OKLAHOMA
Turnpike Authority

OKLAHOMA TURNPIKE AUTHORITY SYSTEM

COMPREHENSIVE TRAFFIC & REVENUE UPDATE

SUMMARY REPORT
August 2023

CDM Smith

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Disclaimer

CDM Smith used currently-accepted professional practices and procedures in the development of traffic and revenue estimates. However, as with any forecast, 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 Oklahoma Turnpike Authority (OTA). 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 OTA. 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 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 OTA and does not owe a fiduciary duty pursuant to Section 15B of the Exchange Act to OTA with respect to the information and material contained in this report. CDM Smith is not recommending and has not recommended any action to the OTA. The OTA 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.

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Section 1
Introduction

This comprehensive traffic and toll revenue study summarizes CDM Smith's current efforts to update the toll revenue forecasts for the Oklahoma Turnpike Authority System (OTA System) as well as evaluate three newly proposed toll projects: the Tri-City Connector, the East-West Connector, and the South Extension Turnpike. The work effort associated with this endeavor includes the development of a system-wide review and update of toll revenue estimates for all existing OTA facilities and the development of long-term revenue forecasts for the Tri-City Connector, East-West Connector, and South Extension Turnpike projects.

The Oklahoma Turnpike Authority System

The OTA System consists of eleven turnpikes that serve different functions for their respective regions and for the State of Oklahoma, as shown in **Figure 1-1**. The original six turnpikes – Turner, Will Rogers, H.E. Bailey, Muskogee, Indian Nation, and Cimarron – serve mostly as intercity connectors within Oklahoma and interstate connections for their respective regions. The Cherokee and Chickasaw Turnpikes mimic the functionality of the original six turnpikes as intercity and interstate connectors, while the Creek, Kilpatrick, and Kickapoo Turnpikes serve the dual purposes of regional connectors, as well as intra-city connectors for the metropolitan areas of Tulsa and Oklahoma City.

The OTA was authorized by the Oklahoma Legislature in 1947, specifically created to develop a turnpike running from Oklahoma City to Tulsa. The new road, which was later named the Turner Turnpike, was completed and opened in 1953. The process was seen as so successful in developing and delivering a high-quality highway independent of the ODOT funding stream that the legislature expanded the OTA from its original four-county area to cover the entire state, and at the same time authorized a new northeastern turnpike. The new road, named the Will Rogers Turnpike, was opened in 1957.

The completed Turner Turnpike and Will Rogers Turnpike were operated by OTA successfully and were immediately recognized as providing significant mobility to the state and to the larger region. As such, the two turnpikes were designated as I-44 of the interstate highway system, although they have remained part of the OTA System. OTA funds all operations and maintenance expenses on both turnpikes. The Turner Turnpike is 86 miles long, and the Will Rogers Turnpike is 88.5 miles long.

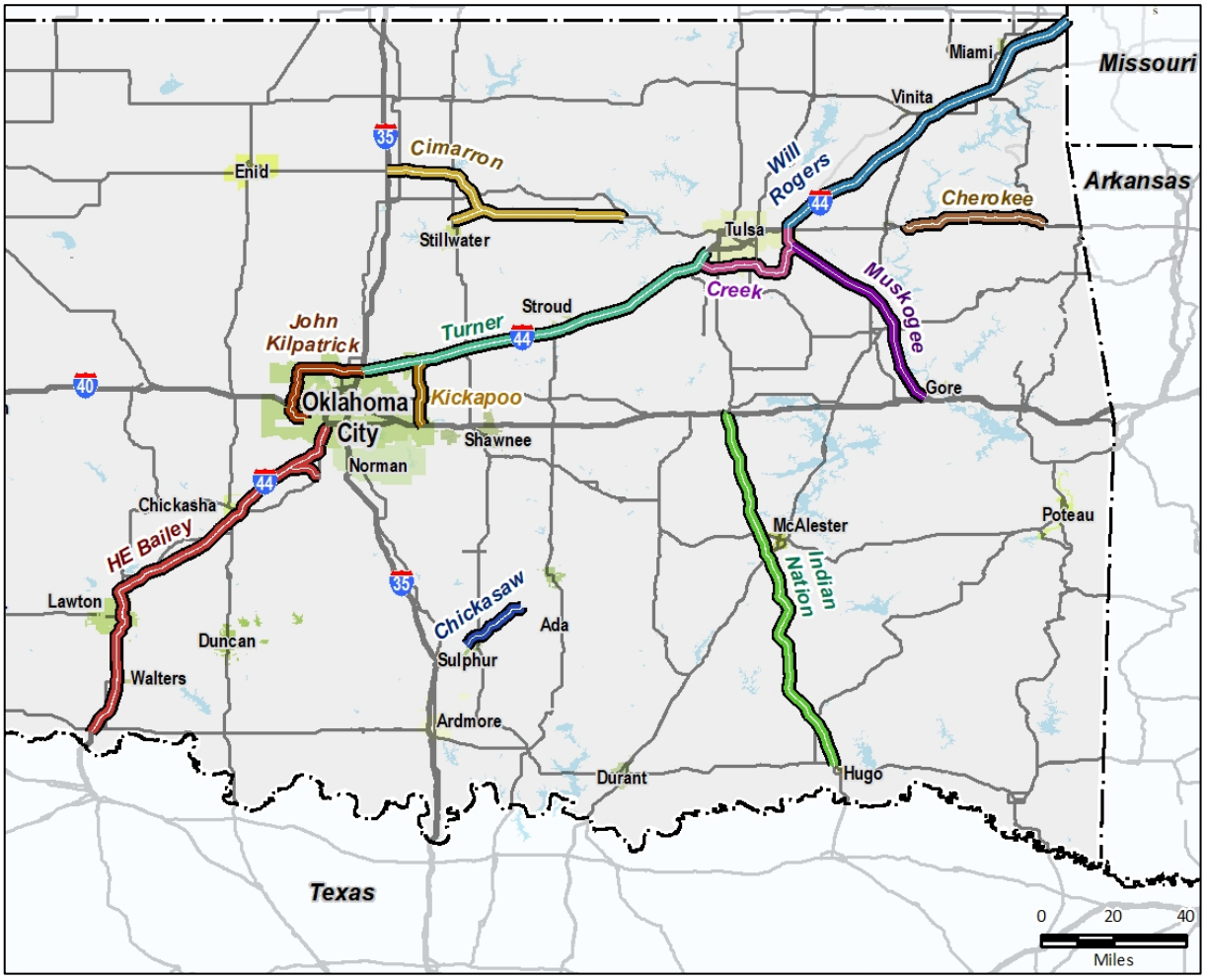

Figure 1-1. Oklahoma Turnpike Authority System

The continued success of the new turnpike system drove its expansion throughout the decade of the 1960s. The H.E. Bailey Turnpike opened in 1964, extending I-44 almost to the Texas state line. This turnpike has a distinct 60.6-mile northern section and a 24.4-mile southern section, separated by a 16.7-mile non-tolled section running through Lawton. The 41-mile northern section of the Indian Nation Turnpike opened in 1966, followed by the completion of the 55.9-mile Muskogee Turnpike in 1969. Continuing its expansion program into the 1970s, OTA completed the 63.6-mile southern section of the Indian Nation Turnpike in 1970. With this new section, the total length of the turnpike was extended to almost 105 miles. This was followed by the completion of the 58.7-mile Cimarron Turnpike in 1975.

No new turnpikes were constructed on the system until the 1990s. The 33-mile long Cherokee Turnpike opened in 1991 as the first new turnpike in 16 years. It was followed later that same year by the openings of the first nine miles of the John Kilpatrick Turnpike and by the 17-mile long Chickasaw Turnpike. Other projects in the 1990s included the first seven-mile section of the Creek Turnpike, which opened in 1992.

In 1991, OTA implemented its electronic tolling system, PIKEPASS. PIKEPASS enables motorists to pay tolls through a pre-paid account, which is debited as their vehicle passes toll points at highway speeds. PIKEPASS users receive a five percent discount for each toll, and an additional five percent volume discount is available for motorists with at least twenty toll transactions per month. Since 2014, PIKEPASS has been interoperable with both the North Texas Toll Authority and the Kansas Turnpike Authority and has more recently become interoperable with several other Texas toll agencies.

