

## APPENDIX E

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# RELATIONSHIP BETWEEN FREIGHT TRANSPORTATION INFRASTRUCTURE AND ECONOMIC DEVELOPMENT

This section describes the objectives and structure of a Simplified Economic Analysis Tool that was developed as part of this study to consider the economic impacts of freight-related and other transportation projects. The tool will allow SEMCOG and its partners to conduct benefit-cost analyses and estimate the economic impacts of projects using standard rules of thumb or multipliers derived from available regional models. The tool uses output from travel demand modeling that SEMCOG already conducts as part of the regional transportation planning process. While the tool can be used to assess and prioritize freight projects, it will also be useful in conducting alternatives analysis for a series of proposed transportation improvements. The tool is simple to use and consistent with past SEMCOG practices and existing Michigan Department of Transportation (MDOT) procedures.

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## OBJECTIVES

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In the context of transportation planning, economic analysis can provide many measures to inform decision makers:

- Improved travel efficiency
- Improvements to economic vitality
- Return on public investment
- Improved economic opportunity.

In turn, these measures can be captured by several different types of economic impact:

- Monetized user savings (e.g., travel time, vehicle operating costs, or safety)
- Growth of economic activity (e.g., sales, jobs, wages, or value added)
- Overall growth of economic activity (i.e., multiplier effects)
- Fiscal impacts (i.e., government revenues and costs)
- Land development (i.e., land use and property values)
- Environment and quality of life impacts.

SEMCOG and the Study Advisory Committee (SAC) emphasized that the study should result in a tool that would be simple to use and consistent with SEMCOG practices and existing tools. In addition, it was recognized that a model capable of handling all kinds of transportation projects would help the region target finite transportation resources at projects that deliver the greatest user and economic benefits. While no tool can make the final decision, quantitative analysis and indicators would help inform the decision-making process.

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## MODEL TYPES

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There are several types of economic analyses conducted in the transportation field. It is important to distinguish them because not all are appropriate for assessing the long-term benefits of freight and other transportation projects. Examples of economic analyses include:

- **CLUSTER ANALYSES OR SUPPLY CHAIN ANALYSES.** These analyses are appropriate for determining regional economic development opportunities, but are less applicable to the long-term benefits of individual projects. SEMCOG and its partners have already conducted a number of cluster or supply chain analyses in previous studies. These analyses helped SEMCOG and the SAC identify target industries for this study. As described further below, an understanding of the supply chain can help other economic analyses, such as regional economic models and benefit-cost models.
- **FIELD VISITS TO DETERMINE POTENTIAL ECONOMIC IMPACTS.** For freight-related projects, these may include visits to economic development agencies, potential warehouse or locations for logistics operations, ports and intermodal facilities, developers, and freight carriers. For other types of transportation projects, these may include visits to retail businesses or local stakeholders. Field visits can help make the case for a freight transportation/economic development program and identify target industries. However, they cannot assess the long-term benefits of freight-related projects. The industry profiles developed in this study can help SEMCOG and its partners understand industry issues and prepare for field visits to discuss specific impacts and needs.
- **BENEFIT-COST MODELS.** Benefit-cost analyses typically compare the user benefits of projects (i.e., travel time reductions, reliability improvements, safety improvements, and operating cost reductions) to the agency costs for building the projects. The analyses may also consider societal impacts, such as air quality or noise, but they do not often consider the wider economic impacts of projects. In the past, benefit-cost models have tended to focus on passenger movement projects, but there have been a number of efforts to expand them to goods movement.
- **REGIONAL ECONOMIC MODELS.** Economic models based on input-output tables or generalized equilibrium analysis can estimate the regional economic impact of transportation projects in terms of employment (jobs), value-added (Gross Regional Product), industrial output, labor income, and tax revenue. Examples of such models include IMPLAN Professional, Regional Economic Models, Inc. (REMI) TranSight/Policy Insight, and the Transportation Economic Development Impact System (TREDIS). Typically, regional economic models are used to estimate the short-term direct, indirect, and induced impacts of spending money to building transportation infrastructure as well as the long-term user impacts. Simple input-output models do not capture the benefits of making goods movement faster, better, or cheaper. However, innovations in policy variables and freight flow modules allow the models to capture the effects of transportation cost reductions on other industries.

SEMCOG and the SAC decided to use regional economic modeling and benefit-cost modeling to determine how well projects address prioritized freight and transportation deficiencies. Both types of models can contribute to the analysis, but they assess very different benefits. Regional economic modeling focuses on how the expenditure of money on projects or transportation cost reductions impacts other industries, while benefit-cost analysis focuses on the direct user benefits (e.g., travelers and freight carriers).

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## SELECTED MODEL

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### STRUCTURE

The Simplified Economic Analysis Tool (SEAT) developed in this study combines benefit-cost modeling with rules-of-thumb derived from regional economic modeling to estimate the long-term user impacts as well as the economic impact in terms of jobs, personal income, and Gross Regional Product. The methodology focuses on the travel efficiency benefits that accrue to facility users after the project is completed.

There are other types of economic impacts that the SEAT does not capture:

- Construction Impacts: Impacts resulting from the expenditures on local labor and materials in constructing the facility.
- Operations and Maintenance (O&M) Impacts: Impacts resulting from the expenditures on local labor and supplies to operate and maintain the facility upon completion.

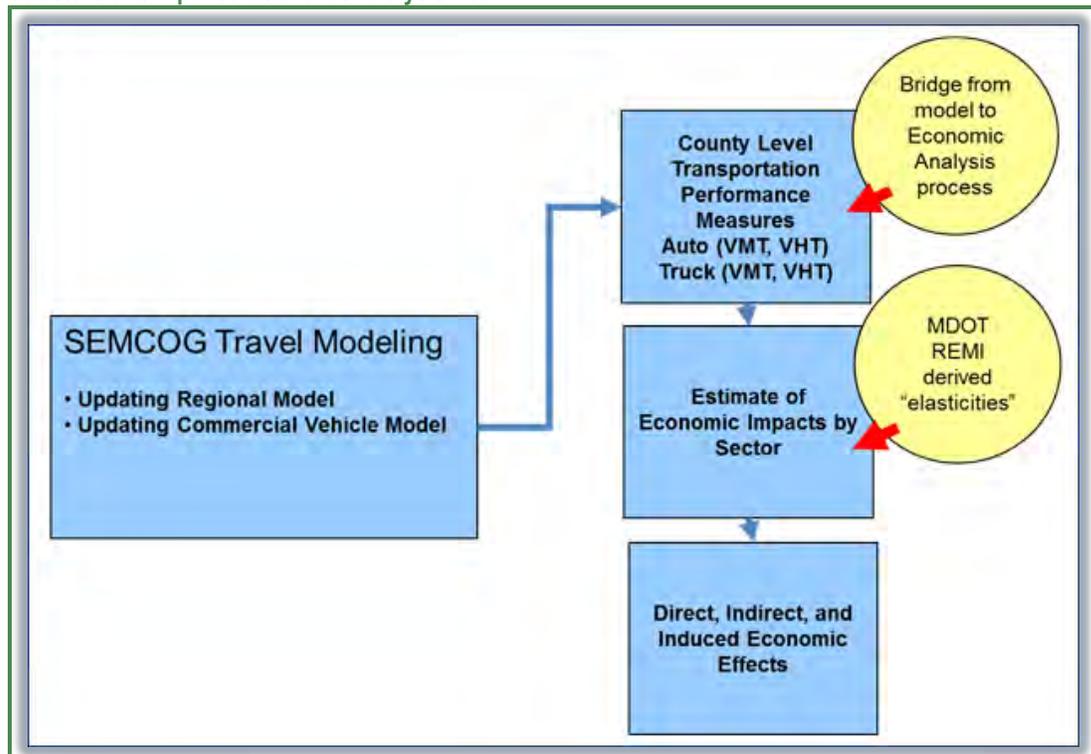
These impacts can be captured by standard multipliers. For example, the U.S. President's Council of Economic Advisers issued a May 2009 memorandum on how to estimate the jobs created by the expenditures through the American Recovery and Reinvestment Act (ARRA) of 2009. In the guidance, the Council of Economic Advisors suggests using a simple rule for estimating the jobs created by government spending – \$92,000 of government spending creates one job-year of employment. Regional economic models can produce similar rules-of-thumb and estimate roughly the same level of impact.

An important point about construction multipliers is that they produce the same impact per dollar, regardless of the project. A project that costs \$30 million in construction expenditures has exactly the same impact as another project that costs \$30 million. As a result, these impacts cannot be used to differentiate projects. SEMCOG and the SAC decided to use multipliers to estimate construction employment benefits and target the Simplified Economic Analysis Tool on economic impacts that do differentiate projects – direct user benefits.

The Simplified Economic Analysis Tool is a spreadsheet that links travel demand model outputs for two investment scenarios (i.e., build and no build) in the present and future, converts those measures into estimates of the economic impact on the SEMCOG region and computes a benefit-cost ratio.

Figure E-1 illustrates the basic economic analysis process. A project is run in the SEMCOG travel demand model. For freight projects, this step is enhanced by recent efforts to update the commercial vehicle model. County-level transportation performance measures capture the impact on automobiles and trucks in terms of changes in vehicle-miles traveled (VMT) and vehicle-hours traveled (VHT). These are used to estimate economic impacts by sector using rules of thumb derived from a regional economic model. The resulting measures of jobs, personal income, and Gross Regional Product capture the direct, indirect, and induced economic effects. With the exception of generating the travel demand model outputs, the entire analysis occurs within a single spreadsheet.

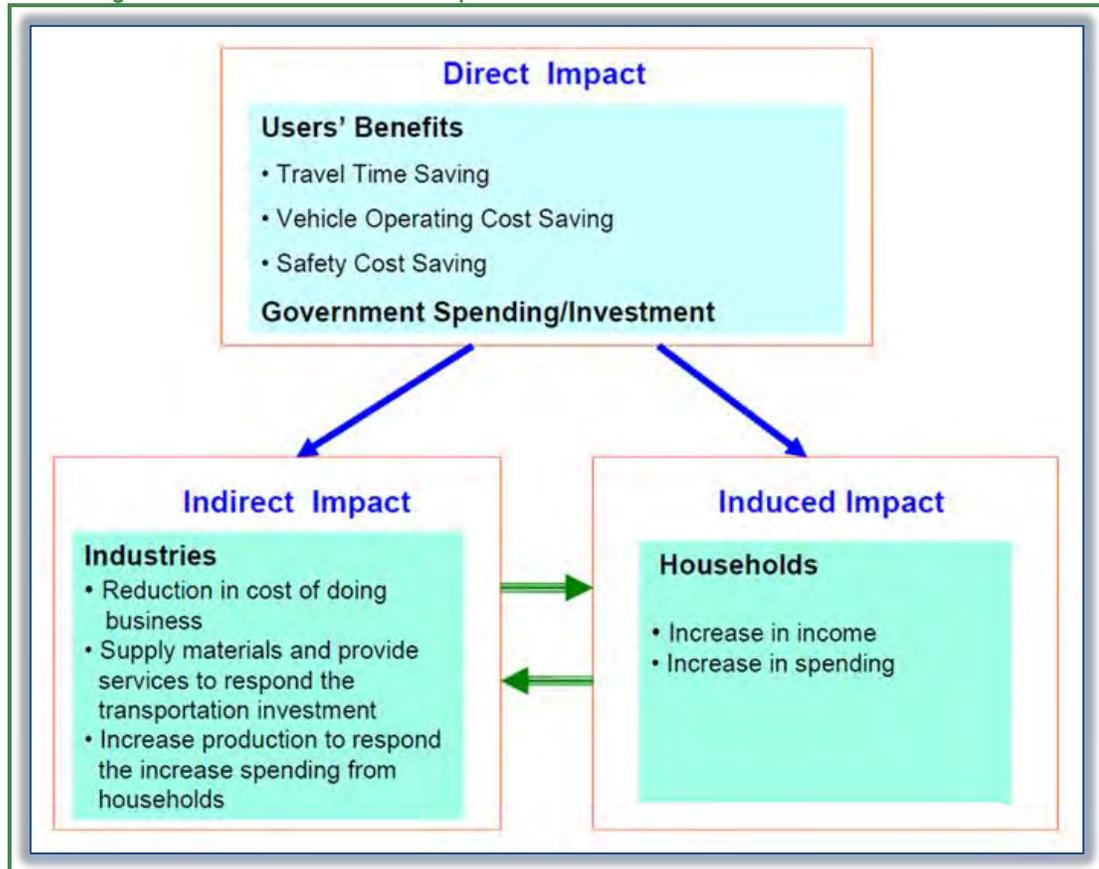
**Figure E-1**  
**Structure of Simplified Economic Analysis Tool**



Source: System Metrics Group, Inc.

Figure E-2 highlights the process by which the direct user and construction spending impacts lead to the indirect and induced impacts that magnify the effect on the economy. As stated earlier, the Simplified Economic Analysis Tool focuses on the user benefits (which are long-term) rather than the government spending benefits (which are short term).

Figure E-2  
Translating User Benefits into Economic Impacts



Source: System Metrics Group, Inc.

