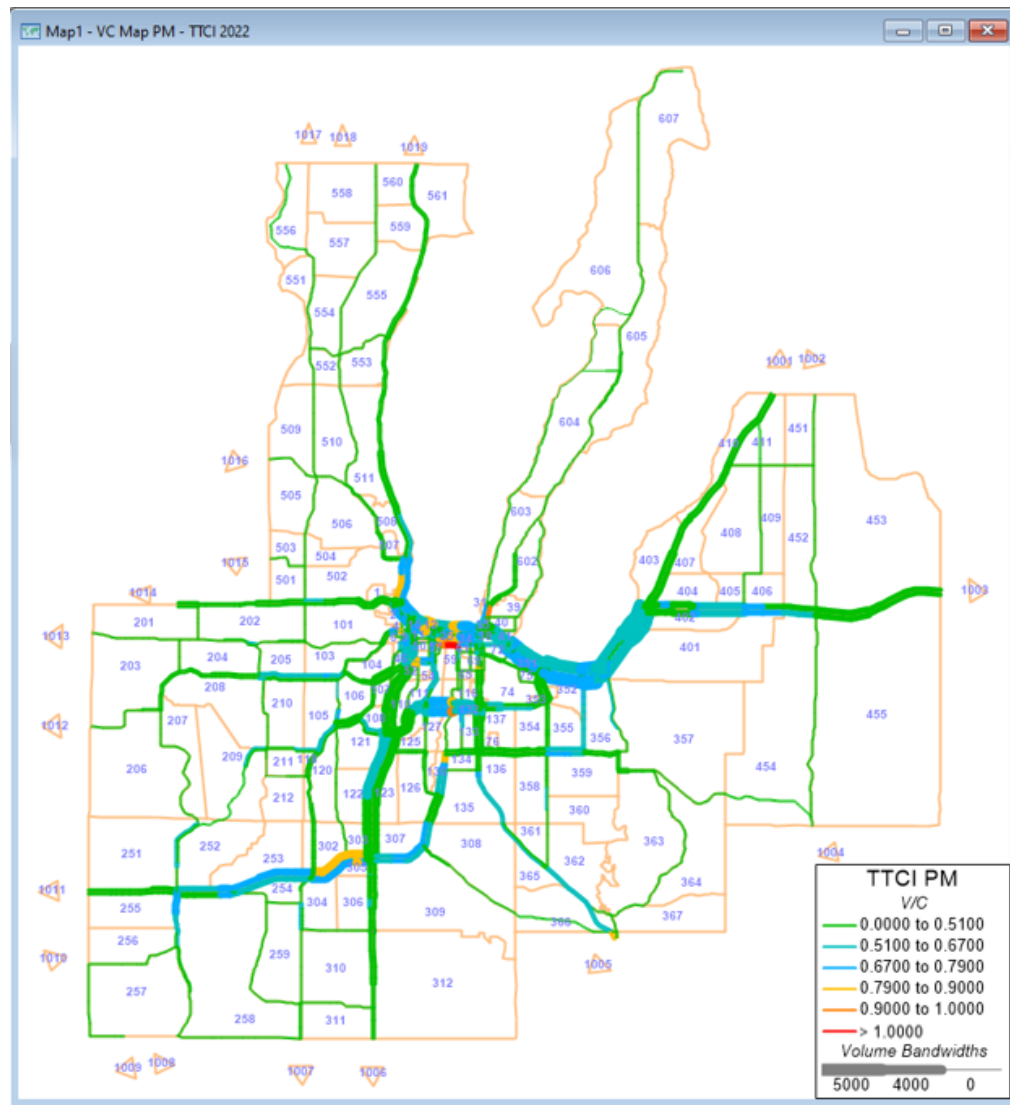
Model Output – Daily Flow



Model Output – AM Flow



Model Output – PM Flow



Volume/Capacity Ratio – Corridors

Daily V/C Rank	Road Name	Extent	V/C					
			AM Peak (7:00am-9:00am)		PM Peak (3:00pm-6:00pm)		Daily (24h)	
			Min - Max	Average	Min - Max	Average	Min - Max	Average
➡ 1	WB Front St.	From Division St. to Hall St	0.74 - 1.07	0.91	0.78 - 1.08	0.94	0.74 - 0.99	0.88
➡ 2	WB 8th St.	From Lake Ave to Woodmere Ave	0.90 - 1.25	0.99	0.88 - 1.17	0.95	0.81 - 1.02	0.86
➡ 3	EB 8th St.	From Union St. to Woodmere Ave	0.73 - 1.08	0.97	0.68 - 1.06	0.92	0.63 - 0.94	0.83
4	WB 14th St.	From Division St to Veterans Dr.	0.81 - 0.92	0.88	0.79 - 0.90	0.86	0.71 - 0.80	0.76
5	EB Front St.	From Sixth St Ext to Division St	0.78 - 0.91	0.85	0.64 - 0.90	0.81	0.62 - 0.82	0.74
6	WB Front St.	From Sixth St Ext to Eddivision St	0.62 - 0.94	0.78	0.72 - 0.88	0.79	0.61 - 0.78	0.72
7	EB 14th St.	From Division St to Veterans Dr.	0.76 - 0.87	0.83	0.73 - 0.83	0.79	0.66 - 0.75	0.71
8	EB US-31	From West Silver Lake Rd to M-37	0.86 - 0.92	0.88	0.73 - 0.80	0.77	0.66 - 0.72	0.69
9	WB US-31	From West Silver Lake Rd to M-37	0.71 - 0.78	0.74	0.82 - 0.87	0.85	0.66 - 0.71	0.68
10	SE Grandview Pkwy	From Traverse Hwy to Cass St	0.77 - 0.86	0.83	0.71 - 0.79	0.75	0.62 - 0.71	0.67
➡ 11	SB Peninsula Dr.	From Garfield Ave to Center Rd	0.94 - 1.04	0.98	0.63 - 0.74	0.68	0.64 - 0.72	0.67
12	SB W Bay Shore	From Traverse Hwy to Cherry Bend Rd	0.82 - 0.86	0.84	0.69 - 0.79	0.74	0.61 - 0.73	0.67
13	NB Peninsula Dr.	From Garfield Ave to Center Rd	0.69 - 0.80	0.74	0.78 - 0.90	0.83	0.63 - 0.72	0.67
14	NB W Bay Shore	From Traverse Hwy to Cherry Bend Rd	0.66 - 0.77	0.71	0.76 - 0.78	0.77	0.60 - 0.71	0.65
15	EB S. Airport	From Cass Rd to Park Dr.	0.64 - 0.93	0.78	0.60 - 0.90	0.76	0.51 - 0.77	0.64
16	WB S. Airport	From Cass Rd to Park Dr.	0.60 - 0.95	0.78	0.60 - 0.88	0.74	0.51 - 0.76	0.64