The OTA System expanded further with the opening of several sections of Kilpatrick Extensions in 2000 and 2001, several extensions to the Creek Turnpike east and west from 2000 to 2002, and the H.E. Bailey Spur in 2001. The extensions brought the total length of the Kilpatrick Turnpike to 25 miles from I-35 to I-40. The Creek Turnpike extensions completed its route around the southern and eastern sides of Tulsa from the Turner Turnpike to the Will Rogers Turnpike, extending for 35.6 miles. The 7.8-mile H.E. Bailey Spur connects the turnpike to SH 9 for improved access to the Norman area.

On October 29, 2015, Governor Mary Fallin and the OTA announced the Driving Forward Program, which included six major projects to improve and expand OTA's system of turnpikes. Two of these projects (the Southwest Kilpatrick Extension and the Kickapoo Turnpike) were new facilities that opened to traffic in 2020 and added a combined 24 centerline miles to the OTA System. The current OTA System now includes eleven turnpikes totaling more than 600 centerline miles of roadway.

ACCESS Oklahoma Program

On December 7, 2021, the OTA announced the ACCESS Oklahoma Program, which includes the widening of three existing turnpikes, a series of access and interchange improvements across the OTA System, the extension of the Gilcrease Expressway (a non-System turnpike) and three new turnpikes. As shown in **Figure 1-2**, the three new facilities (the Tri-City Connector, East-West Connector, and South Extension Turnpike) are all located in the southern Oklahoma City region and will add a combined 50 centerline miles to OTA's network of turnpikes.

Tri-City Connector

Figure 1-3 shows the planned alignment of the Tri-City Connector in southwestern Oklahoma City. The proposed project extends from SH 152 near the terminus of the John Kilpatrick Turnpike to I-44 between SW 104th Street and SW 119th Street. The project will provide high-speed connectivity from the John Kilpatrick Turnpike to the H.E. Bailey Turnpike and the East-West Connector. It will also provide improved access between the Will Rogers World Airport and the southwestern portions of the greater Oklahoma City area.

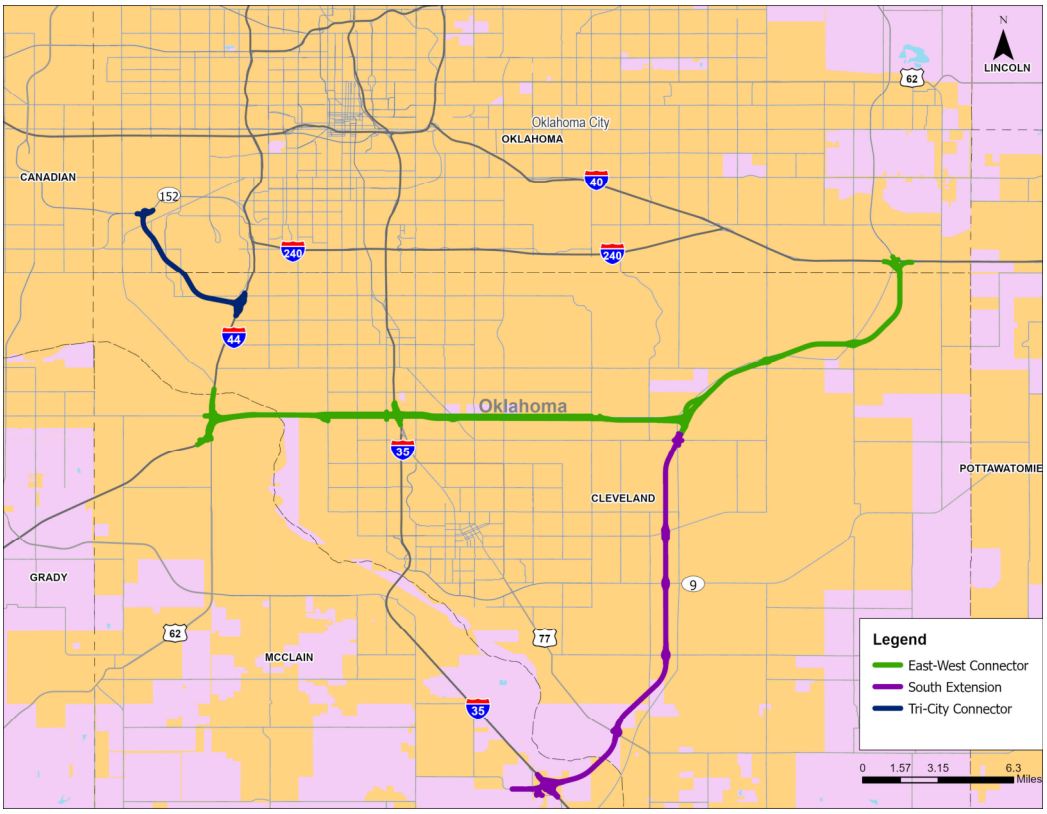

Figure 1-2. ACCESS Oklahoma Projects

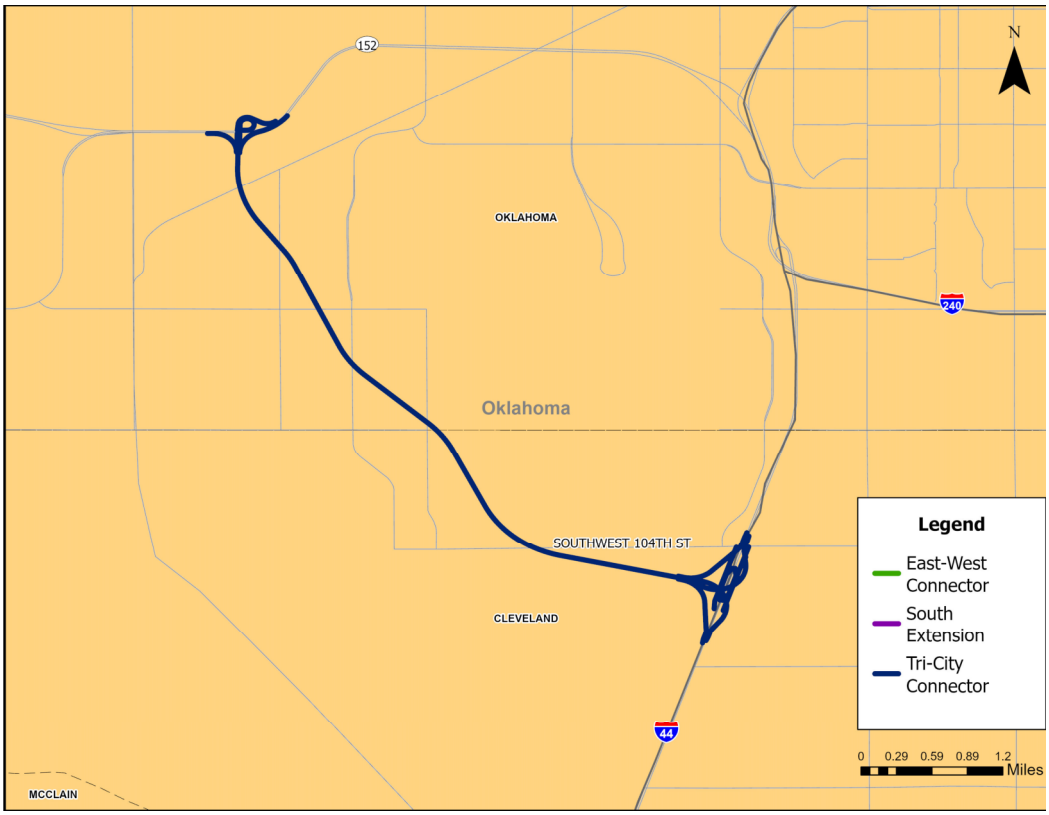

Figure 1-3. Tri-City Connector

East-West Connector

As shown in **Figure 1-4**, The proposed East-West Connector would provide a high-speed, controlled access route between I-44 and I-40 in the through the Moore and Norman areas. The proposed corridor extends from the intersection of I-44 and SH 38 east to the intersection of I-40 and Kickapoo Turnpike. The East West Connector would connect directly to the Kickapoo Turnpike and provide continuous access north to the Turner Turnpike near Luther. The project would serve local traffic as well as provide a potential alternative route for vehicles traveling between the H.E. Bailey Turnpike and Turner Turnpike.

