Phase 1

DRAFT

Statewide Traffic & Revenue Analysis

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Michigan Statewide Tolling Feasibility Analysis

MDOT

HNTB

CDM Smith

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Executive Summary

This Phase 1 Statewide Traffic & Revenue Study report summarizes the assumptions, methodology, and results for the initial high-level traffic and revenue (T&R) analysis process that was conducted to support the Michigan Statewide Tolling Study. The purpose of the Phase 1 statewide T&R analysis was to provide the Michigan Department of Transportation (MDOT) with high-level toll revenue estimates on the over 1,900 centerline miles of Interstate and all other limited-access highways in Michigan. The results were used as one of several criteria to support initial screening of potential toll corridors in Michigan by the consultant team and MDOT.

Three different toll rate per mile scenarios were analyzed, at $0.04 per mile, $0.06 per mile, and $0.08 per mile for passenger cars. The $0.04 per mile rate is similar to the lowest passenger car transponder per mile rates in the country, $0.06 per mile is similar to the passenger car transponder rates on the Ohio Turnpike, and $0.08 per mile is similar to the passenger car transponder rates on the Indiana Toll Road. Commercial vehicle toll rates were assumed at 1.5 times and 4 times multipliers compared to passenger cars for single unit trucks and multi-unit trucks, respectively. The Phase 1 analysis included high-level analysis of traffic, revenue, and potential diversion for the analysis year 2030.

Phase 1 high-level gross revenue estimates by vehicle class for the three different per mile toll scenarios are shown in Table ES-1 and Table ES-2. Revenue is shown to increase with the progressively higher toll rate per mile scenarios. Some factors driving higher gross revenue on different routes are higher average traffic levels, relatively higher shares of commercial vehicles which have higher toll rates, and longer route length. Note that results associated to highways with concurrent numbering were assigned to only one highway to avoid double counting results. This is described in more detail in the body of this report.

Percent traffic diversion associated with each of the routes and toll rate scenarios was included in the study. Diversion was estimated to vary by route and toll rate. Considering all routes of at least 10 miles in length, diversion was estimated to range from 4 percent to 12 percent for the $0.04 per mile toll rate scenario, 6 percent to 18 percent for the $0.06 per mile toll rate scenario, and 9 to 24 percent for the $0.08 per mile toll rate scenario. Diversion can be impacted in this analysis by factors including the toll rate scenario applied, the proximity, speed, and capacity of alternative routes, and the value of time of drivers using the route.

Table ES-1: 2030 Interstate and U.S. Route Annual Gross Revenue (in thousands of constant 2020$)[1]

Route	Miles	$0.04 Per Mile Scenario			$0.06 Per Mile Scenario			$0.08 Per Mile Scenario		
		Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total
I-69	203.5	$ 68,535	$ 63,224	$131,758	$ 96,103	$ 88,589	$184,693	$119,267	$109,844	$229,111
I-75	395.5	191,774	80,619	272,393	273,392	114,038	387,429	344,989	142,857	487,845
I-94	271.0	204,318	133,309	337,627	292,105	189,529	481,634	369,516	238,400	607,916
I-94	1.0	78	6	84	110	8	119	138	10	148
I-96	184.5	154,810	48,731	203,541	221,736	68,965	290,701	281,288	86,368	367,657
I-194	3.4	1,057	119	1,176	1,523	172	1,696	1,951	222	2,173
I-196	80.7	34,935	25,845	60,780	49,864	37,341	87,205	63,110	47,893	111,003
I-275	30.6	26,411	9,741	36,152	37,944	13,964	51,908	48,242	17,736	65,979
I-375	1.2	501	27	529	698	40	738	865	50	916
I-475	16.8	6,294	1,100	7,394	8,776	1,538	10,314	10,896	1,918	12,813
I-496	11.5	7,995	991	8,986	11,419	1,434	12,853	14,468	1,843	16,310
I-675	7.8	2,031	231	2,262	2,896	330	3,226	3,657	418	4,075
I-696	29.1	54,204	9,401	63,605	79,418	13,814	93,232	103,122	18,047	121,169
US-10	57.9	13,994	3,762	17,756	19,746	5,370	25,116	24,622	6,794	31,416
BUS US-10	2.6	589	82	672	839	121	960	1,059	157	1,216
US-23	90.5	64,022	31,112	95,133	92,343	44,234	136,577	117,841	55,555	173,396
Connector US-23	1.9	137	52	188	185	72	258	222	90	312
US-31	94.0	23,971	7,614	31,585	34,144	10,959	45,103	43,159	14,008	57,167
US-127	152.6	34,593	11,569	46,163	48,624	16,517	65,141	60,503	20,952	81,455
US-131	168.8	69,187	30,441	99,627	98,312	44,076	142,387	123,873	56,653	180,527
BUS US-131	4.2	296	50	346	403	71	474	492	90	583

[1]Gross revenue estimates do not account for any costs, such as for toll collection and roadway maintenance, that would be required to operate a toll facility.

Table ES-2: 2030 Michigan Route and Total Annual Gross Revenue (in thousands of constant 2020$)[1]

Route	Miles	$0.04 Per Mile Scenario			$0.06 Per Mile Scenario			$0.08 Per Mile Scenario		
		Passenger Car	Commercial Vehicle	Total	Passenger Car	Commer-cial Vehicle	Total	Passenger Car	Commer-cial Vehicle	Total
5	7.6	$ 4,526	$ 208	$ 4,734	$ 6,351	$ 275	$ 6,626	$ 7,933	$ 369	$ 8,301
6	18.2	9,278	3,882	13,161	13,014	5,477	18,491	16,166	6,844	23,010
8	2.7	1,781	289	2,071	2,461	379	2,840	3,008	484	3,493
10	18.2	22,044	1,240	23,284	31,708	1,776	33,484	40,369	2,221	42,590
14	20.2	18,409	5,246	23,655	26,493	7,464	33,957	33,803	9,390	43,193
39	13.9	20,713	1,656	22,369	30,077	2,409	32,485	38,668	3,110	41,778
47	4.1	722	69	791	1,047	101	1,148	1,344	132	1,476
53	11.7	7,750	1,034	8,784	11,250	1,495	12,745	14,515	1,910	16,424
59	13.2	15,505	1,445	16,950	22,402	2,062	24,463	28,677	2,616	31,293
60	3.0	579	120	699	839	175	1,014	1,085	228	1,313
Total Interstate	1,236.6	752,945	373,344	1,126,289	1,075,985	529,764	1,605,748	1,361,509	665,607	2,027,116
Total U.S. Route	572.6	206,788	84,681	291,470	294,595	121,420	416,016	371,771	154,299	526,070
Total M-Route	112.8	101,307	15,191	116,498	145,642	21,613	167,254	185,567	27,304	212,871
Grand Total	1,922.0	1,061,040	473,216	1,534,257	1,516,222	672,797	2,189,018	1,918,848	847,210	2,766,057

[1]Gross revenue estimates do not account for any costs, such as for toll collection and roadway maintenance, that would be required to operate a toll facility.

1. Introduction

This Phase 1 Statewide Traffic & Revenue Study report summarizes the assumptions, methodology, and results for the initial high-level traffic and revenue (T&R) analysis process that was conducted to support the Michigan Statewide Tolling Study. This is a supporting report to the main *Michigan Statewide Tolling Study: Feasibility Analysis* report. The modeling and analysis documented in this report was conducted by CDM Smith as part of a consultant contract led by HNTB Michigan, Inc. for the Michigan Department of Transportation (MDOT).

1.1. Study Purpose & Project Description

The purpose of the Phase 1 statewide T&R analysis was to provide MDOT with high-level toll revenue estimates on all Interstate and all other limited-access highways in Michigan. Phase 1 included high-level analysis of traffic, revenue, and potential diversion. The results were used as one of several criteria to support initial screening of potential toll corridors in Michigan by the consultant team and MDOT.

1.2. Study Corridors

The Phase 1 analysis examined all Interstate and all other limited-access highways across the state, including U.S. and state routes. All corridors analyzed were required to have no at-grade intersections. The highways examined in this study are shown in Figure 1-1 and Figure 1-2, for Michigan statewide and Southeastern Michigan, respectively, with Interstate routes in red and other limited-access highways in Michigan in grey. Existing toll facilities in Michigan or nearby states are shown in green. There are currently four tolled international crossing bridges or tunnels between Michigan and Ontario, Canada, with a fifth, the Gordie Howe International Bridge, currently under construction. There are also two other non-international toll bridges in the state, the Mackinac Bridge and Grosse Isle Bridge, with others under development in Bay City. While Michigan does not currently have any toll roads, the Indiana Toll Road and the Ohio Turnpike are located close to the Michigan border in Indiana and Ohio, respectively. A list of the limited-access highways in Michigan analyzed in the Phase 1 study is presented in Table 1-1 and Table 1-2. Note that distances, traffic, and revenues associated to highways with concurrent numbering were assigned to only one highway to avoid double counting results. These assumptions are indicated in the "Concurrent Highway Segments" column.

Figure 1-1: Limited-Access Highways in Michigan and Toll Facilities in Michigan and Nearby States

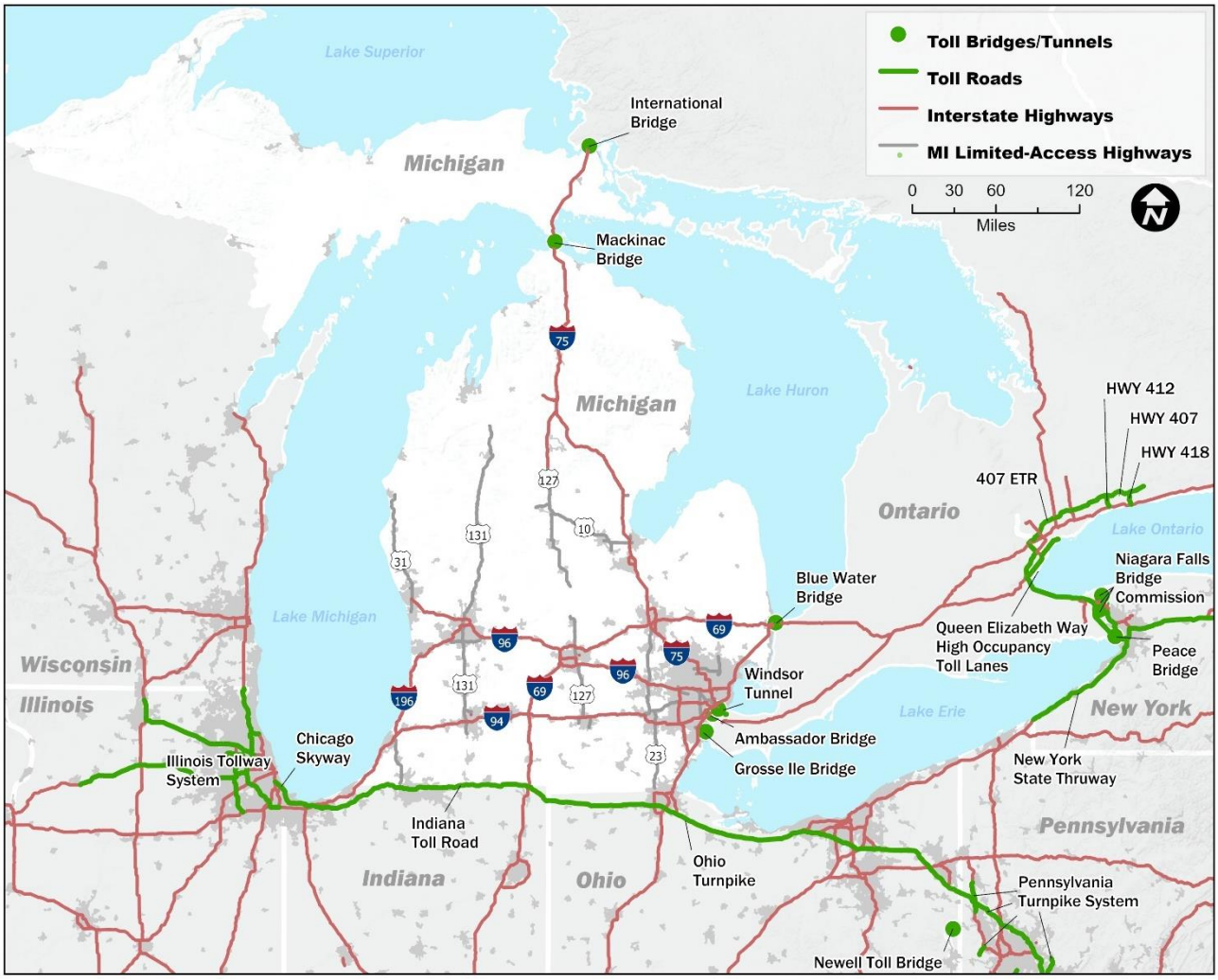


Figure 1-2: Limited-Access Highways in Southeastern Michigan

Note: The Gordie Howe Bridge is currently under construction and will directly connect I-75 in Michigan to HWY 401 in Ontario

Table 1-1: Interstate and U.S. Route Limited-Access Highways Studied in the Phase 1 Traffic and Revenue Analysis

Route	Alternate Route Names	Model Distance (mi)	General Location	Concurrent Highway Segments
69		203.5	Indiana Border to Ontario Border	Concurrent Segments of I-69 and I-94 as well as I-69 and I-96 are attributed to I-69
75	Walter P. Chrysler Freeway Fisher Freeway Detroit-Toledo Expressway	395.5	Ohio Border to Ontario Border	Concurrent Segments of I-75 and US-23 are attributed to I-75
94	Detroit Industrial Expressway E. Edsel Ford Freeway	271.0	Indiana Border to Ontario Border	Concurrent Segments of I-69 and I-94 are attributed to I-69; Concurrent Segments of I-94 and US-127 are attributed to I-94
94	Business I-94/ East Main Street	1.0	Benton Harbor	
96	Jeffries Freeway	184.5	Muskegon to Detroit	Concurrent Segments of I-69 and I-96 are attributed to I-69; Concurrent Segments of I-96 and I-275 are attributed to I-96
194		3.4	Battle Creek	
196	Gerald R. Ford Freeway	80.7	Benton Harbor to Grand Rapids	
275		30.6	Western Detroit Suburbs	Concurrent Segments of I-96 and I-275 are attributed to I-96
375	Walter P. Chrysler Freeway	1.2	Detroit	
475	U.A.W. Freeway	16.8	Flint	
496		11.5	Lansing	Concurrent Segments of I-496 and US-127 are attributed to I-496
675		7.8	Saginaw	
696	Walter P. Reuther Freeway	29.1	Northern Detroit Suburbs	
10		57.9	Farwell to Bay City	Concurrent Segments of US-10 and US-127 are attributed to US-10
BUSINESS 10		2.6	Midland	
23		90.5	Ohio Border to Flint	Concurrent Segments of I-75 and US-23 are attributed to I-75; Concurrent Segments of US-23 and M-14 are attributed to US-23
Connector 23		1.9	Standish	
31		94.0	Indiana Border to Benton Harbor; Holland to Ludington	
127		152.6	Jackson to Grayling	Concurrent Segments of I-94 and US-127 are attributed to I-94; Concurrent Segments of I-496 and US-127 are attributed to I-496; Concurrent Segments of US-10 and US-127 are attributed to US-10
131		168.8	Portage to Manton	
BUSINESS 131		4.2	Kalamazoo	

Table 1-2: Michigan Route Limited-Access Highways Studied in the Phase 1 Traffic and Revenue Analysis

Route	Alternate Route Names	Model Distance (mi)	General Location	Concurrent Highway Segments
5		7.6	Northwestern Detroit Suburbs	
6	Paul B. Henry Freeway	18.2	Southern Grand Rapid Suburbs	
8	Davison Freeway	2.7	Detroit	
10	John C. Lodge Freeway	18.2	Southfield to Detroit	
14		20.2	Ann Arbor to Plymouth	Concurrent Segments of US-23 and M-14 are attributed to US-23
39	Southfield Freeway	13.9	Southfield to Allen Park	
47		4.1	Midland	
53	Van Dyke Freeway	11.7	Northern Detroit Suburbs	
59	Veterans Memorial Freeway	13.2	Northern Detroit Suburbs	
60		3.0	Jackson	

1.3. Report Structure

This report is split into three remaining chapters and one appendix:

Chapter 2, **Existing Conditions and Assumptions**, details historical traffic growth on Michigan roadways and summarizes the study assumptions.

Chapter 3, **Traffic and Revenue Model**, provides a summary of the modeling approach and the calibration results.

Chapter 4, **Phase 1 High-Level Results**, details the traffic, revenue, and diversion based on the three toll rate scenarios for the 31 routes.

Appendix A, **Results by Segment**, provides traffic and revenue results for the 91 segments.

2. Existing Conditions and Assumptions

This chapter details historical traffic growth on Michigan roadways and summarizes the study assumptions.

2.1. Historical Traffic Growth

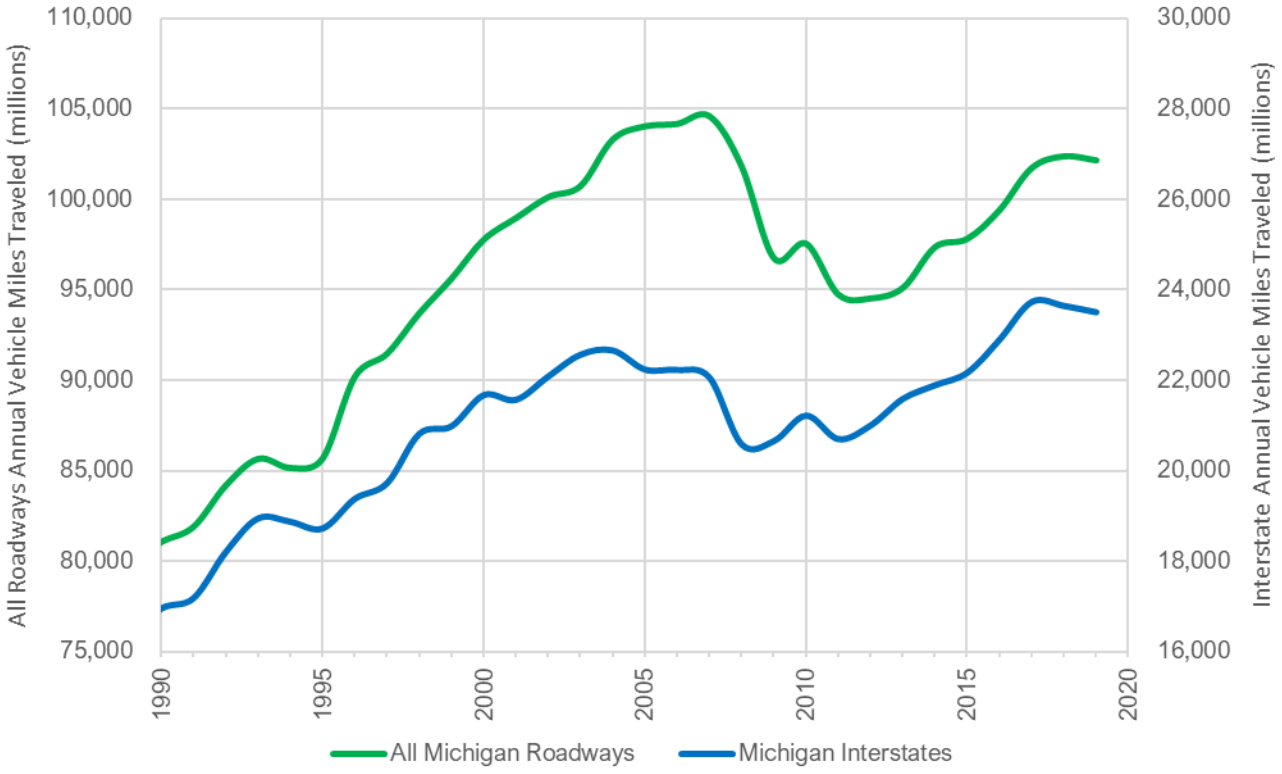
Figure 2-1 illustrates historical annual vehicle miles traveled (VMT) on Michigan roadways from 1990 through 2019, based on data provided in the Federal Highway Administration (FHWA) Highway Statistics publication. VMT on all Michigan roadways is shown in green and Interstate VMT is shown in blue. The average annual percent change of VMT for groups of years between general points of inflection in the chart are presented in tabular format in Table 2-1. Michigan saw steady traffic growth from 1990 to 2004, averaging 1.7 percent annually for total (on all roadways) VMT and 2.1 percent for Interstate VMT. Between 2004 and 2007, the average change was slightly positive for total VMT and negative for Interstate VMT. The years 2007 through 2011 saw annual declines of 2.4 percent per year across the state and declines of 1.6 percent per year for Interstate VMT as a result of the Great Recession. Traffic levels have since rebounded, increasing by 1.2 percent per year from 2011 to 2017 for total VMT and 2.3 percent per year for Interstate VMT. Between 2017 and 2019, VMT was steady at slightly below peak 2007 volumes for total and higher than previous peak 2007 volumes for Interstates.