0.0 < V/C < 0.51

0.51 < V/C < 0.67

0.67 < V/C < 0.79

0.79 < V/C < 0.90

0.90 < V/C < 1.00

V/C > 1.00

Volume/Capacity Ratio – Corridors

Daily V/C Rank	Road Name	Extent	V/C					
			AM Peak (7:00am-9:00am)		PM Peak (3:00pm-6:00pm)		Daily (24h)	
			Min - Max	Average	Min - Max	Average	Min - Max	Average
➡ 1	WB Front St.	From Division St. to Hall St	0.74 - 1.07	0.91	0.78 - 1.08	0.94	0.74 - 0.99	0.88
➡ 2	WB 8th St.	From Lake Ave to Woodmere Ave	0.90 - 1.25	0.99	0.88 - 1.17	0.95	0.81 - 1.02	0.86
➡ 3	EB 8th St.	From Union St. to Woodmere Ave	0.73 - 1.08	0.97	0.68 - 1.06	0.92	0.63 - 0.94	0.83
4	WB 14th St.	From Division St to Veterans Dr.	0.81 - 0.92	0.88	0.79 - 0.90	0.86	0.71 - 0.80	0.76
5	EB Front St.	From Sixth St Ext to Division St	0.78 - 0.91	0.85	0.64 - 0.90	0.81	0.62 - 0.82	0.74
6	WB Front St.	From Sixth St Ext to Eddivision St	0.62 - 0.94	0.78	0.72 - 0.88	0.79	0.61 - 0.78	0.72
7	EB 14th St.	From Division St to Veterans Dr.	0.76 - 0.87	0.83	0.73 - 0.83	0.79	0.66 - 0.75	0.71
8	EB US-31	From West Silver Lake Rd to M-37	0.86 - 0.92	0.88	0.73 - 0.80	0.77	0.66 - 0.72	0.69
9	WB US-31	From West Silver Lake Rd to M-37	0.71 - 0.78	0.74	0.82 - 0.87	0.85	0.66 - 0.71	0.68
10	SE Grandview Pkwy	From Traverse Hwy to Cass St	0.77 - 0.86	0.83	0.71 - 0.79	0.75	0.62 - 0.71	0.67
11	SB Peninsula Dr.	From Garfield Ave to Center Rd	0.94 - 1.04	0.98	0.63 - 0.74	0.68	0.64 - 0.72	0.67
12	SB W Bay Shore	From Traverse Hwy to Cherry Bend Rd	0.82 - 0.86	0.84	0.69 - 0.79	0.74	0.61 - 0.73	0.67
13	NB Peninsula Dr.	From Garfield Ave to Center Rd	0.69 - 0.80	0.74	0.78 - 0.90	0.83	0.63 - 0.72	0.67
14	NB W Bay Shore	From Traverse Hwy to Cherry Bend Rd	0.66 - 0.77	0.71	0.76 - 0.78	0.77	0.60 - 0.71	0.65
15	EB S. Airport	From Cass Rd to Park Dr.	0.64 - 0.93	0.78	0.60 - 0.90	0.76	0.51 - 0.77	0.64
16	WB S. Airport	From Cass Rd to Park Dr.	0.60 - 0.95	0.78	0.60 - 0.88	0.74	0.51 - 0.76	0.64