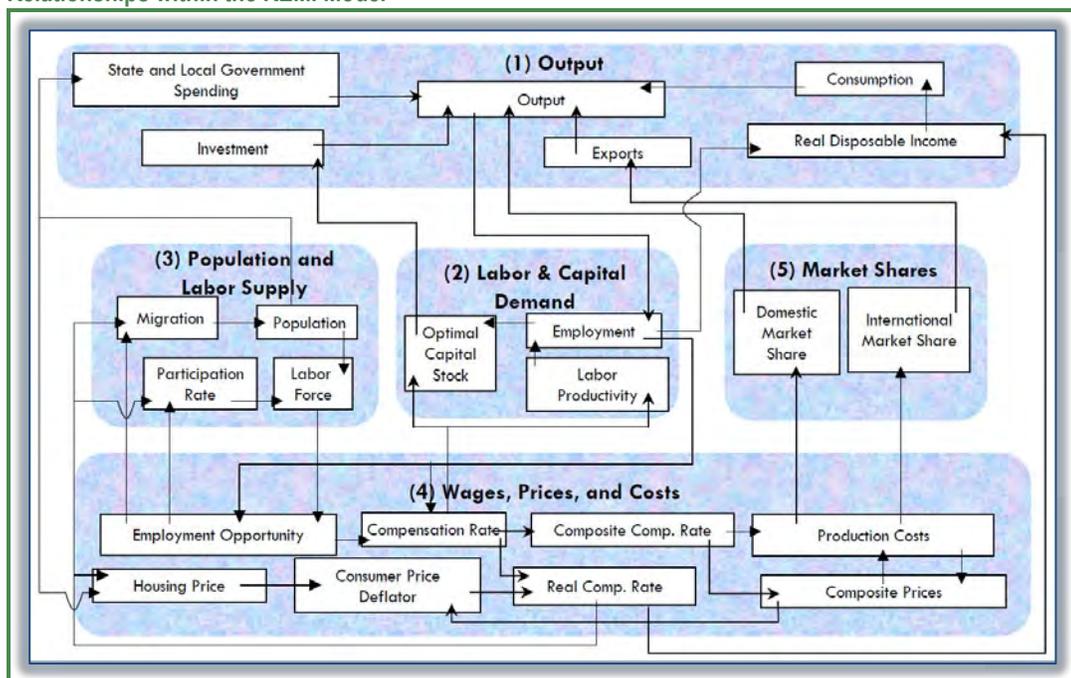
The overall process takes advantage of four primary components – a travel demand model, a user benefit-cost analysis system, a module to determine potential business cost savings, and a REMI-based economic impact model. The last three components are incorporated into a single spreadsheet, which is the Simplified Economic Analysis Tool. The tool uses rule of thumb multipliers derived from the REMI-based economic impact model. The REMI model could be run independently for more complicated or more comprehensive analyses.

All four components are described further below:

1. **SEMOG TRAVEL DEMAND MODEL** – The traffic assignment model predicts the direct effects of a highway system improvement on traffic patterns, levels of service, and speeds. It estimates aggregate measures of VMT and VHT. These are inputted into the Simplified Economic Analysis Tool and the counties with impacts are identified.

2. **MONETIZATION OF USER BENEFITS** – The Simplified Economic Analysis Tool calculates changes in travel time, vehicle operating cost, safety, and emissions using VMT and VHT measures from the travel demand model and lookup tables from the economic analysis process used by MDOT. The dollar values of these benefits are estimated using standard economic values consistent with the MDOT practice.
3. **BUSINESS COSTS SAVINGS** – This module translates the dollar value estimates of user travel time, vehicle operating cost, and safety benefits from Step 2 into the direct economic impacts on business operating costs. User benefits are converted to freight-related business cost savings using the 1997 Transportation Satellite Accounts. The module includes only the user benefits associated with work-related automobile travel and truck travel. Safety benefits include only the portion of safety costs that impact the economy. While a standalone module was developed to generate the economic impact rules of thumb (described next), the important components of this module are incorporated into the Simplified Economic Analysis Tool. The standalone module can be run separately for more complicated analyses using REMI.
4. **REGIONAL ECONOMIC MODEL** – MDOT currently runs a REMI regional economic model to estimate the economic impacts of transportation investments. The model has a complicated set of equations to capture linkages throughout the economy. To be responsive to the new realities of Michigan’s economy, MDOT worked the University of Michigan to calibrate the REMI input data so that it is consistent with the most current socio-economic data. Figure E-3 provides an overview of these relationships. The Simplified Economic Analysis Tool uses rule-of-thumb relationships derived from REMI to estimate the full economic impacts of the transportation investment in the SEMCOG region.

**Figure E-3**  
**Relationships within the REMI Model**



Source: Regional Economic Models, Inc.

During testing, it was discovered that the economic impacts are linearly scalable, but vary by county. The Simplified Economic Analysis Tool takes advantage of these findings by using rules of thumb. The business cost savings are multiplied by REMI-derived rules of thumb (i.e., \$1 business cost savings yielding \$X economic benefit). Because these relationships are the same for any project, the REMI model is not needed for subsequent runs. The economic benefits are computed for the entire SEMCOG region by counties with user benefits. Impacts are shown in terms of several regional variables: Gross Regional Product (GRP), real personal income, and total (direct, indirect, and induced) employment changes over a 25-year analysis period. The employment changes are listed for industry groups that correspond to the industries highlighted in the industry profiles.

### ***Intended Use***

The Simplified Economic Analysis Tool is intended to be used to assess the user benefits and economic impacts of individual projects, groups of projects, or programs of projects that can be modeled in the SEMCOG travel demand model. The tool can be used to assess the overall benefits of projects, chose among alternatives, or prioritize projects. Since the economic impacts are driven by work-related automobile travel and truck travel, the tool can help assess projects that improve freight travel.

### ***Model Inputs***

The Simplified Economic Analysis Tool uses the following inputs:

- **TRAVEL DEMAND MODEL PERFORMANCE MEASURES** – VMT and VHT values are generated from build and no-build scenarios and for a base and forecast year from the SEMCOG travel demand model.
- **REAL DISCOUNT RATE** – Discounting streams of benefits and costs takes into account the time value of money. This rate reflects the expected return on investment, absent inflation, if the dollars invested in the infrastructure projects were invested elsewhere in the economy. The tool uses a discount rate consistent with current SEMCOG and MDOT practice.
- **PROJECT DEVELOPMENT AND CONSTRUCTION COSTS** – These are the initial capital costs, usually spread over a number of years. Capital costs are discounted to the base year of the analysis.
- **OPERATION AND MAINTENANCE COSTS (O&M)** – These costs cover the annual maintenance and public safety that begin when a project opens to traffic and continues throughout its economic life. Annual O&M costs increase with lane mileage and annual public safety costs increase with centerline miles. These costs are discounted using the same real discount rate as the benefits and capital costs.

## **Model Outputs**

The Simplified Economic Analysis Tool generates the following outputs:

- Travel Efficiency Measures (in 2010 dollars)
  - Travel time savings
  - Vehicle operating cost savings
  - Safety improvements
  - Emission cost savings
- Specific Regional Economic Impacts (in 2010 dollars)
  - Gross Regional Product
  - Personal income
  - Employment (total and by industry group)

The model also calculates two measures of the cost-effectiveness of a project:

- **BENEFIT-COST RATIO.** The benefit-cost ratio is calculated by dividing the total discounted benefits by total discounted costs. A benefit-cost ratio of 3.0 means that the public receives three dollars in benefits for every dollar invested (in construction, operations, and maintenance).
- **NET PRESENT VALUE (NPV).** The net present value is the difference between the discounted present value of benefits and the discounted present value of costs. A positive NPV indicates that benefits exceed costs. However, a large project can have a larger NPV than a small project and still have a lower benefit-cost ratio.

## **Model Parameters**

The Simplified Economic Analysis Tool incorporates several assumptions and parameters. SEMCOG and the SAC worked with MDOT to ensure that the values adopted are consistent with the standard practices used by MDOT in its economic analysis procedures. The current values are shown in Figure E-4.

The Simplified Economic Analysis Tool also has economic impact multipliers (i.e., rules of thumb derived from REMI) as well as fuel costs, emissions rates, and emissions costs consistent with MDOT economic analysis procedures.

Figure E-4  
Economic Parameters in Simplified Economic Analysis Tool

<b>Percent Business-Related Auto Travel</b>	4.6%	
<b>Real Discount Rate</b>	3.1%	
<b>Annualization</b>	300	days per year
<b>Value of Time</b>		
Automobile	\$11.62	2010\$ per person-hour
Truck	\$59.61	2010\$ per person-hour
<b>Fuel Cost (excluding excise taxes)</b>		
Automobile	\$2.481	2010\$ per gallon
Truck	\$2.854	2010\$ per gallon
<b>Non-Fuel Costs</b>		
Automobile	\$0.165	2010\$ per vehicle-mile
Truck	\$0.165	2010\$ per vehicle-mile
<b>Statewide Accident Rates</b>		
Fatalities	0.01295	accidents per million miles
Injuries	1.29709	accidents per million miles
Property Damage Only	3.11378	accidents per million miles
<b>Accident Costs</b>		
Fatalities	\$3,104,738	2010\$ per accident
Injuries	\$81,572	2010\$ per accident
Property Damage Only	\$6,850	2010\$ per accident
Total	\$167,342	2010\$ per million miles
<b>Value of Emissions</b>		
VOC	\$0.00105	2010\$ per gram
NO <sub>x</sub>	\$0.01504	2010\$ per gram
CO	\$0.00007	2010\$ per gram
SO <sub>x</sub>	\$0.06070	2010\$ per gram
PM <sub>10</sub>	\$0.12154	2010\$ per gram

Source: System Metrics Group, Inc.

Note: Economic Parameters within the Simplified Economic Analysis Tool can be adjusted to match changes with MDOT economic analysis procedures (e.g. the Real Discount Rate used by MDOT is now 2.3%) and to conduct sensitivity analysis.

## APPLICATION

The next few pages show an example of using the Simplified Economic Analysis Tool. The example is based on one of the model applications (improvements to I-94) tested during model development. The project costs listed were created for the example and do not correspond to the actual cost of any particular improvements on I-94.

The analysis starts by modeling the project using the SEMCOG regional travel demand model. For this project, SEMCOG generate four sets of model results:

- 2010 No Build
- 2010 Build
- 2035 No Build
- 2035 Build.

The 2010 Build scenario was run even though the hypothetical project is expected to open in 2015. This is necessary so the Simplified Economic Analysis Tool can interpolate benefits over the analysis period. The tool correctly starts benefits when the project opens.

After the travel demand model scenarios are run, the results are summarized in terms of VMT and VHT by “speed bin” (i.e., amount of VMT and VHT that occurs at a particular speed) and mode (i.e., automobiles and trucks). Figure E-5 shows part of the data summarized for the 2035 Build scenario to illustrate the concept of speed bins. Data were summarized in a similar manner for all four travel demand model scenarios. In all cases, the performance measures reflect the impact across the entire SEMCOG region. Alternatively, these measures could be summarized by county.

**Figure E-5**  
**Example of Speed Bin Data from Travel Demand Model**

Speed	Sum of Auto VMT	Sum of Auto VHT	Sum of Truck VMT	Sum of Truck VHT
0	2830.9	9246.4	65.7	203.0
1	4885.8	4791.3	278.4	241.4
2	29908.6	13322.5	1744.9	777.0
3	19547.3	6534.4	1558.0	516.6
4	28235.0	7172.1	2016.4	504.1
5	72479.5	14281.8	5704.1	1114.1
6	125162.0	20805.4	9457.3	1571.4
7	223580.5	31892.8	16477.0	2355.8
8	284282.6	35720.3	17635.1	2219.4
9	347654.3	38238.7	28416.1	3118.0
10	373801.8	37446.1	31353.9	3131.7
11	350237.3	31719.4	24467.0	2215.3
12	547808.7	45467.4	37581.9	3119.2

Source: System Metrics Group, Inc.

After the speed bin data are ready, the project can be assessed using the Simplified Economic Analysis Tool. The first step is to enter the project information. Figure E-6 shows the data entered into the tool for this example. SEAT discounts all benefits and costs to the current year (2012 in this case). The year construction begins (2012) indicates when project development and construction costs begin. The benefits start the year the project opens (2015). The project information also includes the base and forecast years (2010 and 2035) for the travel demand model data. The tool can include safety impacts (0% improvement in this case). Induced travel benefits refer to increases in travel demand due to the projects. They are not included in the example.

**Figure E-6**  
**Example of Speed Bin Data from Travel Demand Model**

<b>Project Timing</b>	
Current Year	2012
Year Construction Begins	2012
Year Project Opens	2015
<b>Years for Model Data</b>	
Base Year	2010
Forecast Year	2035
<b>Safety Impact</b>	
Percent Improvement	0%
Include Induced Travel in Benefits?	N

The project costs are entered as shown in Figure E-7. The costs include all of the project development costs and subsequent operating and maintenance costs. The project development costs start in the “Year Construction Begins.” The operating and maintenance costs start the “Year Project Opens” and continue over the 25-year project analysis period to 2039. The Simplified Economic Analysis Tool ignores any costs beyond 25 years after the project opens.