It is important to note that nearly all roadways across the nation saw drastic declines traffic volumes in March to May 2020 due to the COVID-19 pandemic, and Michigan was no exception. With state-mandated stay-at-home orders and a swift shift to work-from-home procedures for many jobs beginning in March 2020, traffic volumes on many roadways in the state fell quickly. Volumes have since gradually recovered to around 10 to 15 percent lower than pre-pandemic levels as of early 2021. As discussed in more detail later in this report, because the Phase 1 future analysis year of 2030 is several years in the future, the study model was calibrated to pre-pandemic 2019 traffic levels.

2.2. Key Assumptions

The key assumptions this study was built upon are detailed in Table 2-2 through Table 2-4. These assumptions were agreed upon by the study team and are considered reasonable for the Phase 1 high-level analysis. The assumptions are grouped by tolling and operation assumptions, model input assumptions, and other study assumptions. Several study assumptions are discussed in more detail in subsequent sub-sections of this chapter.

Figure 2-1: Historical Annual Vehicle Miles Traveled in Michigan



Source: Federal Highway Administration Highway Statistics

Table 2-1: Average Annual Percent Change in Historical Annual Vehicle Miles Traveled between Inflection Years

Roadway Type	1990 - 2004	2004 - 2007	2007 - 2011	2011 - 2017	2017 - 2019
Interstate	2.1%	-0.9%	-1.6%	2.3%	-0.5%
Total	1.7%	0.4%	-2.4%	1.2%	0.2%

Table 2-2: Phase 1 Tolling and Operations Assumptions

Assumption	Assumption Details
Tolled Corridors	All limited-access highways in Michigan.
Tolling Hours	24 hours a day, 7 days a week.
Analysis Year	2030
Toll Collection Methods	For Phase 1 T&R it was assumed all vehicles have a transponder. Alternate payment types will be considered in later study phases.
Eligible Tolled Traffic	Assume all vehicles pay a toll with higher toll rates for larger vehicles.
Discount Programs	None.
Vehicle Classes	Three vehicle classes were assumed for Phase 1 T&R: Passenger cars (PC) corresponding to FHWA classes 1 to 4, single unit trucks (SUT) corresponding to FHWA classes 5 to 7, and multi unit trucks (MUT) corresponding to FHWA classes 8 to 13.
Passenger Car Toll Rates	Three different sets of PC transponder toll rates were analyzed: $0.04, $0.06, and $0.08 per mile (2020 rates in 2020$). These rates are similar the lowest PC transponder per mile rates in the country, the PC transponder rates on the Ohio Turnpike, and the PC transponder rates on the Indiana Toll Road, respectively. Other rates may be analyzed in subsequent phases.
Commercial Vehicle Toll Rates	SUTs and MUTs were assumed to have toll rates at 1.5x and 4x multipliers, respectively, compared to PCs.
Toll Rate Increases	Toll rates were assumed to increase annually at the rate of inflation. However, because the modeling was peformed in constant 2020$ (see more detail on this in the Model Input Assumptions below), inflation between 2020 and 2030 was not applied for the toll rates in the 2030 model analysis.
Toll Rates on Other Toll Facilities	Toll rates on other toll facilities important to the study were accounted for using time penalties, an artificial delay added to the travel time of a facility in an attempt to mimic the toll cost in accordance with appropriate value of time. These are the Mackinac Bridge, International Bridge, Blue Water Bridge, Windsor Tunnel, Ambassador Bridge, Gordie Howe International Bridge (future years only), Ohio Turnpike, and Indiana Toll Road.

Table 2-3: Phase 1 Model Input Assumptions

Assumption	Assumption Details
Model	The latest Michigan Statewide Model was used as a basis for developing the study model. The model was converted from its native TransCAD platform to CUBE which is the standard software CDM Smith uses for T&R analysis.
Model Calibration Approach	The model was calibrated to a 2019 base year using PC, SUT, and MUT average weekday daily traffic (AWDT) estimates. AWDT was calculated between major interchanges for all limited-access highways for use in calibration.
Model Trip Tables	PC, SUT, and MUT trip tables for the AM, midday, PM, and overnight time periods were used for the Phase 1 T&R. The PC trip table was split using an estimate of Michigan resident and non-residents for each origin-destination pair.
Resident versus Non-Resident	The split of the PC trip table into Michigan resident and non-resident trips was made using an analysis process that relied mostly on zonal AirSage cellular data that was obtained during the Michigan Statewide Model development. The AirSage data was supplemented by data from cross-border survey data between the U.S. and Canada.
Trip Table Growth	The trip table growth to the 2030 analysis year was based on the inherent growth in the latest Michigan Statewide Model.
Highway Improvements	The 2030 analysis year included assumed highway improvements related to the Gordie Howe International Bridge project, and the US 31 Extension to I-94 project in southwestern Michigan.
Inflation	An inflation rate was not assumed for the modeling. All modeling was performed in 2020$. Inflation will be applied during the financial analysis part of the overall study.
Value of Time (VOT)	PC VOT for the study was estimated based on on a weighted average VOT by county in Michigan. The VOT weighting used the number of trip origins corresponding to a specific county and number of trip destinations corresponding to a specific county for all trips in the trip table. The county-level Michigan VOT was estimated using a standard CDM Smith VOT estimation methodology that considers county-level household income, number of hours worked, number of households, and overall VOT perception weighting by trip type. The overall average Michigan PC VOT for all counties was $0.22/minute. The VOT for SUT at $0.40 per minute and MUT at $0.80 per minute was assumed to be the same for all trips and was based on commercial vehicle VOT used by CDM Smith in similar studies. (All VOTs in 2020$.)
Real increase in VOT	No increase in VOT above inflation was assumed. This is sometimes assumed in T&R studies in urban areas with significant real income growth over time.
Vehicle Operating Cost (VOC)	Assumed $0.19 per mile for PC, $0.51 per mile for SUT, and $0.67 per mile for MUT (all for 2030 in 2020$) based on a standard CDM Smith VOC analysis methodology.
Input Transponder Market Penetration Rate	For Phase 1 T&R it was assumed all vehicles have a transponder. Specific transponder adoption rates will be considered in later analysis phases.

Table 2-4: Phase 1 Other Study Assumptions

Assumption	Assumption Details
Gross Revenue	Gross toll revenue was estimated. Net revenue, which will consider tolling and roadway costs, will be analyzed later in the study.
Revenue Adjustments	No adjustments for leakage, fines, fees, or other income were applied.
Annualization Factors	Annualization factors by class were applied to convert the average weekday (assumed to be Monday through Thursday) model results to annual results. These were calculated using data from continuous traffic count stations in Michigan.
Ramp Up Factors	No ramp up factors were applied.
Long-Term Trends	• No major recession at the local or national level will occur to significantly disrupt the long-range pattern of future growth in traffic and revenue. • Over the long term, motor fuel will remain in adequate supply, with no unexpected or substantial increases in fuel prices other than those due to seasonal or inflationary causes, throughout the forecast period.
Acts of God	• No natural disasters will occur that could significantly alter travel patterns in and through the area. • No local, regional, or national emergency will arise that would abnormally restrict the use of motor vehicles.

2.2.1. Toll Collection Method

It is assumed that all-electronic tolling (AET) would be utilized for any new tolling projects in Michigan. The most common payment method with AET is by using an electronic toll collection transponder to pay tolls. Users would add funds or connect a payment method to automatically debit tolls as they pass under high-speed toll gantries. Under these assumptions, cash would not be accepted and toll booths requiring stopping to pay tolls would not be used. An AET collection system, as pictured in Figure 2-2, allows vehicles to travel at normal highway speeds while passing under overhead toll gantries, removing the need for drivers to stop and potentially queue at a toll booth. For the high-level Phase 1 analysis, it was assumed all drivers would have a transponder for payment. Future phases of this study will consider alternate AET payment types such as using license plate recognition technology to issue invoices to drivers without a transponder.

Figure 2-2: Example of All-Electronic Tolling Collection System

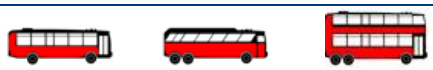
Source: Illinois State Toll Highway Authority

2.2.2. Vehicle Classes and Toll Rates

The Phase 1 T&R analysis utilized the FHWA vehicle classification system for the assumed toll rate classes. Table 2-4 details the 13 classes recognized by the FHWA, along with the classes used for this study. Passenger Car (PC) was assumed to be FHWA classes 1 through 4, Single-Unit Truck (SUT) was assumed to be classes 5 through 7, and Multi-Unit Truck (MUT) was assumed for the remaining FHWA classes. The FHWA vehicle classes were utilized as the best available classification data widely available in Michigan for the Phase 1 analysis. Future Phases may consider other vehicle classification systems that are commonly used in the tolling industry, for example classifications based only on the number of axles, based only on vehicle shape, or a combination of both.

The study classes were given an assumed toll multiplier for each toll rate scenario analyzed, as shown in Table 2-5. The three different tolling scenarios shown in this table are based on PC toll rates of $0.04, $0.06, and $0.08 per mile. These rates are similar to the lowest PC transponder per mile rates in the country, the PC transponder rates on the Ohio Turnpike, and the PC transponder rates on the Indiana Toll Road, respectively.

Table 2-5: Vehicle Classification

FHWA Class	Description	Image	Study Class
Class 1	Motorcycles		Passenger Car (PC)
Class 2	Passenger Cars and Light Trailers		
Class 3	Four Tire, Single Unit Vehicles		
Class 4	Buses		
Class 5	Two Axle, Six Tire, Single Unit Vehicles		Single-Unit Truck (SUT)
Class 6	Three Axles, Single Unit Vehicles		
Class 7	Four or More Axle, Single Unit Vehicles		
Class 8	Four or Less Axle, Single Trailer Vehicles		Multi-Unit Truck (MUT)
Class 9	5-Axle Tractor Semitrailer Vehicles		
Class 10	Six or More Axle, Single Trailer Vehicles		
Class 11	Five or Less Axle, Multi-Trailer Vehicles		
Class 12	Six Axle, Multi-Trailer Vehicles		
Class 13	Seven or More Axle, Multi-Trailer Vehicles		

Source: Federal Highway Administration

Table 2-6: Toll Rates by Vehicle Classification

Tolling Scenario	Passenger Car Toll Rate ($ per mile)	Single-Unit Truck Toll Rate ($ per mile)	Multi-Unit Truck Toll Rate ($ per mile)
$0.04	$0.04	$0.06	$0.16
$0.06	$0.06	$0.09	$0.24
$0.08	$0.08	$0.12	$0.32
Toll Muliplier vs. Passenger Car	1.0x	1.5x	4.0x

2.2.3. Roadway Improvements Already in Process

Upcoming roadway improvements that add significant new capacity or create new routes have the potential to alter future traffic patterns and impact revenue potential in a T&R study. Therefore, it is important to include the most recent major planned roadway improvements in the travel demand model. For this study, it was determined that that the US-31 Extension and the Gordie Howe International Crossing were two important future projects to consider in the Phase 1 analysis.

US-31

US-31 in southwestern Michigan is a 4-lane divided highway running approximately 24.5 miles from the Michigan-Indiana border near South Bend, Indiana to E Napier Ave in Benton Township, Michigan. By 2022, the roadway is expected to be extended approximately 2.4 miles to I-94 near Business I-94 in Benton Harbor. A full interchange with I-94 will be included with the project.

Gordie Howe International Crossing

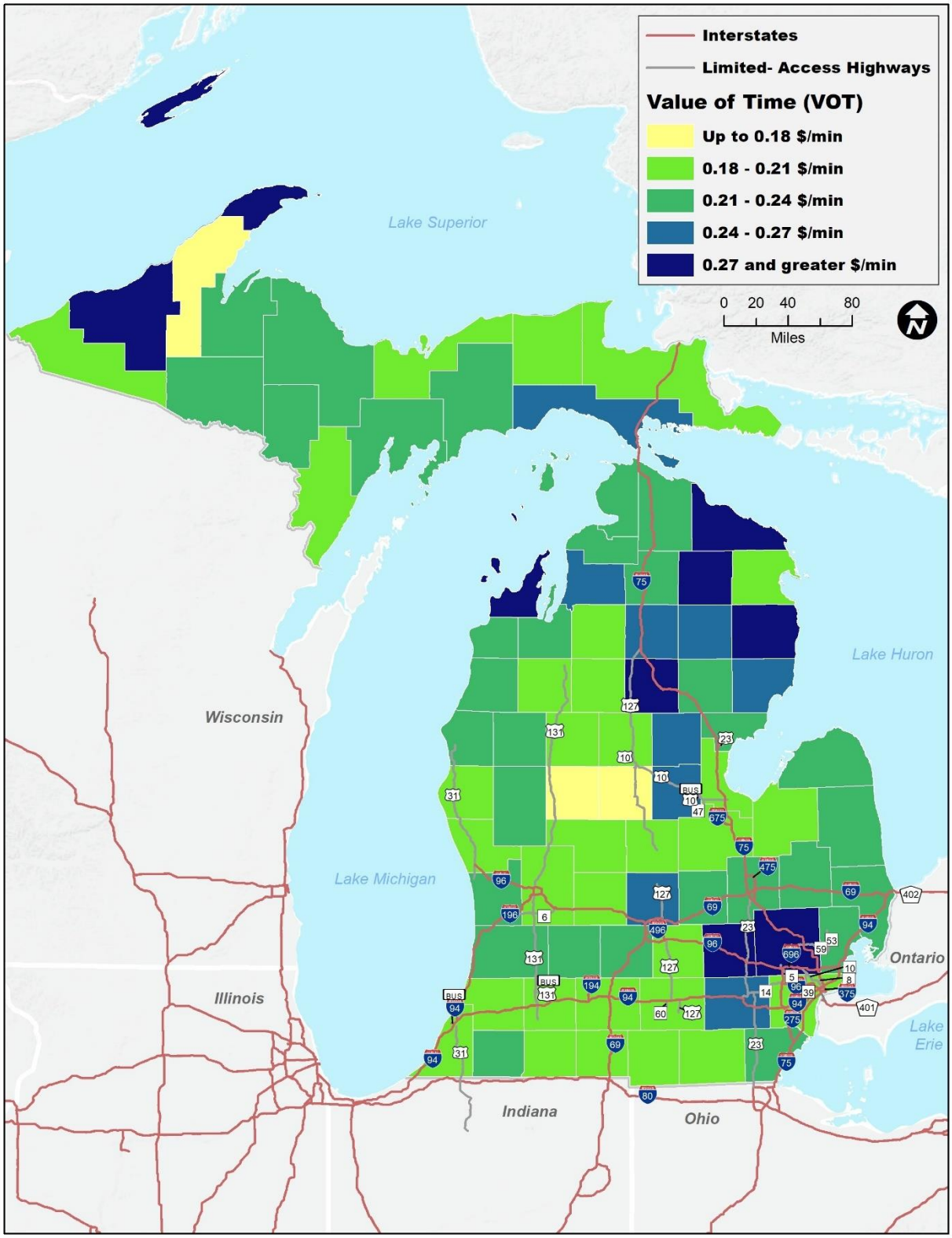
Currently, two international vehicular crossings are located between Detroit and Windsor, Ontario. The Detroit-Windsor Tunnel connects downtown Detroit to downtown Windsor, and the Ambassador Bridge connects Detroit to Windsor via I-75 in Michigan and Huron Church Road in Ontario. Construction is ongoing on a third crossing, the Gordie Howe International Bridge between I-75 in Michigan and Highway 401 in Ontario, located south of the existing Ambassador Bridge. The new bridge will include 6 vehicular travel lanes across the Detroit River, with additional customs lanes at both the United States and Canadian points of entry. The Gordie Howe Bridge is expected to reduce border crossing wait times upon its completion in 2024 and reduce travel times by providing a direct, highway to highway connection.

2.2.4. Value of Time (VOT)

Value of time (VOT) is a measure of how much an individual is willing to pay for a given amount of time savings and is an integral input to the travel demand modeling process. The higher the value of time the higher likelihood a user would choose to use a tolled route over a free route. For this study, VOT was calculated for passenger cars at the county level for the 83 counties in Michigan using a standard CDM Smith methodology that uses income and hours worked data from the U.S. Census Bureau and weighting factors by assumed trip type. Average passenger car VOT values were also calculated for neighboring states and Ontario for trips including external origins and/or destinations. Each county-level passenger car VOT value was then applied at the trip matrix level, weighted by the number of trips produced and attracted by each location. Passenger car VOT estimated for each Michigan county in 2020$ is presented in Figure 2-3. Note that the highest passenger car VOT is estimated in highly populated counties that have higher incomes and also in some less-populated counties with a significant share of seasonal and tourist employment as well as relatively older permanent residents. The statewide average VOT for passenger cars was $0.22 per minute ($13.20 per hour) in 2020$.

VOT for commercial vehicles was applied globally for all commercial vehicle trips. A VOT of $0.40 per minute ($24.00 per hour) was assumed for single unit trucks and $0.80 per minute ($48.00 per hour) for multi-unit trucks (all in 2020$). These values are similar to those typically used by CDM Smith on other T&R studies.

Figure 2-3: Michigan Passenger Car Value of Time in 2020 Dollars by County



2.2.5. Vehicle Operation Costs (VOC)

Vehicle Operating Costs (VOC) is the direct cost associated with vehicle ownership, in dollars per mile. Using standard methodologies also used on other T&R studies, CDM Smith calculated VOC for 2030 in 2020$ for PCs at $0.19 per mile, with SUT and MUT valued at $0.51 and $0.67, respectively. The VOC calculation considers the price of fuel and fuel efficiency to consider fuel-based operating costs, the price of tires, and other maintenance costs. Future estimated changes in fuel efficiency out to 2030 are considered in the estimate. Vehicle purchase costs, insurance costs, and costs for permits or licenses are not included. The sources of these data are the Energy Information Administration, American Automobile Association, the American Trucking Research Institute, and the National Household Travel Survey. VOC values for this study are presented in Table 2-7.

Table 2-7: 2030 Vehicle Operation Costs (VOC) by Vehicle Type in 2020 Dollars

Vehicle Type	VOC per Mile	VOC Factor vs. Passenger Car
Passenger Car	$0.19	1.0x
Single-Unit Truck	$0.51	2.7x
Multi-Unit Truck	$0.67	3.5x

2.2.6. Annualization Factors

Average weekday daily revenue from the T&R analysis results was “annualized” in Phase 1 based on data from continuous count data received from MDOT. The annualization process utilizes “annualization factors” which were calculated by dividing the total annual traffic by average weekday daily traffic at the different available continuous count locations. Average weekday in this study was based on average Monday to Thursday traffic. Typically, passenger car traffic has much higher annualization factors compared to commercial vehicles given that passenger cars typically have relatively higher weekend versus weekday traffic compared to commercial vehicles. Also routes or route segments that serve high levels of weekend tourist or vacationing traffic typically have higher annualization factors compared to routes or route segments that serve more weekday, commuter-based traffic. Annualization factors greater than 365 indicate higher weekend (Friday to Sunday) traffic, on average, compared to weekday (Monday to Thursday).

Annualization factors were assumed and applied for each route segment and for each vehicle class based on continuous count data from that segment or a similar segment. (More detail on the location of route segments can be found in Appendix A.) Annualization factors by vehicle class and averaged by route are shown in Table 2-8.

The annualization factors will be further refined in subsequent phases of this study using additional continuous count data more recently provided by MDOT.

Table 2-8: Interstate and US Route Annualization Factors by Roadway and Vehicle Type[1]

Roadway	Passenger Car (PC)	Single-Unit Trucks (SUT)	Multi-Unit Trucks (MUT)
69	381	306	300
75	383	303	291
94	364	289	289
94	367	270	277
96	361	297	289
194	332	285	283
196	366	296	290
275	353	300	296
375	344	288	285
475	353	301	297
496	339	291	283
675	354	301	297
696	334	293	286
10	365	310	291
BUSINESS 10	355	299	287
23	356	326	323
Connector 23	443	327	290
31	353	294	280
127	400	318	296
131	369	294	288
BUSINESS 131	332	285	283

[1]Based on countinous count data provided by MDOT

Table 2-9: Michigan Route Annualization Factors by Roadway and Vehicle Type[1]

Roadway	Passenger Car (PC)	Single-Unit Trucks (SUT)	Multi-Unit Trucks (MUT)
5	334	293	286
6	332	285	283
8	344	288	285
10	344	288	285
14	345	292	286
39	344	288	285
47	355	299	287
53	334	293	286
59	334	293	286
60	354	298	285

[1]Based on countinous count data provided by MDOT

3. Traffic & Revenue Model

The latest Michigan Statewide Model as of December 2020 was used as a basis for developing the tolling study model. The development of the tolling study model was conducted by CDM Smith. Tolling study team member Resource Systems Group supported mobilization with the Michigan Statewide Model and the production of various inputs for the tolling study model. This chapter provides a summary of the toll modeling approach and the calibration results.