0.0 < V/C < 0.51

0.51 < V/C < 0.67

0.67 < V/C < 0.79

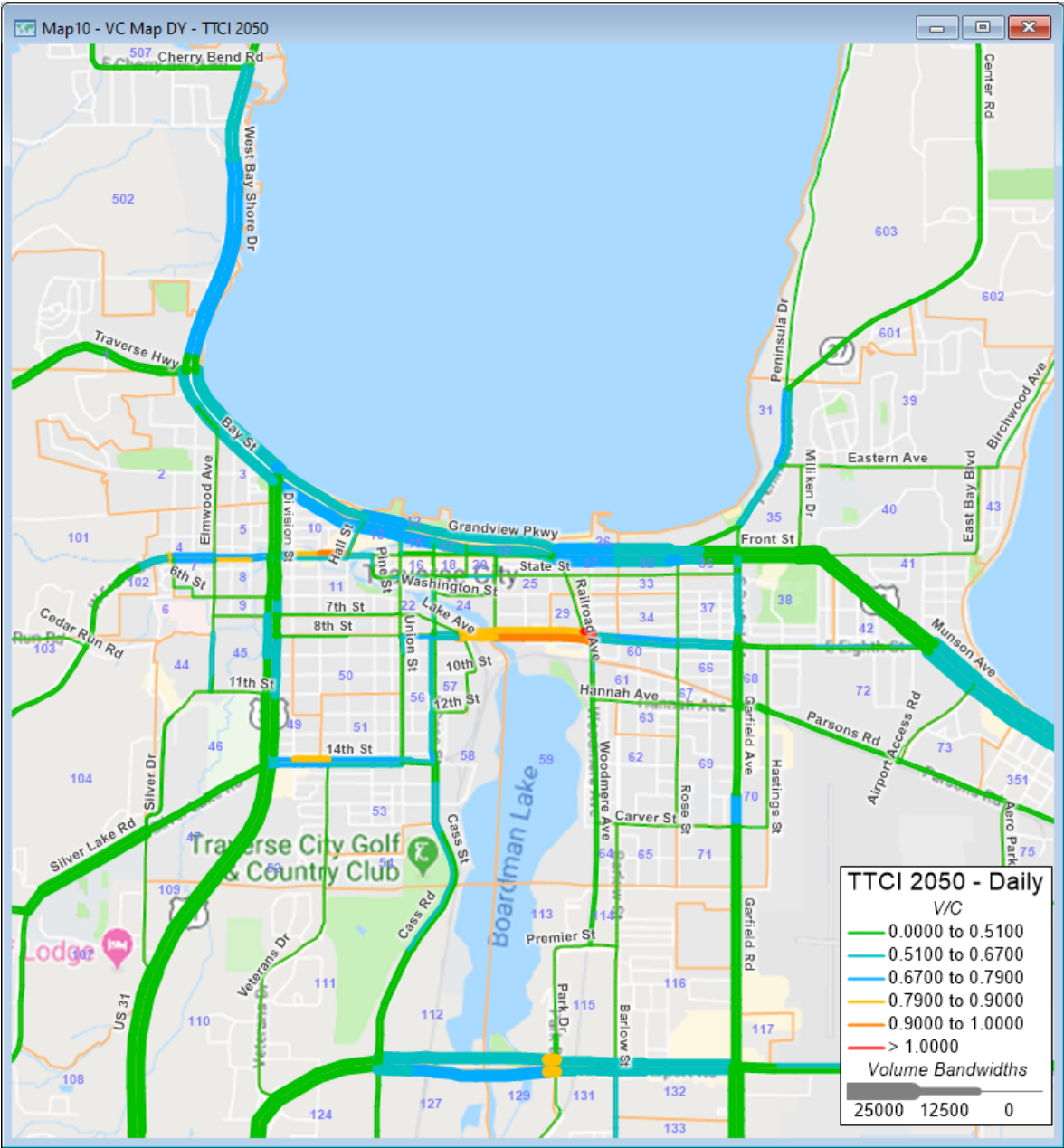