Figure E-7  
 Example of Speed Bin Data from Travel Demand Model

Year	Project Costs		Total Costs	
	Construction	Operating & Maintenance	Constant Dollars	Present Value
2012	\$120,000,000		\$120,000,000	\$120,000,000
2013	\$90,000,000		\$90,000,000	\$87,293,889
2014	\$90,000,000		\$90,000,000	\$84,669,146
2015		\$250,000	\$250,000	\$228,120
2016		\$250,000	\$250,000	\$221,261
2017		\$250,000	\$250,000	\$214,608
2018		\$250,000	\$250,000	\$208,156
2019		\$1,000,000	\$1,000,000	\$807,587
2020		\$250,000	\$250,000	\$195,826
2021		\$250,000	\$250,000	\$189,938
2022		\$250,000	\$250,000	\$184,227
2023		\$250,000	\$250,000	\$178,688
2024		\$2,000,000	\$2,000,000	\$1,386,520
2025		\$250,000	\$250,000	\$168,104
2026		\$250,000	\$250,000	\$163,049
2027		\$250,000	\$250,000	\$158,147
2028		\$250,000	\$250,000	\$153,392
2029		\$1,000,000	\$1,000,000	\$595,117
2030		\$250,000	\$250,000	\$144,306
2031		\$250,000	\$250,000	\$139,967
2032		\$250,000	\$250,000	\$135,758
2033		\$250,000	\$250,000	\$131,676
2034		\$2,000,000	\$2,000,000	\$1,021,738
2035		\$250,000	\$250,000	\$123,877
2036		\$250,000	\$250,000	\$120,152
2037		\$250,000	\$250,000	\$116,540
2038		\$250,000	\$250,000	\$113,035
2039		\$1,000,000	\$1,000,000	\$438,547
2040			\$0	\$0
2041			\$0	\$0
2042			\$0	\$0
2043			\$0	\$0
2044			\$0	\$0
2045			\$0	\$0
2046			\$0	\$0
2047			\$0	\$0
2048			\$0	\$0
2049			\$0	\$0
2050			\$0	\$0
2051			\$0	\$0
<b>TOTAL</b>	<b>\$300,000,000</b>	<b>\$12,000,000</b>	<b>\$312,000,000</b>	<b>\$299,501,371</b>

Source: System Metrics Group, Inc.

The final inputs are the travel demand model data. Figure E-8 shows part of the information entered in the “Definition of Model Groups” for this example. Each row (or group) corresponds to a particular speed bin. The full table extends to the 70-mph speed bin. The information in the “Label” column is used throughout the tool as a nickname (or shorthand) for the data. The “Name of Model Group” column provides a more complete description of the data.

**Figure E-8**  
**Example of Model Group Definitions**

<b>DEFINITIONS OF MODEL GROUPS</b>					
	<b>Label</b>	<b>Name of Model Group</b>	<b>County</b>	<b>Avg. Vehicle Occupancy (AVO)</b>	<b>Percent Trucks</b>
Model Group 1	0 mph	0 mph speed bin	Detroit	1.15	
Model Group 2	1 mph	1 mph speed bin	Detroit	1.15	
Model Group 3	2 mph	2 mph speed bin	Detroit	1.15	
Model Group 4	3 mph	3 mph speed bin	Detroit	1.15	
Model Group 5	4 mph	4 mph speed bin	Detroit	1.15	
Model Group 6	5 mph	5 mph speed bin	Detroit	1.15	
Model Group 7	6 mph	6 mph speed bin	Detroit	1.15	
Model Group 8	7 mph	7 mph speed bin	Detroit	1.15	
Model Group 9	8 mph	8 mph speed bin	Detroit	1.15	
Model Group 10	9 mph	9 mph speed bin	Detroit	1.15	
Model Group 11	10 mph	10 mph speed bin	Detroit	1.15	
Model Group 12	11 mph	11 mph speed bin	Detroit	1.15	

In this example, the SEMCOG travel demand model data are summarized for the region. Because most of the impacts are expected to occur in the City of Detroit, “Detroit” is picked as the county. Alternatively, the data could be summarized by individual county and data entered for each county. The “County” column indicates where the transportation performance impacts occur. If data are summarized for the region, the county receiving the largest portion of the impacts should be entered.

The Simplified Economic Analysis Tool also requires input of “Average Vehicle Occupancy (AVO)” and “Percent Trucks” data. They can be entered in the model group definitions as shown in Figure E-8 for AVO or later with the individual travel demand model scenarios. In the example, the percentage of trucks is expected to change over the years, so that column is left blank in the model definitions and entered along with the detailed model data.

After the model groups are defined, the model data are entered for all four scenarios:

- 2010 No Build
- 2010 Build
- 2035 No Build
- 2035 Build.

Figure E-9 shows part of the data entered for the 2010 No Build scenario. The VMT and VHT are entered for each speed bin. The tool automatically calculates speeds from the VMT and VHT data (VMT/VHT = speed). The AVO figures carry down from the data entered in the model group definitions (1.15). Because the percentages of trucks vary across scenarios and years, they are entered manually for each set of model data. If the percentages were not manually entered, the percentages would have carried down from the model group definitions as 0 percent. In Figure E-9, this column is shaded to indicate that the tool calculations (0 percent) are overridden.

**Figure E-9**  
**Example of Model Data Entered into Tool**

<b>MODEL DATA - YEAR 2010 NO BUILD</b>						
	<b>Number of Trips</b>	<b>Vehicle Miles Traveled (VMT)</b>	<b>Vehicle Hours Traveled (VHT)</b>	<b>Speed</b>	<b>Avg. Vehicle Occupancy (AVO)</b>	<b>Percent Trucks</b>
1 0 mph		1,304	2,651	0.5	1.15	2.8%
2 1 mph		3,982	3,244	1.2	1.15	5.4%
3 2 mph		4,153	2,157	1.9	1.15	7.1%
4 3 mph		19,229	6,244	3.1	1.15	7.7%
5 4 mph		35,755	9,003	4.0	1.15	7.6%
6 5 mph		69,680	13,658	5.1	1.15	5.3%
7 6 mph		46,892	7,674	6.1	1.15	8.2%
8 7 mph		109,848	15,637	7.0	1.15	8.2%
9 8 mph		204,432	25,436	8.0	1.15	5.9%
10 9 mph		214,220	23,808	9.0	1.15	8.8%
11 10 mph		358,031	35,894	10.0	1.15	7.7%
12 11 mph		276,493	25,321	10.9	1.15	7.1%
13 12 mph		432,419	36,102	12.0	1.15	8.3%

Similar information is entered into the model data tables for the other three scenarios. Using this information, the tool conducts the benefit-cost analysis and estimates the economic impacts. The detailed calculations are shown on subsequent pages in the tool, but the tool can be used simply by entering the data in the input page and looking at the results page. Detailed impacts are shown on the following pages:

- Travel Time
- Vehicle Operating Costs
- Safety
- Emissions
- Economic Impacts.

The user benefits are aggregated on the “Final Calculations” page and the tool parameters are shown on the “Parameters” page.

## RESULTS

Figure E-10 shows the final results for the example. The direct user benefits and the benefit-cost calculation are shown on the left side of the results page. The right side shows the impacts that the project has on the overall SEMCOG regional economy. As noted on the results page, the economic impacts capture only the long-term improvements in the economy due to production cost savings. They do not include the short-term construction impacts, which must be estimated outside the tool.

Figure E-10  
Example of Results

<b>SEMCOG</b>		<b>SIMPLIFIED ECONOMIC ANALYSIS TOOL</b>				
		25-Year	Annual		25-Year	Annual
		Total	Average		Total	Average
<b>DIRECT USER BENEFITS</b> (mil. 2010\$)				<b>IMPACTS ON SEMCOG REGIONAL ECONOMY</b>		
Travel Time Savings		\$932.3	\$37.3	Gross Regional Product (mil. 2010\$)	\$2,139.3	\$85.6
Vehicle Operating Cost Savings		\$84.0	\$3.4	Real Personal Income (mil. 2010\$)	\$2,404.6	\$96.2
Safety Improvements		\$0.0	\$0.0	Employment (job-years)	16,744	670
Emissions Cost Savings		-\$20.1	-\$0.8	Natural Resources, Mining & Utilities	32	1.3
<b>TOTAL USER BENEFITS</b>		\$996.2	\$39.8	Construction	1,139	45.6
<b>BENEFIT-COST RATIO</b>		3.3		Manufacturing (other than Motor Vehicles)	281	11.2
<b>NET PRESENT VALUE</b> (mil. 2010\$)		\$696.7		Motor Vehicles, Bodies & Parts Manuf.	22	0.9
				Wholesale & Retail Trade	1,601	64.0
				Transportation and Warehousing	606	24.2
				Information, Finance & Real Estate	1,804	72.2
				Management, Prof. Services, Education	1,569	62.8
				Health Care & Social Assistance	2,595	103.8
				Accommodation & Food Services	1,370	54.8
				Other Services	3,260	130.4
				Government	2,466	98.6

*Note: Impacts on the SEMCOG regional economy do not include short-term construction impact*

## Appendix E-1 MODEL APPLICATIONS

## Model Applications

The Simplified Economic Analysis Tool was run for two sample projects. The projects were chosen to test the ability of the combination of the SEMCOG travel demand model and the Simplified Economic Analysis Tool to capture project benefits in a number of different circumstances:

- I-75 Widening in Oakland County
- I-94 Widening in City of Detroit

The next two sections show the input data and model results. Cost data were not available for the sample projects. As a result, the costs were entered as \$0 and the construction period was expected to be one year for the sample projects.

The Simplified Economic Analysis Tool was also run for the entire SEMCOG Regional Transportation Plan (RTP) to create the test cases used to develop the economic impact rules of thumb from REMI. The results of that analysis are not shown here.

## I-75 Widening in Oakland County

### PROJECT INFORMATION

I-75

#### Project Timing

Current Year	2012
Year Construction Begins	2012
Year Project Opens	2013

#### Years for Model Data

Base Year	2010
Forecast Year	2035

#### Safety Impact

Percent Improvement	0%
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Include Induced Travel in Benefits?

Y
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# PROJECT COSTS

Year	Project Costs		Total Costs	
	Construction	Operating & Maintenance	Constant Dollars	Present Value
2012			\$0	\$0
2013			\$0	\$0
2014			\$0	\$0
2015			\$0	\$0
2016			\$0	\$0
2017			\$0	\$0
2018			\$0	\$0
2019			\$0	\$0
2020			\$0	\$0
2021			\$0	\$0
2022			\$0	\$0
2023			\$0	\$0
2024			\$0	\$0
2025			\$0	\$0
2026			\$0	\$0
2027			\$0	\$0
2028			\$0	\$0
2029			\$0	\$0
2030			\$0	\$0
2031			\$0	\$0
2032			\$0	\$0
2033			\$0	\$0
2034			\$0	\$0
2035			\$0	\$0
2036			\$0	\$0
2037			\$0	\$0
2038			\$0	\$0
2039			\$0	\$0
2040			\$0	\$0
2041			\$0	\$0
2042			\$0	\$0
2043			\$0	\$0
2044			\$0	\$0
2045			\$0	\$0
2046			\$0	\$0
2047			\$0	\$0
2048			\$0	\$0
2049			\$0	\$0
2050			\$0	\$0
2051			\$0	\$0
TOTAL	\$0	\$0	\$0	\$0