3.1. Model Development

The model includes the entire contiguous United States as well as parts of the remainder of North America. The most refined network and zonal detail is focused in Michigan and the immediate surrounding areas of Wisconsin, Illinois, Indiana, Ohio, and Ontario. A total of 4,792 zones are included in the model, with 4,431 zones in Michigan. Figure 3-1 shows the entire network coverage area of the Michigan Statewide Model. Figure 3-2 shows the Michigan and surrounding area detail, with limited-access highways shown in purple.

Figure 3-1: Full Michigan Statewide Model Network Coverage

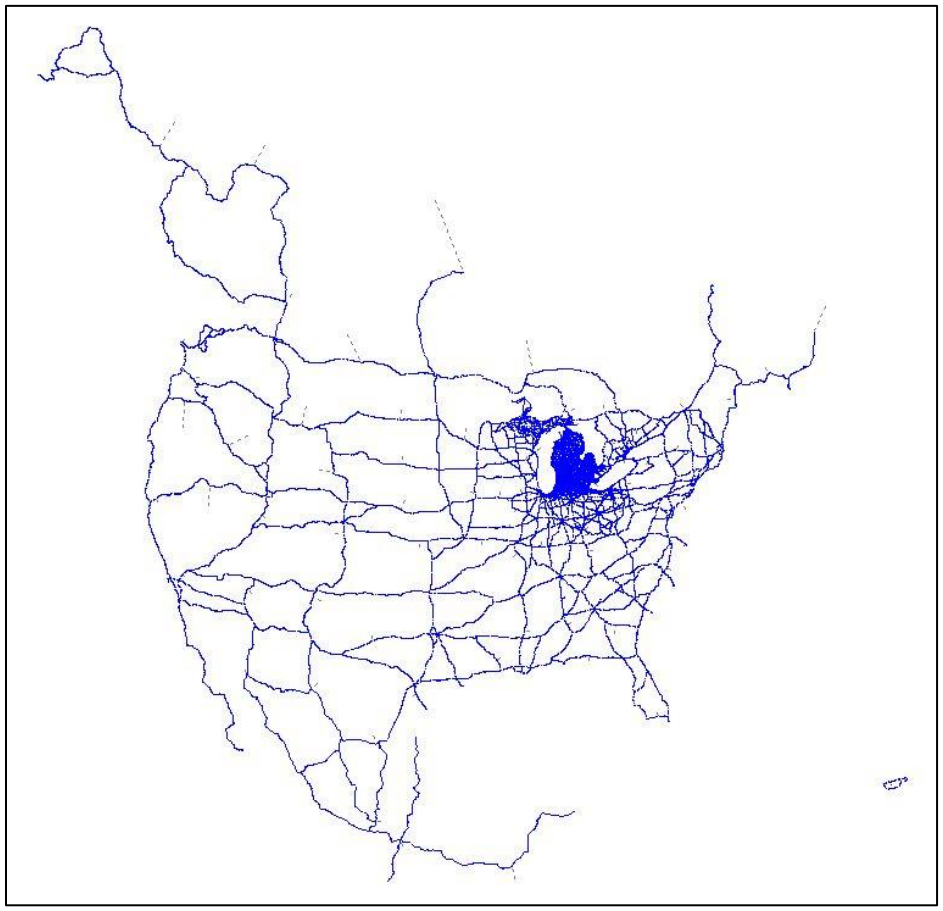
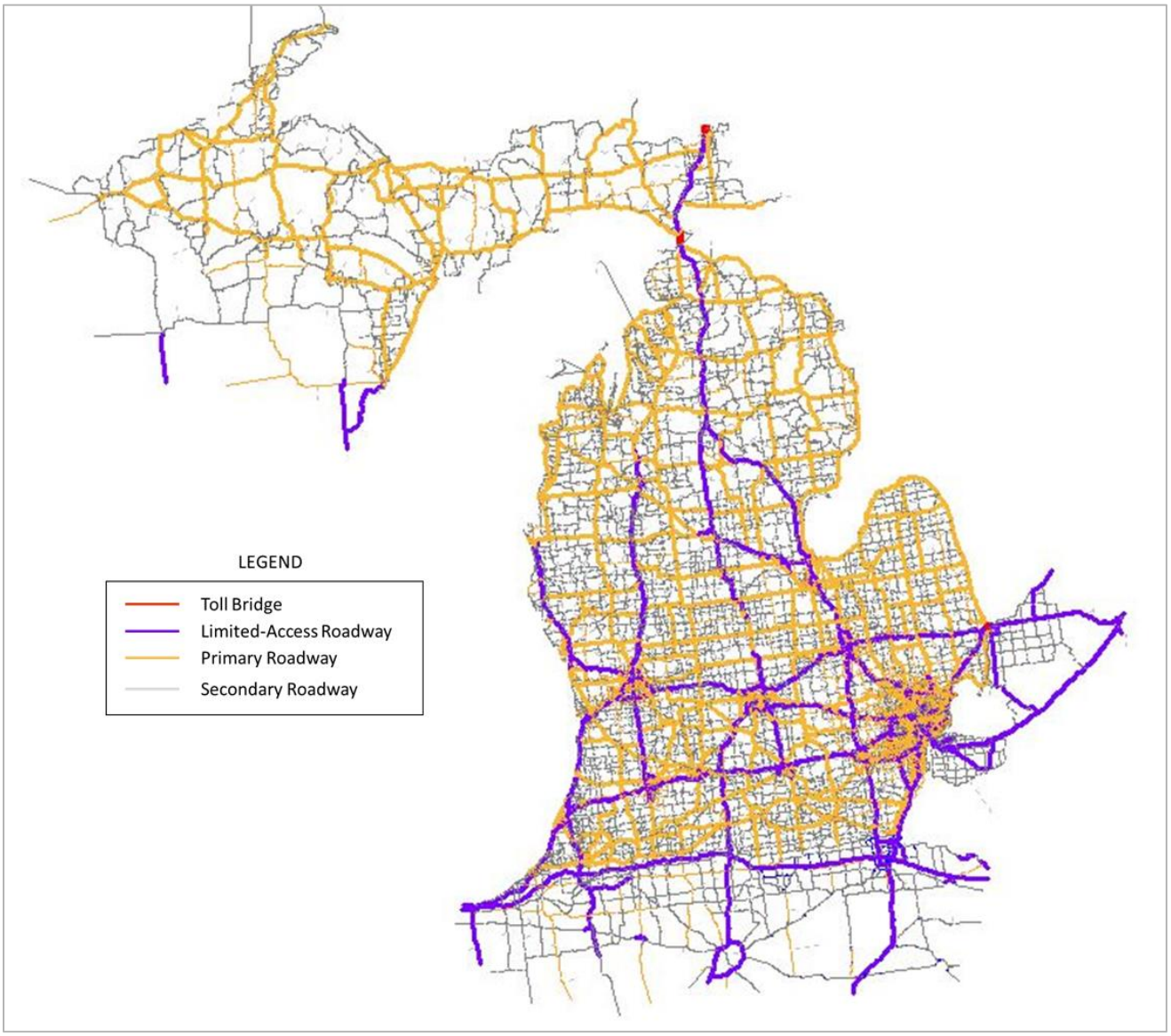


Figure 3-2: Michigan and Surrounding Area Network Coverage in the Michigan Statewide Model

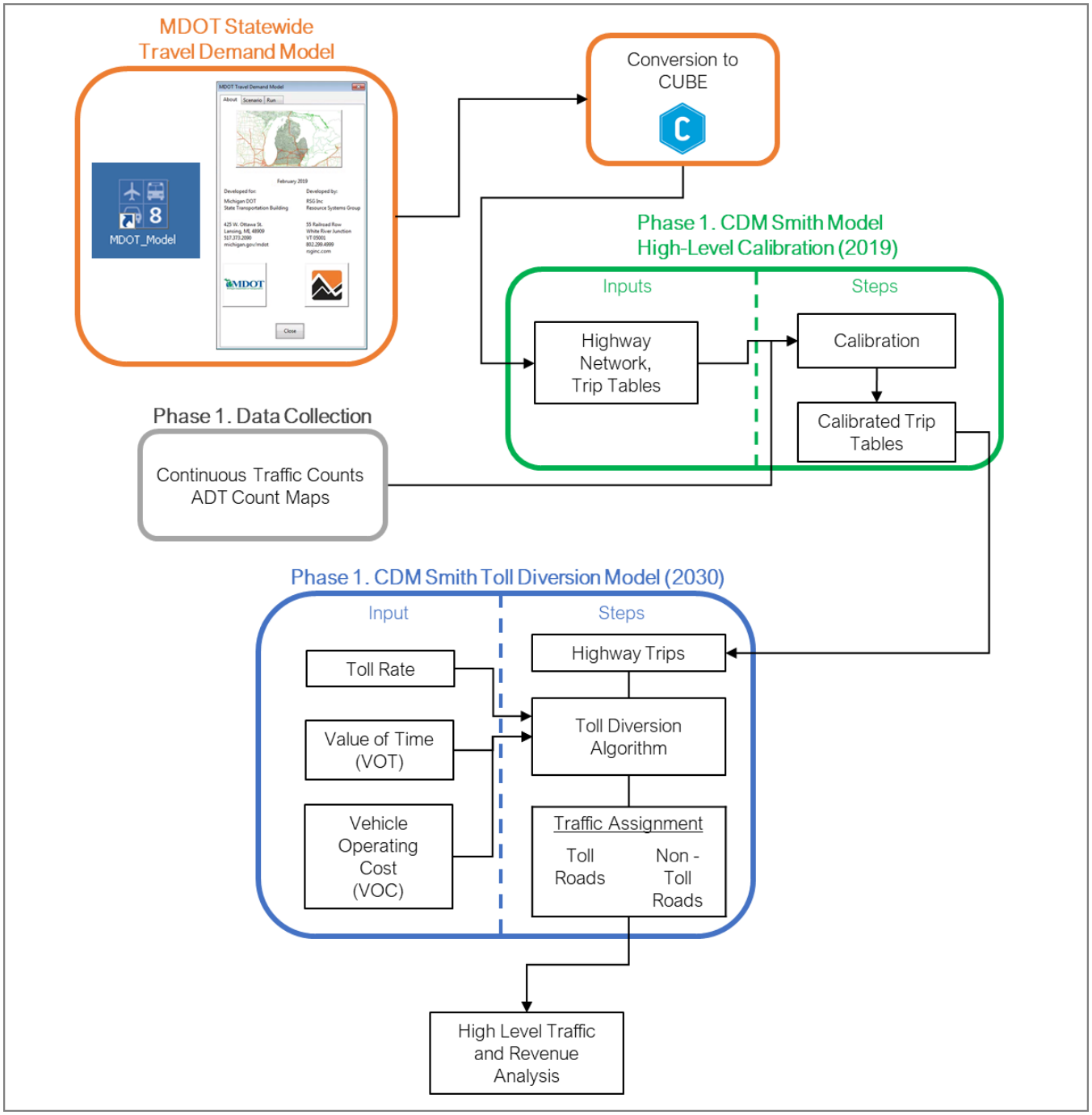


3.2. Overall Modeling Methodology

Figure 3-3 provides an overview of the modeling process. After obtaining the Michigan Statewide Model in its native TransCAD platform, the model was converted to CUBE which is the standard software CDM Smith uses for T&R analysis. The orange boxes represent obtaining the statewide model and this conversion process. The statewide model and traffic counts were the major inputs to the Phase 1 CDM Smith model high-level calibration process. The resulting calibrated trip tables were then used in the Phase 1 CDM Smith toll diversion model process.

The model input assumptions noted previously in Chapter 2, including toll rates, VOT, and VOC, were used as inputs to the toll diversion process. Several parts of the overall model process are discussed in more detail in subsequent sections.

Figure 3-3: Phase 1 Michigan Tolling Study Modeling Process



3.3. Conversion to CUBE

As shown previously, the Michigan Statewide Model was converted from its native TransCAD platform to CUBE which is the standard software CDM Smith uses for T&R analysis. Upon completion of this conversion, the base model was run in CUBE and several checks were performed to validate that the model results closely matched those from the TransCAD model. For example, Table 3-1 shows a comparison of the total model average daily vehicle miles traveled (in millions) for the CUBE model results compared to the TransCAD results. The comparison is shown for 2015 which corresponds to the base year used in the development of the Michigan Statewide Model. (Note that a more recent base year of 2019 was developed and used specifically for this study after the model conversion process from TransCAD to CUBE.) The comparison is broken down by facility type. Passenger car results showed only a -0.1 percent difference at a total level and were 1.0 percent higher for Interstates and freeways. Commercial vehicles were 2.8 percent higher in total and 2.4 percent for Interstates and freeways. These results were determined to be reasonable according to typical modeling industry standards to use as an input to the model calibration process.

Table 3-1: Comparison of Total Model Average Daily Vehicle Miles Traveled in Millions for 2015

Facility Type	Passenger Car	Commercial Vehicle	Total
Michigan Statewide Model TransCAD Results			
Interstate / Freeway (including ramps)	85.05	7.01	92.06
Principal Arterial	76.02	3.62	79.64
Minor Arterial	28.25	1.09	29.34
Other	21.32	0.68	22.01
Total	210.65	12.40	223.05
Michigan Statewide Model CUBE Results			
Interstate / Freeway (including ramps)	85.88	7.18	93.05
Principal Arterial	74.08	3.63	77.71
Minor Arterial	28.40	1.12	29.52
Other	22.18	0.82	23.00
Total	210.54	12.75	223.28
Percentage Difference: CUBE Results vs. TransCAD			
Interstate / Freeway (including ramps)	1.0%	2.4%	1%
Principal Arterial	-2.5%	0.3%	-2%
Minor Arterial	0.5%	3.2%	1%
Other	4.0%	19.2%	4%
Total	-0.1%	2.8%	0%

3.4. 2019 Model Calibration

3.4.1. Calibration Process

A model calibration process was conducted to verify that the model reasonably replicated recent traffic count data. The level of calibration conducted was appropriate for a "high-level" T&R analysis as was assumed for Phase 1 of this study. The year 2019 was used for calibration as the most recent full calendar year before COVID-19 impacted traffic levels. Pre-COVID-19 traffic levels were used for calibration given that significant traffic recovery has been already observed since the large losses in March to May 2020. It is likely that additional recovery will occur in the future before the assumed analysis year of 2030.

An origin-destination matrix estimation (ODME) process was utilized for the calibration. ODME uses an input seed matrix and target volumes. An algorithm is used to make adjustments to the seed matrix to best match target volumes in a series of assignment iterations. The seed matrices in the ODME process were interpolated statewide model 2019 trip tables. The count targets for the ODME process were estimated average annual weekday daily traffic (AAWDT) levels at most mainline segments of limited-access highways across the state. At this level of analysis, the base model factors used for converting daily traffic levels to the four model time periods were used rather than calibrating by time period. The AAWDT used in the ODME process were estimated using the following methodology:

1. The 2018 average annual daily traffic (AADT) for three different classes, passenger cars, single unit trucks, and multi-unit trucks, was provided by MDOT in a mapped format that aligned with the statewide model network links.
2. CDM Smith reviewed this data and identified locations on mainline segments of limited-access highways across the state suitable for use in the calibration process. Over 700 locations were used.
3. The 2018 data was adjusted to 2019 levels using 2018 to 2019 growth factors by roadway class and type provided by MDOT.
4. Data from continuous traffic count stations across the state was also provided by MDOT. CDM Smith used this data to calculate AADT to AWDT conversion factors by vehicle class that were applied to the AADT data. The factors were applied by route and route segment by determining the AADT to AWDT factor that would best apply to a given location based on review of all the available factor locations.
5. The resulting AWDT volumes by class at the over 700 locations were used in the ODME process.

A visualization of the AWDT (total of both directions) used as the target volume input to the ODME process is in Figure 3-4 and Figure 3-5, for Michigan statewide and Southeastern Michigan, respectively. The AWDT is presented on a scale with lower volumes in green, transitioning to the highest volumes in red. The highest weekday volumes throughout the state are found near the state's large urban centers. The Detroit metro region includes bi-directional average weekday volumes of over 140,000 on several highway segments. The lowest highway volumes in the state can be found in northern lower Michigan and in the Upper Peninsula.

Figure 3-4: 2019 Average Weekday Daily Traffic on Michigan Limited-Access Highways

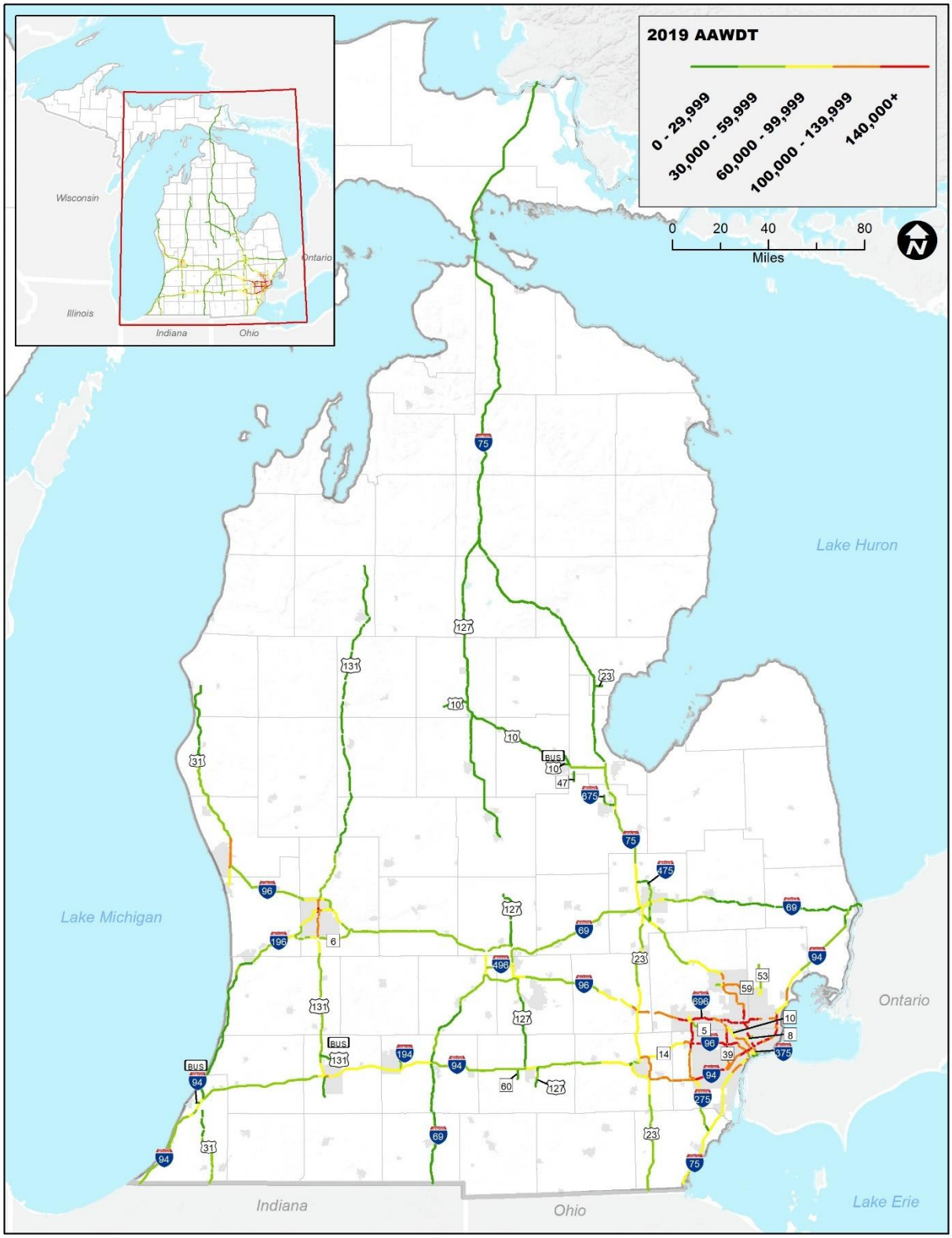
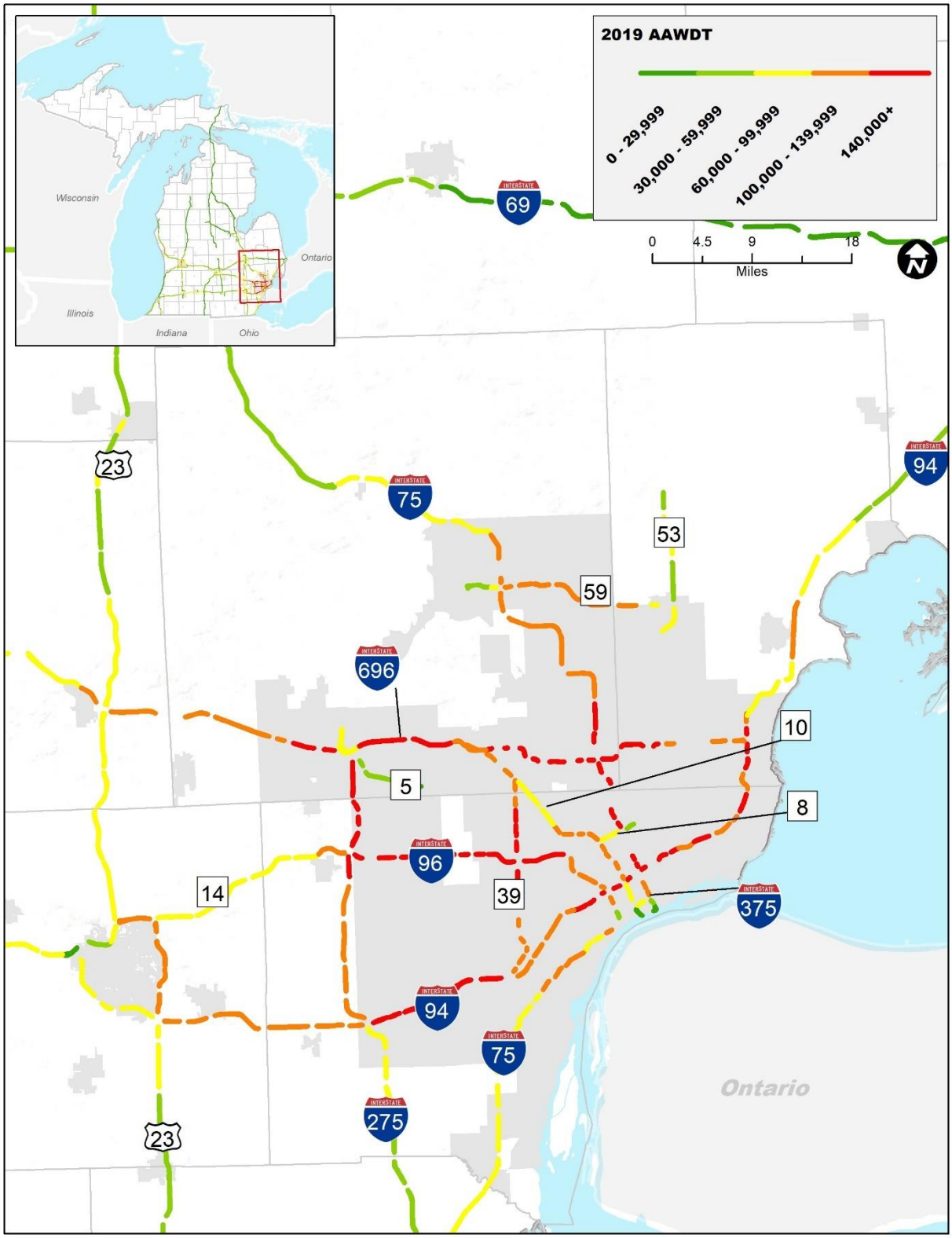