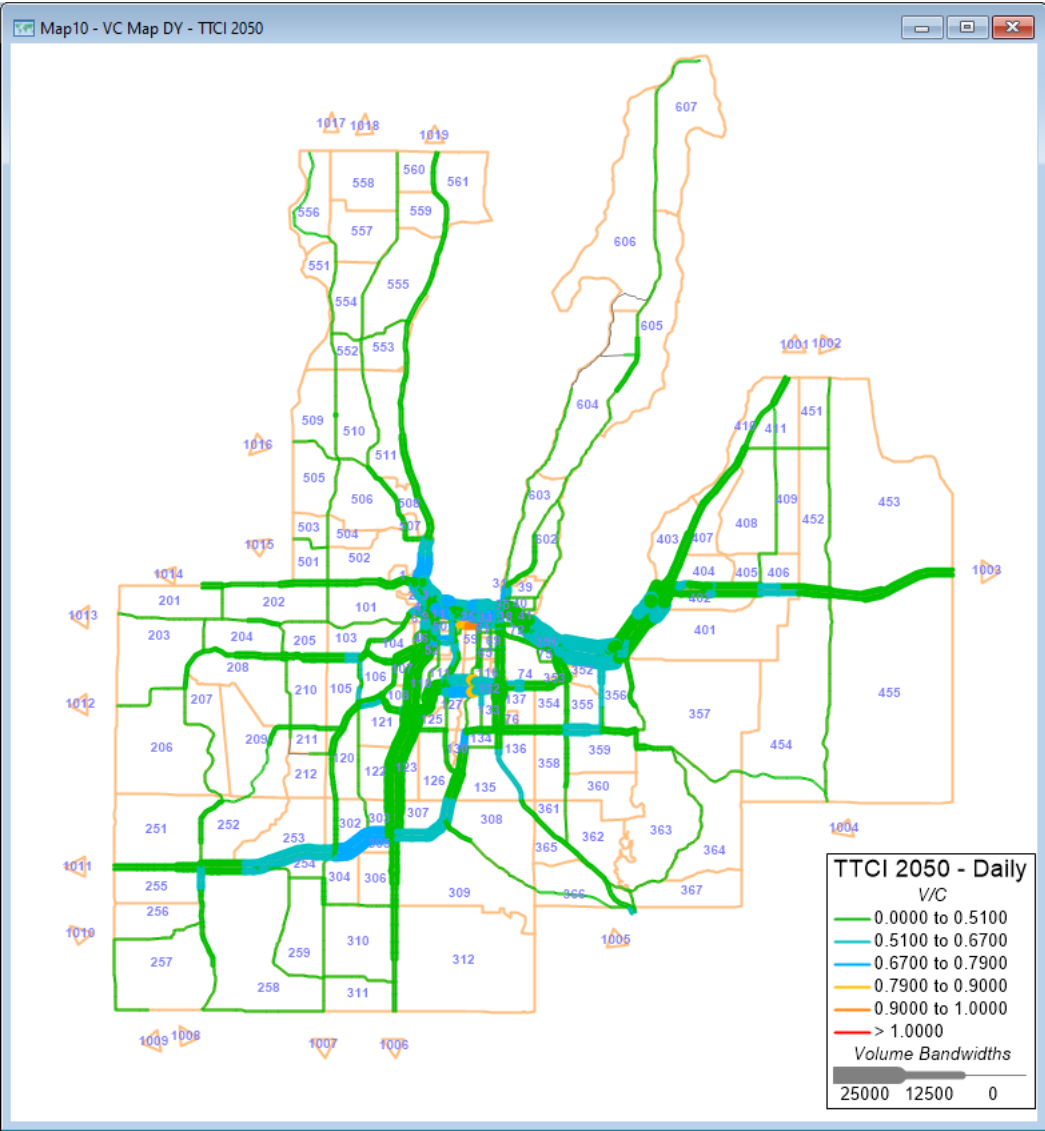
0.79 < V/C < 0.90