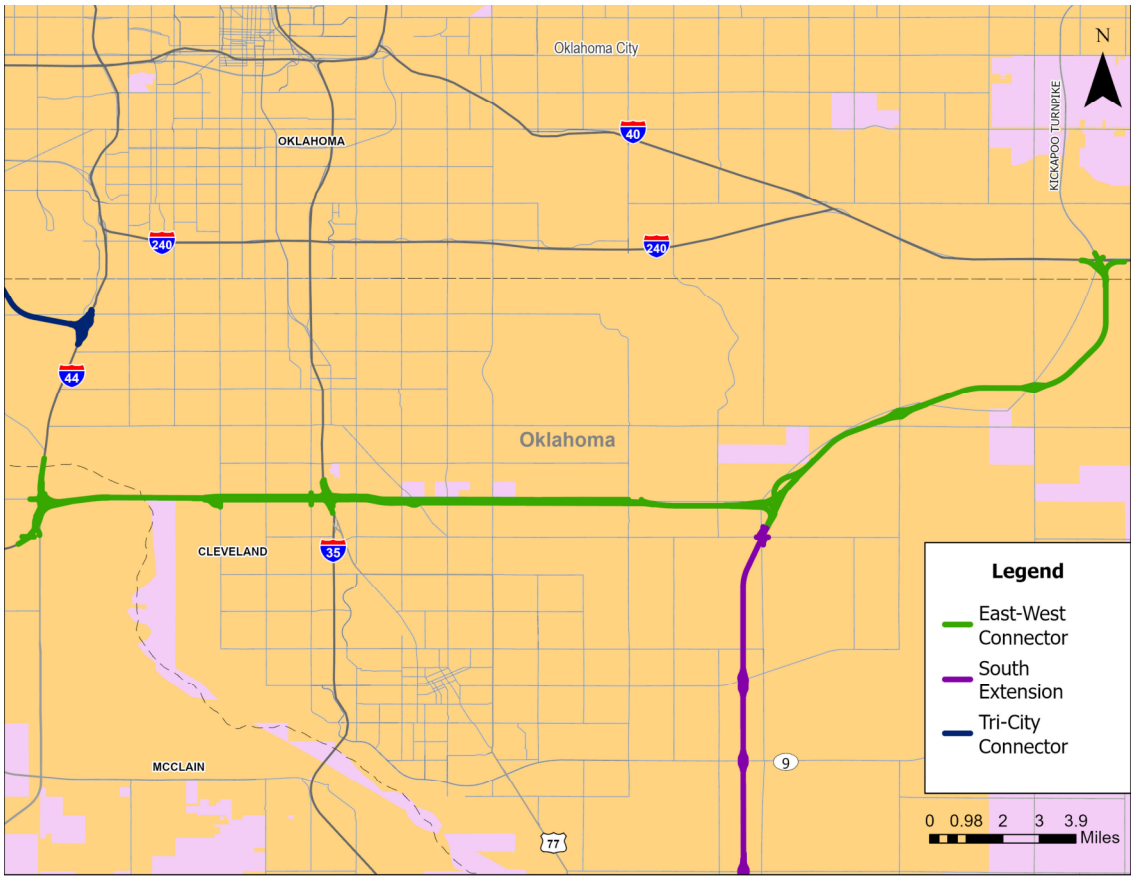

Figure 1-4. East-West Connector

South Extension Turnpike

The proposed South Extension Turnpike would provide a high-speed, controlled access route between I-35 near Purcell and the East-West Connector in the southeastern Oklahoma City region. The proposed corridor would serve as part of a continuous route from I-35 to the Turner Turnpike via the East-West Connector and Kickapoo Turnpike. The project would serve local traffic as well as provide a potential alternative route for vehicles traveling through Oklahoma City that are currently using I-35. The anticipated alignment of the South Extension Turnpike is depicted in **Figure 1-5**.

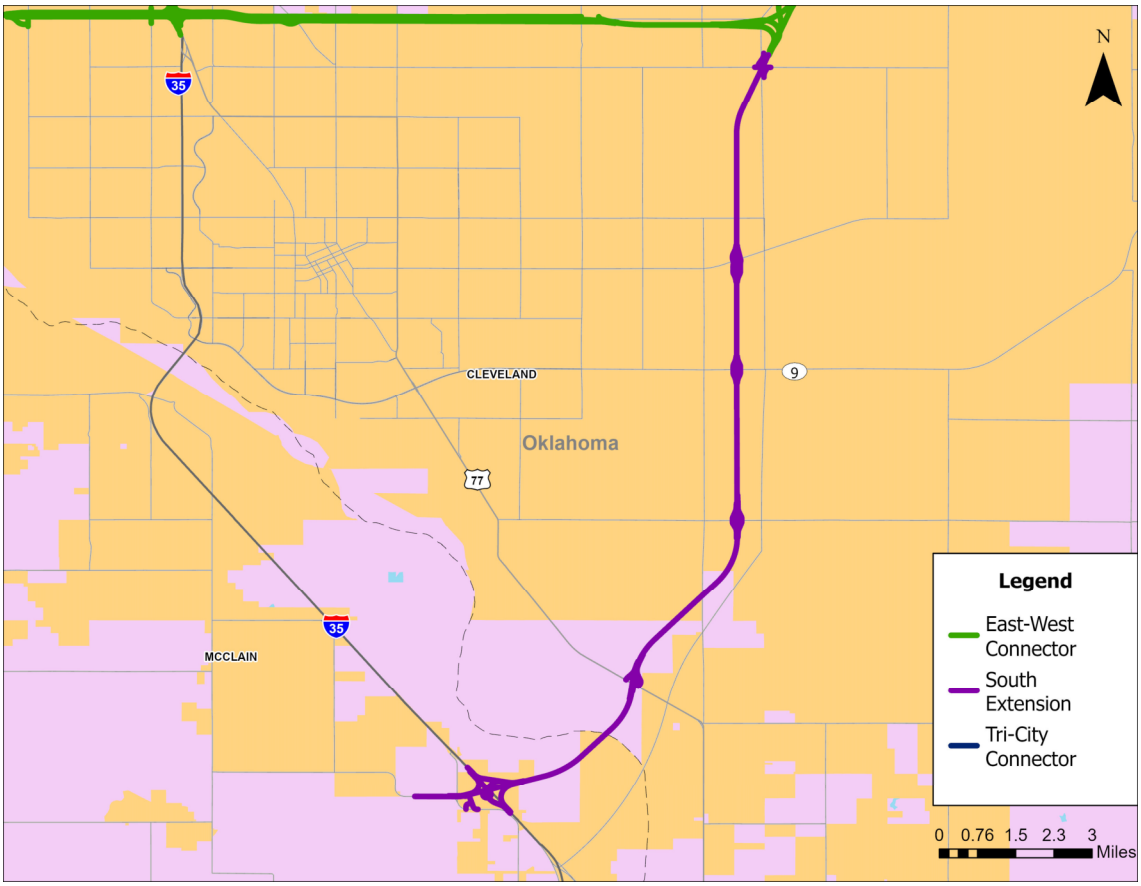

Figure 1-5. South Extension Turnpike

Structure of Study and Report

The purpose of this study is to develop updated toll revenue forecasts for the existing OTA System and long-term forecasts for the Tri-City Connector, East-West Connector, and South Extension Turnpike projects. The following outlines the general structure of this report:

Section 2 – OTA System Historical Trends

This section provides information regarding the historical and existing traffic and toll revenue performance of OTA System turnpikes. The information in this section provides a historical overview of OTA System trends and characteristics, which were used as a primary input when developing the updated traffic and toll revenue forecasts.

Section 3 – Oklahoma City Area Transportation Demand Profile

This section describes the travel demand data that was collected in the Oklahoma City region as part of developing toll revenue forecasts for the Tri-City Connector, East-West Connector, and South Extension Turnpike projects. The data collected includes traffic counts at specific locations around the project corridors and comprehensive travel speed information for the

region. This section also includes a summary of the origin-destination data collected in the region to analyze travel patterns.

Section 4 – Socio-Economic Characteristics

This section provides a description of the historical and expected future demographic growth in the Oklahoma City and Tulsa areas and from a statewide perspective. This includes an analysis of population and employment as well as several key economic indicators within the state. Research and Demographic Solutions (RDS) performed an independent review and update of the official Oklahoma City and Tulsa area demographic forecasts developed by the Association of Central Oklahoma Governments (ACOG) and Indian Nations Council of Governments (INCOG), respectively.

Section 5 – Traffic Forecasting Methodology

This section describes the databases utilized as part of the analysis and highlights the methodologies implemented to develop the models used to project future year traffic on the existing OTA System and proposed turnpikes. A series of multi-variate regression models were used to estimate traffic on most of the existing OTA System facilities. For forecasting traffic on the Kilpatrick, Kickapoo, and newly proposed turnpikes, ACOG's travel demand model for the Oklahoma City region was used, which was calibrated to current traffic conditions to ensure that it accurately reflected the observed traffic characteristics along the existing corridors.