Figure 3-5: 2019 Average Weekday Daily Traffic on Southeastern Michigan Limited-Access Highways



3.4.2. Calibration Results

Various checks were performed on the calibration results to verify that the ODME process did not cause underlying model issues. One check was to compare the overall model trip length distribution before and after ODME. The results of this comparison are shown in **Figure 3-6** on a daily basis. As shown, there were only minor changes in trip length distribution as a result of the ODME process. Based on this and other checks, the ODME process was determined to function appropriately for calibration of the study model.

Figure 3-6: Model Daily Trip Length Distribution Before and After ODME

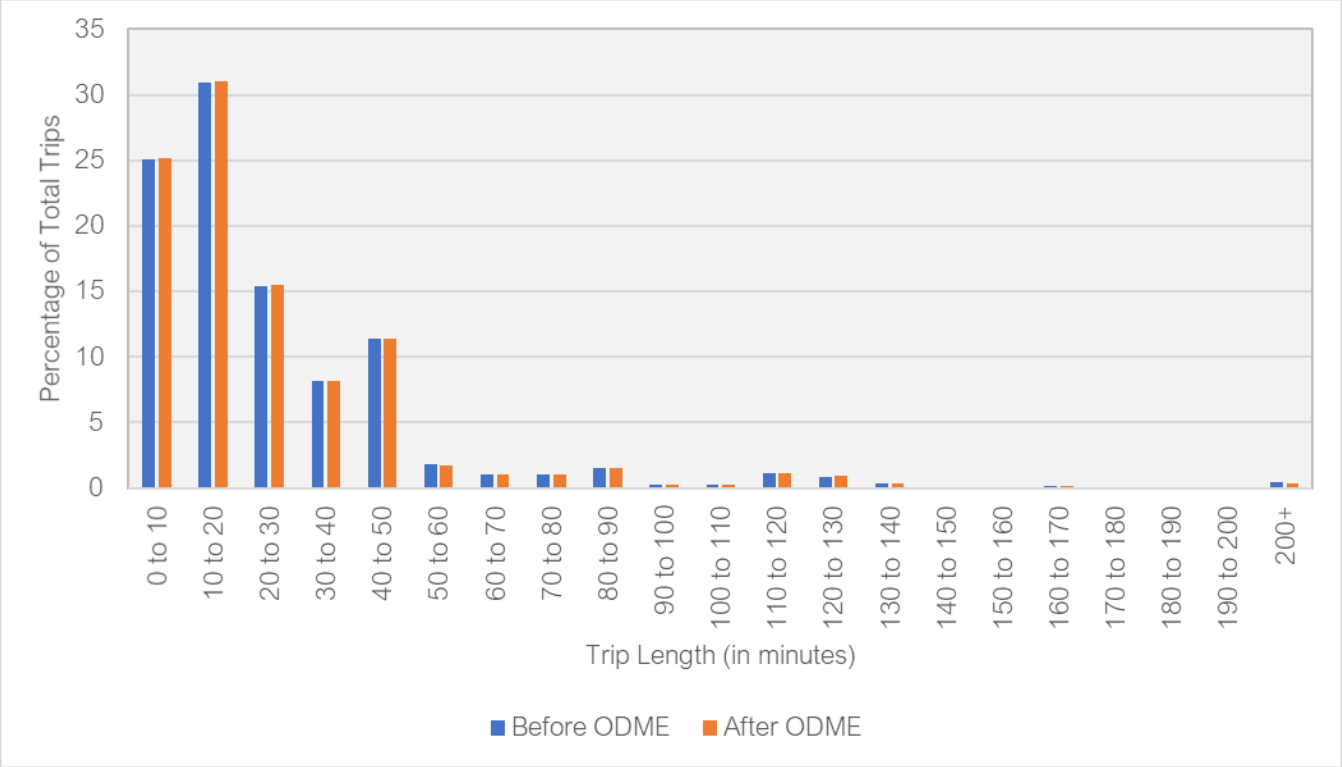


Table 3-2 and **Table 3-3** present the calibration results for all routes in the study. The "Number of Count Locations" in the third column are the mainline segments on limited-access highways described previously in the calibration AWDT estimation methodology. The total sum of all the AWDT volumes at all the count locations are provided in the "Sum of Counts at All Locations" columns. The final four columns show the absolute and percent differences between the base model and actual AWDT (before ODME) and the absolute and percent differences between the calibrated model and actual AWDT. General improvement between the differences in the base model vs. actual and the calibrated model vs. actual is shown resulting from the ODME process. Considering the calibrated model differences, generally only routes less than five miles are calibrated to outside a ten percent threshold. Larger discrepancies are on small volume roadways or short distance roadways, such as I-375 (Detroit) or US-23 Connector (Standish). It can also be observed that longer distance routes over 100 miles are all calibrated to within five percent of actuals. These calibration results were determined by the study team to be appropriate for the Phase 1 high-level T&R analysis.

Table 3-2: Interstate and U.S. Route 2019 Calibration Results

Route	Miles	Number of Count Locations	Sum of Counts at All Locations			Difference Base Model vs. Actual		Difference Calibrated Model vs. Actual	
			Actual	Base Model	Calibrated Model				
I-69	203.5	58	2,045,620	2,015,172	1,994,375	-30,448	-1%	-51,245	-3%
I-75	395.5	117	6,977,861	7,692,603	7,213,285	714,742	10%	235,424	3%
I-94	270.9	120	10,177,440	10,518,764	10,017,752	341,324	3%	-159,688	-2%
I-94	1.0	1	4,534	4,490	4,173	-44	-1%	-361	-8%
I-96	184.6	76	6,685,004	6,719,914	6,650,977	34,910	1%	-34,027	-1%
I-194	3.4	3	80,896	74,000	75,540	-6,896	-9%	-5,356	-7%
I-196	80.7	30	1,489,462	1,416,504	1,400,774	-72,958	-5%	-88,688	-6%
I-275	30.6	12	991,914	857,156	928,491	-134,758	-14%	-63,423	-6%
I-375	1.2	2	54,270	92,403	85,337	38,133	70%	31,067	57%
I-475	16.8	12	432,668	434,715	431,913	2,047	0%	-755	0%
I-496	11.5	10	639,719	577,478	596,335	-62,241	-10%	-43,384	-7%
I-675	7.8	4	110,704	98,034	100,865	-12,670	-11%	-9,839	-9%
I-696	29.1	21	3,261,080	3,587,545	3,413,455	326,465	10%	152,375	5%
US-10	57.9	20	471,651	424,519	465,622	-47,132	-10%	-6,029	-1%
BUS US-10	2.6	2	39,509	36,376	40,368	-3,133	-8%	859	2%
US-23	90.4	37	2,384,066	2,231,559	2,276,717	-152,507	-6%	-107,349	-5%
Connector US-23	1.9	1	4,705	9,508	6,508	4,803	102%	1,803	38%
US-31	91.0	30	839,541	766,693	799,778	-72,848	-9%	-39,763	-5%
US-127	152.6	45	1,119,409	1,068,638	1,092,736	-50,771	-5%	-26,673	-2%
US-131	168.8	53	3,030,836	2,887,155	2,912,567	-143,681	-5%	-118,269	-4%
BUSINESS US-131	4.3	2	14,095	15,601	14,715	1,506	11%	620	4%

Table 3-3: Michigan Route 2019 Calibration Results

Route	Miles	Number of Count Locations	Sum of Counts at All Locations			Difference Base Model vs. Actual		Difference Calibrated Model vs. Actual	
			Actual	Base Model	Calibrated Model				
5	7.6	4	211,196	219,656	214,264	8,460	4%	3,068	1%
6	18.2	7	347,849	317,567	328,088	-30,282	-9%	-19,761	-6%
8	2.7	4	294,700	381,640	327,535	86,940	30%	32,835	11%
10	18.2	19	1,873,252	2,257,732	2,074,471	384,480	21%	201,219	11%
14	20.2	10	679,775	655,454	675,195	-24,321	-4%	-4,580	-1%
39	13.9	13	1,705,007	1,617,309	1,622,529	-87,698	-5%	-82,478	-5%
47	4.1	2	14,342	12,511	12,513	-1,831	-13%	-1,829	-13%
53	11.7	4	245,960	231,167	233,080	-14,793	-6%	-12,880	-5%
59	13.2	10	942,278	868,516	884,631	-73,762	-8%	-57,647	-6%
60	3.0	2	32,994	20,686	22,184	-12,308	-37%	-10,810	-33%

3.5. Future Year 2030 Model Development

The future year networks for the 2030 model included the assumed future network improvements documented previously in this report. Base 2030 trip tables for the toll study were developed assuming the future network improvements were in place. The base 2030 trip tables were then adjusted by applying the same differences between the base and adjusted (calibrated) 2019 model trip tables on an absolute difference basis.

Table 3-4 shows the resulting average weekday VMT for the 2019 and toll free 2030 model results by facility type and class. The average annual percent change is also shown. The overall total average annual percent growth of 0.4 percent is similar to recent observed historical growth trends as discussed previously in Chapter 2.

3.6. Toll Diversion and Traffic and Revenue Analysis

CDM Smith applied a toll diversion assignment process for the different tolling scenarios within the CUBE study model. The process includes an iterative equilibrium-based assignment process that builds tolled and toll-free paths between different origins and destinations and determines the market share of toll trips. A cost ratio approach is used to determine the market share of trips. This equation is shown in Figure 3-7.

The results of the toll diversion assignment were exported to excel where a post-processing adjustment was applied to the results to account for any remaining differences between the estimated actual 2019 AWDT volumes and 2019 AWDT calibrated model results. Following this adjustment, the average weekday gross revenue was calculated using the assumed toll rates and the annual gross revenue was calculated using the assumed annualization factors.

Table 3-4: Average Weekday Vehicle Miles Traveled, 2019 to 2030 Toll-Free Model (in millions)

Facility Type	Passenger Car	Commercial Vehicle	Total
2019 Model Results			
Interstate / Freeway (including ramps)	83.11	9.17	92.28
Principal Arterial	74.50	3.94	78.45
Minor Arterial	28.88	1.23	30.11
Other	47.36	1.97	49.34
Total	233.86	16.31	250.16
2030 Toll-Free Model Results			
Interstate / Freeway (including ramps)	85.84	10.77	96.61
Principal Arterial	77.31	4.24	81.55
Minor Arterial	30.27	1.29	31.57
Other	49.56	2.07	51.63
Total	242.99	18.37	261.36
2019 to 2030 Average Annual Percent Change			
Interstate / Freeway (including ramps)	0.3%	1.5%	0.4%
Principal Arterial	0.3%	0.7%	0.4%
Minor Arterial	0.4%	0.5%	0.4%
Other	0.4%	0.4%	0.4%
Total	0.3%	1.1%	0.4%

Figure 3-7: Cost Ratio Equation from Toll Assignment

$$CR = \frac{Toll\ Path\ Cost}{Free\ Path\ Cost}$$

$$CR = \frac{VOT * Tt + OC * Dt + Toll}{VOT * Tf + OC * Df}$$

where,

CR = Cost Ratio
VOT = Value of Time
Tt = Travel Time on Toll Path
Dt = Distance traveled on Toll Path
Tf = Travel Time on Free Path
Df = Distance traveled on Free Path
$Toll$ = Toll Cost
OC = Vehicle Operating Cost

4. Phase 1 High-Level Results

This chapter presents a summary of the Phase 1 statewide T&R analysis conducted for model year 2030, for passenger car per mile rate scenarios of $0.04 per mile, $0.06 per mile, and $0.08 per mile. In addition to the total route-level results provided in this chapter, T&R results were divided into a number of smaller segments within the 31 routes. A map of these smaller T&R segments along with segment-level T&R results tables can be found in Appendix A.

4.1. 2030 Traffic and Revenue Results

Phase 1, high-level 2030 T&R results are broken down for the 31 routes, by class, and for each of the three toll rate scenarios as follows:

1. Average weekday vehicle miles traveled estimates are in Table 4-1 and Table 4-2. This shows the total amount of travel for all vehicles by route for an average weekday.
2. Average weekday daily traffic for both directions of travel estimates are in Table 4-3 and Table 4-4. These results are calculated as the average weekday vehicle miles traveled for the route divided by route centerline mileage. This shows the amount of traffic for an average bi-directional cross section of the route.
3. Annual gross revenue (in 2020$) estimates are in Table 4-5 and Table 4-6. Gross revenue estimates do not account for any costs, such as for toll collection and roadway maintenance, that would be required to operate a toll facility.
4. Annual gross revenue per mile (in 2020$) estimates are in Table 4-7 and Table 4-8. This is the total annual revenue divided by the route centerline mileage.

For each set of results, the first table includes Interstate route and U.S. route results. The second table includes Michigan route results, sub-total results by route type, and grand total results. Traffic levels decline and revenue increases with the progressively higher toll rate per mile scenarios. Some factors driving higher gross revenue on different routes in Table 4-5 and Table 4-6 are higher average traffic levels (see Table 4-3 and Table 4-4), relatively higher shares of commercial vehicles which have higher toll rates, and longer route length.

4.2. Diversion

Percent traffic diversion associated with each of the roadways and toll rates analyzed can be found in Table 4-9 and Table 4-10. Diversion increases as toll rates increase and is estimated to be generally around 10 percent for the longest routes (I-69, I-75, I-94, I-96, US 127, and US 131) at the $0.04 per mile scenario, 15 percent for the longest routes at the $0.06 per mile scenario, and 20 percent for the longest routes at the $0.08 per mile scenario. Considering all routes of at least 10 miles in length, diversion was estimated to range from 4 percent to 12 percent for the $0.04 per mile toll rate scenario, 6 percent to 18 percent for the $0.06 per mile toll rate scenario, and 9 to 24 percent for the $0.08 per mile toll rate scenario. In addition to toll rates, diversion rates between different segments and routes can be impacted in this analysis by other factors including the proximity, speed, and capacity of alternative routes and the value of time of drivers using the segment or route.

Table 4-1: 2030 Interstate and U.S. Route Average Weekday Vehicle Miles Traveled (in thousands)

Route	Miles	$0.04 Per Mile Scenario			$0.06 Per Mile Scenario			$0.08 Per Mile Scenario		
		Passenger Car	Commer-cial Vehicle	Total	Passenger Car	Commer-cial Vehicle	Total	Passenger Car	Commer-cial Vehicle	Total
69	203.5	4,498	1,396	5,895	4,206	1,308	5,514	3,916	1,221	5,136
75	395.5	12,491	1,921	14,412	11,883	1,819	13,702	11,258	1,716	12,974
94	271.0	14,016	3,141	17,157	13,367	2,987	16,354	12,691	2,829	15,520
94	1.0	5	0	6	5	0	5	5	0	5
96	184.5	10,698	1,230	11,928	10,224	1,168	11,392	9,736	1,104	10,841
194	3.4	80	3	83	76	3	80	73	3	76
196	80.7	2,384	602	2,985	2,270	580	2,850	2,156	559	2,715
275	30.6	1,918	255	2,173	1,837	244	2,082	1,752	234	1,986
375	1.2	36	1	37	34	1	35	31	1	32
475	16.8	457	31	488	425	29	454	396	27	423
496	11.5	589	29	618	561	28	589	533	27	560
675	7.8	148	7	154	140	6	146	133	6	139
696	29.1	4,058	247	4,304	3,963	242	4,205	3,860	237	4,097
10	57.9	958	91	1,049	902	87	988	844	82	926
BUSINESS 10	2.6	41	2	44	39	2	41	37	2	39
23	90.5	4,498	669	5,167	4,325	636	4,962	4,140	603	4,742
Connector 23	1.9	8	1	9	7	1	8	6	1	7
31	94.0	1,698	196	1,893	1,612	188	1,801	1,529	181	1,710
127	152.6	2,164	279	2,442	2,027	266	2,293	1,891	254	2,145
131	168.8	4,675	771	5,446	4,434	747	5,181	4,195	723	4,918
BUSINESS 131	4.2	22	1	24	20	1	22	19	1	20

Table 4-2: 2030 Michigan Route and Total Average Weekday Vehicle Miles Traveled (in thousands)

Route	Miles	$0.04 Per Mile Scenario			$0.06 Per Mile Scenario			$0.08 Per Mile Scenario		
		Passenger Car	Commer-cial Vehicle	Total	Passenger Car	Commer-cial Vehicle	Total	Passenger Car	Commer-cial Vehicle	Total
5	7.6	339	7	346	317	6	323	297	6	303
6	18.2	698	102	800	652	96	749	608	91	699
8	2.7	129	9	138	119	8	127	109	7	116
10	18.2	1,601	38	1,639	1,535	36	1,571	1,466	34	1,500
14	20.2	1,333	128	1,461	1,279	122	1,401	1,224	115	1,339
39	13.9	1,504	51	1,555	1,456	50	1,506	1,404	48	1,452
47	4.1	51	2	53	49	2	51	47	2	49
53	11.7	580	30	610	561	29	590	543	28	571
59	13.2	1,161	43	1,204	1,118	41	1,159	1,073	39	1,113
60	3.0	41	3	44	39	3	42	38	3	41
Total Interstate	1,236.6	51,378	8,863	60,241	48,992	8,416	57,408	46,539	7,964	54,503
Total U.S. Route	572.6	14,063	2,010	16,073	13,366	1,929	15,295	12,660	1,847	14,507
Total M-Route	112.8	7,437	412	7,849	7,127	393	7,520	6,810	374	7,184
Grand Total	1,922.0	72,878	11,285	84,163	69,485	10,738	80,223	66,009	10,186	76,195

Table 4-3: 2030 Interstate and U.S. Route Average Weekday Daily Traffic (in thousands, total of both directions)