0.90 < V/C < 1.00

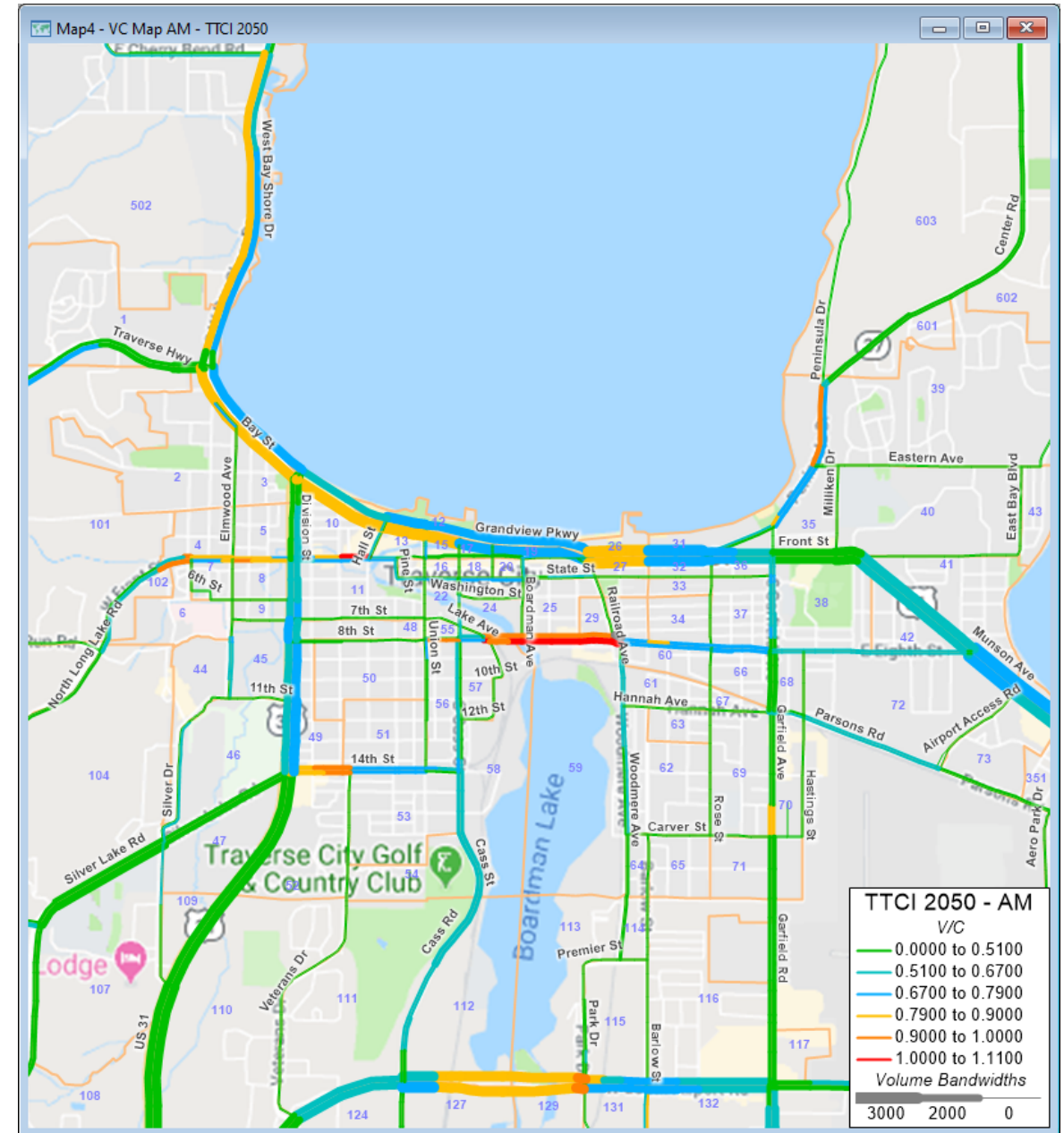
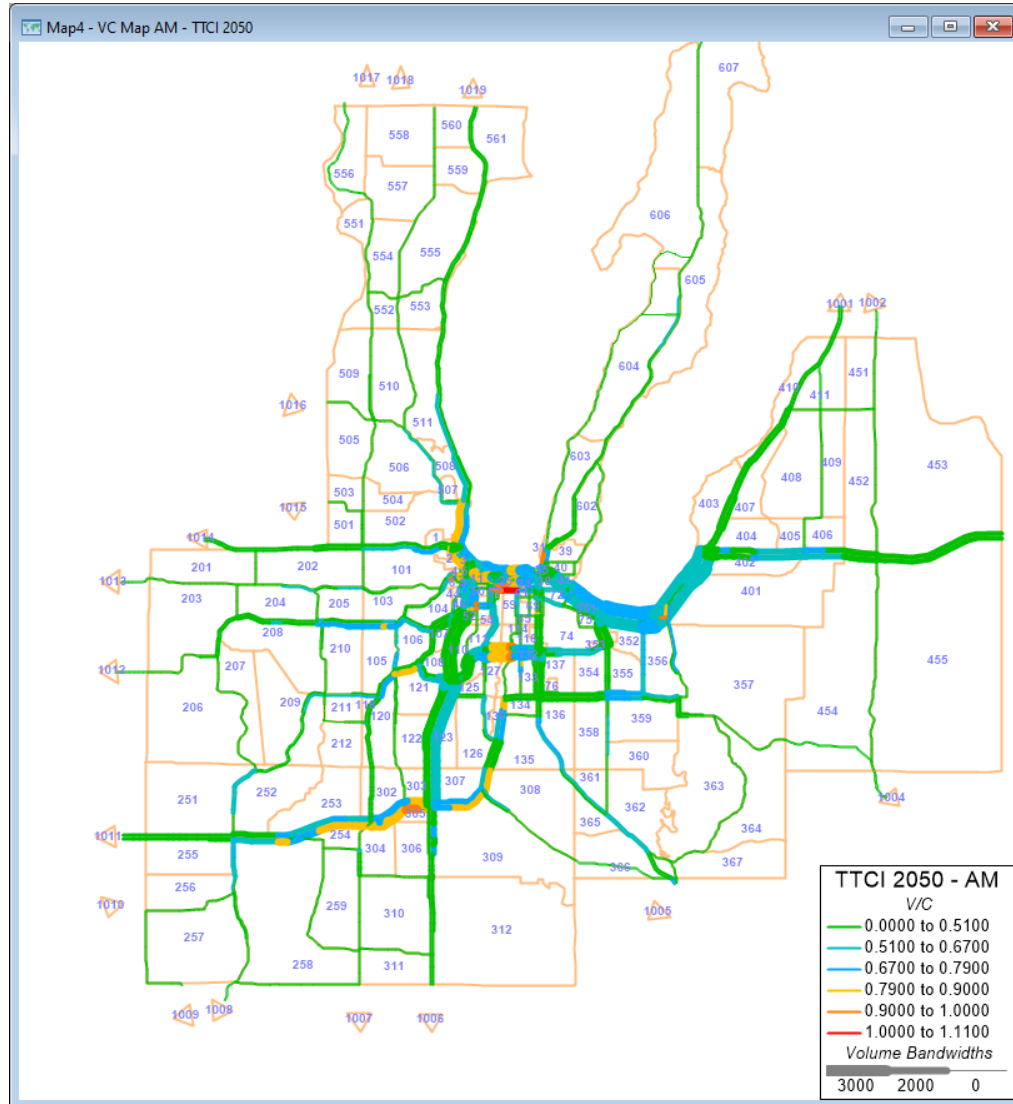
V/C > 1.00