**DEFINITIONS OF MODEL GROUPS**

	Label	Name of Model Group	County	Avg. Vehicle Occupancy (AVO)	Percent Trucks
Model Group 1	0 mph	0 mph speed bin	Oakland	1.15	
Model Group 2	1 mph	1 mph speed bin	Oakland	1.15	
Model Group 3	2 mph	2 mph speed bin	Oakland	1.15	
Model Group 4	3 mph	3 mph speed bin	Oakland	1.15	
Model Group 5	4 mph	4 mph speed bin	Oakland	1.15	
Model Group 6	5 mph	5 mph speed bin	Oakland	1.15	
Model Group 7	6 mph	6 mph speed bin	Oakland	1.15	
Model Group 8	7 mph	7 mph speed bin	Oakland	1.15	
Model Group 9	8 mph	8 mph speed bin	Oakland	1.15	
Model Group 10	9 mph	9 mph speed bin	Oakland	1.15	
Model Group 11	10 mph	10 mph speed bin	Oakland	1.15	
Model Group 12	11 mph	11 mph speed bin	Oakland	1.15	
Model Group 13	12 mph	12 mph speed bin	Oakland	1.15	
Model Group 14	13 mph	13 mph speed bin	Oakland	1.15	
Model Group 15	14 mph	14 mph speed bin	Oakland	1.15	
Model Group 16	15 mph	15 mph speed bin	Oakland	1.15	
Model Group 17	16 mph	16 mph speed bin	Oakland	1.15	
Model Group 18	17 mph	17 mph speed bin	Oakland	1.15	
Model Group 19	18 mph	18 mph speed bin	Oakland	1.15	
Model Group 20	19 mph	19 mph speed bin	Oakland	1.15	
Model Group 21	20 mph	20 mph speed bin	Oakland	1.15	
Model Group 22	21 mph	21 mph speed bin	Oakland	1.15	
Model Group 23	22 mph	22 mph speed bin	Oakland	1.15	
Model Group 24	23 mph	23 mph speed bin	Oakland	1.15	
Model Group 25	24 mph	24 mph speed bin	Oakland	1.15	
Model Group 26	25 mph	25 mph speed bin	Oakland	1.15	
Model Group 27	26 mph	26 mph speed bin	Oakland	1.15	
Model Group 28	27 mph	27 mph speed bin	Oakland	1.15	
Model Group 29	28 mph	28 mph speed bin	Oakland	1.15	
Model Group 30	29 mph	29 mph speed bin	Oakland	1.15	
Model Group 31	30 mph	30 mph speed bin	Oakland	1.15	
Model Group 32	31 mph	31 mph speed bin	Oakland	1.15	
Model Group 33	32 mph	32 mph speed bin	Oakland	1.15	
Model Group 34	33 mph	33 mph speed bin	Oakland	1.15	
Model Group 35	34 mph	34 mph speed bin	Oakland	1.15	
Model Group 36	35 mph	35 mph speed bin	Oakland	1.15	
Model Group 37	36 mph	36 mph speed bin	Oakland	1.15	
Model Group 38	37 mph	37 mph speed bin	Oakland	1.15	
Model Group 39	38 mph	38 mph speed bin	Oakland	1.15	
Model Group 40	39 mph	39 mph speed bin	Oakland	1.15	
Model Group 41	40 mph	40 mph speed bin	Oakland	1.15	
Model Group 42	41 mph	41 mph speed bin	Oakland	1.15	
Model Group 43	42 mph	42 mph speed bin	Oakland	1.15	
Model Group 44	43 mph	43 mph speed bin	Oakland	1.15	
Model Group 45	44 mph	44 mph speed bin	Oakland	1.15	
Model Group 46	45 mph	45 mph speed bin	Oakland	1.15	
Model Group 47	46 mph	46 mph speed bin	Oakland	1.15	
Model Group 48	47 mph	47 mph speed bin	Oakland	1.15	
Model Group 49	48 mph	48 mph speed bin	Oakland	1.15	
Model Group 50	49 mph	49 mph speed bin	Oakland	1.15	
Model Group 51	50 mph	50 mph speed bin	Oakland	1.15	
Model Group 52	51 mph	51 mph speed bin	Oakland	1.15	
Model Group 53	52 mph	52 mph speed bin	Oakland	1.15	
Model Group 54	53 mph	53 mph speed bin	Oakland	1.15	
Model Group 55	54 mph	54 mph speed bin	Oakland	1.15	
Model Group 56	55 mph	55 mph speed bin	Oakland	1.15	
Model Group 57	56 mph	56 mph speed bin	Oakland	1.15	
Model Group 58	57 mph	57 mph speed bin	Oakland	1.15	
Model Group 59	58 mph	58 mph speed bin	Oakland	1.15	
Model Group 60	59 mph	59 mph speed bin	Oakland	1.15	
Model Group 61	60 mph	60 mph speed bin	Oakland	1.15	
Model Group 62	61 mph	61 mph speed bin	Oakland	1.15	
Model Group 63	62 mph	62 mph speed bin	Oakland	1.15	
Model Group 64	63 mph	63 mph speed bin	Oakland	1.15	
Model Group 65	64 mph	64 mph speed bin	Oakland	1.15	
Model Group 66	65 mph	65 mph speed bin	Oakland	1.15	
Model Group 67	66 mph	66 mph speed bin	Oakland	1.15	
Model Group 68	67 mph	67 mph speed bin	Oakland	1.15	
Model Group 69	68 mph	68 mph speed bin	Oakland	1.15	
Model Group 70	69 mph	69 mph speed bin	Oakland	1.15	
Model Group 71	70 mph	70 mph speed bin	Oakland	1.15	
Model Group 72					
Model Group 73					
Model Group 74					
Model Group 75					
Model Group 76					
Model Group 77					
Model Group 78					
Model Group 79					
Model Group 80					
Model Group 81					
Model Group 82					
Model Group 83					
Model Group 84					
Model Group 85					
Model Group 86					
Model Group 87					
Model Group 88					
Model Group 89					
Model Group 90					
Model Group 91					
Model Group 92					
Model Group 93					
Model Group 94					
Model Group 95					
Model Group 96					
Model Group 97					
Model Group 98					
Model Group 99					
Model Group 100					

MODEL DATA - YEAR 2010 NO BUILD

	Vehicle Miles Traveled (VMT)	Vehicle Hours Traveled (VHT)	Speed	Avg. Vehicle Occupancy (AVO)	Percent Trucks
1 0 mph	1,304	2,651	0.5	1.15	2.8%
2 1 mph	3,982	3,244	1.2	1.15	5.4%
3 2 mph	4,153	2,157	1.9	1.15	7.1%
4 3 mph	19,229	6,244	3.1	1.15	7.7%
5 4 mph	35,755	9,003	4.0	1.15	7.6%
6 5 mph	69,680	13,658	5.1	1.15	5.3%
7 6 mph	46,892	7,674	6.1	1.15	8.2%
8 7 mph	109,848	15,637	7.0	1.15	8.2%
9 8 mph	204,432	25,436	8.0	1.15	5.9%
10 9 mph	214,220	23,808	9.0	1.15	8.8%
11 10 mph	358,031	35,894	10.0	1.15	7.7%
12 11 mph	276,493	25,321	10.9	1.15	7.1%
13 12 mph	432,419	36,102	12.0	1.15	8.3%
14 13 mph	459,748	35,409	13.0	1.15	7.3%
15 14 mph	569,844	40,742	14.0	1.15	8.1%
16 15 mph	1,574,474	104,931	15.0	1.15	7.0%
17 16 mph	825,272	51,637	16.0	1.15	7.8%
18 17 mph	1,011,892	59,428	17.0	1.15	7.5%
19 18 mph	1,332,832	73,926	18.0	1.15	7.8%
20 19 mph	1,076,385	56,639	19.0	1.15	8.2%
21 20 mph	1,617,356	80,813	20.0	1.15	7.9%
22 21 mph	1,419,570	67,542	21.0	1.15	8.4%
23 22 mph	1,505,169	68,399	22.0	1.15	8.1%
24 23 mph	1,625,459	70,686	23.0	1.15	8.0%
25 24 mph	2,076,416	86,507	24.0	1.15	8.3%
26 25 mph	2,528,825	101,070	25.0	1.15	7.6%
27 26 mph	2,599,001	99,878	26.0	1.15	8.4%
28 27 mph	2,772,127	102,552	27.0	1.15	8.0%
29 28 mph	3,334,566	119,167	28.0	1.15	8.2%
30 29 mph	3,995,458	137,682	29.0	1.15	8.0%
31 30 mph	5,316,428	177,547	29.9	1.15	8.3%
32 31 mph	3,040,356	98,093	31.0	1.15	8.4%
33 32 mph	4,210,485	131,561	32.0	1.15	8.5%
34 33 mph	4,010,402	121,492	33.0	1.15	8.6%
35 34 mph	5,674,784	166,701	34.0	1.15	8.3%
36 35 mph	5,843,865	167,734	34.8	1.15	8.7%
37 36 mph	1,893,411	52,568	36.0	1.15	9.4%
38 37 mph	1,610,195	43,472	37.0	1.15	9.6%
39 38 mph	1,795,025	47,199	38.0	1.15	9.6%
40 39 mph	2,515,394	64,453	39.0	1.15	9.8%
41 40 mph	2,175,118	54,575	39.9	1.15	10.9%
42 41 mph	1,175,827	28,676	41.0	1.15	9.8%
43 42 mph	1,267,321	30,176	42.0	1.15	10.7%
44 43 mph	1,430,233	33,197	43.1	1.15	12.0%
45 44 mph	2,422,981	54,937	44.1	1.15	12.4%
46 45 mph	6,197,312	138,046	44.9	1.15	13.7%
47 46 mph	1,250,799	27,201	46.0	1.15	9.7%
48 47 mph	599,227	12,768	46.9	1.15	9.9%
49 48 mph	778,393	16,246	47.9	1.15	11.0%
50 49 mph	874,375	17,827	49.0	1.15	9.6%
51 50 mph	1,334,251	26,663	50.0	1.15	10.1%
52 51 mph	669,992	13,101	51.1	1.15	10.5%
53 52 mph	991,053	19,057	52.0	1.15	9.5%
54 53 mph	762,937	14,377	53.1	1.15	10.0%
55 54 mph	986,720	18,205	54.2	1.15	11.5%
56 55 mph	1,033,888	18,788	55.0	1.15	10.5%
57 56 mph	1,877,115	33,506	56.0	1.15	9.7%
58 57 mph	1,339,362	23,509	57.0	1.15	10.0%
59 58 mph	2,877,089	49,590	58.0	1.15	10.0%
60 59 mph	3,906,873	66,173	59.0	1.15	10.3%
61 60 mph	6,010,780	100,482	59.8	1.15	10.4%
62 61 mph	644,757	10,566	61.0	1.15	11.1%
63 62 mph	1,130,684	18,265	61.9	1.15	11.1%
64 63 mph	1,563,503	24,796	63.1	1.15	12.5%
65 64 mph	2,521,172	39,348	64.1	1.15	11.5%
66 65 mph	5,048,656	77,671	64.8	1.15	12.5%
67 66 mph	329,545	4,998	65.9	1.15	13.9%
68 67 mph	889,354	14,764	67.0	1.15	12.5%
69 68 mph	1,272,274	18,688	68.1	1.15	10.9%
70 69 mph	1,335,445	19,333	69.1	1.15	11.4%
71 70 mph	4,017,393	57,484	69.9	1.15	12.0%
72 Not Used			55.0	0.00	0.0%
73 Not Used			55.0	0.00	0.0%
74 Not Used			55.0	0.00	0.0%
75 Not Used			55.0	0.00	0.0%
76 Not Used			55.0	0.00	0.0%
77 Not Used			55.0	0.00	0.0%
78 Not Used			55.0	0.00	0.0%
79 Not Used			55.0	0.00	0.0%
80 Not Used			55.0	0.00	0.0%
81 Not Used			55.0	0.00	0.0%
82 Not Used			55.0	0.00	0.0%
83 Not Used			55.0	0.00	0.0%
84 Not Used			55.0	0.00	0.0%
85 Not Used			55.0	0.00	0.0%
86 Not Used			55.0	0.00	0.0%
87 Not Used			55.0	0.00	0.0%
88 Not Used			55.0	0.00	0.0%
89 Not Used			55.0	0.00	0.0%
90 Not Used			55.0	0.00	0.0%
91 Not Used			55.0	0.00	0.0%
92 Not Used			55.0	0.00	0.0%
93 Not Used			55.0	0.00	0.0%
94 Not Used			55.0	0.00	0.0%
95 Not Used			55.0	0.00	0.0%
96 Not Used			55.0	0.00	0.0%
97 Not Used			55.0	0.00	0.0%
98 Not Used			55.0	0.00	0.0%
99 Not Used			55.0	0.00	0.0%
100 Not Used			55.0	0.00	0.0%
TOTAL	0	126,825,606	3,717,868		