Route	Miles	$0.04 Per Mile Scenario			$0.06 Per Mile Scenario			$0.08 Per Mile Scenario		
		Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total
I-69	203.5	22.1	6.9	29.0	20.7	6.4	27.1	19.2	6.0	25.2
I-75	395.5	31.6	4.9	36.4	30.0	4.6	34.6	28.5	4.3	32.8
I-94	271.0	51.7	11.6	63.3	49.3	11.0	60.4	46.8	10.4	57.3
I-94	1.0	5.5	0.3	5.8	5.2	0.2	5.4	4.9	0.2	5.1
I-96	184.5	58.0	6.7	64.6	55.4	6.3	61.7	52.8	6.0	58.8
I-194	3.4	23.3	1.0	24.3	22.4	1.0	23.4	21.5	0.9	22.5
I-196	80.7	29.5	7.5	37.0	28.1	7.2	35.3	26.7	6.9	33.6
I-275	30.6	62.7	8.3	71.0	60.1	8.0	68.0	57.3	7.6	64.9
I-375	1.2	30.1	0.7	30.8	27.9	0.7	28.6	26.0	0.7	26.6
I-475	16.8	27.1	1.8	29.0	25.2	1.7	26.9	23.5	1.6	25.1
I-496	11.5	51.1	2.5	53.7	48.7	2.5	51.1	46.3	2.4	48.6
I-675	7.8	18.8	0.8	19.7	17.9	0.8	18.7	17.0	0.8	17.7
I-696	29.1	139.5	8.5	147.9	136.2	8.3	144.5	132.7	8.1	140.8
US-10	57.9	16.5	1.6	18.1	15.6	1.5	17.1	14.6	1.4	16.0
BUS US-10	2.6	15.9	0.8	16.7	15.1	0.8	15.9	14.3	0.8	15.0
US-23	90.5	49.7	7.4	57.1	47.8	7.0	54.8	45.8	6.7	52.4
Connector US-23	1.9	4.1	0.7	4.8	3.7	0.6	4.3	3.3	0.6	3.9
US-31	94.0	18.1	2.1	20.1	17.1	2.0	19.1	16.3	1.9	18.2
US-127	152.6	14.2	1.8	16.0	13.3	1.7	15.0	12.4	1.7	14.1
US-131	168.8	27.7	4.6	32.3	26.3	4.4	30.7	24.8	4.3	29.1
BUS US-131	4.2	5.2	0.3	5.6	4.8	0.3	5.1	4.4	0.3	4.7

Table 4-4: 2030 Michigan Route and Total Average Weekday Daily Traffic (in thousands, total of both directions)

Route	Miles	$0.04 Per Mile Scenario			$0.06 Per Mile Scenario			$0.08 Per Mile Scenario		
		Passenger Car	Commer-cial Vehicle	Total	Passenger Car	Commer-cial Vehicle	Total	Passenger Car	Commer-cial Vehicle	Total
5	7.6	44.7	0.9	45.6	41.9	0.8	42.7	39.2	0.8	40.0
6	18.2	38.3	5.6	43.8	35.8	5.3	41.1	33.3	5.0	38.3
8	2.7	48.5	3.2	51.7	44.7	2.8	47.6	41.0	2.7	43.7
10	18.2	87.9	2.1	90.0	84.3	2.0	86.3	80.5	1.9	82.4
14	20.2	66.0	6.3	72.3	63.3	6.0	69.3	60.6	5.7	66.3
39	13.9	108.2	3.7	111.8	104.7	3.6	108.3	101.0	3.5	104.4
47	4.1	12.4	0.5	12.9	12.0	0.5	12.4	11.5	0.4	12.0
53	11.7	49.7	2.6	52.3	48.1	2.5	50.6	46.6	2.4	49.0
59	13.2	87.8	3.3	91.1	84.6	3.1	87.7	81.2	3.0	84.2
60	3.0	13.5	1.0	14.5	13.0	1.0	14.0	12.7	0.9	13.6
Total Interstate	1,236.6	41.5	7.2	48.7	39.6	6.8	46.4	37.6	6.4	44.1
Total U.S. Route	572.6	24.6	3.5	28.1	23.3	3.4	26.7	22.1	3.2	25.3
Total M-Route	112.8	65.9	3.7	69.6	63.2	3.5	66.7	60.4	3.3	63.7
Grand Total	1,922.0	37.9	5.9	43.8	36.2	5.6	41.7	34.3	5.3	39.6

Table 4-5: 2030 Interstate and U.S. Route Total Annual Gross Revenue (in thousands of constant 2020$)

Route	Miles	$0.04 Per Mile Scenario			$0.06 Per Mile Scenario			$0.08 Per Mile Scenario		
		Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total
I-69	203.5	$ 68,535	$ 63,224	$131,758	$ 96,103	$ 88,589	$184,693	$119,267	$109,844	$229,111
I-75	395.5	191,774	80,619	272,393	273,392	114,038	387,429	344,989	142,857	487,845
I-94	271.0	204,318	133,309	337,627	292,105	189,529	481,634	369,516	238,400	607,916
I-94	1.0	78	6	84	110	8	119	138	10	148
I-96	184.5	154,810	48,731	203,541	221,736	68,965	290,701	281,288	86,368	367,657
I-194	3.4	1,057	119	1,176	1,523	172	1,696	1,951	222	2,173
I-196	80.7	34,935	25,845	60,780	49,864	37,341	87,205	63,110	47,893	111,003
I-275	30.6	26,411	9,741	36,152	37,944	13,964	51,908	48,242	17,736	65,979
I-375	1.2	501	27	529	698	40	738	865	50	916
I-475	16.8	6,294	1,100	7,394	8,776	1,538	10,314	10,896	1,918	12,813
I-496	11.5	7,995	991	8,986	11,419	1,434	12,853	14,468	1,843	16,310
I-675	7.8	2,031	231	2,262	2,896	330	3,226	3,657	418	4,075
I-696	29.1	54,204	9,401	63,605	79,418	13,814	93,232	103,122	18,047	121,169
US-10	57.9	13,994	3,762	17,756	19,746	5,370	25,116	24,622	6,794	31,416
BUS US-10	2.6	589	82	672	839	121	960	1,059	157	1,216
US-23	90.5	64,022	31,112	95,133	92,343	44,234	136,577	117,841	55,555	173,396
Connector US-23	1.9	137	52	188	185	72	258	222	90	312
US-31	94.0	23,971	7,614	31,585	34,144	10,959	45,103	43,159	14,008	57,167
US-127	152.6	34,593	11,569	46,163	48,624	16,517	65,141	60,503	20,952	81,455
US-131	168.8	69,187	30,441	99,627	98,312	44,076	142,387	123,873	56,653	180,527
BUS US-131	4.2	296	50	346	403	71	474	492	90	583

Table 4-6: 2030 Michigan Route and Total Annual Gross Revenue (in thousands of constant 2020$)

Route	Miles	$0.04 Per Mile Scenario			$0.06 Per Mile Scenario			$0.08 Per Mile Scenario		
		Passenger Car	Commercial Vehicle	Total	Passenger Car	Commer-cial Vehicle	Total	Passenger Car	Commer-cial Vehicle	Total
5	7.6	$ 4,526	$ 208	$ 4,734	$ 6,351	$ 275	$ 6,626	$ 7,933	$ 369	$ 8,301
6	18.2	9,278	3,882	13,161	13,014	5,477	18,491	16,166	6,844	23,010
8	2.7	1,781	289	2,071	2,461	379	2,840	3,008	484	3,493
10	18.2	22,044	1,240	23,284	31,708	1,776	33,484	40,369	2,221	42,590
14	20.2	18,409	5,246	23,655	26,493	7,464	33,957	33,803	9,390	43,193
39	13.9	20,713	1,656	22,369	30,077	2,409	32,485	38,668	3,110	41,778
47	4.1	722	69	791	1,047	101	1,148	1,344	132	1,476
53	11.7	7,750	1,034	8,784	11,250	1,495	12,745	14,515	1,910	16,424
59	13.2	15,505	1,445	16,950	22,402	2,062	24,463	28,677	2,616	31,293
60	3.0	579	120	699	839	175	1,014	1,085	228	1,313
Total Interstate	1,236.6	752,945	373,344	1,126,289	1,075,985	529,764	1,605,748	1,361,509	665,607	2,027,116
Total U.S. Route	572.6	206,788	84,681	291,470	294,595	121,420	416,016	371,771	154,299	526,070
Total M-Route	112.8	101,307	15,191	116,498	145,642	21,613	167,254	185,567	27,304	212,871
Grand Total	1,922.0	1,061,040	473,216	1,534,257	1,516,222	672,797	2,189,018	1,918,848	847,210	2,766,057

Table 4-7: 2030 Interstate and U.S. Route Annual Gross Revenue Per Mile (in thousands of constant 2020$)

Route	Miles	$0.04 Per Mile Scenario			$0.06 Per Mile Scenario			$0.08 Per Mile Scenario		
		Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total
I-69	203.5	$ 337	$ 311	$ 647	$ 472	$ 435	$ 908	$ 586	$ 540	$ 1,126
I-75	395.5	485	204	689	691	288	980	872	361	1,234
I-94	271.0	754	492	1,246	1,078	699	1,778	1,364	880	2,244
I-94	1.0	81	6	88	115	9	123	143	10	154
I-96	184.5	839	264	1,103	1,202	374	1,575	1,524	468	1,992
I-194	3.4	310	35	345	447	51	498	573	65	638
I-196	80.7	433	320	753	618	463	1,081	782	593	1,376
I-275	30.6	863	318	1,182	1,240	457	1,697	1,577	580	2,157
I-375	1.2	414	23	437	577	33	610	715	42	757
I-475	16.8	374	65	439	521	91	612	647	114	761
I-496	11.5	694	86	780	991	125	1,116	1,256	160	1,416
I-675	7.8	259	29	289	370	42	412	467	53	520
I-696	29.1	1,863	323	2,186	2,730	475	3,204	3,544	620	4,164
US-10	57.9	242	65	307	341	93	434	425	117	543
BUS US-10	2.6	226	32	257	321	46	368	406	60	466
US-23	90.5	708	344	1,052	1,021	489	1,510	1,303	614	1,917
Connector US-23	1.9	73	27	100	99	38	137	118	48	166
US-31	94.0	255	81	336	363	117	480	459	149	608
US-127	152.6	227	76	302	319	108	427	396	137	534
US-131	168.8	410	180	590	582	261	843	734	336	1,069
BUS US-131	4.2	70	12	82	95	17	112	116	21	137

Table 4-8: 2030 Michigan Route and Total Annual Gross Revenue Per Mile (in thousands of constant 2020$)

Route	Miles	$0.04 Per Mile Scenario			$0.06 Per Mile Scenario			$0.08 Per Mile Scenario		
		Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total
5	7.6	$ 598	$ 28	$ 625	$ 839	$ 36	$ 875	$ 1,047	$ 49	$ 1,096
6	18.2	509	213	721	713	300	1,014	886	375	1,261
8	2.7	668	109	777	923	142	1,065	1,129	182	1,310
10	18.2	1,210	68	1,278	1,741	97	1,838	2,216	122	2,338
14	20.2	911	260	1,171	1,312	370	1,681	1,673	465	2,138
39	13.9	1,489	119	1,608	2,163	173	2,336	2,780	224	3,004
47	4.1	176	17	193	255	25	280	328	32	360
53	11.7	665	89	753	965	128	1,093	1,245	164	1,408
59	13.2	1,173	109	1,283	1,695	156	1,851	2,170	198	2,368
60	3.0	191	40	231	277	58	335	359	75	434
Total Interstate	1,236.6	609	302	911	870	428	1,299	1,101	538	1,639
Total U.S. Route	572.6	361	148	509	514	212	727	649	269	919
Total M-Route	112.8	898	135	1,033	1,291	192	1,483	1,645	242	1,887
Grand Total	1,922.0	552	246	798	789	350	1,139	998	441	1,439

Table 4-9: 2030 Interstate and U.S. Route Diversion Results

Route	Miles	$0.04 Per Mile Scenario			$0.06 Per Mile Scenario			$0.08 Per Mile Scenario		
		Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total	Passenger Car	Commercial Vehicle	Total
I-69	203.5	12%	10%	11%	18%	16%	17%	24%	21%	23%
I-75	395.5	9%	8%	9%	13%	13%	13%	18%	18%	18%
I-94	271.0	9%	13%	10%	13%	17%	14%	18%	21%	18%
I-94	1.0	11%	15%	11%	16%	21%	17%	22%	27%	22%
I-96	184.5	8%	9%	8%	12%	14%	12%	16%	19%	17%
I-194	3.4	5%	0%	5%	9%	4%	9%	13%	7%	12%
I-196	80.7	9%	7%	8%	13%	10%	12%	17%	14%	17%
I-275	30.6	7%	7%	7%	11%	11%	11%	15%	15%	15%
I-375	1.2	12%	40%	13%	19%	43%	19%	24%	46%	25%
I-475	16.8	12%	11%	12%	19%	17%	18%	24%	22%	24%
I-496	11.5	9%	6%	8%	13%	9%	13%	17%	12%	17%
I-675	7.8	10%	9%	10%	14%	13%	14%	19%	18%	19%
I-696	29.1	4%	3%	4%	6%	5%	6%	9%	7%	9%
US-10	57.9	11%	9%	11%	16%	13%	16%	22%	17%	21%
BUS US-10	2.6	10%	5%	9%	14%	8%	14%	19%	11%	18%
US-23	90.5	7%	10%	7%	10%	14%	11%	14%	19%	15%
Connector US-23	1.9	16%	11%	15%	24%	16%	23%	32%	21%	31%
US-31	94.0	9%	10%	9%	13%	13%	13%	18%	17%	18%
US-127	152.6	11%	8%	11%	17%	12%	16%	22%	16%	22%
US-131	168.8	9%	7%	9%	14%	10%	13%	18%	13%	18%
BUS US-131	4.2	16%	10%	16%	24%	15%	23%	30%	19%	30%

Table 4-10: 2030 Michigan Route Diversion Results

Route	Miles	$0.04 Per Mile Scenario			$0.06 Per Mile Scenario			$0.08 Per Mile Scenario		
		Passenger Car	Commer-cial Vehicle	Total	Passenger Car	Commer-cial Vehicle	Total	Passenger Car	Commer-cial Vehicle	Total
5	7.6	11%	25%	12%	17%	31%	17%	22%	30%	23%
6	18.2	12%	11%	12%	18%	16%	18%	24%	21%	23%
8	2.7	13%	19%	13%	19%	27%	20%	26%	31%	26%
10	18.2	7%	18%	8%	11%	22%	11%	15%	26%	15%
14	20.2	7%	11%	7%	10%	16%	11%	14%	20%	15%
39	13.9	5%	4%	5%	8%	6%	8%	11%	9%	11%
47	4.1	7%	5%	7%	10%	7%	10%	14%	9%	13%
53	11.7	6%	6%	6%	9%	9%	9%	12%	13%	12%
59	13.2	7%	8%	7%	10%	12%	10%	14%	15%	14%
60	3.0	6%	6%	6%	10%	8%	10%	12%	11%	12%

4.3. Michigan Resident Share

As listed previously in the model input assumptions table in Chapter 2, an estimate of the share of Michigan resident versus non-resident for passenger cars was made and built into the study model. The model input estimate was made using previously obtained AirSage travel data in collaboration with tolling study partner Resource Systems Group. Table 4-11 and Table 4-12 show the resulting share of Michigan residents for traffic and revenue by toll rate scenario. The shares range from 81 percent to 99 percent by route, with Interstate and U.S. routes that are at or near the Indiana, Ohio, or Ontario borders showing the lowest Michigan resident shares for passenger cars. I-69, I-94, I-196, and US 23 have Michigan resident shares less than 90 percent. I-75, I-275, and I-375 have resident shares right at 90 percent.

Table 4-11: 2030 Interstate and U.S. Route Share of Passenger Car Traffic and Revenue for Michigan Residents

Route	Miles	$0.04 Per Mile Scenario		$0.06 Per Mile Scenario		$0.08 Per Mile Scenario	
		Passenger Car Weekday VMT	Passenger Car Annual Revenue	Passenger Car Weekday VMT	Passenger Car Annual Revenue	Passenger Car Weekday VMT	Passenger Car Annual Revenue
69	203.5	82%	82%	82%	82%	81%	81%
75	395.5	90%	90%	90%	90%	90%	90%
94	271.0	87%	86%	87%	86%	87%	86%
94	1.0	95%	95%	95%	95%	95%	95%
96	184.5	96%	96%	96%	96%	96%	96%
194	3.4	98%	98%	98%	98%	98%	98%
196	80.7	88%	87%	88%	87%	88%	87%
275	30.6	90%	90%	90%	90%	90%	90%
375	1.2	90%	90%	90%	90%	90%	90%
475	16.8	96%	96%	96%	96%	96%	96%
496	11.5	98%	98%	98%	98%	98%	98%
675	7.8	98%	98%	98%	98%	98%	98%
696	29.1	99%	99%	99%	99%	99%	99%
10	57.9	97%	96%	97%	96%	97%	97%
BUSINESS 10	2.6	98%	98%	98%	98%	98%	98%
23	90.5	87%	87%	88%	87%	88%	87%
Connector 23	1.9	97%	97%	97%	97%	97%	97%
31	94.0	92%	92%	92%	92%	92%	92%
127	152.6	96%	96%	96%	96%	96%	96%
131	168.8	96%	96%	96%	96%	96%	96%
BUSINESS 131	4.2	98%	98%	99%	99%	99%	99%

Table 4-12: 2030 Michigan Route Share of Passenger Car Traffic and Revenue for Michigan Residents

Route	Miles	$0.04 Per Mile Scenario		$0.06 Per Mile Scenario		$0.08 Per Mile Scenario	
		Passenger Car Weekday VMT	Passenger Car Annual Revenue	Passenger Car Weekday VMT	Passenger Car Annual Revenue	Passenger Car Weekday VMT	Passenger Car Annual Revenue
5	7.6	98%	98%	98%	98%	98%	98%
6	18.2	96%	96%	96%	96%	96%	96%
8	2.7	99%	99%	99%	99%	99%	99%
10	18.2	98%	98%	98%	98%	98%	98%
14	20.2	93%	93%	93%	93%	93%	93%
39	13.9	97%	97%	97%	97%	97%	97%
47	4.1	99%	99%	99%	99%	99%	99%
53	11.7	99%	99%	99%	99%	99%	99%
59	13.2	99%	99%	99%	99%	99%	99%
60	3.0	98%	98%	98%	98%	98%	98%

4.4. Results Summaries

This section shows graphs and ranking summaries for the $0.06 Per Mile Scenario. This includes graphs for average weekday vehicle miles traveled, average weekday daily traffic, annual gross revenue, annual gross revenue per mile, diversion, and percent non-resident in Figure 4.1 to Figure 4.6. The results included are intended to show the relative differences between different routes. Results for the $0.06 Per Mile Scenario are shown as this is the middle of the three toll rate scenarios analyzed.

Table 4-13 is also provided which includes a ranking of the top 20 routes in terms of total annual gross revenue and total annual gross revenue per mile for the $0.06 Per Mile Scenario. The top four total annual gross revenue routes are the longest mileage Interstates route of I-94, I-75, I-96, and I-69. The top four annual gross revenue per mile routes are shorter southeastern Michigan routes I-696 (Walter P. Reuther Freeway), M-39 (Southfield Freeway), M-59 (Veterans Memorial Freeway), and M-10 (John C. Lodge Freeway).