HORIZON YEAR (2050) MODEL RESULTS

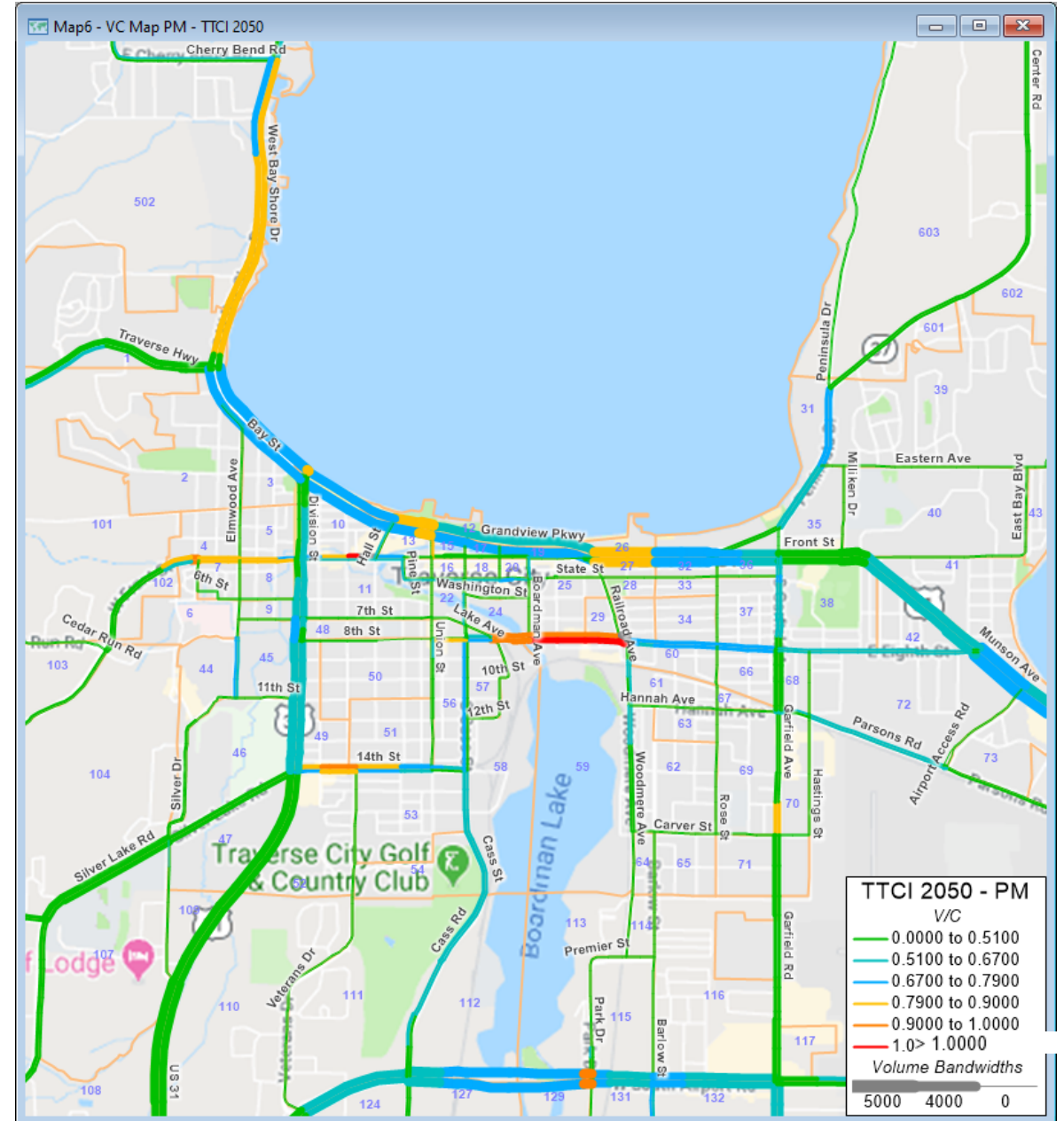
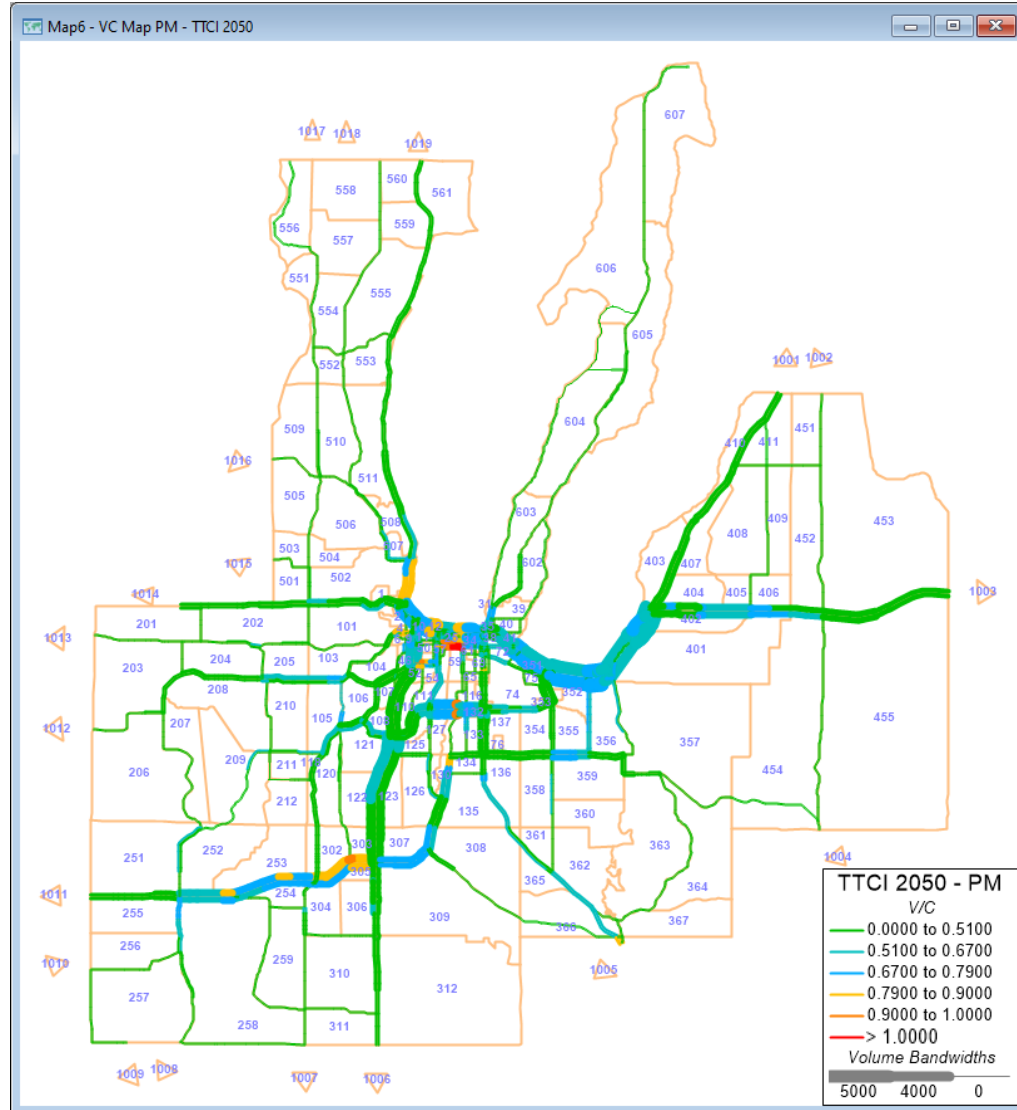
Model Output – Daily Flow