MODEL DATA - YEAR 2010 BUILD

	Vehicle Miles Traveled (VMT)	Vehicle Hours Traveled (VHT)	Speed	Avg. Vehicle Occupancy (AVO)	Percent Trucks
1 0 mph	0	0	55.0	1.15	0.0%
2 1 mph	5,298	5,277	1.0	1.15	4.7%
3 2 mph	5,429	2,830	1.9	1.15	6.7%
4 3 mph	14,695	4,891	3.0	1.15	7.7%
5 4 mph	33,922	8,567	4.0	1.15	7.8%
6 5 mph	71,066	13,908	5.1	1.15	5.6%
7 6 mph	51,176	8,446	6.1	1.15	8.2%
8 7 mph	105,814	15,120	7.0	1.15	8.4%
9 8 mph	204,574	25,292	8.1	1.15	5.9%
10 9 mph	266,492	29,827	8.9	1.15	7.9%
11 10 mph	288,377	28,989	9.9	1.15	8.1%
12 11 mph	246,509	22,350	11.0	1.15	7.3%
13 12 mph	504,661	42,401	11.9	1.15	8.1%
14 13 mph	506,182	38,954	13.0	1.15	7.0%
15 14 mph	525,789	37,526	14.0	1.15	7.9%
16 15 mph	1,516,588	101,092	15.0	1.15	7.1%
17 16 mph	819,746	51,327	16.0	1.15	7.7%
18 17 mph	894,370	52,623	17.0	1.15	7.9%
19 18 mph	1,234,392	68,540	18.0	1.15	7.6%
20 19 mph	1,090,172	57,378	19.0	1.15	8.1%
21 20 mph	1,638,996	81,930	20.0	1.15	7.8%
22 21 mph	1,355,634	64,498	21.0	1.15	8.5%
23 22 mph	1,484,032	67,504	22.0	1.15	8.2%
24 23 mph	1,773,156	77,048	23.0	1.15	8.0%
25 24 mph	2,077,918	86,515	24.0	1.15	8.1%
26 25 mph	2,363,924	94,524	25.0	1.15	7.9%
27 26 mph	2,442,578	93,992	26.0	1.15	8.3%
28 27 mph	2,683,893	99,284	27.0	1.15	8.1%
29 28 mph	3,411,782	121,921	28.0	1.15	8.1%
30 29 mph	3,920,502	134,959	29.0	1.15	8.1%
31 30 mph	5,001,364	167,013	29.9	1.15	8.2%
32 31 mph	3,255,381	105,039	31.0	1.15	8.3%
33 32 mph	4,110,982	128,501	32.0	1.15	8.6%
34 33 mph	4,008,216	121,453	33.0	1.15	8.5%
35 34 mph	5,898,293	173,278	34.0	1.15	8.4%
36 35 mph	5,946,406	170,683	34.8	1.15	8.6%
37 36 mph	2,006,931	55,641	36.1	1.15	9.3%
38 37 mph	1,629,668	44,053	37.0	1.15	9.5%
39 38 mph	1,918,689	50,439	38.0	1.15	9.5%
40 39 mph	2,366,547	60,613	39.0	1.15	9.9%
41 40 mph	2,220,982	55,687	39.9	1.15	10.9%
42 41 mph	1,201,198	29,228	41.1	1.15	10.1%
43 42 mph	1,376,273	32,743	42.0	1.15	10.4%
44 43 mph	1,384,212	32,148	43.1	1.15	11.9%
45 44 mph	2,333,200	52,929	44.1	1.15	12.6%
46 45 mph	5,847,097	130,208	44.9	1.15	13.9%
47 46 mph	1,409,142	30,604	46.0	1.15	10.0%
48 47 mph	688,407	14,685	46.9	1.15	9.1%
49 48 mph	912,795	19,053	47.9	1.15	11.0%
50 49 mph	977,967	19,941	49.0	1.15	9.5%
51 50 mph	1,235,153	24,721	50.0	1.15	10.4%
52 51 mph	919,196	17,987	51.1	1.15	10.0%
53 52 mph	728,854	14,010	52.0	1.15	9.9%
54 53 mph	899,300	17,001	52.9	1.15	9.4%
55 54 mph	963,550	17,789	54.2	1.15	11.1%
56 55 mph	1,152,999	20,975	55.0	1.15	10.7%
57 56 mph	1,892,631	33,815	56.0	1.15	9.7%
58 57 mph	1,152,056	20,200	57.0	1.15	9.9%
59 58 mph	2,831,573	48,815	58.0	1.15	10.4%
60 59 mph	4,353,741	73,712	59.1	1.15	10.2%
61 60 mph	5,904,861	98,694	59.8	1.15	10.5%
62 61 mph	887,111	14,502	61.2	1.15	10.5%
63 62 mph	725,238	11,689	62.0	1.15	11.7%
64 63 mph	1,614,355	25,608	63.0	1.15	12.4%
65 64 mph	2,567,075	40,060	64.1	1.15	11.5%
66 65 mph	5,028,727	77,561	64.8	1.15	12.6%
67 66 mph	329,589	4,998	65.9	1.15	13.9%
68 67 mph	897,622	13,395	67.0	1.15	12.6%
69 68 mph	1,364,198	20,051	68.0	1.15	11.0%
70 69 mph	1,334,538	19,317	69.1	1.15	11.4%
71 70 mph	4,011,824	57,403	69.9	1.15	12.0%
72 Not Used			55.0	0.00	0.0%
73 Not Used			55.0	0.00	0.0%
74 Not Used			55.0	0.00	0.0%
75 Not Used			55.0	0.00	0.0%
76 Not Used			55.0	0.00	0.0%
77 Not Used			55.0	0.00	0.0%
78 Not Used			55.0	0.00	0.0%
79 Not Used			55.0	0.00	0.0%
80 Not Used			55.0	0.00	0.0%
81 Not Used			55.0	0.00	0.0%
82 Not Used			55.0	0.00	0.0%
83 Not Used			55.0	0.00	0.0%
84 Not Used			55.0	0.00	0.0%
85 Not Used			55.0	0.00	0.0%
86 Not Used			55.0	0.00	0.0%
87 Not Used			55.0	0.00	0.0%
88 Not Used			55.0	0.00	0.0%
89 Not Used			55.0	0.00	0.0%
90 Not Used			55.0	0.00	0.0%
91 Not Used			55.0	0.00	0.0%
92 Not Used			55.0	0.00	0.0%
93 Not Used			55.0	0.00	0.0%
94 Not Used			55.0	0.00	0.0%
95 Not Used			55.0	0.00	0.0%
96 Not Used			55.0	0.00	0.0%
97 Not Used			55.0	0.00	0.0%
98 Not Used			55.0	0.00	0.0%
99 Not Used			55.0	0.00	0.0%
100 Not Used			55.0	0.00	0.0%
TOTAL	0	126,825,606	3,703,765		

MODEL DATA - YEAR 2035 NO BUILD

	Vehicle Miles		Speed	Avg. Vehicle		Percent
	Number of Trips	Traveled (VMT)		Hours Traveled (VHT)	Occupancy (AVO)	
1 0 mph		1,728	3,785	0.5	1.15	2.4%
2 1 mph		4,247	3,957	1.1	1.15	6.2%
3 2 mph		46,522	20,575	2.3	1.15	6.4%
4 3 mph		20,990	7,036	3.0	1.15	7.3%
5 4 mph		27,242	7,026	3.9	1.15	6.5%
6 5 mph		70,323	13,898	5.1	1.15	6.9%
7 6 mph		121,375	20,294	6.0	1.15	8.4%
8 7 mph		235,073	33,390	7.0	1.15	7.0%
9 8 mph		337,621	42,202	8.0	1.15	5.1%
10 9 mph		396,098	43,754	9.1	1.15	7.8%
11 10 mph		343,574	34,573	9.9	1.15	8.1%
12 11 mph		404,657	36,880	11.0	1.15	6.6%
13 12 mph		710,999	59,275	12.0	1.15	6.9%
14 13 mph		544,043	41,866	13.0	1.15	7.2%
15 14 mph		725,040	51,689	14.0	1.15	7.5%
16 15 mph		1,086,876	72,335	15.0	1.15	7.1%
17 16 mph		1,052,360	65,769	16.0	1.15	7.1%
18 17 mph		1,188,470	69,952	17.0	1.15	7.1%
19 18 mph		1,286,640	71,441	18.0	1.15	7.7%
20 19 mph		1,478,484	77,589	19.1	1.15	7.5%
21 20 mph		1,771,852	88,656	20.0	1.15	7.7%
22 21 mph		1,890,011	89,947	21.0	1.15	7.5%
23 22 mph		1,841,172	83,627	22.0	1.15	7.5%
24 23 mph		2,166,387	94,178	23.0	1.15	7.8%
25 24 mph		2,387,059	99,597	24.0	1.15	7.5%
26 25 mph		2,521,364	100,715	25.0	1.15	7.4%
27 26 mph		2,581,224	99,380	26.0	1.15	7.5%
28 27 mph		3,058,025	113,242	27.0	1.15	7.8%
29 28 mph		3,652,338	130,374	28.0	1.15	7.5%
30 29 mph		3,915,282	134,906	29.0	1.15	7.3%
31 30 mph		5,407,807	180,825	29.9	1.15	7.8%
32 31 mph		2,883,920	92,942	31.0	1.15	8.0%
33 32 mph		3,786,472	118,222	32.0	1.15	7.7%
34 33 mph		3,646,228	110,480	33.0	1.15	7.7%
35 34 mph		5,850,914	171,928	34.0	1.15	7.8%
36 35 mph		5,613,549	161,109	34.8	1.15	7.9%
37 36 mph		1,198,167	33,264	36.0	1.15	9.5%
38 37 mph		1,703,874	46,063	37.0	1.15	8.6%
39 38 mph		1,933,367	50,805	38.1	1.15	9.1%
40 39 mph		2,557,289	65,579	39.0	1.15	9.3%
41 40 mph		2,287,474	57,350	39.9	1.15	9.7%
42 41 mph		1,488,845	36,326	41.0	1.15	10.0%
43 42 mph		1,255,891	29,937	42.0	1.15	10.1%
44 43 mph		1,596,085	37,078	43.0	1.15	11.5%
45 44 mph		2,695,785	61,140	44.1	1.15	11.6%
46 45 mph		5,755,484	128,169	44.9	1.15	12.2%
47 46 mph		599,166	13,020	46.0	1.15	10.0%
48 47 mph		830,205	17,615	47.1	1.15	10.6%
49 48 mph		750,427	15,642	48.0	1.15	9.2%
50 49 mph		969,542	19,809	48.9	1.15	9.0%
51 50 mph		1,211,531	24,163	50.1	1.15	9.6%
52 51 mph		942,137	18,459	51.0	1.15	10.1%
53 52 mph		897,115	17,246	52.0	1.15	9.3%
54 53 mph		776,087	14,642	53.0	1.15	8.7%
55 54 mph		828,585	15,336	54.0	1.15	8.7%
56 55 mph		942,906	17,121	55.1	1.15	8.8%
57 56 mph		1,532,493	27,397	55.9	1.15	9.3%
58 57 mph		1,522,169	26,728	57.0	1.15	9.3%
59 58 mph		3,215,393	55,426	58.0	1.15	10.0%
60 59 mph		3,586,067	60,745	59.0	1.15	9.3%
61 60 mph		5,831,546	97,464	59.8	1.15	9.4%
62 61 mph		589,424	9,675	60.9	1.15	11.9%
63 62 mph		858,443	13,852	62.0	1.15	10.5%
64 63 mph		2,063,133	32,740	63.0	1.15	11.2%
65 64 mph		3,384,844	52,878	64.0	1.15	11.3%
66 65 mph		3,937,764	60,627	65.0	1.15	11.6%
67 66 mph		707,313	10,704	66.1	1.15	12.6%
68 67 mph		759,270	11,309	67.1	1.15	10.1%
69 68 mph		950,013	13,946	68.1	1.15	10.4%
70 69 mph		1,133,245	16,393	69.1	1.15	11.0%
71 70 mph		3,415,041	48,884	69.9	1.15	11.6%
72 Not Used				55.0	0.00	0.0%
73 Not Used				55.0	0.00	0.0%
74 Not Used				55.0	0.00	0.0%
75 Not Used				55.0	0.00	0.0%
76 Not Used				55.0	0.00	0.0%
77 Not Used				55.0	0.00	0.0%
78 Not Used				55.0	0.00	0.0%
79 Not Used				55.0	0.00	0.0%
80 Not Used				55.0	0.00	0.0%
81 Not Used				55.0	0.00	0.0%
82 Not Used				55.0	0.00	0.0%
83 Not Used				55.0	0.00	0.0%
84 Not Used				55.0	0.00	0.0%
85 Not Used				55.0	0.00	0.0%
86 Not Used				55.0	0.00	0.0%
87 Not Used				55.0	0.00	0.0%
88 Not Used				55.0	0.00	0.0%
89 Not Used				55.0	0.00	0.0%
90 Not Used				55.0	0.00	0.0%
91 Not Used				55.0	0.00	0.0%
92 Not Used				55.0	0.00	0.0%
93 Not Used				55.0	0.00	0.0%
94 Not Used				55.0	0.00	0.0%
95 Not Used				55.0	0.00	0.0%
96 Not Used				55.0	0.00	0.0%
97 Not Used				55.0	0.00	0.0%
98 Not Used				55.0	0.00	0.0%
99 Not Used				55.0	0.00	0.0%
100 Not Used				55.0	0.00	0.0%
TOTAL	0	127,762,084	3,904,943			