Figure 4-1: 2030 Average Weekday Vehicle Miles Traveled by Route for $0.06 Per Mile Scenario

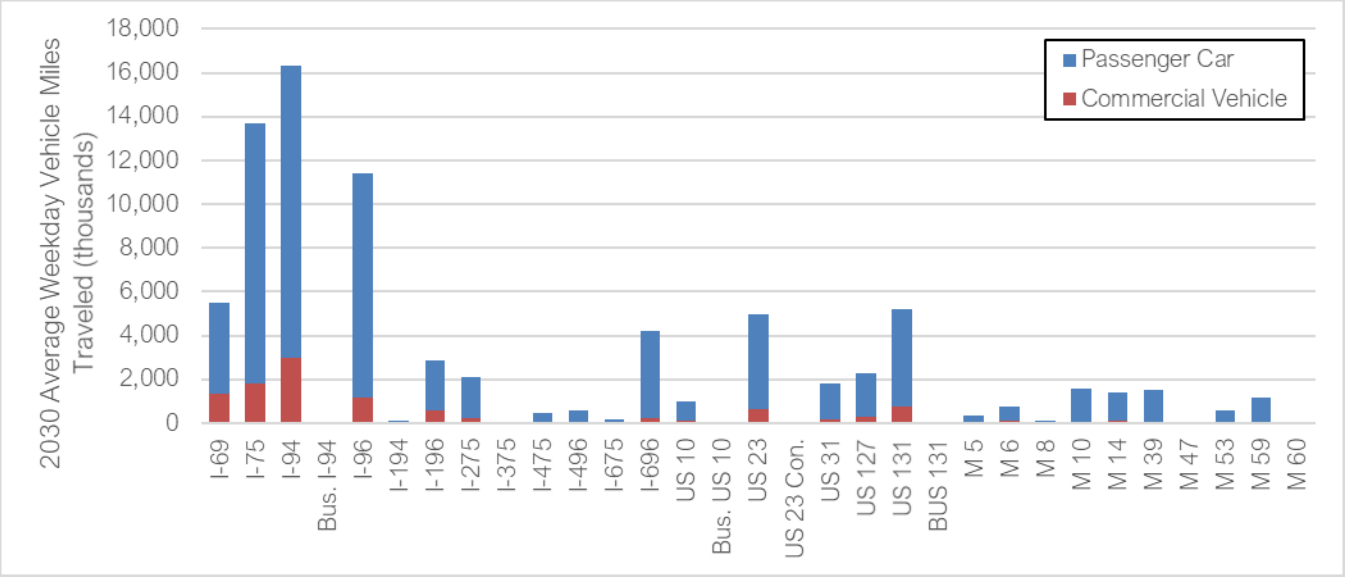


Figure 4-2: 2030 Average Weekday Daily Traffic by Route for $0.06 Per Mile Scenario

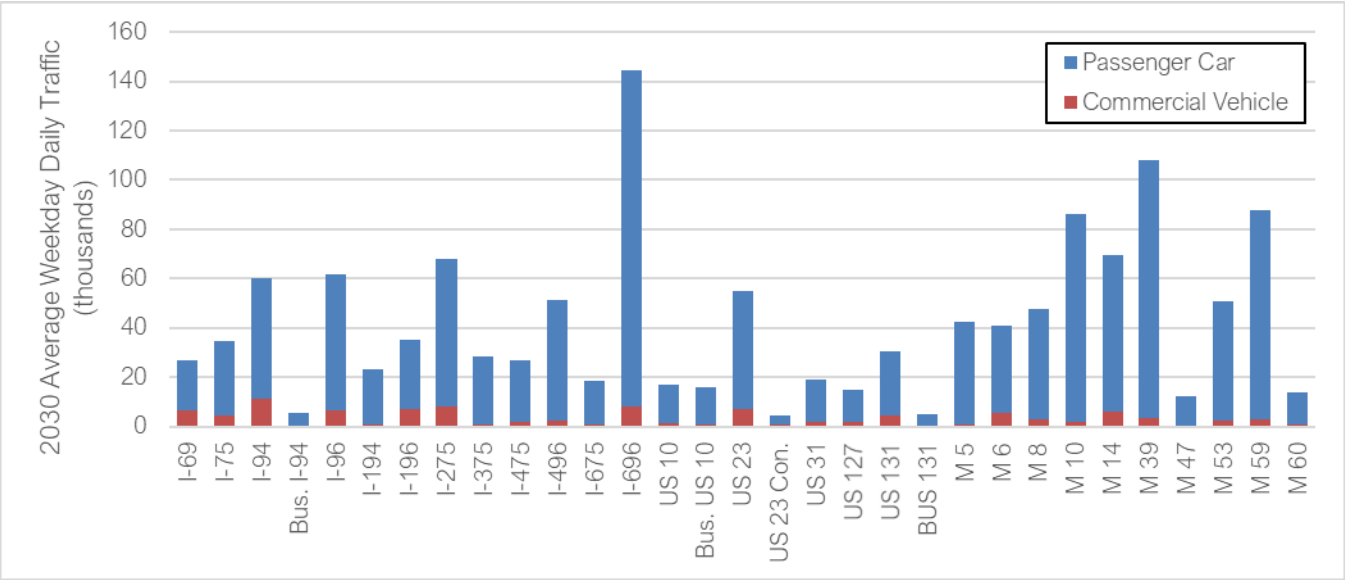


Figure 4-3: 2030 Annual Gross Revenue by Route for $0.06 Per Mile Scenario

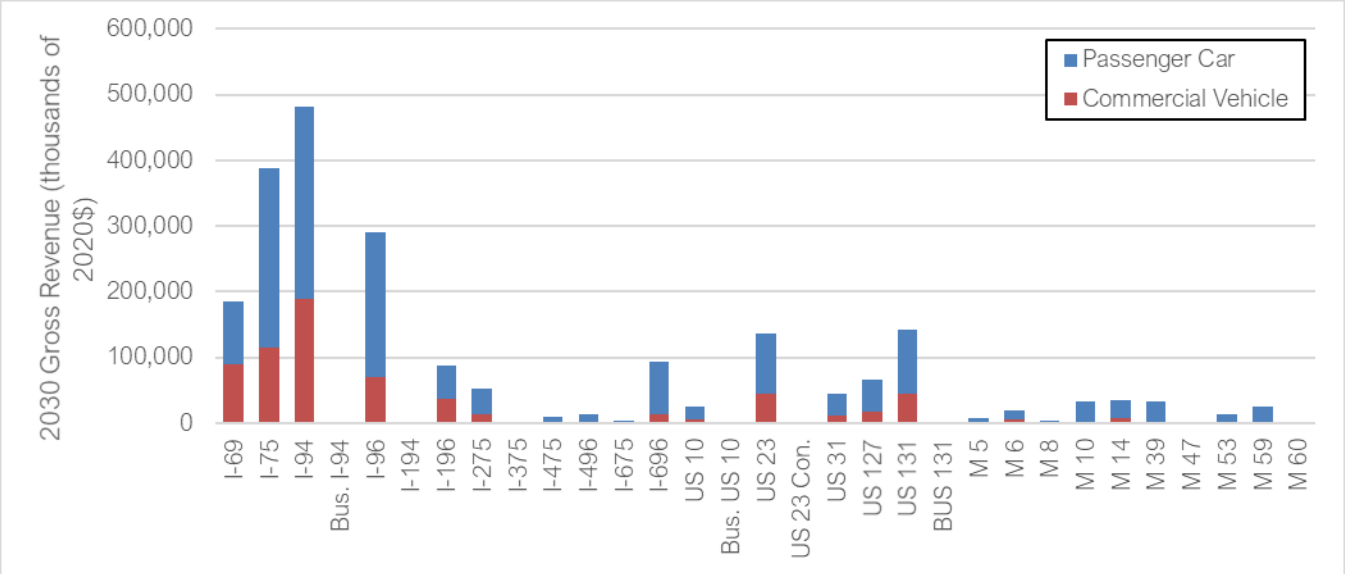


Figure 4-4: 2030 Annual Gross Revenue Per Mile by Route for $0.06 Per Mile Scenario

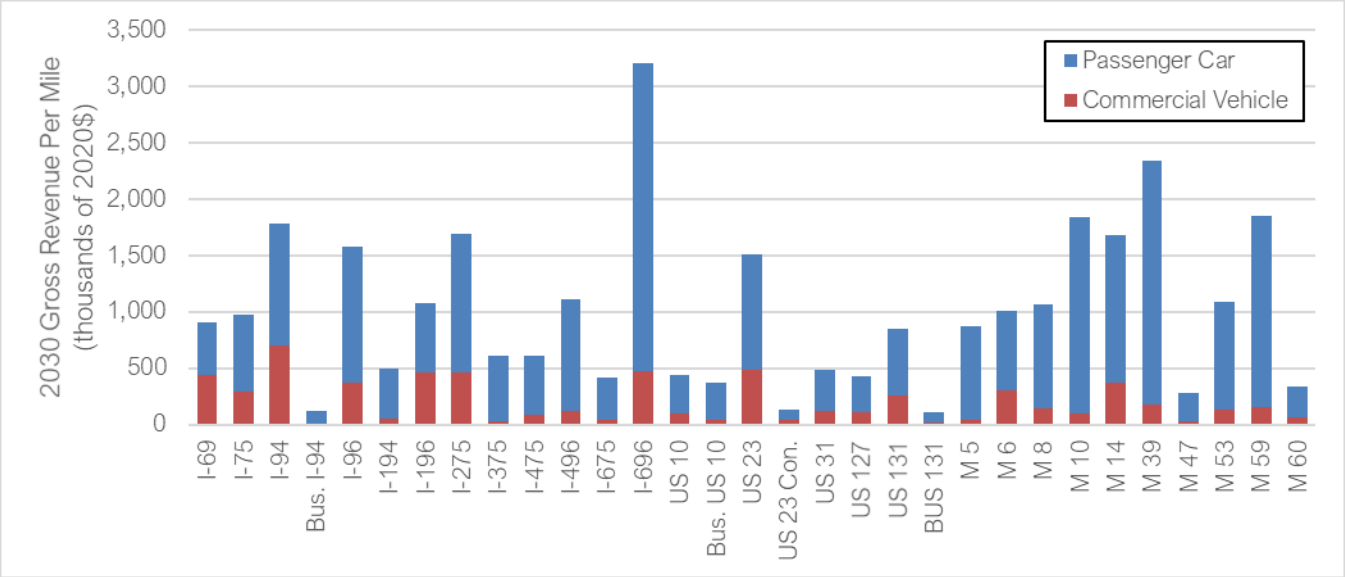


Figure 4-5: 2030 Diversion Rate by Route for $0.06 Per Mile Scenario

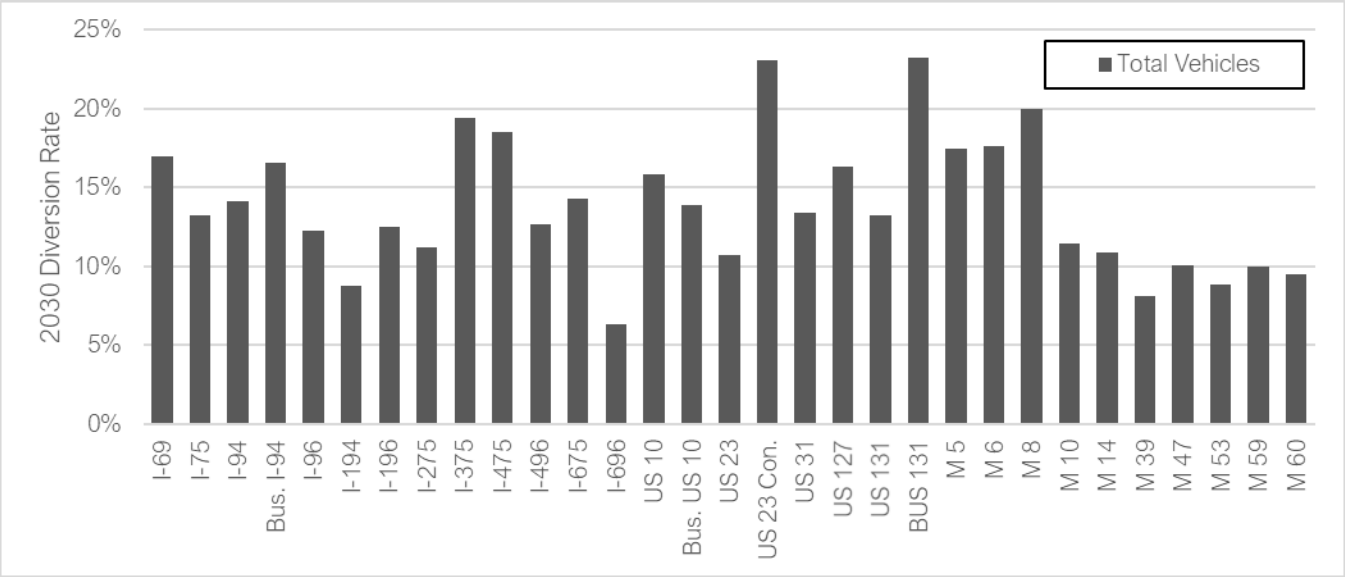


Figure 4-6: 2030 Share of Passenger Car Non-Resident by Route for $0.06 Per Mile Scenario

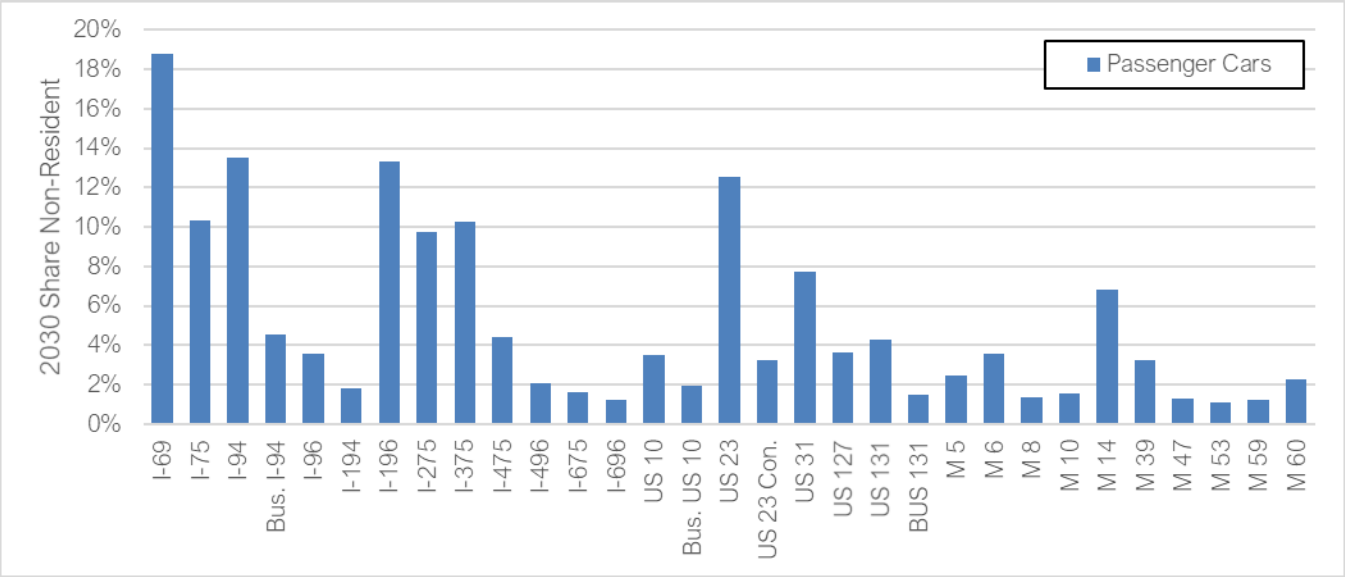


Table 4-13: Top 20 Ranking of 2030 Annual Gross Revenue and Annual Gross Revenue Per Mile (2020$) for $0.06 Per Mile Scenario (in thousands)

Annual Gross Revenue					Annual Gross Revenue Per Mile				
Route	Rank by Total Rev.	Passenger Car	Commer-cial Vehicle	Total	Route	Rank by Total Rev. Per Mile	Passenger Car	Commer-cial Vehicle	Total
94	1	$ 292,105	$ 189,529	$ 481,634	696	1	$ 2,730	$ 475	$ 3,204
75	2	273,392	114,038	387,429	39	2	2,163	173	2,336
96	3	221,736	68,965	290,701	59	3	1,695	156	1,851
69	4	96,103	88,589	184,693	10	4	1,741	97	1,838
131	5	98,312	44,076	142,387	94	5	1,078	699	1,778
23	6	92,343	44,234	136,577	275	6	1,240	457	1,697
696	7	79,418	13,814	93,232	14	7	1,312	370	1,681
196	8	49,864	37,341	87,205	96	8	1,202	374	1,575
127	9	48,624	16,517	65,141	23	9	1,021	489	1,510
275	10	37,944	13,964	51,908	496	10	991	125	1,116
31	11	34,144	10,959	45,103	53	11	965	128	1,093
14	12	26,493	7,464	33,957	196	12	618	463	1,081
10	13	31,708	1,776	33,484	8	13	923	142	1,065
39	14	30,077	2,409	32,485	6	14	713	300	1,014
10	15	19,746	5,370	25,116	75	15	691	288	980
59	16	22,402	2,062	24,463	69	16	472	435	908
6	17	13,014	5,477	18,491	5	17	839	36	875
496	18	11,419	1,434	12,853	131	18	582	261	843
53	19	11,250	1,495	12,745	475	19	521	91	612
475	20	8,776	1,538	10,314	375	20	577	33	610

4.5. Disclaimer

CDM Smith used currently-accepted professional practices and procedures in the development of the traffic and revenue estimates in this report. However, as with any forecast, it should be understood that differences between forecasted and actual results may occur, as caused by events and circumstances beyond the control of the forecasters. In formulating the estimates, CDM Smith reasonably relied upon the accuracy and completeness of information provided (both written and oral) by MDOT. CDM Smith also relied upon the reasonable assurances of independent parties and is not aware of any material facts that would make such information misleading.

CDM Smith made qualitative judgments related to several key variables in the development and analysis of the traffic and revenue estimates that must be considered as a whole; therefore, selecting portions of any individual result without consideration of the intent of the whole may create a misleading or incomplete view of the results and the underlying methodologies used to obtain the results. CDM Smith gives no opinion as to the value or merit of partial information extracted from this report.

All estimates and projections reported herein are based on CDM Smith's experience and judgment and on a review of information obtained from multiple agencies, including MDOT. These estimates and projections may not be indicative of actual or future values and are therefore subject to substantial uncertainty. Certain variables such as future developments, economic cycles, global pandemics and impacts related to advances in automotive technology etc. cannot be predicted with certainty and may affect the estimates or projections expressed in this report, such that CDM Smith does not specifically guarantee or warrant any estimate or projection contained within this report.

While CDM Smith believes that the projections and other forward-looking statements contained within the report are based on reasonable assumptions as of the date of the report, such forward-looking statements involve risks and uncertainties that may cause actual results to differ materially from the results predicted. Therefore, following the date of this report, CDM Smith will take no responsibility or assume any obligation to advise of changes that may affect its assumptions contained within the report, as they pertain to socioeconomic and demographic forecasts, proposed residential or commercial land use development projects and/or potential improvements to the regional transportation network.

CDM Smith is not, and has not been, a municipal advisor as defined in Federal law (the Dodd Frank Bill) to MDOT and does not owe a fiduciary duty pursuant to Section 15B of the Exchange Act to MDOT with respect to the information and material contained in this report. CDM Smith is not recommending and has not recommended any action to MDOT. MDOT should discuss the information and material contained in this report with any and all internal and external advisors that it deems appropriate before acting on this information.

Appendix A. Results by Segment

This Appendix includes two figures, **Figure A-1** and **Figure A-2**, that show maps of how the 31 routes were divided segments for Michigan statewide and southeastern Michigan, respectively. A total of 91 segments are included. The segment dividing points were determined at key major interchanges between different routes or at route termini. **Table A-1** through **Table A-31** show the segment level traffic and revenue estimates. Each table includes results for a specific route, grouped by $0.04 per mile scenario, $0.06 per mile scenario, and $0.08 per mile scenario.