Section 6 – Toll Revenue Forecasts

This section provides the toll sensitivity analyses performed as part of the study, the key input assumptions used in the development of traffic forecasts and the resulting toll revenue estimates. Also presented are the planned/proposed tolling configurations and a series of sensitivity tests undertaken to reflect variance to several key influential factors such as demographic growth and value-of-time (VOT).

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Section 2

OTA System Historical Trends

This section provides background information regarding the historical trends of revenue growth for each turnpike in the OTA System. This section also includes a summary of the historical trends of several other key traffic characteristics such as commercial vehicle share and PIKEPASS share used as input in the development of the future toll revenue forecasts.

Historical Toll Revenue Growth

Historical toll revenue generated by the OTA System and each of its eleven turnpikes through 2022 is shown in **Figure 2-1**. Summaries of 2022 revenue broken down by turnpike are shown in **Figures 2-2** and **2-3**. Historically, the interstate turnpikes (Turner, Will Rogers and H.E. Bailey) have generated the majority of OTA's annual toll revenue, and in 2022 accounted for approximately 53 percent of total OTA System revenue. However, OTA's two urban loops (John Kilpatrick and Creek) have grown steadily since opening in the early 1990s and now generate 27 percent of the OTA's annual toll revenue. OTA's six remaining turnpikes (Kickapoo, Indian Nation, Muskogee, Cherokee, Cimarron, and Chickasaw) generated 20 percent of total revenue in 2022. Since 2002, revenue on the OTA System has increased at an average annual rate of 3.7 percent, due in part to periodic toll rate increases and expansions of the turnpike system (as shown in **Tables 2-1** and **2-2**). Since the most recent toll rate increase was implemented in 2019, revenue on the system has increased by more than eleven percent, despite the impacts of the COVID-19 pandemic in 2020 and 2021, due in part to the opening of the Kickapoo Turnpike and Southwest Kilpatrick Extension.

Recent Toll Revenue Growth

Figure 2-4 illustrates the average annual growth in toll revenue on each of the OTA's eleven turnpikes from 2018 through 2022. Following reductions in revenue in 2020 due to the COVID-19 pandemic, the OTA System experienced a very quick recovery, and most turnpikes generated higher revenue in 2021 than in 2010. The highest levels of post-COVID revenue growth were seen on the Turner Turnpike and Will Rogers Turnpike. Revenue on the John Kilpatrick Turnpike also saw large increases in 2021 and 2022 due to the opening of the Southwest Kilpatrick Extension. Several turnpikes experienced a slight reduction in revenue in 2022, but overall system revenue was higher due in part to additional revenue generated by the Kickapoo Turnpike and Southwest Kilpatrick Extension. Overall, revenue on the OTA System increased by almost fifteen percent between 2018 and 2022.