MODEL DATA - YEAR 2035 BUILD

	Vehicle Miles Traveled (VMT)	Vehicle Hours Traveled (VHT)	Speed	Avg. Vehicle Occupancy (AVO)	Percent Trucks
1 0 mph	2,018	7,209	0.3	1.15	1.9%
2 1 mph	4,106	5,043	0.8	1.15	4.5%
3 2 mph	30,983	14,358	2.2	1.15	5.5%
4 3 mph	22,215	7,455	3.0	1.15	7.4%
5 4 mph	30,915	7,803	4.0	1.15	6.2%
6 5 mph	73,851	14,637	5.0	1.15	7.2%
7 6 mph	142,168	23,836	6.0	1.15	7.4%
8 7 mph	159,468	22,682	7.0	1.15	7.8%
9 8 mph	354,339	44,419	8.0	1.15	5.6%
10 9 mph	325,474	35,835	9.1	1.15	7.4%
11 10 mph	365,133	36,696	10.0	1.15	8.1%
12 11 mph	390,744	35,341	11.1	1.15	6.5%
13 12 mph	606,174	50,422	12.0	1.15	6.6%
14 13 mph	574,205	44,141	13.0	1.15	7.4%
15 14 mph	627,960	44,756	14.0	1.15	7.4%
16 15 mph	1,790,041	119,145	15.0	1.15	6.6%
17 16 mph	1,106,440	69,346	16.0	1.15	6.9%
18 17 mph	1,174,020	69,074	17.0	1.15	7.2%
19 18 mph	1,033,702	57,319	18.0	1.15	7.5%
20 19 mph	1,309,592	68,709	19.1	1.15	7.6%
21 20 mph	1,625,164	81,313	20.0	1.15	7.3%
22 21 mph	1,813,010	86,316	21.0	1.15	7.7%
23 22 mph	1,882,682	85,544	22.0	1.15	7.4%
24 23 mph	1,901,351	82,749	23.0	1.15	7.7%
25 24 mph	2,365,115	98,629	24.0	1.15	7.6%
26 25 mph	2,317,859	92,676	25.0	1.15	7.3%
27 26 mph	2,670,123	102,719	26.0	1.15	7.6%
28 27 mph	3,064,072	113,457	27.0	1.15	7.7%
29 28 mph	3,414,197	122,050	28.0	1.15	7.5%
30 29 mph	4,005,315	137,916	29.0	1.15	7.3%
31 30 mph	5,056,383	168,909	29.9	1.15	7.7%
32 31 mph	3,114,277	100,425	31.0	1.15	7.9%
33 32 mph	3,610,701	112,793	32.0	1.15	7.8%
34 33 mph	3,593,886	108,957	33.0	1.15	7.7%
35 34 mph	6,119,377	179,916	34.0	1.15	7.7%
36 35 mph	5,785,486	166,031	34.8	1.15	7.8%
37 36 mph	1,549,001	43,099	35.9	1.15	9.3%
38 37 mph	1,743,910	47,123	37.0	1.15	8.8%
39 38 mph	1,962,611	51,580	38.0	1.15	9.2%
40 39 mph	2,697,866	69,208	39.0	1.15	9.1%
41 40 mph	2,233,014	55,959	39.9	1.15	10.0%
42 41 mph	1,697,404	41,445	41.0	1.15	9.8%
43 42 mph	1,164,289	27,716	42.0	1.15	10.0%
44 43 mph	1,606,956	37,360	43.0	1.15	11.5%
45 44 mph	2,774,207	62,929	44.1	1.15	11.5%
46 45 mph	5,747,314	127,930	44.9	1.15	12.1%
47 46 mph	653,060	14,193	46.0	1.15	9.9%
48 47 mph	677,594	14,404	47.0	1.15	10.3%
49 48 mph	1,136,143	23,687	48.0	1.15	9.1%
50 49 mph	980,133	20,012	49.0	1.15	9.0%
51 50 mph	679,502	13,595	50.0	1.15	9.9%
52 51 mph	1,319,429	25,853	51.0	1.15	9.6%
53 52 mph	983,390	18,911	52.0	1.15	9.5%
54 53 mph	510,565	9,640	53.0	1.15	9.3%
55 54 mph	985,777	18,281	53.9	1.15	8.8%
56 55 mph	985,066	17,910	55.0	1.15	8.8%
57 56 mph	1,670,616	29,840	56.0	1.15	9.1%
58 57 mph	1,433,036	25,153	57.0	1.15	9.1%
59 58 mph	3,170,403	54,645	58.0	1.15	9.9%
60 59 mph	3,896,305	65,999	59.0	1.15	9.4%
61 60 mph	5,298,984	88,535	59.9	1.15	9.3%
62 61 mph	613,449	10,070	60.9	1.15	11.5%
63 62 mph	972,557	15,668	62.1	1.15	10.7%
64 63 mph	1,761,328	27,923	63.1	1.15	11.1%
65 64 mph	3,306,128	51,655	64.0	1.15	11.3%
66 65 mph	4,057,762	62,477	64.9	1.15	11.3%
67 66 mph	683,069	10,336	66.1	1.15	12.6%
68 67 mph	762,130	11,355	67.1	1.15	10.2%
69 68 mph	917,524	13,471	68.1	1.15	10.4%
70 69 mph	1,145,443	16,566	69.1	1.15	11.0%
71 70 mph	3,523,575	50,429	69.9	1.15	11.6%
72 Not Used			55.0	0.00	0.0%
73 Not Used			55.0	0.00	0.0%
74 Not Used			55.0	0.00	0.0%
75 Not Used			55.0	0.00	0.0%
76 Not Used			55.0	0.00	0.0%
77 Not Used			55.0	0.00	0.0%
78 Not Used			55.0	0.00	0.0%
79 Not Used			55.0	0.00	0.0%
80 Not Used			55.0	0.00	0.0%
81 Not Used			55.0	0.00	0.0%
82 Not Used			55.0	0.00	0.0%
83 Not Used			55.0	0.00	0.0%
84 Not Used			55.0	0.00	0.0%
85 Not Used			55.0	0.00	0.0%
86 Not Used			55.0	0.00	0.0%
87 Not Used			55.0	0.00	0.0%
88 Not Used			55.0	0.00	0.0%
89 Not Used			55.0	0.00	0.0%
90 Not Used			55.0	0.00	0.0%
91 Not Used			55.0	0.00	0.0%
92 Not Used			55.0	0.00	0.0%
93 Not Used			55.0	0.00	0.0%
94 Not Used			55.0	0.00	0.0%
95 Not Used			55.0	0.00	0.0%
96 Not Used			55.0	0.00	0.0%
97 Not Used			55.0	0.00	0.0%
98 Not Used			55.0	0.00	0.0%
99 Not Used			55.0	0.00	0.0%
100 Not Used			55.0	0.00	0.0%
TOTAL	0	127,762,084	3,893,581		

**SEMCOG****SIMPLIFIED ECONOMIC ANALYSIS TOOL**

DIRECT USER BENEFITS (mil. 2010\$)	25-Year	Annual
	Total	Average
Travel Time Savings	\$1,497.2	\$59.9
Vehicle Operating Cost Savings	\$231.7	\$9.3
Safety Improvements	\$0.0	\$0.0
Emissions Cost Savings	\$3.2	\$0.1
<b>TOTAL USER BENEFITS</b>	<b>\$1,732.1</b>	<b>\$69.3</b>

BENEFIT-COST RATIO n/a

NET PRESENT VALUE (mil. 2010\$) \$1,732.1

*Note: Impacts on the SEMCOG regional economy do not include short-term construction impact*

IMPACTS ON SEMCOG REGIONAL ECONOMY	25-Year	Annual
	Total	Average
Gross Regional Product (mil. 2010\$)	\$2,913.3	\$116.5
Real Personal Income (mil. 2010\$)	\$3,007.9	\$120.3
Employment (job-years)	19,824	793
Natural Resources, Mining & Utilities	93	3.7
Construction	1,655	66.2
Manufacturing (other than Motor Vehicles)	396	15.8
Motor Vehicles, Bodies & Parts Manuf.	33	1.3
Wholesale & Retail Trade	1,772	70.9
Transportation and Warehousing	856	34.2
Information, Finance & Real Estate	2,264	90.6
Management, Prof. Services, Education	2,738	109.5
Health Care & Social Assistance	3,183	127.3
Accommodation & Food Services	1,796	71.9
Other Services	3,745	149.8
Government	1,293	51.7

## I-94 Widening in City of Detroit

### PROJECT INFORMATION

I-94

#### Project Timing

Current Year	2012
Year Construction Begins	2012
Year Project Opens	2013

#### Years for Model Data

Base Year	2010
Forecast Year	2035

#### Safety Impact

Percent Improvement	0%
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Include Induced Travel in Benefits?

Y
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# PROJECT COSTS

Year	Project Costs		Total Costs	
	Construction	Operating & Maintenance	Constant Dollars	Present Value
2012			\$0	\$0
2013			\$0	\$0
2014			\$0	\$0
2015			\$0	\$0
2016			\$0	\$0
2017			\$0	\$0
2018			\$0	\$0
2019			\$0	\$0
2020			\$0	\$0
2021			\$0	\$0
2022			\$0	\$0
2023			\$0	\$0
2024			\$0	\$0
2025			\$0	\$0
2026			\$0	\$0
2027			\$0	\$0
2028			\$0	\$0
2029			\$0	\$0
2030			\$0	\$0
2031			\$0	\$0
2032			\$0	\$0
2033			\$0	\$0
2034			\$0	\$0
2035			\$0	\$0
2036			\$0	\$0
2037			\$0	\$0
2038			\$0	\$0
2039			\$0	\$0
2040			\$0	\$0
2041			\$0	\$0
2042			\$0	\$0
2043			\$0	\$0
2044			\$0	\$0
2045			\$0	\$0
2046			\$0	\$0
2047			\$0	\$0
2048			\$0	\$0
2049			\$0	\$0
2050			\$0	\$0
2051			\$0	\$0
TOTAL	\$0	\$0	\$0	\$0

**DEFINITIONS OF MODEL GROUPS**

	Label	Name of Model Group	County	Avg. Vehicle Occupancy (AVO)	Percent Trucks
Model Group 1	0 mph	0 mph speed bin	Detroit	1.15	
Model Group 2	1 mph	1 mph speed bin	Detroit	1.15	
Model Group 3	2 mph	2 mph speed bin	Detroit	1.15	
Model Group 4	3 mph	3 mph speed bin	Detroit	1.15	
Model Group 5	4 mph	4 mph speed bin	Detroit	1.15	
Model Group 6	5 mph	5 mph speed bin	Detroit	1.15	
Model Group 7	6 mph	6 mph speed bin	Detroit	1.15	
Model Group 8	7 mph	7 mph speed bin	Detroit	1.15	
Model Group 9	8 mph	8 mph speed bin	Detroit	1.15	
Model Group 10	9 mph	9 mph speed bin	Detroit	1.15	
Model Group 11	10 mph	10 mph speed bin	Detroit	1.15	
Model Group 12	11 mph	11 mph speed bin	Detroit	1.15	
Model Group 13	12 mph	12 mph speed bin	Detroit	1.15	
Model Group 14	13 mph	13 mph speed bin	Detroit	1.15	
Model Group 15	14 mph	14 mph speed bin	Detroit	1.15	
Model Group 16	15 mph	15 mph speed bin	Detroit	1.15	
Model Group 17	16 mph	16 mph speed bin	Detroit	1.15	
Model Group 18	17 mph	17 mph speed bin	Detroit	1.15	
Model Group 19	18 mph	18 mph speed bin	Detroit	1.15	
Model Group 20	19 mph	19 mph speed bin	Detroit	1.15	
Model Group 21	20 mph	20 mph speed bin	Detroit	1.15	
Model Group 22	21 mph	21 mph speed bin	Detroit	1.15	
Model Group 23	22 mph	22 mph speed bin	Detroit	1.15	
Model Group 24	23 mph	23 mph speed bin	Detroit	1.15	
Model Group 25	24 mph	24 mph speed bin	Detroit	1.15	
Model Group 26	25 mph	25 mph speed bin	Detroit	1.15	
Model Group 27	26 mph	26 mph speed bin	Detroit	1.15	
Model Group 28	27 mph	27 mph speed bin	Detroit	1.15	
Model Group 29	28 mph	28 mph speed bin	Detroit	1.15	
Model Group 30	29 mph	29 mph speed bin	Detroit	1.15	
Model Group 31	30 mph	30 mph speed bin	Detroit	1.15	
Model Group 32	31 mph	31 mph speed bin	Detroit	1.15	
Model Group 33	32 mph	32 mph speed bin	Detroit	1.15	
Model Group 34	33 mph	33 mph speed bin	Detroit	1.15	
Model Group 35	34 mph	34 mph speed bin	Detroit	1.15	
Model Group 36	35 mph	35 mph speed bin	Detroit	1.15	
Model Group 37	36 mph	36 mph speed bin	Detroit	1.15	
Model Group 38	37 mph	37 mph speed bin	Detroit	1.15	
Model Group 39	38 mph	38 mph speed bin	Detroit	1.15	
Model Group 40	39 mph	39 mph speed bin	Detroit	1.15	
Model Group 41	40 mph	40 mph speed bin	Detroit	1.15	
Model Group 42	41 mph	41 mph speed bin	Detroit	1.15	
Model Group 43	42 mph	42 mph speed bin	Detroit	1.15	
Model Group 44	43 mph	43 mph speed bin	Detroit	1.15	
Model Group 45	44 mph	44 mph speed bin	Detroit	1.15	
Model Group 46	45 mph	45 mph speed bin	Detroit	1.15	
Model Group 47	46 mph	46 mph speed bin	Detroit	1.15	
Model Group 48	47 mph	47 mph speed bin	Detroit	1.15	
Model Group 49	48 mph	48 mph speed bin	Detroit	1.15	
Model Group 50	49 mph	49 mph speed bin	Detroit	1.15	
Model Group 51	50 mph	50 mph speed bin	Detroit	1.15	
Model Group 52	51 mph	51 mph speed bin	Detroit	1.15	
Model Group 53	52 mph	52 mph speed bin	Detroit	1.15	
Model Group 54	53 mph	53 mph speed bin	Detroit	1.15	
Model Group 55	54 mph	54 mph speed bin	Detroit	1.15	
Model Group 56	55 mph	55 mph speed bin	Detroit	1.15	
Model Group 57	56 mph	56 mph speed bin	Detroit	1.15	
Model Group 58	57 mph	57 mph speed bin	Detroit	1.15	
Model Group 59	58 mph	58 mph speed bin	Detroit	1.15	
Model Group 60	59 mph	59 mph speed bin	Detroit	1.15	
Model Group 61	60 mph	60 mph speed bin	Detroit	1.15	
Model Group 62	61 mph	61 mph speed bin	Detroit	1.15	
Model Group 63	62 mph	62 mph speed bin	Detroit	1.15	
Model Group 64	63 mph	63 mph speed bin	Detroit	1.15	
Model Group 65	64 mph	64 mph speed bin	Detroit	1.15	
Model Group 66	65 mph	65 mph speed bin	Detroit	1.15	
Model Group 67	66 mph	66 mph speed bin	Detroit	1.15	
Model Group 68	67 mph	67 mph speed bin	Detroit	1.15	
Model Group 69	68 mph	68 mph speed bin	Detroit	1.15	
Model Group 70	69 mph	69 mph speed bin	Detroit	1.15	
Model Group 71	70 mph	70 mph speed bin	Detroit	1.15	
Model Group 72					
Model Group 73					
Model Group 74					
Model Group 75					
Model Group 76					
Model Group 77					
Model Group 78					
Model Group 79					
Model Group 80					
Model Group 81					
Model Group 82					
Model Group 83					
Model Group 84					
Model Group 85					
Model Group 86					
Model Group 87					
Model Group 88					
Model Group 89					
Model Group 90					
Model Group 91					
Model Group 92					
Model Group 93					
Model Group 94					
Model Group 95					
Model Group 96					
Model Group 97					
Model Group 98					
Model Group 99					
Model Group 100					