Figure A-1: Segment Locations Michigan Statewide

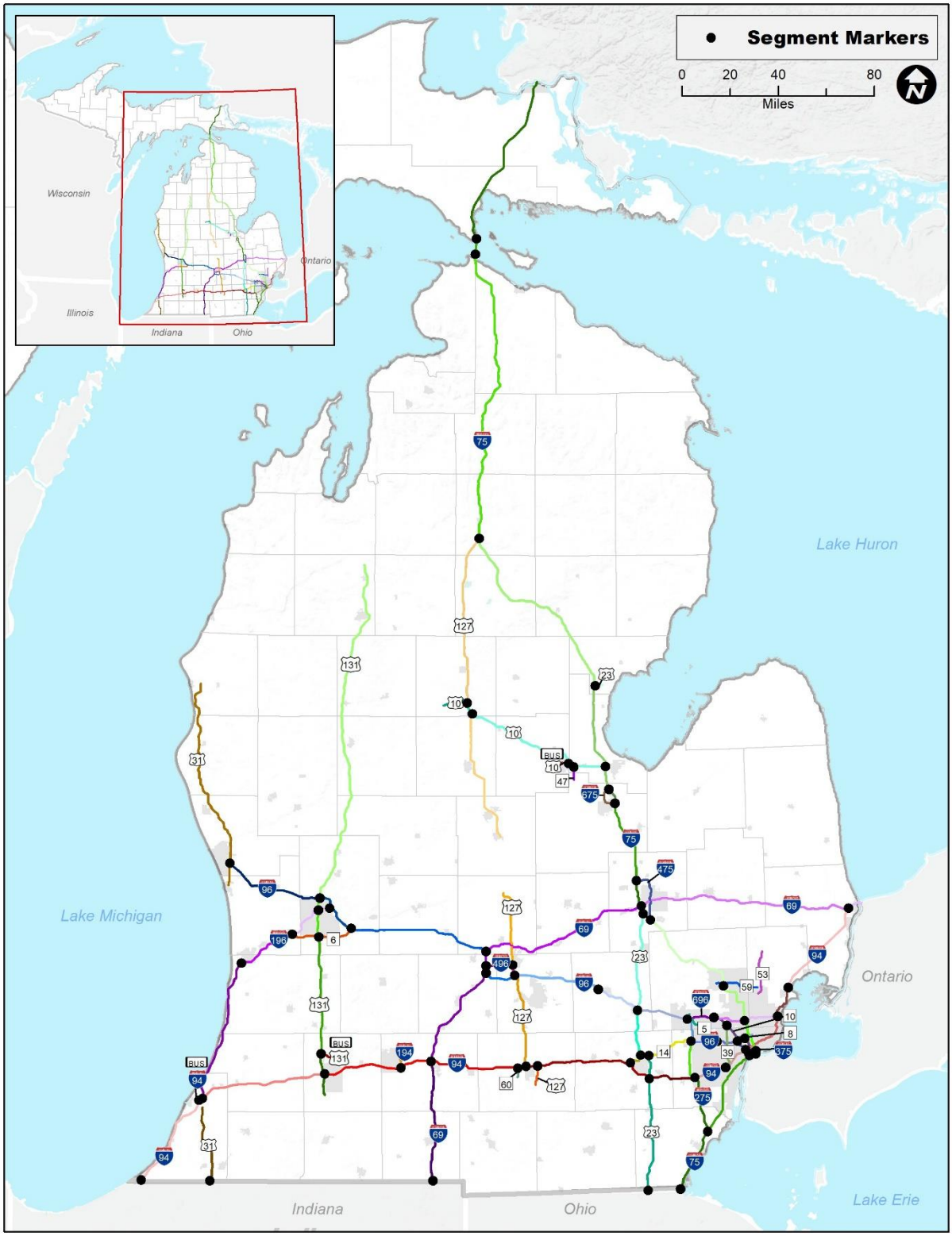


Figure A-2: Segment Locations Southeastern Michigan

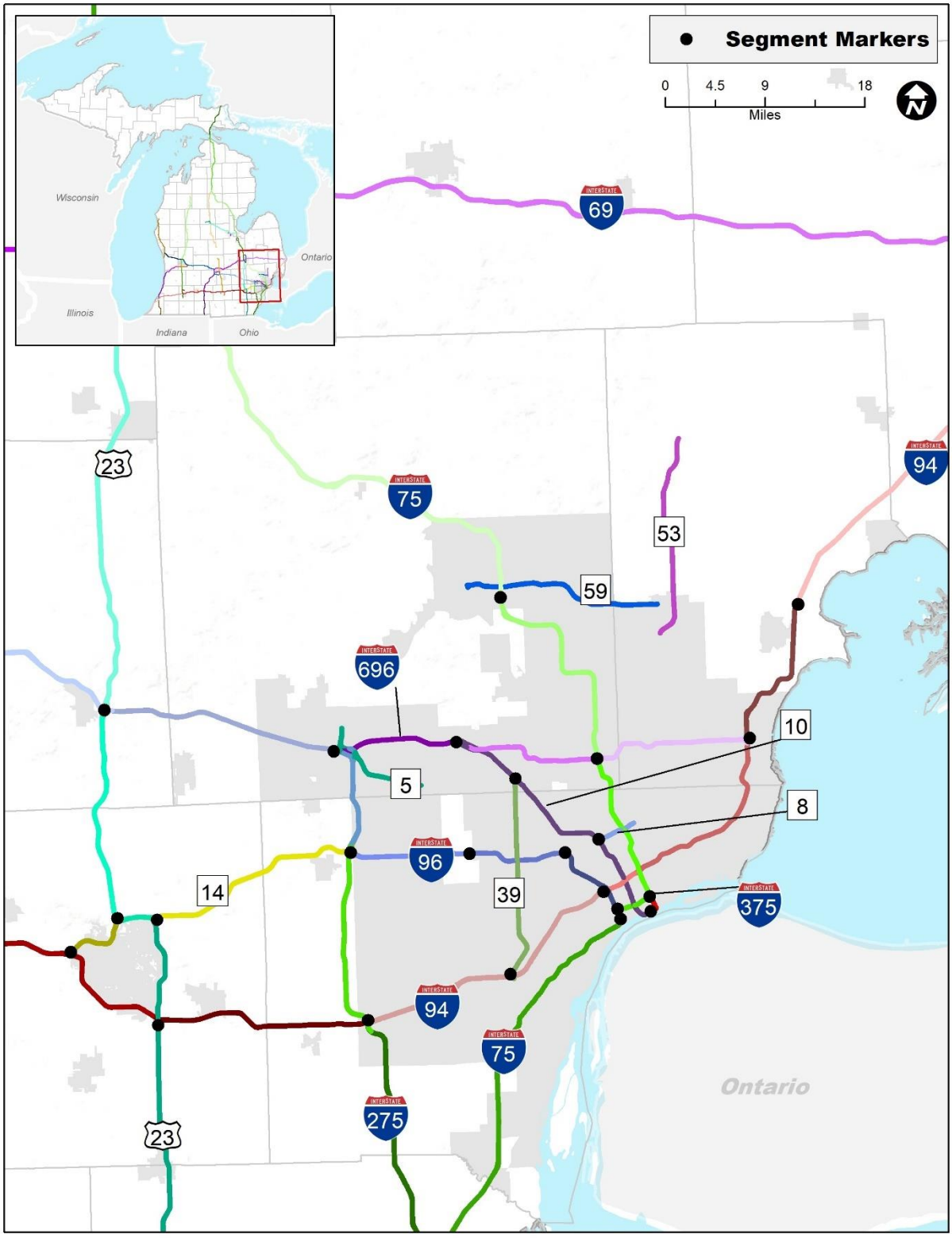


Table A-1: 2030 Segment-Level Results for I-69

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.04 per mile								
I-69 [1,2]	Indiana	I-94	37.8	859	22.8	8%	$ 22,971	$ 608
	I-94	I-96	34.8	1,009	29.0	13%	$ 24,662	$ 708
	I-69	Concurrent	7.8	367	47.1	12%	$ 6,872	$ 882
	I-96	I-75	51.7	1,812	35.0	13%	$ 36,638	$ 708
	I-75	I-94	66.8	1,757	26.3	10%	$ 38,637	$ 578
	I-94	Canada	4.6	90	19.7	7%	$ 1,978	$ 434
Grand Total							$ 131,758	$ 647
$0.06 per mile								
I-69 [1,2]	Indiana	I-94	37.8	792	21.0	15%	$ 31,615	$ 837
	I-94	I-96	34.8	933	26.8	20%	$ 34,087	$ 979
	I-69	Concurrent	7.8	343	44.0	18%	$ 9,637	$ 1,237
	I-96	I-75	51.7	1,686	32.6	19%	$ 51,092	$ 987
	I-75	I-94	66.8	1,672	25.0	14%	$ 55,376	$ 829
	I-94	Canada	4.6	87	19.1	10%	$ 2,885	$ 634
Grand Total							$ 184,693	$ 908
$0.08 per mile								
I-69 [1,2]	Indiana	I-94	37.8	728	19.3	22%	$ 38,506	$ 1,020
	I-94	I-96	34.8	859	24.7	26%	$ 41,631	$ 1,196
	I-69	Concurrent	7.8	319	41.0	24%	$ 11,955	$ 1,534
	I-96	I-75	51.7	1,562	30.2	25%	$ 62,996	$ 1,217
	I-75	I-94	66.8	1,585	23.7	19%	$ 70,292	$ 1,052
	I-94	Canada	4.6	84	18.4	13%	$ 3,732	$ 820
Grand Total							$ 229,111	$ 1,126

[1]Concurrent Segments of I-69 and I-94 are attributed to I-69 for this analysis.

[2]Concurrent Segments of I-69 and I-96 are attributed to I-69 for this analysis.

Table A-2 (continued next page): 2030 Segment-Level Results for I-75

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Annual Revenue (000's) (in constant 2020$) Per Mile
$0.04 per mile								
I-75[1]	Ohio	I-275	19.8	1,237	62.5	8%	$ 30,566	$ 1,544
	I-275	I-96	28.8	2,037	70.8	11%	$ 44,135	$ 1,534
	I-96	I-375	2.8	209	75.0	10%	$ 3,858	$ 1,383
	I-375	I-696	9.7	1,471	151.2	4%	$ 22,687	$ 2,332
	I-696	M-59	16.1	1,965	121.9	4%	$ 29,175	$ 1,811
	M-59	I-475	33.6	2,150	64.0	10%	$ 36,151	$ 1,076
	I-475	I-475 Alternate	14.4	871	60.4	11%	$ 15,275	$ 1,059
	I-475	I-675	24.2	1,293	53.4	12%	$ 24,725	$ 1,021
	I-675	I-675 Alternate	6.2	244	39.7	11%	$ 4,704	$ 765
	I-675	US-23	31.7	725	22.9	13%	$ 14,779	$ 467
	US-23	M-127	62.2	705	11.4	9%	$ 15,384	$ 248
	M-127	Mackinac	89.2	1,196	13.4	7%	$ 24,719	$ 277
	Mackinac Bridge		4.9	63	12.9	4%	$ 1,314	$ 268
	Mackinac	Canada	51.9	247	4.8	11%	$ 4,921	$ 95
Grand Total							$ 272,393	$ 689
$0.06 per mile								
I-75[1]	Ohio	I-275	19.8	1,171	59.2	13%	$ 43,254	$ 2,185
	I-275	I-96	28.8	1,907	66.3	17%	$ 61,917	$ 2,152
	I-96	I-375	2.8	196	70.2	16%	$ 5,372	$ 1,925
	I-375	I-696	9.7	1,439	148.0	6%	$ 33,295	$ 3,422
	I-696	M-59	16.1	1,917	119.0	7%	$ 42,652	$ 2,647
	M-59	I-475	33.6	2,036	60.6	15%	$ 51,240	$ 1,525
	I-475	I-475 Alternate	14.4	821	56.9	16%	$ 21,570	$ 1,496
	I-475	I-675	24.2	1,207	49.9	18%	$ 34,594	$ 1,429
	I-675	I-675 Alternate	6.2	229	37.2	17%	$ 6,606	$ 1,074
	I-675	US-23	31.7	672	21.2	19%	$ 20,590	$ 650
	US-23	M-127	62.2	669	10.8	14%	$ 21,925	$ 353
	M-127	Mackinac	89.2	1,144	12.8	11%	$ 35,512	$ 398
	Mackinac Bridge		4.9	62	12.6	6%	$ 1,929	$ 394
	Mackinac	Canada	51.9	232	4.5	16%	$ 6,973	$ 134
Grand Total							$ 387,429	$ 980

[1]Concurrent Segments of I-75 and US-23 are attributed to I-75 for this analysis.

Table A-2 (continued): 2030 Segment-Level Results for I-75

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.08 per mile								
I-75[1]	Ohio	I-275	19.8	1,106	55.9	18%	$ 54,270	$ 2,741
	I-275	I-96	28.8	1,772	61.6	22%	$ 76,770	$ 2,669
	I-96	I-375	2.8	181	65.0	22%	$ 6,602	$ 2,366
	I-375	M-696	9.7	1,402	144.1	8%	$ 43,179	$ 4,438
	M-696	M-59	16.1	1,866	115.8	9%	$ 55,253	$ 3,429
	M-59	I-475	33.6	1,924	57.3	19%	$ 64,378	$ 1,916
	I-475	I-475 Alternate	14.4	768	53.3	21%	$ 26,871	$ 1,864
	I-475	I-675	24.2	1,121	46.3	23%	$ 42,765	$ 1,767
	I-675	I-675 Alternate	6.2	213	34.7	22%	$ 8,209	$ 1,335
	I-675	US-23	31.7	621	19.6	25%	$ 25,355	$ 800
	US-23	M-127	62.2	631	10.2	19%	$ 27,676	$ 445
	M-127	Mackinac	89.2	1,092	12.2	16%	$ 45,247	$ 507
	Mackinac Bridge		4.9	60	12.3	8%	$ 2,515	$ 513
	Mackinac	Canada	51.9	217	4.2	22%	$ 8,753	$ 169
Grand Total							$ 487,845	$ 1,234

[1]Concurrent Segments of I-75 and US-23 are attributed to I-75 for this analysis.

Table A-3 (continued next page): 2030 Segment-Level Results for I-94

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.04 per mile								
I-94 [1,2]	Indiana	I-196	33.7	1,643	48.7	14%	$ 42,804	$ 1,270
	I-196	US-131	39.6	1,643	41.5	15%	$ 39,394	$ 995
	US-131	I-69	34.5	2,270	65.9	14%	$ 48,167	$ 1,398
	I-69	US-127	30.4	995	32.7	15%	$ 24,197	$ 795
	US-127	US-23	41.0	2,354	57.4	11%	$ 48,710	$ 1,188
	US-23	I-275	14.5	1,475	101.5	8%	$ 24,310	$ 1,673
	I-275	I-96	19.4	2,388	123.0	6%	$ 38,849	$ 2,001
	I-96	I-75	2.5	350	140.2	3%	$ 5,383	$ 2,155
	I-75	I-696	13.0	1,713	131.8	4%	$ 26,164	$ 2,013
	I-696	M-59	11.2	1,134	101.1	7%	$ 17,659	$ 1,575
	M-59	I-69	31.2	1,193	38.3	6%	$ 21,991	$ 706
Grand Total							$ 337,627	$ 1,246
$0.06 per mile								
I-94 [1,2]	Indiana	I-196	33.7	1,551	46.0	19%	$ 60,550	$ 1,797
	I-196	US-131	39.6	1,541	38.9	20%	$ 55,189	$ 1,394
	US-131	I-69	34.5	2,126	61.7	19%	$ 67,767	$ 1,967
	I-69	US-127	30.4	932	30.6	21%	$ 33,869	$ 1,113
	US-127	US-23	41.0	2,235	54.5	15%	$ 69,238	$ 1,689
	US-23	I-275	14.5	1,414	97.4	11%	$ 34,939	$ 2,405
	I-275	I-96	19.4	2,304	118.7	9%	$ 56,311	$ 2,901
	I-96	I-75	2.5	343	137.4	5%	$ 7,962	$ 3,187
	I-75	I-696	13.0	1,670	128.4	6%	$ 38,452	$ 2,958
	I-696	M-59	11.2	1,085	96.8	11%	$ 25,369	$ 2,263
	M-59	I-69	31.2	1,153	37.0	10%	$ 31,988	$ 1,027
Grand Total							$ 481,634	$ 1,778

[1]Concurrent Segments of I-69 and I-94 are attributed to I-69 for this analysis.

[2]Concurrent Segments of I-94 and US-127 are attributed to I-94 for this analysis.

Table A-3 (continued): 2030 Segment-Level Results for I-94

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.08 per mile								
I-94 [1,2]	Indiana	I-196	33.7	1,457	43.2	23%	$ 75,767	$ 2,248
	I-196	US-131	39.6	1,435	36.2	26%	$ 68,242	$ 1,723
	US-131	I-69	34.5	1,982	57.5	25%	$ 84,425	$ 2,451
	I-69	US-127	30.4	864	28.4	26%	$ 41,767	$ 1,373
	US-127	US-23	41.0	2,112	51.5	20%	$ 87,045	$ 2,124
	US-23	I-275	14.5	1,351	93.0	15%	$ 44,451	$ 3,060
	I-275	I-96	19.4	2,220	114.4	12%	$ 72,435	$ 3,731
	I-96	I-75	2.5	336	134.5	7%	$ 10,434	$ 4,177
	I-75	I-696	13.0	1,615	124.3	10%	$ 49,742	$ 3,826
	I-696	M-59	11.2	1,034	92.2	15%	$ 32,263	$ 2,878
	M-59	I-69	31.2	1,114	35.8	13%	$ 41,345	$ 1,327
Grand Total							$ 607,916	$ 2,244

[1]Concurrent Segments of I-69 and I-94 are attributed to I-69 for this analysis.

[2]Concurrent Segments of I-94 and US-127 are attributed to I-94 for this analysis.

Table A-4: 2030 Segment-Level Results for I-94 Business Loop

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.04 per mile								
I-94 Bus	Crystal Ave	I-94	1.0	6	5.8	11%	$ 84	$ 88
Grand Total							$ 84	$ 88
$0.06 per mile								
I-94 Bus	Crystal Ave	I-94	1.0	5	5.4	17%	$ 119	$ 123
Grand Total							$ 119	$ 123
$0.08 per mile								
I-94 Bus	Crystal Ave	I-94	1.0	5	5.1	22%	$ 148	$ 154
Grand Total							$ 148	$ 154

Table A-5 (continued next page): 2030 Segment-Level Results for I-96

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.04 per mile								
I-96[1,2]	M-31	US-131	31.2	1,202	38.6	8%	$ 19,535	$ 626
	US-131	M-6	15.1	774	51.1	9%	$ 11,809	$ 780
	M-6	I-69	42.7	1,665	39.0	13%	$ 35,773	$ 837
	I-69	I-496 / US-127	9.3	374	40.4	12%	$ 7,663	$ 827
	I-496 / US-127	M-59	27.1	1,341	49.6	11%	$ 25,980	$ 960
	M-59	M-23	14.9	1,043	70.0	8%	$ 17,471	$ 1,173
	M-23	I-696 / M-5	15.3	1,795	117.5	5%	$ 28,612	$ 1,873
	I-696 / M-5	M-14	8.4	1,112	132.7	4%	$ 16,993	$ 2,028
	M-14	Telegraph Rd	7.5	1,090	144.8	7%	$ 16,444	$ 2,184
	Telegraph Rd	Davison Rd	6.6	997	151.1	5%	$ 14,932	$ 2,263
	Davison Rd	I-75	6.5	534	82.8	8%	$ 8,328	$ 1,291
Grand Total							$ 203,541	$ 1,103
$0.06 per mile								
I-96[1,2]	M-31	US-131	31.2	1,146	36.7	12%	$ 27,950	$ 896
	US-131	M-6	15.1	737	48.7	13%	$ 16,776	$ 1,108
	M-6	I-69	42.7	1,547	36.2	19%	$ 49,851	$ 1,167
	I-69	I-496 / US-127	9.3	348	37.6	18%	$ 10,682	$ 1,153
	I-496 / US-127	M-59	27.1	1,255	46.4	17%	$ 36,386	$ 1,344
	M-59	M-23	14.9	997	66.9	12%	$ 24,973	$ 1,676
	M-23	I-696 / M-5	15.3	1,749	114.5	7%	$ 41,753	$ 2,733
	I-696 / M-5	M-14	8.4	1,090	130.1	5%	$ 24,977	$ 2,980
	M-14	Telegraph Rd	7.5	1,048	139.2	11%	$ 23,693	$ 3,147
	Telegraph Rd	Davison Rd	6.6	964	146.0	8%	$ 21,648	$ 3,280
	Davison Rd	I-75	6.5	510	79.0	13%	$ 12,013	$ 1,862
Grand Total							$ 290,701	$ 1,575

[1]Concurrent Segments of I-69 and I-96 are attributed to I-69 for this analysis.

[2]Concurrent Segments of I-96 and I-275 are attributed to I-96 for this analysis.

Table A-5 (continued): 2030 Segment-Level Results for I-96

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.08 per mile								
I-96 [1,2]	31	131	31.2	1,090	35.0	17%	$ 35,484	$ 1,138
	131	6	15.1	697	46.0	18%	$ 21,062	$ 1,391
	6	69	42.7	1,430	33.5	25%	$ 61,433	$ 1,438
	69	496 / 127	9.3	323	34.8	24%	$ 13,168	$ 1,421
	496 / 127	59	27.1	1,170	43.2	22%	$ 45,078	$ 1,666
	59	23	14.9	951	63.8	16%	$ 31,600	$ 2,121
	23	696 / 5	15.3	1,701	111.3	10%	$ 54,002	$ 3,534
	696 / 5	14	8.4	1,066	127.2	8%	$ 32,545	$ 3,883
	14	Telegraph Rd	7.5	1,003	133.2	14%	$ 30,212	$ 4,012
	Telegraph Rd	Davison Rd	6.6	926	140.3	12%	$ 27,723	$ 4,201
	Davison Rd	75	6.5	486	75.3	17%	$ 15,350	$ 2,379
Grand Total							$ 367,657	$ 1,992

[1]Concurrent Segments of I-69 and I-96 are attributed to I-69 for this analysis.

[2]Concurrent Segments of I-96 and I-275 are attributed to I-96 for this analysis.