Model Output – AM Flow



Model Output – PM Flow



Volume/Capacity Ratio – Corridors

Daily V/C Rank 2022	Daily V/C Rank 2050	Road Name	Extent	V/C								
				AM Peak (7:00am-9:00am)			PM Peak (3:00pm-6:00pm)			Daily (24h)		
				Min - Max	2050 Average	(FYI) 2022 Average	Min - Max	Average	(FYI) 2022 Average	Min - Max	2050 Average	(FYI) 2022 Average
1	1	WB Front St.	From Division St. to Hall St	0.75 - 1.08	0.92	0.91	0.78 - 1.09	0.94	0.94	0.73 - 1.00	0.88	0.88
2	2	WB 8th St.	From Lake Ave to Woodmere Ave	0.91 - 1.27	1.00	0.99	0.90 - 1.21	0.98	0.95	0.83 - 1.05	0.88	0.86
3	3	EB 8th St.	From Union St. to Woodmere Ave	0.76 - 1-11	1.00	0.97	0.69 - 1.07	0.93	0.92	0.64 - 0.96	0.85	0.83
4	4	WB 14th St.	From Division St to Veterans Dr.	0.81 - 0.92	0.88	0.88	0.83 - 0.93	0.89	0.86	0.73 - 0.82	0.79	0.76
5	5	EB Front St.	From Sixth St Ext to Division St	0.79 - 0.98	0.87	0.85	0.66 - 0.92	0.82	0.81	0.66 - 0.84	0.77	0.74
6	6	WB Front St.	From Sixth St Ext to Edivision St	0.64 - 0.97	0.80	0.78	0.74 - 0.92	0.82	0.79	0.64 - 0.82	0.74	0.72
7	7	EB 14th St.	From Division St to Veterans Dr.	0.80 - 0.91	0.86	0.83	0.74 - 0.84	0.80	0.79	0.68 - 0.77	0.73	0.71
8	8	EB US-31	From West Silver Lake Rd to M-37	0.89 - 0.96	0.91	0.88	0.76 - 0.84	0.79	0.77	0.69 - 0.75	0.71	0.69
9	9	WB US-31	From West Silver Lake Rd to M-37	0.74 - 0.82	0.77	0.74	0.85 - 0.91	0.87	0.85	0.69 - 0.74	0.71	0.68
10	10	SE Grandview Pkwy	From Traverse Hwy to Cass St	0.80 - 0.90	0.86	0.83	0.71 - 0.80	0.76	0.75	0.64 - 0.72	0.69	0.67
11	15	SB Peninsula Dr.	From Garfield Ave to Center Rd	0.79 - 0.94	0.85	0.98	0.61 - 0.71	0.65	0.68	0.57 - 0.67	0.61	0.67
12	11	SB W Bay Shore	From Traverse Hwy to Cherry Bend Rd	0.87 - 0.90	0.88	0.84	0.70 - 0.79	0.75	0.74	0.63 - 0.75	0.69	0.67
13	16	NB Peninsula Dr.	From Garfield Ave to Center Rd	0.68 - 0.78	0.72	0.74	0.66 - 0.78	0.71	0.83	0.57 - 0.66	0.61	0.67
14	12	NB W Bay Shore	From Traverse Hwy to Cherry Bend Rd	0.66 - 0.77	0.72	0.71	0.80 - 0.81	0.80	0.77	0.62 - 0.72	0.67	0.65
15	13	EB S. Airport	From Cass Rd to Park Dr.	0.67 - 0.98	0.82	0.78	0.61 - 0.92	0.77	0.76	0.54 - 0.80	0.67	0.64
16	14	WB S. Airport	From Cass Rd to Park Dr.	0.62 - 0.96	0.80	0.78	0.63 - 0.92	0.77	0.74	0.53 - 0.79	0.66	0.64