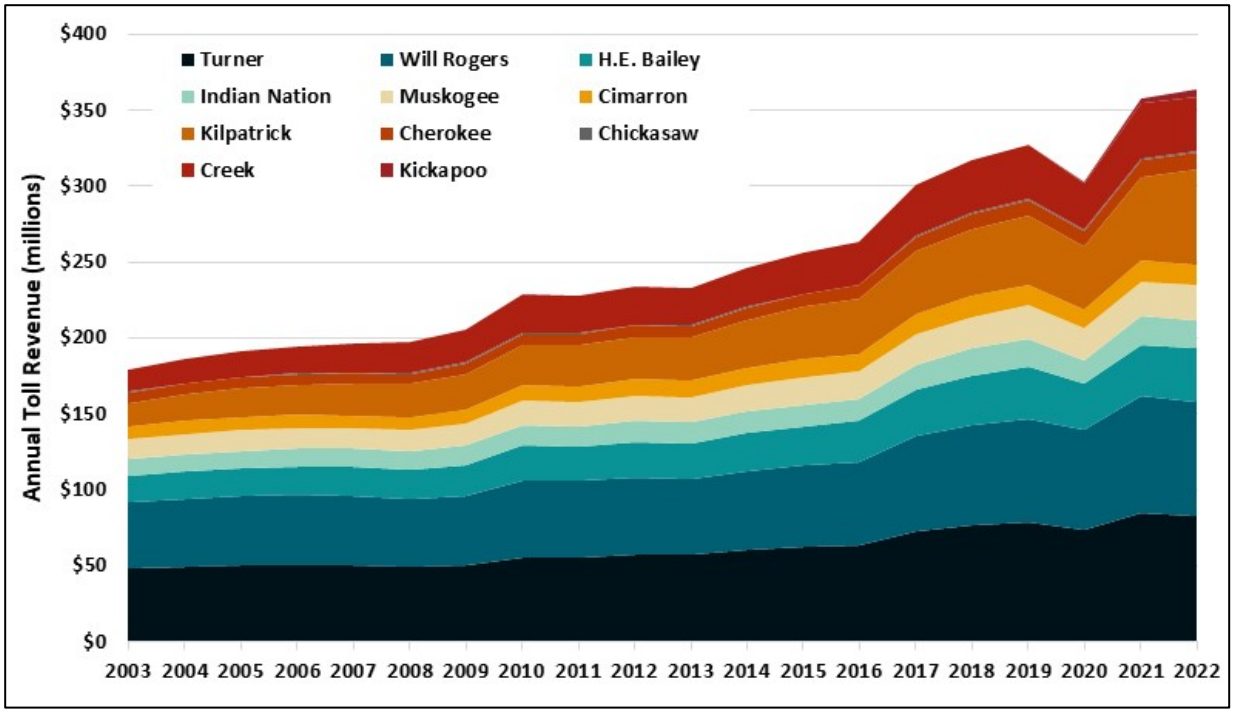

Figure 2-1. OTA System Historical Toll Revenue Growth

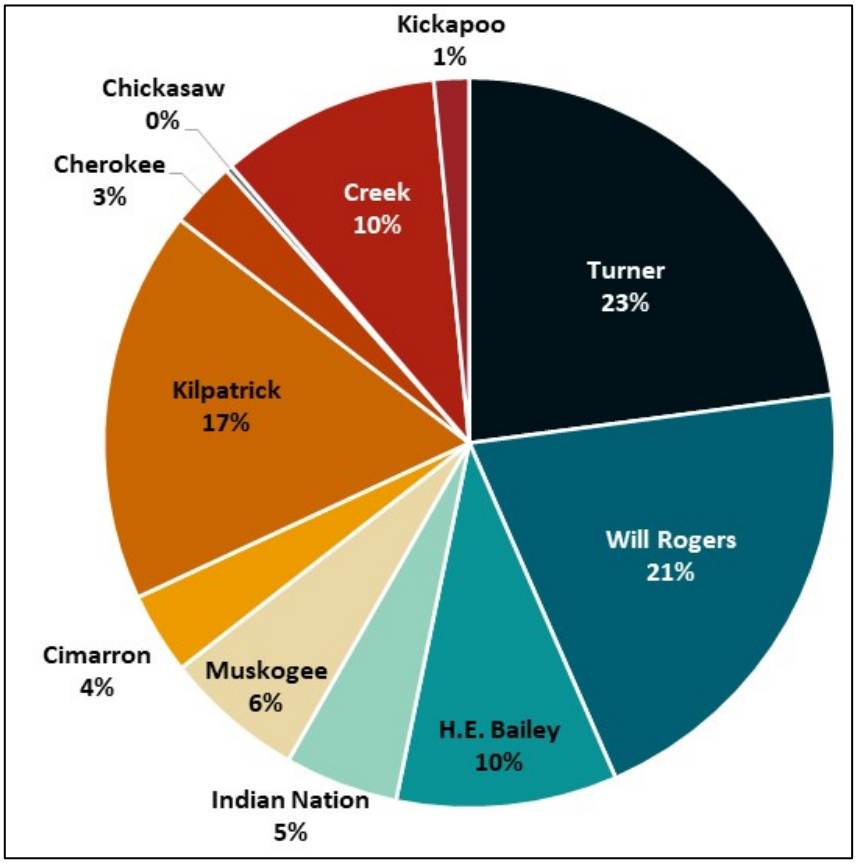

Figure 2-2. 2022 Toll Revenue Breakdown by Facility

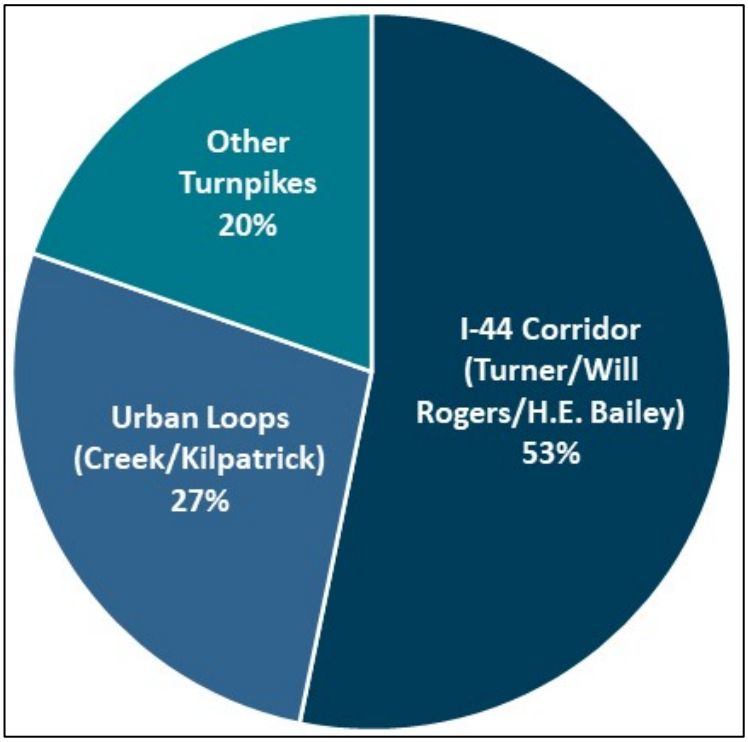

Figure 2-3. 2022 Toll Revenue Breakdown by Group

Table 2-1. OTA System Expansions

Facility	Opened	Length (mi)
Turner Turnpike	1953	86.0
Will Rogers Turnpike	1957	88.5
H.E. Bailey Turnpike	1964	86.4
Norman Spur	2001	8.2
Indian Nation	1966	41.1
Southern Segment	1970	64.1
Cimarron Turnpike	1975	67.7
Muskogee Turnpike	1969	53.1
John Kilpatrick Turnpike	1991	9.5
Extension	2001	15.8
Southwest Extension	2020	6.3
Cherokee Turnpike	1991	32.8
Chickasaw Turnpike	1991	27.1
Creek Turnpike	1992	7.4
Creek West Extension	2000	4.9
Creek East & Broken Arrow	2002	22.1
Kickapoo Turnpike	2021	18.5

Table 2-2. OTA System Historical Toll Rate Increases

Year	Rate Increase	
	Passenger Cars	Commercial Vehicles
1968	14%	14%
1975	13%	13%
1979	17%	35%
1991	25%	30%
1993	10%	25%
1995	10%	4%
2001	16%	30%
2009	16%	16%
2017	12%	12%
2018	2.5%	2.5%
2019	2.5%	2.5%

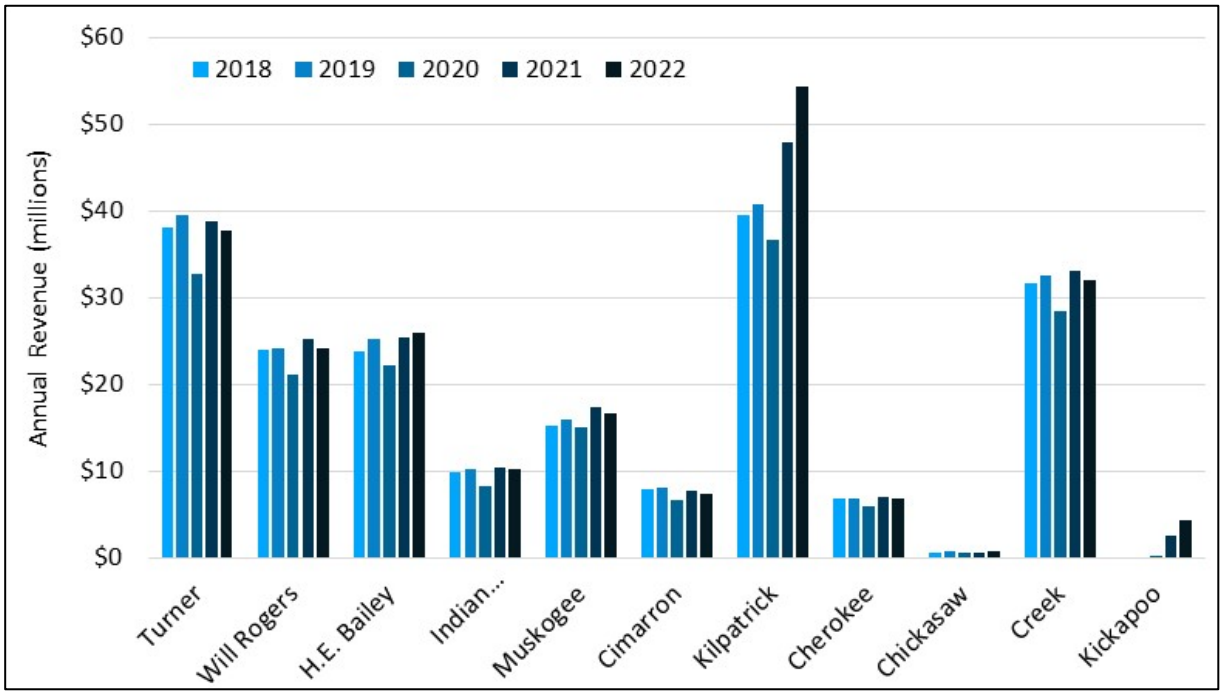

Figure 2-4. OTA System Recent Toll Revenue Growth

Commercial Vehicle Growth

Growth in commercial vehicle traffic is a significant contributor to OTA System revenue growth due to the much higher toll rates paid by this vehicle class. For several of OTA's turnpikes, the commercial traffic accounts for a significant portion of total turnpike revenue. **Figure 2-5** illustrates the share of total revenue generated by commercial vehicles on each turnpike in 2022. As shown in the figure, both the Turner and Will Rogers turnpikes draw over 50 percent of their revenue from commercial vehicles. Commercial vehicles generate almost forty percent of total system revenue, and account for over twenty percent of revenue on all but two of OTA's turnpikes. The John Kilpatrick Turnpike and Creek Turnpike both lie in urban areas that generate significant amounts of passenger car traffic. As a result, less than fifteen percent of total revenue on each is generated by commercial vehicles. This is consistent with what has been observed on other urban turnpikes across the country.

Figure 2-6 shows the growth in commercial vehicle revenue share for the OTA System over the last twenty years. The revenue split between passenger cars and commercial vehicles has remained relatively stable over that time period, with commercial vehicles generating between 37 and 43 percent of total toll revenue in each year. However, the average share of revenue generated by commercial vehicles for the period of 2020-2022 was 40 percent, compared to 37 percent for the period of 2017-2019. This is likely due in part to changes in passenger car travel pattern changes following the impacts of the COVID-19 pandemic.

Weekday vs. Weekend Usage

Another key factor considered as part of the revenue forecasting process is the relationship between weekday and weekend demand along the turnpikes. Because most travel demand models are built around average weekday volumes, it is important to understand how the demand on the weekend compares to typical weekday levels. This relationship was shown to vary significantly across the eleven OTA System turnpikes. **Figure 2-7** summarizes the average weekend traffic on each turnpike in 2022 as a percentage of the average weekday traffic. As shown in the figure, two turnpikes (Cherokee and Cimarron), generated, on average, more traffic on the weekend than on weekdays. Most of the other rural and interstate turnpikes generated approximately 80 to 90 percent as much traffic on the weekends compared to weekdays. OTA's two urban facilities, Kilpatrick and Creek, are used as daily commuting corridors much more than the other turnpikes and have demonstrated average weekend volumes that are approximately 30 percent lower than those observed during the average weekday.