Table A-6: 2030 Segment-Level Results for I-194

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.04 per mile								
I-194	I-94	66	3.4	83	24.3	5%	$ 1,176	$ 345
Grand Total							$ 1,176	$ 345
$0.06 per mile								
I-194	I-94	66	3.4	80	23.4	9%	$ 1,696	$ 498
Grand Total							$ 1,696	$ 498
$0.08 per mile								
I-194	I-94	66	3.4	76	22.5	12%	$ 2,173	$ 638
Grand Total							$ 2,173	$ 638

Table A-7: 2030 Segment-Level Results for I-196

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.04 per mile								
I-196	I-94	US-31 / I-196	44.5	1,168	26.2	8%	$ 30,253	$ 679
	US-31 / I-196	US-6	19.6	739	37.7	11%	$ 14,243	$ 727
	US-6	I-96	16.6	1,078	65.0	7%	$ 16,283	$ 982
Grand Total							$ 60,780	$ 753
$0.06 per mile								
I-196	I-94	US-31 / I-196	44.5	1,114	25.0	13%	$ 43,458	$ 976
	US-31 / I-196	US-6	19.6	695	35.5	16%	$ 20,167	$ 1,030
	US-6	I-96	16.6	1,041	62.7	10%	$ 23,580	$ 1,422
Grand Total							$ 87,205	$ 1,081
$0.08 per mile								
I-196	I-94	US-31 / I-196	44.5	1,061	23.8	17%	$ 55,425	$ 1,245
	US-31 / I-196	US-6	19.6	652	33.3	21%	$ 25,301	$ 1,292
	US-6	I-96	16.6	1,001	60.4	13%	$ 30,277	$ 1,825
Grand Total							$ 111,003	$ 1,376

Table A-8: 2030 Segment-Level Results for I-275

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.04 per mile								
I-275[1]	I-96 / US-14	I-94	17.2	761	44.1	9%	$ 13,846	$ 803
	I-94	I-75	13.3	1,412	105.8	7%	$ 22,307	$ 1,672
Grand Total							$ 36,152	$ 1,182
$0.06 per mile								
I-275[1]	I-96 / US-14	I-94	17.2	725	42.1	13%	$ 19,785	$ 1,147
	I-94	I-75	13.3	1,356	101.6	10%	$ 32,123	$ 2,407
Grand Total							$ 51,908	$ 1,697
$0.08 per mile								
I-275[1]	I-96 / US-14	I-94	17.2	688	39.9	17%	$ 24,982	$ 1,449
	I-94	I-75	13.3	1,298	97.3	14%	$ 40,997	$ 3,073
Grand Total							$ 65,979	$ 2,157

[1]Concurrent Segments of I-96 and I-275 are attributed to I-96 for this analysis.

Table A-9: 2030 Segment-Level Results for I-375

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
375	Jefferson Ave	75	1.2	37	30.8	13%	$ 529	$ 437
Grand Total							$ 529	$ 437
$0.06 per mile								
375	Jefferson Ave	75	1.2	35	28.6	19%	$ 738	$ 610
Grand Total							$ 738	$ 610
$0.08 per mile								
375	Jefferson Ave	75	1.2	32	26.6	25%	$ 916	$ 757
Grand Total							$ 916	$ 757

Table A-10: 2030 Segment-Level Results for I-475

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
475	75 Alternate	75	16.8	488	29.0	12%	$ 7,394	$ 439
Grand Total							$ 7,394	$ 439
$0.06 per mile								
475	75 Alternate	75	16.8	454	26.9	18%	$ 10,314	$ 612
Grand Total							$ 10,314	$ 612
$0.08 per mile								
475	75 Alternate	75	16.8	423	25.1	24%	$ 12,813	$ 761
Grand Total							$ 12,813	$ 761

Table A-11: 2030 Segment-Level Results for I-496

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.04 per mile								
I-496[1]	I-69 / I-96	US-127	8.6	415	48.5	8%	$ 5,870	$ 685
	US-127	I-96	3.0	203	68.6	10%	$ 3,116	$ 1,055
Grand Total							$ 8,986	$ 780
$0.06 per mile								
I-496[1]	I-69 / I-96	US-127	8.6	398	46.4	12%	$ 8,430	$ 984
	US-127	I-96	3.0	192	64.8	15%	$ 4,424	$ 1,498
Grand Total							$ 12,853	$ 1,116
$0.08 per mile								
I-496[1]	I-69 / I-96	US-127	8.6	380	44.3	16%	$ 10,735	$ 1,253
	US-127	I-96	3.0	181	61.2	20%	$ 5,575	$ 1,888
Grand Total							$ 16,310	$ 1,416

[1]Concurrent Segments of I-496 and US-127 are attributed to I-496 for this analysis.

Table A-12: 2030 Segment-Level Results for I-675

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.04 per mile								
I-675	I-75	I-75 Alternate	7.8	154	19.7	10%	$ 2,262	$ 289
Grand Total							$ 2,262	$ 289
$0.06 per mile								
I-675	I-75	I-75 Alternate	7.8	146	18.7	14%	$ 3,226	$ 412
Grand Total							$ 3,226	$ 412
$0.08 per mile								
I-675	I-75	I-75 Alternate	7.8	139	17.7	19%	$ 4,075	$ 520
Grand Total							$ 4,075	$ 520

Table A-13: 2030 Segment-Level Results for I-696

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
696	96 / 5	10	8.2	1,269	153.9	3%	$ 20,115	$ 2,441
	10	75	10.4	1,549	148.8	4%	$ 22,257	$ 2,138
	75	94	10.4	1,487	142.4	5%	$ 21,233	$ 2,033
Grand Total							$ 63,605	$ 2,186
$0.06 per mile								
696	96 / 5	10	8.2	1,246	151.2	5%	$ 29,653	$ 3,598
	10	75	10.4	1,512	145.2	7%	$ 32,587	$ 3,131
	75	94	10.4	1,448	138.6	7%	$ 30,992	$ 2,967
Grand Total							$ 93,232	$ 3,204
$0.08 per mile								
696	96 / 5	10	8.2	1,220	148.0	7%	$ 38,764	$ 4,703
	10	75	10.4	1,473	141.5	9%	$ 42,335	$ 4,067
	75	94	10.4	1,404	134.4	10%	$ 40,070	$ 3,836
Grand Total							$ 121,169	$ 4,164

Table A-14: 2030 Segment-Level Results for US-10

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.04 per mile								
US-10	US-115	US-127	8.2	59	7.2	12%	$ 1,628	$ 198
	US-127	US-127 Concurrent	3.5	59	16.7	12%	$ 1,243	$ 353
	US-127	I-75	46.2	931	20.2	11%	$ 14,885	$ 322
Grand Total							$ 17,756	$ 307
$0.06 per mile								
US-10	US-115	US-127	8.2	55	6.7	17%	$ 2,322	$ 282
	US-127	US-127 Concurrent	3.5	55	15.6	18%	$ 1,742	$ 495
	US-127	I-75	46.2	878	19.0	16%	$ 21,053	$ 456
Grand Total							$ 25,116	$ 434
$0.08 per mile								
US-10	US-115	US-127	8.2	52	6.3	23%	$ 2,927	$ 356
	US-127	US-127 Concurrent	3.5	51	14.5	24%	$ 2,156	$ 612
	US-127	I-75	46.2	824	17.8	21%	$ 26,332	$ 570
Grand Total							$ 31,416	$ 543

Table A-15: 2030 Segment-Level Results for BUSINESS US-10

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.04 per mile								
Business US-10	US-10	Saginaw Rd	2.6	44	16.7	9%	$ 672	$ 257
Grand Total							$ 672	$ 257
$0.06 per mile								
Business US-10	US-10	Saginaw Rd	2.6	41	15.9	14%	$ 960	$ 368
Grand Total							$ 960	$ 368
$0.08 per mile								
Business US-10	US-10	Saginaw Rd	2.6	39	15.0	18%	$ 1,216	$ 466
Grand Total							$ 1,216	$ 466

Table A-16: 2030 Segment-Level Results for US-23

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.04 per mile								
US-23 [1,2]	Ohio	I-94	35.0	1,515	43.3	9%	$ 33,346	$ 953
	I-94	I-14	7.2	622	86.9	6%	$ 10,430	$ 1,456
	I-14	Concurrent I-14	3.1	256	82.7	7%	$ 4,426	$ 1,428
	I-14	I-96	14.0	1,022	72.9	6%	$ 17,236	$ 1,229
	I-96	I-75	31.2	1,751	56.1	7%	$ 29,696	$ 952
Grand Total							$ 95,133	$ 1,052
$0.06 per mile								
US-23 [1,2]	Ohio	I-94	35.0	1,448	41.4	13%	$ 47,575	$ 1,360
	I-94	I-14	7.2	601	83.9	9%	$ 15,058	$ 2,102
	I-14	Concurrent I-14	3.1	245	79.2	11%	$ 6,331	$ 2,043
	I-14	I-96	14.0	987	70.4	9%	$ 24,869	$ 1,774
	I-96	I-75	31.2	1,680	53.8	11%	$ 42,744	$ 1,370
Grand Total							$ 136,577	$ 1,510
$0.08 per mile								
US-23 [1,2]	Ohio	I-94	35.0	1,380	39.5	17%	$ 60,079	$ 1,718
	I-94	I-14	7.2	577	80.6	13%	$ 19,243	$ 2,687
	I-14	Concurrent I-14	3.1	233	75.3	15%	$ 7,998	$ 2,581
	I-14	I-96	14.0	948	67.6	13%	$ 31,678	$ 2,259
	I-96	I-75	31.2	1,604	51.4	15%	$ 54,399	$ 1,743
Grand Total							$ 173,396	$ 1,917

[1]Concurrent Segments of I-75 and US-23 are attributed to I-75 for this analysis.

[2]Concurrent Segments of US-23 and M-14 are attributed to US-23 for this analysis.

Table A-17: 2030 $ Segment-Level Results for US-23 Connector

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
Connector 23	75	23	1.9	9	4.8	15%	$ 188	$ 100
Grand Total							$ 188	$ 100
$0.06 per mile								
Connector 23	75	23	1.9	8	4.3	23%	$ 258	$ 137
Grand Total							$ 258	$ 137
$0.08 per mile								
Connector 23	75	23	1.9	7	3.9	31%	$ 312	$ 166
Grand Total							$ 312	$ 166

Table A-18: 2030 Segment-Level Results for US-31

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
31	Indiana	94	27.5	404	14.7	11%	$ 7,920	$ 288
	104	10	66.6	1,489	22.4	8%	$ 23,664	$ 356
Grand Total							$ 31,585	$ 336
$0.06 per mile								
31	Indiana	94	27.5	381	13.9	16%	$ 11,195	$ 408
	104	10	66.6	1,420	21.3	13%	$ 33,908	$ 509
Grand Total							$ 45,103	$ 480
$0.08 per mile								
31	Indiana	94	27.5	358	13.0	21%	$ 14,037	$ 511
	104	10	66.6	1,352	20.3	17%	$ 43,129	$ 648
Grand Total							$ 57,167	$ 608

Table A-19: 2030 Segment-Level Results for US-127

Roadway	Segment From	Segment To	Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$) Total	Per Mile
$0.04 per mile								
US-127[1,2,3]	Floyd Ave	I-94	6.1	151	24.5	11%	$ 2,526	$ 412
	I-94	I-96	29.6	708	23.9	13%	$ 11,475	$ 388
	I-496	US-127	23.8	574	24.1	9%	$ 11,055	$ 464
	US-127	US-10	41.7	607	14.5	9%	$ 12,292	$ 295
	US-10	I-75	51.4	403	7.8	11%	$ 8,814	$ 172
Grand Total							$ 46,163	$ 302
$0.06 per mile								
US-127[1,2,3]	Floyd Ave	I-94	6.1	143	23.4	15%	$ 3,617	$ 589
	I-94	I-96	29.6	655	22.1	20%	$ 15,913	$ 538
	I-496	US-127	23.8	544	22.8	14%	$ 15,715	$ 660
	US-127	US-10	41.7	574	13.8	14%	$ 17,506	$ 420
	US-10	I-75	51.4	377	7.3	17%	$ 12,390	$ 241
Grand Total							$ 65,141	$ 427
$0.08 per mile								
US-127[1,2,3]	Floyd Ave	I-94	6.1	136	22.2	19%	$ 4,600	$ 749
	I-94	I-96	29.6	603	20.4	26%	$ 19,527	$ 660
	I-496	US-127	23.8	514	21.6	19%	$ 19,812	$ 832
	US-127	US-10	41.7	541	13.0	19%	$ 22,104	$ 530
	US-10	I-75	51.4	350	6.8	23%	$ 15,413	$ 300
Grand Total							$ 81,455	$ 534

[1]Concurrent Segments of I-94 and US-127 are attributed to I-94 for this analysis.

[2]Concurrent Segments of I-496 and US-127 are attributed to I-496 for this analysis.

[3]Concurrent Segments of US-10 and US-127 are attributed to US-10 for this analysis.

Table A-20: 2030 Segment-Level Results for US-131

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
131	Shaver Rd	BUS 131	13.3	456	34.4	11%	$ 7,491	$ 564
	BUS 131	6	35.1	1,473	42.0	10%	$ 26,763	$ 762
	6	196	9.6	1,030	106.8	4%	$ 15,152	$ 1,572
	196	96	3.9	450	114.0	5%	$ 6,731	$ 1,706
	96	BUS 131	106.8	2,037	19.1	11%	$ 43,490	$ 407
Grand Total							$ 99,627	$ 590
$0.06 per mile								
131	Shaver Rd	BUS 131	13.3	432	32.5	16%	$ 10,685	$ 805
	BUS 131	6	35.1	1,391	39.6	15%	$ 38,143	$ 1,086
	6	196	9.6	1,004	104.1	7%	$ 22,171	$ 2,300
	196	96	3.9	437	110.9	8%	$ 9,823	$ 2,490
	96	BUS 131	106.8	1,917	17.9	16%	$ 61,565	$ 576
Grand Total							$ 142,387	$ 843
$0.08 per mile								
131	Shaver Rd	BUS 131	13.3	407	30.7	20%	$ 13,507	$ 1,017
	BUS 131	6	35.1	1,309	37.3	20%	$ 48,210	$ 1,373
	6	196	9.6	977	101.3	9%	$ 28,785	$ 2,986
	196	96	3.9	425	107.8	10%	$ 12,743	$ 3,230
	96	BUS 131	106.8	1,799	16.8	21%	$ 77,282	$ 723
Grand Total							$ 180,527	$ 1,069

Table A-21: 2030 Segment-Level Results for Business US-131

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
Business 131	131	Douglas Ave	4.2	24	5.6	16%	$ 346	$ 82
Grand Total							$ 346	$ 82
$0.06 per mile								
Business 131	131	Douglas Ave	4.2	22	5.1	23%	$ 474	$ 112
Grand Total							$ 474	$ 112
$0.08 per mile								
Business 131	131	Douglas Ave	4.2	20	4.7	30%	$ 583	$ 137
Grand Total							$ 583	$ 137

Table A-22: 2030 Segment-Level Results for M-5

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
5	13 Mile Rd	Grand River Ave	7.6	346	45.6	12%	$ 4,734	$ 625
Grand Total							$ 4,734	$ 625
$0.06 per mile								
5	13 Mile Rd	Grand River Ave	7.6	323	42.7	17%	$ 6,626	$ 875
Grand Total							$ 6,626	$ 875
$0.08 per mile								
5	13 Mile Rd	Grand River Ave	7.6	303	40.0	23%	$ 8,301	$ 1,096
Grand Total							$ 8,301	$ 1,096

Table A-23: 2030 Segment-Level Results for M-6

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
6	196	96	18.2	800	43.8	12%	$ 13,161	$ 721
Grand Total							$ 13,161	$ 721
$0.06 per mile								
6	196	96	18.2	749	41.1	18%	$ 18,491	$ 1,014
Grand Total							$ 18,491	$ 1,014
$0.08 per mile								
6	196	96	18.2	699	38.3	23%	$ 23,010	$ 1,261
Grand Total							$ 23,010	$ 1,261

Table A-24: 2030 Segment-Level Results for M-8

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
8	10	E Davison St	2.7	138	51.7	13%	$ 2,071	$ 777
Grand Total							$ 2,071	$ 777
$0.06 per mile								
8	10	E Davison St	2.7	127	47.6	20%	$ 2,840	$ 1,065
Grand Total							$ 2,840	$ 1,065
$0.08 per mile								
8	10	E Davison St	2.7	116	43.7	26%	$ 3,493	$ 1,310
Grand Total							$ 3,493	$ 1,310

Table A-25: 2030 Segment-Level Results for M-10

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
M-10	I-696	Jeffesron Ave	18.2	1,639	90.0	8%	$ 23,284	$ 1,278
Grand Total							$ 23,284	$ 1,278
$0.06 per mile								
M-10	I-696	Jeffesron Ave	18.2	1,571	86.3	11%	$ 33,484	$ 1,838
Grand Total							$ 33,484	$ 1,838
$0.08 per mile								
M-10	I-696	Jeffesron Ave	18.2	1,500	82.4	15%	$ 42,590	$ 2,338
Grand Total							$ 42,590	$ 2,338

Table A-26: 2030 Segment-Level Results for M-14

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
M-14	I-94	M-23	4.8	209	43.9	10%	$ 3,641	$ 765
	M-23	I-96 / I-275	15.4	1,252	81.1	7%	$ 20,014	$ 1,296
Grand Total							$ 23,655	$ 1,171
$0.06 per mile								
M-14	I-94	M-23	4.8	199	41.8	14%	$ 5,179	$ 1,088
	M-23	I-96 / I-275	15.4	1,202	77.8	10%	$ 28,778	$ 1,864
Grand Total							$ 33,957	$ 1,681
$0.08 per mile								
M-14	I-94	M-23	4.8	189	39.6	18%	$ 6,527	$ 1,371
	M-23	I-96 / I-275	15.4	1,150	74.5	14%	$ 36,666	$ 2,375
Grand Total							$ 43,193	$ 2,138

Table A-27: 2030 $0.04 Per Mile Scenario Segment-Level Results for M-39

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
M-39	I-94	US-10	13.9	1,555	111.8	5%	$ 22,369	$ 1,608
Grand Total							$ 22,369	$ 1,608
$0.06 per mile								
M-39	I-94	US-10	13.9	1,506	108.3	8%	$ 32,485	$ 2,336
Grand Total							$ 32,485	$ 2,336
$0.08 per mile								
M-39	I-94	US-10	13.9	1,452	104.4	11%	$ 41,778	$ 3,004
Grand Total							$ 41,778	$ 3,004

Table A-28: 2030 Segment-Level Results for M-47

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
M-47	US-10	Midland Rd	4.1	53	12.9	7%	$ 791	$ 193
Grand Total							$ 791	$ 193
$0.06 per mile								
M-47	US-10	Midland Rd	4.1	51	12.4	10%	$ 1,148	$ 280
Grand Total							$ 1,148	$ 280
$0.08 per mile								
M-47	US-10	Midland Rd	4.1	49	12.0	13%	$ 1,476	$ 360
Grand Total							$ 1,476	$ 360

Table A-29: 2030 Segment-Level Results for M-53

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
M-53	Van Dyke Ave	30 Mile Rd	11.7	610	52.3	6%	$ 8,784	$ 753
Grand Total							$ 8,784	$ 753
$0.06 per mile								
M-53	Van Dyke Ave	30 Mile Rd	11.7	590	50.6	9%	$ 12,745	$ 1,093
Grand Total							$ 12,745	$ 1,093
$0.08 per mile								
M-53	Van Dyke Ave	30 Mile Rd	11.7	571	49.0	12%	$ 16,424	$ 1,408
Grand Total							$ 16,424	$ 1,408

Table A-30: 2030 Segment-Level Results for M-59

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
59	Huron St	Van Dyke Ave	13.2	1,204	91.1	7%	$ 16,950	$ 1,283
Grand Total							$ 16,950	$ 1,283
$0.06 per mile								
59	Huron St	Van Dyke Ave	13.2	1,159	87.7	10%	$ 24,463	$ 1,851
Grand Total							$ 24,463	$ 1,851
$0.08 per mile								
59	Huron St	Van Dyke Ave	13.2	1,113	84.2	14%	$ 31,293	$ 2,368
Grand Total							$ 31,293	$ 2,368

Table A-31: 2030 Segment-Level Results for M-60

Roadway	Segment		Model Distance (mi)	Average Weekday Vehicle Miles Traveled (000's)	Average Weekday Daily Traffic (000's)	Total Diversion	Annual Revenue (000's) (in constant 2020$)	
	From	To					Total	Per Mile
$0.04 per mile								
60	Spring Arbor Rd	94	3.0	44	14.5	6%	$ 699	$ 231
Grand Total							$ 699	$ 231
$0.06 per mile								
60	Spring Arbor Rd	94	3.0	42	14.0	10%	$ 1,014	$ 335
Grand Total							$ 1,014	$ 335
$0.08 per mile								
60	Spring Arbor Rd	94	3.0	41	13.6	12%	$ 1,313	$ 434
Grand Total							$ 1,313	$ 434