MODEL DATA - YEAR 2010 NO BUILD

	Vehicle Miles Traveled (VMT)	Vehicle Hours Traveled (VHT)	Speed	Avg. Vehicle Occupancy (AVO)	Percent Trucks
1 0 mph	1,304	2,651	0.5	1.15	2.8%
2 1 mph	3,982	3,244	1.2	1.15	5.4%
3 2 mph	4,153	2,157	1.9	1.15	7.1%
4 3 mph	19,229	6,244	3.1	1.15	7.7%
5 4 mph	35,755	9,003	4.0	1.15	7.6%
6 5 mph	69,680	13,658	5.1	1.15	5.3%
7 6 mph	46,892	7,674	6.1	1.15	8.2%
8 7 mph	109,848	15,637	7.0	1.15	8.2%
9 8 mph	204,432	25,436	8.0	1.15	5.9%
10 9 mph	214,220	23,808	9.0	1.15	8.8%
11 10 mph	358,031	35,894	10.0	1.15	7.7%
12 11 mph	276,493	25,321	10.9	1.15	7.1%
13 12 mph	432,419	36,102	12.0	1.15	8.3%
14 13 mph	459,748	35,409	13.0	1.15	7.3%
15 14 mph	569,844	40,742	14.0	1.15	8.1%
16 15 mph	1,574,474	104,931	15.0	1.15	7.0%
17 16 mph	825,272	51,637	16.0	1.15	7.8%
18 17 mph	1,011,892	59,428	17.0	1.15	7.5%
19 18 mph	1,332,832	73,926	18.0	1.15	7.8%
20 19 mph	1,076,385	56,639	19.0	1.15	8.2%
21 20 mph	1,617,356	80,813	20.0	1.15	7.9%
22 21 mph	1,419,570	67,542	21.0	1.15	8.4%
23 22 mph	1,505,169	68,399	22.0	1.15	8.1%
24 23 mph	1,625,459	70,686	23.0	1.15	8.0%
25 24 mph	2,076,416	86,507	24.0	1.15	8.3%
26 25 mph	2,528,825	101,070	25.0	1.15	7.6%
27 26 mph	2,599,001	99,878	26.0	1.15	8.4%
28 27 mph	2,772,127	102,552	27.0	1.15	8.0%
29 28 mph	3,334,566	119,167	28.0	1.15	8.2%
30 29 mph	3,995,458	137,682	29.0	1.15	8.0%
31 30 mph	5,316,428	177,547	29.9	1.15	8.3%
32 31 mph	3,040,356	98,093	31.0	1.15	8.4%
33 32 mph	4,210,485	131,561	32.0	1.15	8.5%
34 33 mph	4,010,402	121,492	33.0	1.15	8.6%
35 34 mph	5,674,784	166,701	34.0	1.15	8.3%
36 35 mph	5,843,865	167,734	34.8	1.15	8.7%
37 36 mph	1,893,411	52,568	36.0	1.15	9.4%
38 37 mph	1,610,195	43,472	37.0	1.15	9.6%
39 38 mph	1,795,025	47,199	38.0	1.15	9.6%
40 39 mph	2,515,394	64,453	39.0	1.15	9.8%
41 40 mph	2,175,118	54,575	39.9	1.15	10.9%
42 41 mph	1,175,827	28,676	41.0	1.15	9.8%
43 42 mph	1,267,321	30,176	42.0	1.15	10.7%
44 43 mph	1,430,233	33,197	43.1	1.15	12.0%
45 44 mph	2,422,981	54,937	44.1	1.15	12.4%
46 45 mph	6,197,312	138,046	44.9	1.15	13.7%
47 46 mph	1,250,799	27,201	46.0	1.15	9.7%
48 47 mph	599,227	12,768	46.9	1.15	9.9%
49 48 mph	778,393	16,246	47.9	1.15	11.0%
50 49 mph	874,375	17,827	49.0	1.15	9.6%
51 50 mph	1,334,251	26,663	50.0	1.15	10.1%
52 51 mph	669,992	13,101	51.1	1.15	10.5%
53 52 mph	991,053	19,057	52.0	1.15	9.5%
54 53 mph	762,937	14,377	53.1	1.15	10.0%
55 54 mph	986,720	18,205	54.2	1.15	11.5%
56 55 mph	1,033,888	18,788	55.0	1.15	10.5%
57 56 mph	1,877,115	33,506	56.0	1.15	9.7%
58 57 mph	1,339,362	23,509	57.0	1.15	10.0%
59 58 mph	2,877,089	49,590	58.0	1.15	10.0%
60 59 mph	3,906,873	66,173	59.0	1.15	10.3%
61 60 mph	6,010,780	100,482	59.8	1.15	10.4%
62 61 mph	644,757	10,566	61.0	1.15	11.1%
63 62 mph	1,130,684	18,265	61.9	1.15	11.1%
64 63 mph	1,563,503	24,796	63.1	1.15	12.5%
65 64 mph	2,521,172	39,348	64.1	1.15	11.5%
66 65 mph	5,048,656	77,871	64.8	1.15	12.5%
67 66 mph	329,545	4,998	65.9	1.15	13.9%
68 67 mph	889,354	14,764	67.0	1.15	12.5%
69 68 mph	1,272,274	18,688	68.1	1.15	10.9%
70 69 mph	1,335,445	19,333	69.1	1.15	11.4%
71 70 mph	4,017,393	57,484	69.9	1.15	12.0%
72 Not Used			55.0	0.00	0.0%
73 Not Used			55.0	0.00	0.0%
74 Not Used			55.0	0.00	0.0%
75 Not Used			55.0	0.00	0.0%
76 Not Used			55.0	0.00	0.0%
77 Not Used			55.0	0.00	0.0%
78 Not Used			55.0	0.00	0.0%
79 Not Used			55.0	0.00	0.0%
80 Not Used			55.0	0.00	0.0%
81 Not Used			55.0	0.00	0.0%
82 Not Used			55.0	0.00	0.0%
83 Not Used			55.0	0.00	0.0%
84 Not Used			55.0	0.00	0.0%
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88 Not Used			55.0	0.00	0.0%
89 Not Used			55.0	0.00	0.0%
90 Not Used			55.0	0.00	0.0%
91 Not Used			55.0	0.00	0.0%
92 Not Used			55.0	0.00	0.0%
93 Not Used			55.0	0.00	0.0%
94 Not Used			55.0	0.00	0.0%
95 Not Used			55.0	0.00	0.0%
96 Not Used			55.0	0.00	0.0%
97 Not Used			55.0	0.00	0.0%
98 Not Used			55.0	0.00	0.0%
99 Not Used			55.0	0.00	0.0%
100 Not Used			55.0	0.00	0.0%
TOTAL	0	126,825,606	3,717,868		

MODEL DATA - YEAR 2010 BUILD

	Vehicle Miles Traveled (VMT)	Vehicle Hours Traveled (VHT)	Speed	Avg. Vehicle Occupancy (AVO)	Percent Trucks
1 0 mph	0	0	55.0	1.15	0.0%
2 1 mph	4,248	4,909	0.9	1.15	5.0%
3 2 mph	6,980	3,538	2.0	1.15	6.3%
4 3 mph	13,602	4,444	3.1	1.15	7.7%
5 4 mph	36,298	9,210	3.9	1.15	8.0%
6 5 mph	44,114	8,773	5.0	1.15	7.4%
7 6 mph	81,469	13,487	6.0	1.15	6.1%
8 7 mph	113,401	16,207	7.0	1.15	8.3%
9 8 mph	190,782	23,608	8.1	1.15	5.6%
10 9 mph	352,872	38,723	9.1	1.15	7.4%
11 10 mph	235,327	23,508	10.0	1.15	8.8%
12 11 mph	310,219	28,185	11.0	1.15	7.5%
13 12 mph	424,984	35,323	12.0	1.15	7.9%
14 13 mph	412,538	31,907	12.9	1.15	7.2%
15 14 mph	602,736	43,018	14.0	1.15	8.2%
16 15 mph	1,565,867	104,279	15.0	1.15	7.1%
17 16 mph	834,889	52,158	16.0	1.15	7.6%
18 17 mph	972,691	57,172	17.0	1.15	7.7%
19 18 mph	1,436,901	79,666	18.0	1.15	7.5%
20 19 mph	1,074,101	56,466	19.0	1.15	8.1%
21 20 mph	1,335,686	66,787	20.0	1.15	8.0%
22 21 mph	1,539,708	73,333	21.0	1.15	8.5%
23 22 mph	1,486,991	67,552	22.0	1.15	8.0%
24 23 mph	1,650,930	71,767	23.0	1.15	8.2%
25 24 mph	2,111,449	87,993	24.0	1.15	8.2%
26 25 mph	2,428,125	97,032	25.0	1.15	7.8%
27 26 mph	2,505,632	96,369	26.0	1.15	8.2%
28 27 mph	2,759,767	102,007	27.1	1.15	8.1%
29 28 mph	3,167,976	113,238	28.0	1.15	8.1%
30 29 mph	4,276,353	147,363	29.0	1.15	8.1%
31 30 mph	5,009,213	167,270	29.9	1.15	8.2%
32 31 mph	3,178,702	102,603	31.0	1.15	8.3%
33 32 mph	4,251,985	132,900	32.0	1.15	8.6%
34 33 mph	3,998,776	121,126	33.0	1.15	8.5%
35 34 mph	5,932,494	174,314	34.0	1.15	8.3%
36 35 mph	5,869,814	168,510	34.8	1.15	8.6%
37 36 mph	1,800,194	49,896	36.1	1.15	9.3%
38 37 mph	1,382,078	37,372	37.0	1.15	9.8%
39 38 mph	1,921,007	50,553	38.0	1.15	9.6%
40 39 mph	2,568,675	65,823	39.0	1.15	9.5%
41 40 mph	2,165,959	54,339	39.9	1.15	11.2%
42 41 mph	1,175,475	28,618	41.1	1.15	9.9%
43 42 mph	1,339,220	31,855	42.0	1.15	10.6%
44 43 mph	1,325,981	30,804	43.0	1.15	12.0%
45 44 mph	2,512,277	56,996	44.1	1.15	12.4%
46 45 mph	5,884,416	131,032	44.9	1.15	13.9%
47 46 mph	1,224,078	26,617	46.0	1.15	9.4%
48 47 mph	785,843	16,749	46.9	1.15	9.4%
49 48 mph	833,859	17,384	48.0	1.15	11.2%
50 49 mph	879,193	17,914	49.1	1.15	9.6%
51 50 mph	1,089,156	21,743	50.1	1.15	10.2%
52 51 mph	543,378	10,626	51.1	1.15	10.2%
53 52 mph	959,552	18,464	52.0	1.15	9.6%
54 53 mph	763,235	14,390	53.0	1.15	9.9%
55 54 mph	968,460	17,888	54.1	1.15	10.9%
56 55 mph	1,102,347	20,038	55.0	1.15	10.7%
57 56 mph	1,657,127	29,592	56.0	1.15	9.9%
58 57 mph	1,140,992	20,050	56.9	1.15	9.7%
59 58 mph	2,836,165	48,900	58.0	1.15	10.0%
60 59 mph	4,346,572	73,633	59.0	1.15	10.2%
61 60 mph	6,639,151	110,954	59.8	1.15	10.5%
62 61 mph	867,750	14,188	61.2	1.15	10.5%
63 62 mph	818,137	13,185	62.1	1.15	11.5%
64 63 mph	1,515,178	24,021	63.1	1.15	12.5%
65 64 mph	2,486,503	38,799	64.1	1.15	11.5%
66 65 mph	5,136,574	79,221	64.8	1.15	12.5%
67 66 mph	329,596	4,999	65.9	1.15	13.5%
68 67 mph	889,163	14,754	67.0	1.15	12.5%
69 68 mph	1,272,337	18,688	68.1	1.15	10.9%
70 69 mph	1,334,413	19,316	69.1	1.15	11.4%
71 70 mph	4,013,947	57,434	69.9	1.15	12.0%
72 Not Used			55.0	0.00	0.0%
73 Not Used			55.0	0.00	0.0%
74 Not Used			55.0	0.00	0.0%
75 Not Used			55.0	0.00	0.0%
76 Not Used			55.0	0.00	0.0%
77 Not Used			55.0	0.00	0.0%
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81 Not Used			55.0	0.00	0.0%
82 Not Used			55.0	0.00	0.0%
83 Not Used			55.0	0.00	0.0%
84 Not Used			55.0	0.00	0.0%
85 Not Used			55.0	0.00	0.0%
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87 Not Used			55.0	0.00	0.0%
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92 Not Used			55.0	0.00	0.0%
93 Not Used			55.0	0.00	0.0%
94 Not Used			55.0	0.00	0.0%
95 Not Used			55.0	0.00	0.0%
96 Not Used			55.0	0.00	0.0%
97 Not Used			55.0	0.00	0.0%
98 Not Used			55.0	0.00	0.0%
99 Not Used			55.0	0.00	0.0%
100 Not Used			55.0	0.00	0.0%
TOTAL	0	126,825,606	3,711,581		