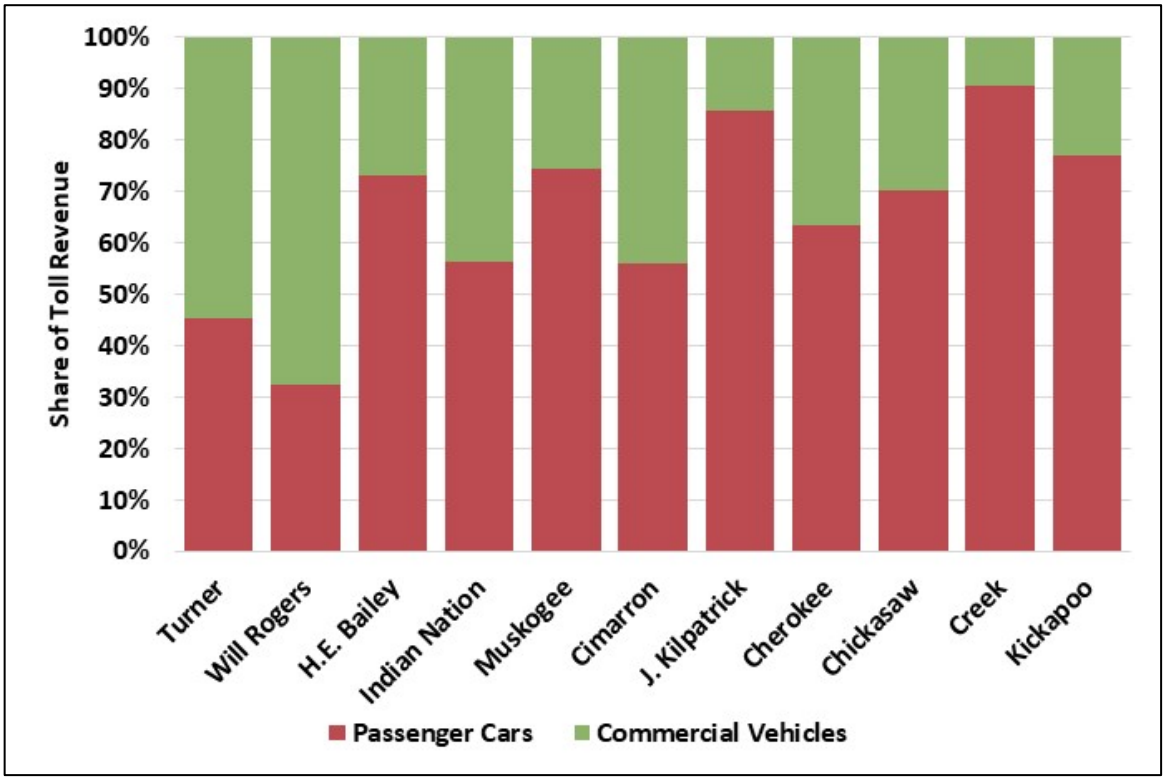

Figure 2-5. OTA System Commercial Vehicle Revenue Share – 2022

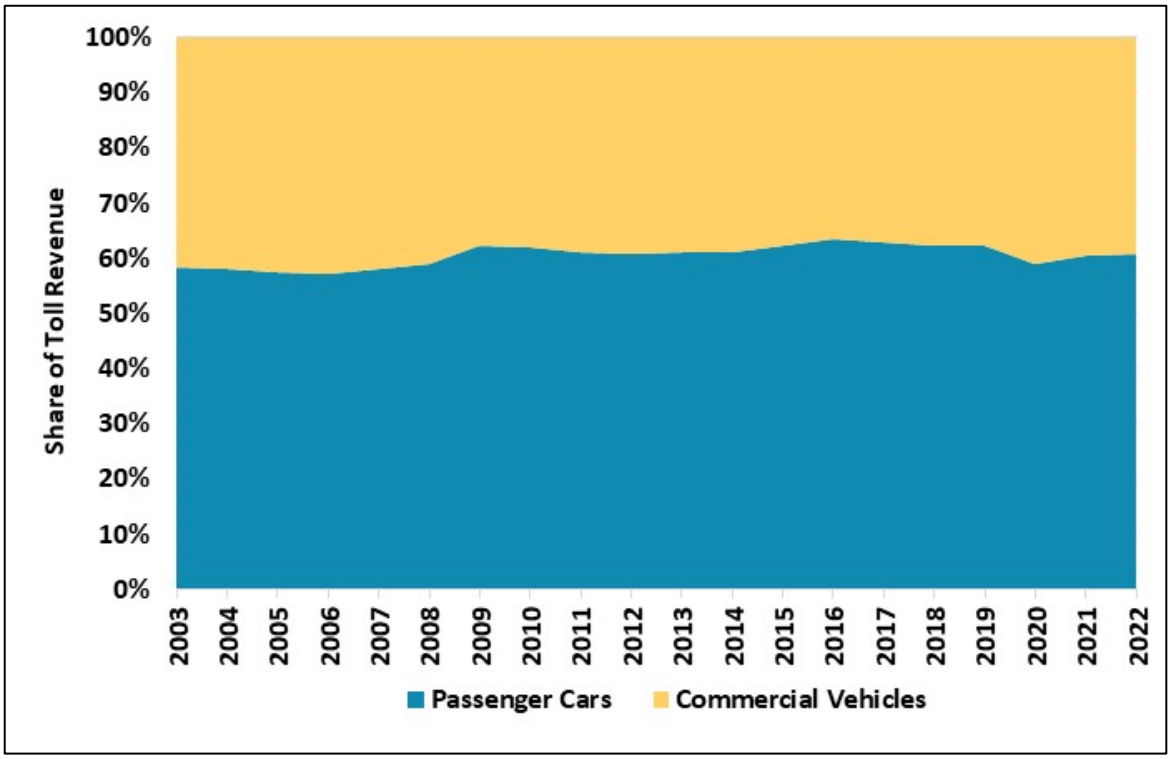

Figure 2-6. OTA System Historical Commercial Vehicle Revenue Share

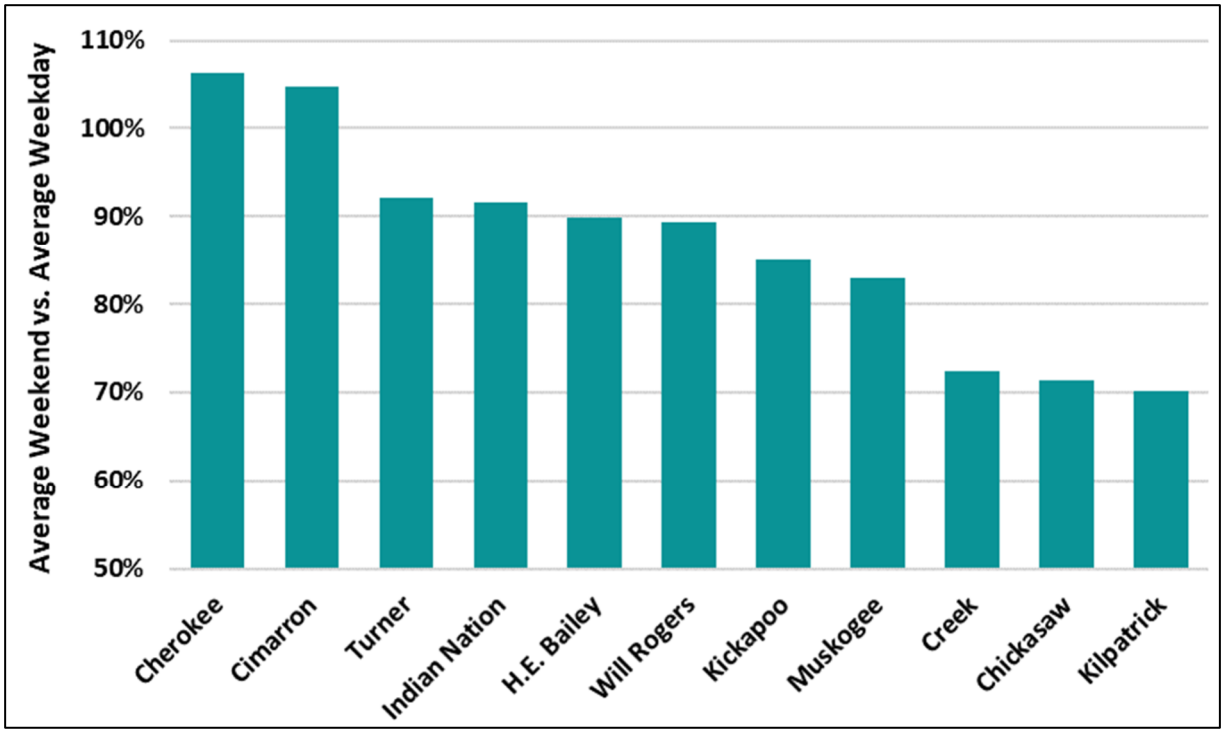

Figure 2-7. Average 2022 Weekend vs. Weekday Traffic

Transition to All-Electronic Tolling

The Oklahoma Turnpike Authority is currently in the process of converting the OTA System to an All-Electronic Tolling (AET) configuration. Under the AET configuration, all cash collection on the system will be replaced with the license plate-based PlatePay system, under which invoices for tolls are mailed to the registered owners of each vehicle. Several turnpikes on the OTA System have already converted to AET, as shown in **Table 2-3**. After adopting PlatePay at a single interchange on Creek Turnpike in 2017, OTA began a systemwide rollout of AET in 2021 beginning with the Kilpatrick Turnpike. As of August 2023, seven of OTA's eleven turnpikes had been fully converted to AET.