0.0 < V/C < 0.51

0.51 < V/C < 0.67

0.67 < V/C < 0.79

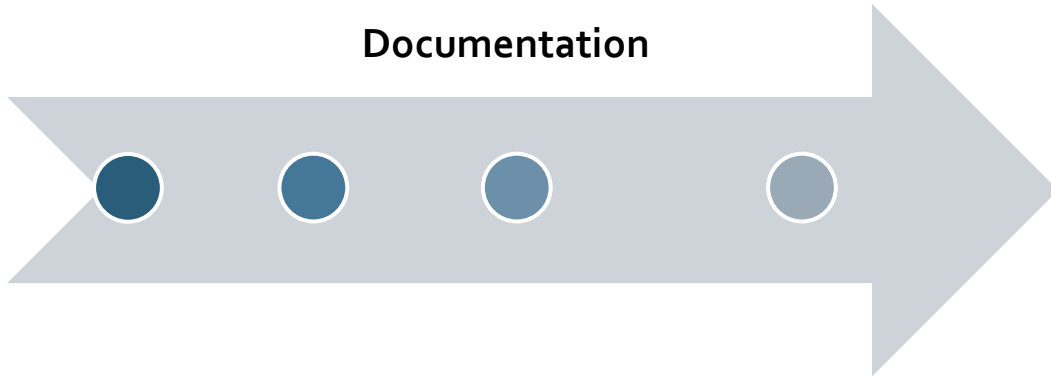
0.79 < V/C < 0.90

0.90 < V/C < 1.00

V/C > 1.00

Next Steps

Documentation



MTP Chapters

- SE Conditions
- Travel Demand Forecast Model
 - TDFM Process
 - Model Results

Task	Task #
Travel Demand Model Work Plan ¹ Development	1
Road Network Development - Base Year ²	2
Traffic Analysis Zone (TAZ) Development	3
MPO review of base year network and TAZ	4
Employment Data Development - Base Year ³	5
Demographic Data Development - Base Year ³	6
MPO review of Employment and demographic data	7
MPO approval of base year network, Employment and demographic data	8
Gather & Process Traffic Count Data (MDOT & Local Agency) ⁴	9
External Travel Estimation - Base Year	10
Trip Generation - Base Year	11
Trip Distribution - Base Year	12
Mode Split / Time of Day - Base Year	13
Traffic Assignment (Auto / Truck) & Calibration / Validation of Model - Base Year	14
Post Processing Model Output & Evaluate Capacity Deficiencies ⁵ - Base Year	15
MPO review and concur of the Model Outputs and Capacity Deficiencies - Base Year	16
Develop Demographic ³ , Employment ³ , & External Travel Forecasts	17
Road Network Development - Forecast Years ⁶	18
MPO review and approval of Forecast Demographic and Employment data	19
Run Model - Forecast Years / Land Use Scenarios / Road Network Alternatives - Evaluate Capacity Deficiencies ⁵	20
MPO review and concur of the Model Outputs and Capacity Deficiencies - Future Year	21
Model Documentation Development	22

How is the Travel Demand Model used?

Congestion Analysis (V/C)

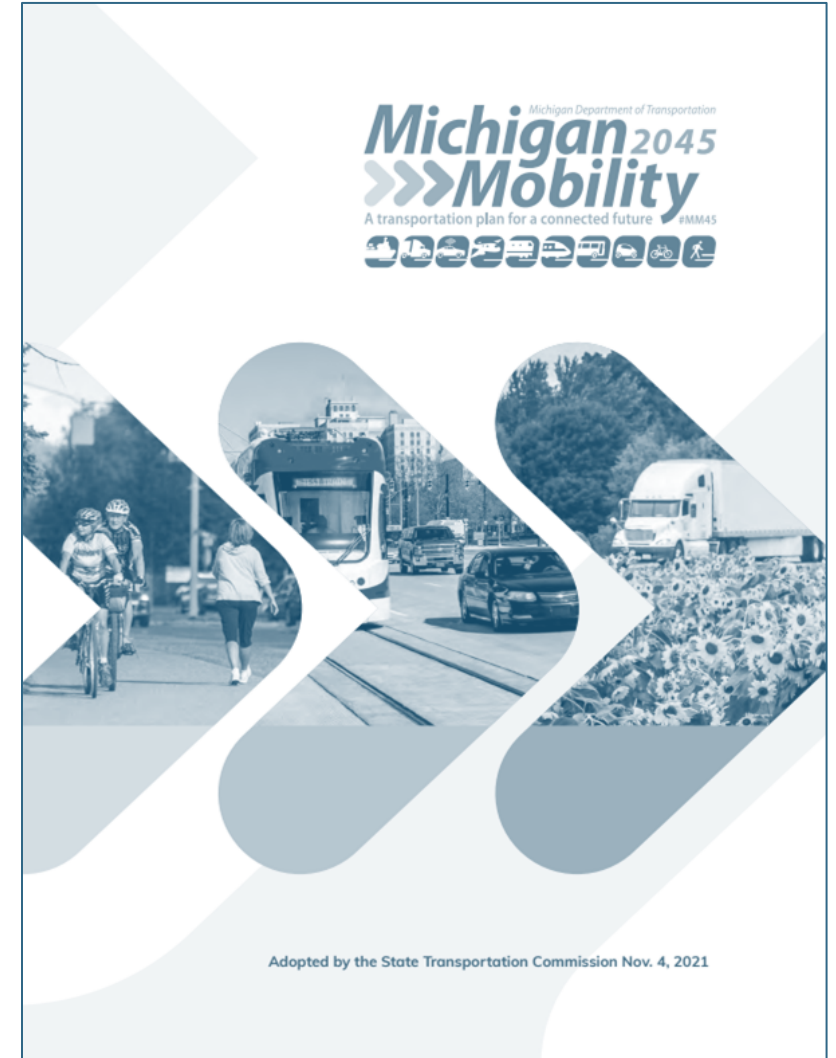
Forecast: How changes in SE data affect traffic flows

Volume /VMT Growth Rates

Workzone/ Diversion Analysis

Select Link Analysis

Alternative Scenarios: Test new major developments/ new major employers/ new projects



QUESTIONS?

THANK YOU!

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