MODEL DATA - YEAR 2035 NO BUILD

	Vehicle Miles Traveled (VMT)	Vehicle Hours Traveled (VHT)	Speed	Avg. Vehicle Occupancy (AVO)	Percent Trucks
1 0 mph	1,728	3,785	0.5	1.15	2.4%
2 1 mph	4,247	3,957	1.1	1.15	6.2%
3 2 mph	46,522	20,575	2.3	1.15	6.4%
4 3 mph	20,990	7,036	3.0	1.15	7.3%
5 4 mph	27,242	7,026	3.9	1.15	6.5%
6 5 mph	70,323	13,898	5.1	1.15	6.9%
7 6 mph	121,375	20,294	6.0	1.15	8.4%
8 7 mph	235,073	33,390	7.0	1.15	7.0%
9 8 mph	337,621	42,202	8.0	1.15	5.1%
10 9 mph	396,098	43,754	9.1	1.15	7.8%
11 10 mph	343,574	34,573	9.9	1.15	8.1%
12 11 mph	404,657	36,880	11.0	1.15	6.6%
13 12 mph	710,999	59,275	12.0	1.15	6.9%
14 13 mph	544,043	41,866	13.0	1.15	7.2%
15 14 mph	725,040	51,689	14.0	1.15	7.5%
16 15 mph	1,086,876	72,335	15.0	1.15	7.1%
17 16 mph	1,052,360	65,769	16.0	1.15	7.1%
18 17 mph	1,188,470	69,952	17.0	1.15	7.1%
19 18 mph	1,286,640	71,441	18.0	1.15	7.7%
20 19 mph	1,478,484	77,589	19.1	1.15	7.5%
21 20 mph	1,771,852	88,656	20.0	1.15	7.7%
22 21 mph	1,890,011	89,947	21.0	1.15	7.5%
23 22 mph	1,841,172	83,627	22.0	1.15	7.5%
24 23 mph	2,166,387	94,178	23.0	1.15	7.8%
25 24 mph	2,387,059	99,597	24.0	1.15	7.5%
26 25 mph	2,521,364	100,715	25.0	1.15	7.4%
27 26 mph	2,581,224	99,380	26.0	1.15	7.5%
28 27 mph	3,058,025	113,242	27.0	1.15	7.8%
29 28 mph	3,652,338	130,374	28.0	1.15	7.5%
30 29 mph	3,915,282	134,906	29.0	1.15	7.3%
31 30 mph	5,407,807	180,825	29.9	1.15	7.8%
32 31 mph	2,883,920	92,942	31.0	1.15	8.0%
33 32 mph	3,786,472	118,222	32.0	1.15	7.7%
34 33 mph	3,646,228	110,480	33.0	1.15	7.7%
35 34 mph	5,850,914	171,928	34.0	1.15	7.8%
36 35 mph	5,613,549	161,109	34.8	1.15	7.9%
37 36 mph	1,198,167	33,264	36.0	1.15	9.5%
38 37 mph	1,703,874	46,063	37.0	1.15	8.6%
39 38 mph	1,933,367	50,805	38.1	1.15	9.1%
40 39 mph	2,557,289	65,579	39.0	1.15	9.3%
41 40 mph	2,287,474	57,350	39.9	1.15	9.7%
42 41 mph	1,488,845	36,326	41.0	1.15	10.0%
43 42 mph	1,255,891	29,937	42.0	1.15	10.1%
44 43 mph	1,596,085	37,078	43.0	1.15	11.5%
45 44 mph	2,695,785	61,140	44.1	1.15	11.6%
46 45 mph	5,755,484	128,169	44.9	1.15	12.2%
47 46 mph	599,166	13,020	46.0	1.15	10.0%
48 47 mph	830,205	17,615	47.1	1.15	10.6%
49 48 mph	750,427	15,642	48.0	1.15	9.2%
50 49 mph	969,542	19,809	48.9	1.15	9.0%
51 50 mph	1,211,531	24,163	50.1	1.15	9.6%
52 51 mph	942,137	18,459	51.0	1.15	10.1%
53 52 mph	897,115	17,246	52.0	1.15	9.3%
54 53 mph	776,087	14,642	53.0	1.15	8.7%
55 54 mph	828,585	15,336	54.0	1.15	8.7%
56 55 mph	942,906	17,121	55.1	1.15	8.8%
57 56 mph	1,532,493	27,397	55.9	1.15	9.3%
58 57 mph	1,522,169	26,728	57.0	1.15	9.3%
59 58 mph	3,215,393	55,426	58.0	1.15	10.0%
60 59 mph	3,586,067	60,745	59.0	1.15	9.3%
61 60 mph	5,831,546	97,464	59.8	1.15	9.4%
62 61 mph	589,424	9,675	60.9	1.15	11.9%
63 62 mph	858,443	13,852	62.0	1.15	10.5%
64 63 mph	2,063,133	32,740	63.0	1.15	11.2%
65 64 mph	3,384,844	52,878	64.0	1.15	11.3%
66 65 mph	3,937,764	60,627	65.0	1.15	11.6%
67 66 mph	707,313	10,704	66.1	1.15	12.6%
68 67 mph	759,270	11,309	67.1	1.15	10.1%
69 68 mph	950,013	13,946	68.1	1.15	10.4%
70 69 mph	1,133,245	16,393	69.1	1.15	11.0%
71 70 mph	3,415,041	48,884	69.9	1.15	11.6%
72 Not Used			55.0	0.00	0.0%
73 Not Used			55.0	0.00	0.0%
74 Not Used			55.0	0.00	0.0%
75 Not Used			55.0	0.00	0.0%
76 Not Used			55.0	0.00	0.0%
77 Not Used			55.0	0.00	0.0%
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80 Not Used			55.0	0.00	0.0%
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85 Not Used			55.0	0.00	0.0%
86 Not Used			55.0	0.00	0.0%
87 Not Used			55.0	0.00	0.0%
88 Not Used			55.0	0.00	0.0%
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93 Not Used			55.0	0.00	0.0%
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95 Not Used			55.0	0.00	0.0%
96 Not Used			55.0	0.00	0.0%
97 Not Used			55.0	0.00	0.0%
98 Not Used			55.0	0.00	0.0%
99 Not Used			55.0	0.00	0.0%
100 Not Used			55.0	0.00	0.0%
TOTAL	0	127,762,084	3,904,943		

MODEL DATA - YEAR 2035 BUILD

	Vehicle Miles Traveled (VMT)	Vehicle Hours Traveled (VHT)	Speed	Avg. Vehicle Occupancy (AVO)	Percent Trucks
1 0 mph	2,797	9,126	0.3	1.15	2.3%
2 1 mph	4,987	4,860	1.0	1.15	5.4%
3 2 mph	30,570	13,617	2.2	1.15	5.5%
4 3 mph	20,383	6,810	3.0	1.15	7.4%
5 4 mph	29,216	7,413	3.9	1.15	6.7%
6 5 mph	75,507	14,869	5.1	1.15	7.3%
7 6 mph	130,011	21,611	6.0	1.15	7.0%
8 7 mph	231,840	33,076	7.0	1.15	6.9%
9 8 mph	291,583	36,641	8.0	1.15	5.8%
10 9 mph	363,197	39,941	9.1	1.15	7.6%
11 10 mph	391,287	39,189	10.0	1.15	7.7%
12 11 mph	361,878	32,773	11.0	1.15	6.5%
13 12 mph	565,352	46,923	12.0	1.15	6.4%
14 13 mph	556,190	42,645	13.0	1.15	7.5%
15 14 mph	640,097	45,783	14.0	1.15	7.5%
16 15 mph	1,856,312	123,441	15.0	1.15	6.6%
17 16 mph	1,153,969	72,165	16.0	1.15	7.1%
18 17 mph	1,159,746	68,090	17.0	1.15	7.1%
19 18 mph	1,068,313	59,236	18.0	1.15	7.7%
20 19 mph	1,325,388	69,505	19.1	1.15	7.7%
21 20 mph	1,724,504	86,255	20.0	1.15	7.4%
22 21 mph	1,733,963	82,420	21.0	1.15	7.7%
23 22 mph	1,798,239	81,630	22.0	1.15	7.4%
24 23 mph	1,962,587	85,476	23.0	1.15	7.7%
25 24 mph	2,371,780	98,942	24.0	1.15	7.5%
26 25 mph	2,417,559	96,508	25.1	1.15	7.4%
27 26 mph	2,623,433	100,876	26.0	1.15	7.5%
28 27 mph	2,973,444	110,030	27.0	1.15	7.7%
29 28 mph	3,673,392	131,159	28.0	1.15	7.6%
30 29 mph	4,021,964	138,441	29.1	1.15	7.3%
31 30 mph	5,103,981	170,478	29.9	1.15	7.7%
32 31 mph	2,947,542	95,016	31.0	1.15	8.0%
33 32 mph	3,667,471	114,521	32.0	1.15	7.8%
34 33 mph	3,948,329	119,658	33.0	1.15	7.7%
35 34 mph	5,732,286	168,412	34.0	1.15	7.7%
36 35 mph	5,607,866	160,940	34.8	1.15	7.9%
37 36 mph	1,483,733	41,230	36.0	1.15	9.3%
38 37 mph	1,755,094	47,472	37.0	1.15	8.6%
39 38 mph	1,870,368	49,201	38.0	1.15	9.2%
40 39 mph	2,819,041	72,355	39.0	1.15	9.2%
41 40 mph	2,349,359	58,858	39.9	1.15	9.7%
42 41 mph	1,617,274	39,469	41.0	1.15	10.1%
43 42 mph	1,266,814	30,145	42.0	1.15	9.7%
44 43 mph	1,582,289	36,795	43.0	1.15	11.6%
45 44 mph	2,654,255	60,189	44.1	1.15	11.6%
46 45 mph	5,743,914	127,875	44.9	1.15	12.1%
47 46 mph	626,932	13,602	46.1	1.15	9.8%
48 47 mph	612,939	13,027	47.1	1.15	10.4%
49 48 mph	772,363	16,107	48.0	1.15	9.5%
50 49 mph	883,668	18,057	48.9	1.15	9.0%
51 50 mph	923,372	18,443	50.1	1.15	9.4%
52 51 mph	1,215,674	23,811	51.1	1.15	9.9%
53 52 mph	756,677	14,561	52.0	1.15	9.4%
54 53 mph	729,357	13,745	53.1	1.15	8.8%
55 54 mph	737,999	13,672	54.0	1.15	8.7%
56 55 mph	936,593	17,054	55.0	1.15	8.8%
57 56 mph	1,559,832	27,906	55.9	1.15	9.2%
58 57 mph	1,372,509	24,086	57.0	1.15	9.1%
59 58 mph	3,406,620	58,759	58.0	1.15	9.9%
60 59 mph	3,597,633	60,949	59.0	1.15	9.3%
61 60 mph	6,201,675	103,638	59.8	1.15	9.4%
62 61 mph	501,205	8,231	60.9	1.15	11.4%
63 62 mph	1,025,020	16,523	62.0	1.15	10.6%
64 63 mph	1,758,024	27,871	63.1	1.15	11.3%
65 64 mph	3,224,003	50,369	64.0	1.15	11.3%
66 65 mph	4,177,274	64,317	64.9	1.15	11.3%
67 66 mph	683,171	10,341	66.1	1.15	12.6%
68 67 mph	762,248	11,361	67.1	1.15	10.2%
69 68 mph	917,542	13,470	68.1	1.15	10.4%
70 69 mph	1,175,296	16,996	69.2	1.15	11.0%
71 70 mph	3,491,387	49,966	69.9	1.15	11.6%
72 Not Used			55.0	0.00	0.0%
73 Not Used			55.0	0.00	0.0%
74 Not Used			55.0	0.00	0.0%
75 Not Used			55.0	0.00	0.0%
76 Not Used			55.0	0.00	0.0%
77 Not Used			55.0	0.00	0.0%
78 Not Used			55.0	0.00	0.0%
79 Not Used			55.0	0.00	0.0%
80 Not Used			55.0	0.00	0.0%
81 Not Used			55.0	0.00	0.0%
82 Not Used			55.0	0.00	0.0%
83 Not Used			55.0	0.00	0.0%
84 Not Used			55.0	0.00	0.0%
85 Not Used			55.0	0.00	0.0%
86 Not Used			55.0	0.00	0.0%
87 Not Used			55.0	0.00	0.0%
88 Not Used			55.0	0.00	0.0%
89 Not Used			55.0	0.00	0.0%
90 Not Used			55.0	0.00	0.0%
91 Not Used			55.0	0.00	0.0%
92 Not Used			55.0	0.00	0.0%
93 Not Used			55.0	0.00	0.0%
94 Not Used			55.0	0.00	0.0%
95 Not Used			55.0	0.00	0.0%
96 Not Used			55.0	0.00	0.0%
97 Not Used			55.0	0.00	0.0%
98 Not Used			55.0	0.00	0.0%
99 Not Used			55.0	0.00	0.0%
100 Not Used			55.0	0.00	0.0%
TOTAL	0	127,762,084	3,898,930		

**SEMCOG****SIMPLIFIED ECONOMIC ANALYSIS TOOL**

DIRECT USER BENEFITS (mil. 2010\$)	25-Year	Annual
	Total	Average
Travel Time Savings	\$946.9	\$37.9
Vehicle Operating Cost Savings	\$67.7	\$2.7
Safety Improvements	\$0.0	\$0.0
Emissions Cost Savings	-\$22.6	-\$0.9
<b>TOTAL USER BENEFITS</b>	<b>\$992.0</b>	<b>\$39.7</b>

BENEFIT-COST RATIO n/a

NET PRESENT VALUE (mil. 2010\$) \$992.0

*Note: Impacts on the SEMCOG regional economy do not include short-term construction impact*

IMPACTS ON SEMCOG REGIONAL ECONOMY	25-Year	Annual
	Total	Average
Gross Regional Product (mil. 2010\$)	\$1,944.8	\$77.8
Real Personal Income (mil. 2010\$)	\$2,186.0	\$87.4
Employment (job-years)	15,221	609
Natural Resources, Mining & Utilities	29	1.2
Construction	1,035	41.4
Manufacturing (other than Motor Vehicles)	255	10.2
Motor Vehicles, Bodies & Parts Manuf.	20	0.8
Wholesale & Retail Trade	1,455	58.2
Transportation and Warehousing	551	22.0
Information, Finance & Real Estate	1,640	65.6
Management, Prof. Services, Education	1,427	57.1
Health Care & Social Assistance	2,359	94.4
Accommodation & Food Services	1,245	49.8
Other Services	2,964	118.6
Government	2,241	89.7