As shown in **Figure 2-8**, the adoption of AET had an immediate impact on the share of transactions generated by PIKEPASS and other transponders. After growing consistently for more than a decade, the PIKEPASS share began to increase quickly as the conversions to AET began, reaching 87 percent by the end of 2022. As shown in **Figure 2-9**, the PIKEPASS share of transactions has continued to increase in 2023. Through June of 2023, PIKEPASS accounted for 89 percent of all OTA System transactions, with 6 percent and 5 percent being generated by cash and PlatePay, respectively.

Table 2-3. OTA System AET Conversion Timeline

Turnpike	PlatePay Conversion
Kilpatrick Turnpike	July 2021
Kickapoo Turnpike	January 2022
HE Bailey Turnpike	June 2022
Chickasaw Turnpike	August 2022
Cimarron Turnpike	November 2022
Cherokee Turnpike	February 2023
Creek Turnpike*	February 2023
Muskogee Turnpike**	*September 2023*
Indian Nation Turnpike**	*January 2025*
Turner Turnpike**	*January 2025*
Will Rogers Turnpike**	*January 2025*

*A single location on Creek Turnpike (Peoria-Elm ramps) converted to AET in January 2017

**Currently assumed conversion dates

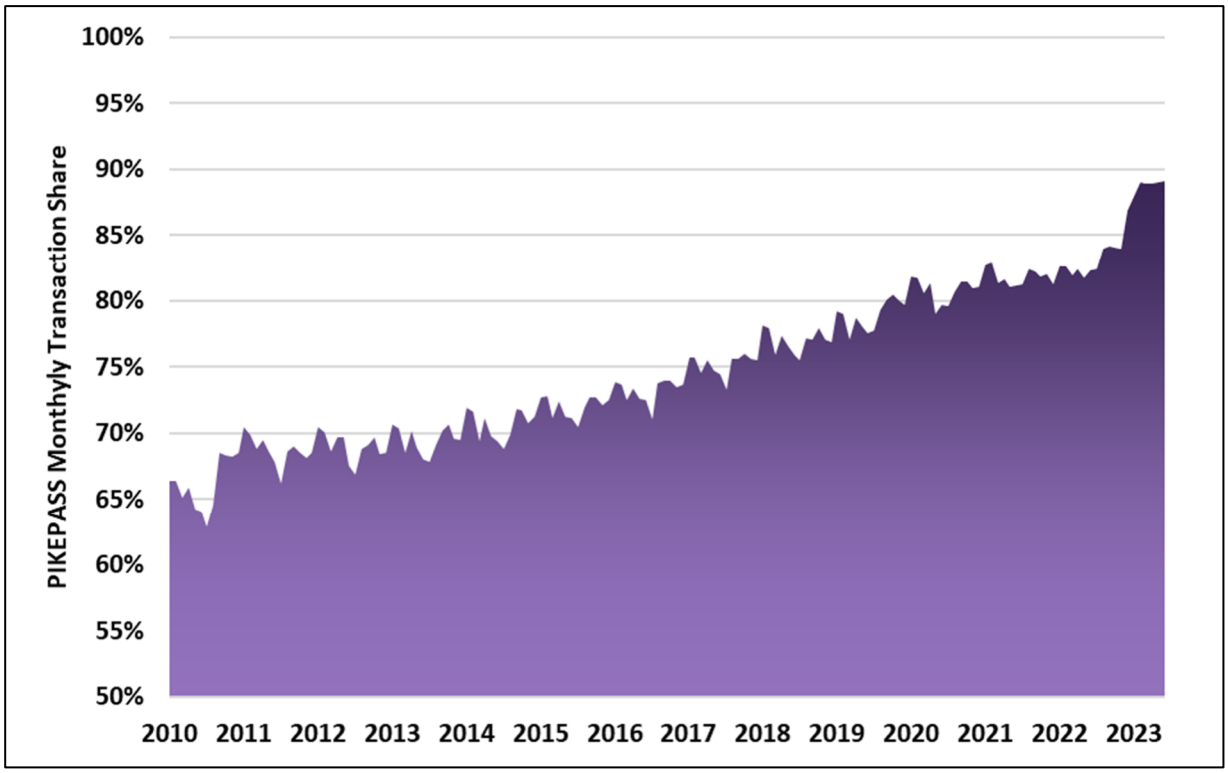

Figure 2-8. OTA System PIKEPASS Transaction Share Trend

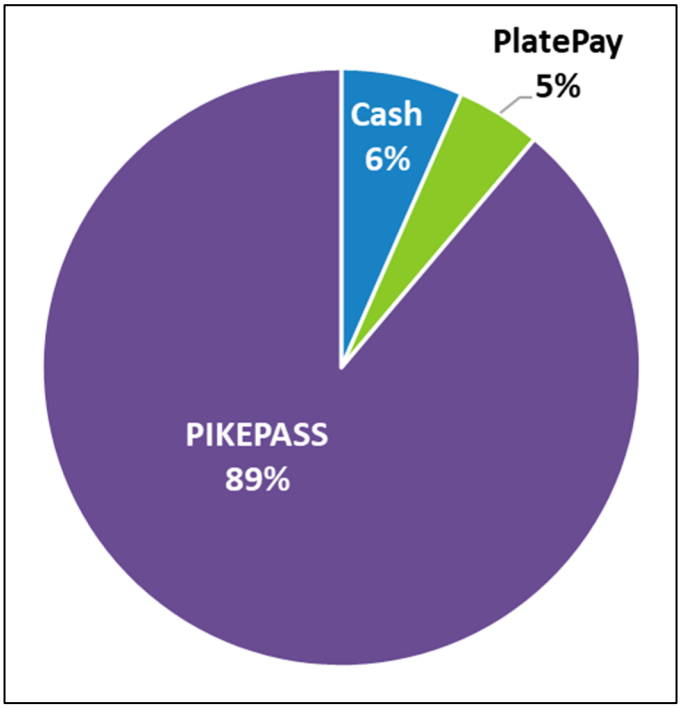

Figure 2-9. Payment Type Transaction Breakdown (January-June 2023)

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Section 3

Regional Traffic Characteristics

This section provides background information about the existing traffic conditions on the roadway infrastructure in and around the OTA System planned ACCESS corridors. The information in this section provides an overview of traffic counts in the greater Oklahoma City area that was used as an input to the traffic and revenue forecasting process for the East-West Connector, Tri-City Connector and South Extension. Additionally, a data collection effort was undertaken for the Oklahoma City and Tulsa areas, which included travel time data analysis, the evaluation of origin-destination patterns and the completion of a stated preference survey.

Traffic Count Collection

As part of the evaluation of traffic and revenue for the East-West Connector, Tri-City Connector and South Extension, CDM Smith compiled a series of traffic counts across multiple screenlines throughout the Oklahoma City region, as shown in **Figures 3-1** and **3-2**. The screenlines were developed to analyze the total corridor traffic trends and were used to ensure that the travel demand model outputs used in the traffic forecasting process reflected current traffic characteristics within the study area. CDM Smith used a base year of 2019 for travel demand model development and utilized traffic counts from existing sources to generate the traffic profile for each screenline. Traffic counts for each screenline were obtained from Oklahoma Turnpike Authority transaction data and from traffic count databases maintained by the Oklahoma Department of Transportation. Counts were obtained for multiple years and adjusted based on historical growth trends to generate 2019 traffic volumes for each screenline location.

CDM Smith used the compiled traffic count data to determine average traffic volumes for each location across fifteen screenlines. This information was then used to validate the travel demand model. **Table 3-1** summarizes the 2019 average daily volumes for each screenline location.

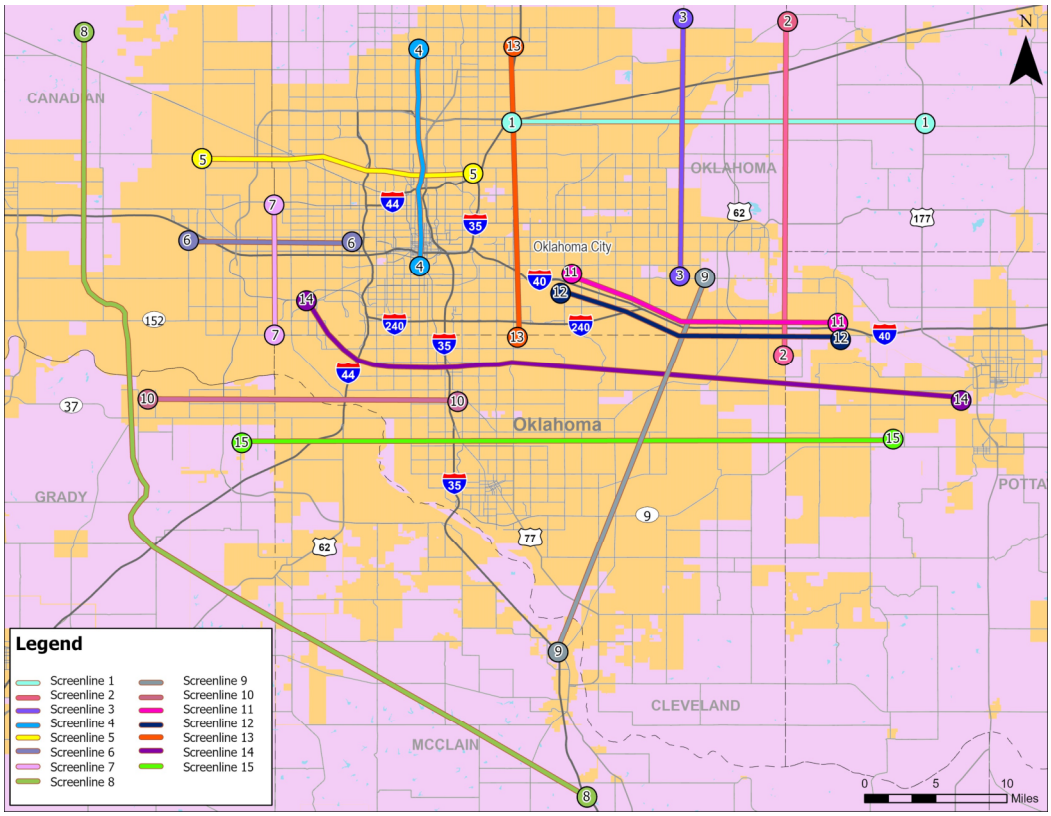

Figure 3-1. Traffic Count Screenlines – Oklahoma City Area

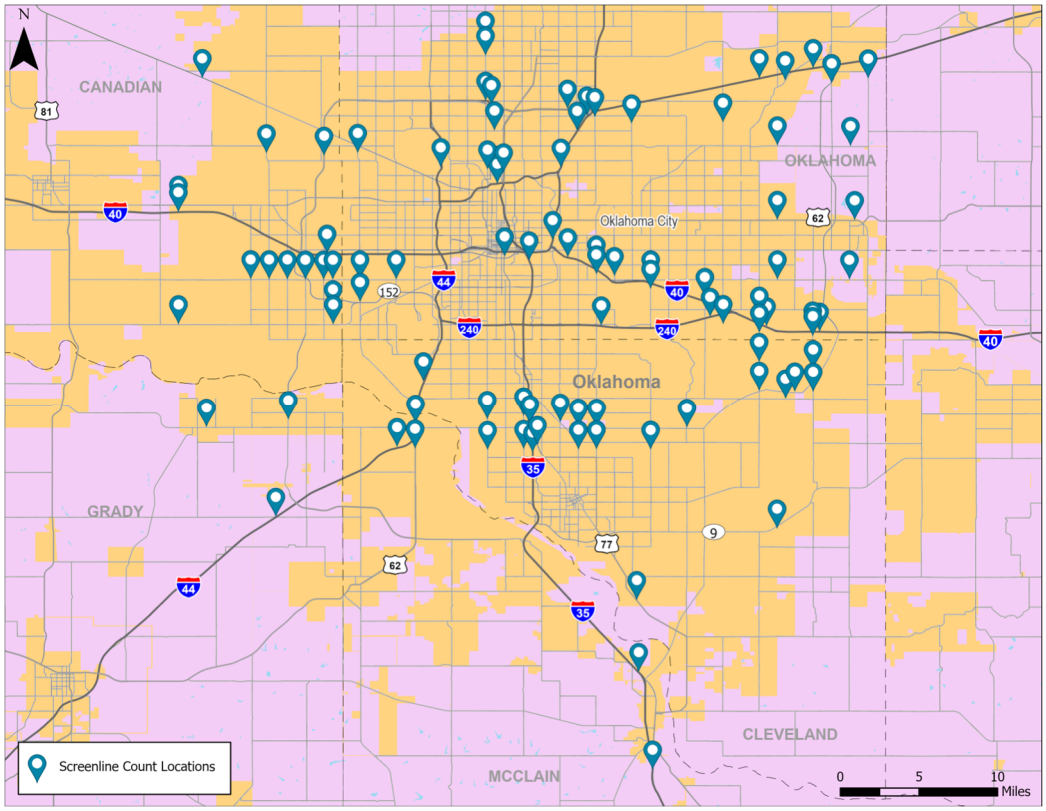

Figure 3-2. Traffic Count Locations – Oklahoma City Area

Table 3-1. Oklahoma City Area 2019 Traffic Counts (vehicles/day)

Screenline 1	
I-35 South of NE 122nd St	88,200
N Sooner Rd South of NE 122nd St	3,500
N Midwest Blvd South of NE 122nd St	2,400
Hiwassee Rd South of NE 122nd St	1,800
Hogback Rd South of NE 122nd St	2,500
Luther Rd South of Turner	1,100
Harrah Rd South of Turner	400
Screenline 2	
I-44 West of Harrah Rd	30,200
Britton Rd West of Harrah Rd	1,600
US 62 West of Harrah Rd	9,200
SE 29th St West of Harrah Rd	2,500
IH-40 East of Harrah Rd	36,700
Screenline 3	
I-44 East of Indian Meridian Rd	31,900
Britton Rd East of Indian Meridian Rd	1,300
US 62 East of Indian Meridian Rd	14,000
SE 29th St East of Indian Meridian Rd	2,900
IH-40 East of Indian Meridian Rd	49,100
Screenline 4	
Danforth Rd West of Santa Fe Ave	15,000
W Edmond Rd West of Santa Fe Ave	20,300
E Memorial Rd West of Santa Fe Ave	16,200
John Kilpatrick Turnpike East of N Western Ave	75,100
W Hefner Rd West of US 77	15,200
NW 63rd St West of US 77	16,800
Rte 66 West of US 77	90,600
US 270 West of S Shields Blvd	117,700
Screenline 5	
N Piedmont Rd North of W Wilshire Blvd	6,300
John Kilpatrick Turnpike North of W Wilshire Blvd	32,900
Council Rd South of Britton Rd	15,400
SH 74 North of Lake Hefner Dr	120,400
Western Ave South of Wilshire Blvd	7,100
US 77 South of Wilshire Blvd	116,400
IH 35 South of Wilshire Blvd	95,900
Screenline 6	
Cemetery Rd North of SW 29th St	8,600
Czech Hall Rd North of SW 29th St	3,700
S Mustang Rd North of SW 29th St	21,400
Sara Rd North of SW 29th St	6,000
S Morgan Rd North of SW 29th St	6,200
Council Rd North of SW 29th St	18,800
S MacArthur Blvd North of SW 29th St	18,800
Screenline 7	
IH 40 East of S Morgan Rd	90,600
SW 29th St East of S Morgan Rd	4,600
E SW 59th St East of S Morgan Rd	7,100
SH 152 East of N Morgan Rd	21,100
Screenline 8	
SH 3 East of US 81	7,400
Rte 66 East of Shepard Ave	7,900
I-40 East of US 81	45,000
SH 152 East of US 81	3,300
E Main St East of SW 4th St	12,500
IH 44 North of CR 1270	21,100
I-35 North of SH 59	35,300

Screenline 9	
I-40 West of Peebly Rd	49,100
Stella Rd West of Peebly Rd	2,600
SH 9 East of 142nd Ave SE	6,500
US 77 South of E Maguire Rd	10,500
I-35 North of intersection of I-35 and SH 74	48,400
Screenline 10	
N Mustang Rd North of NW 32nd St	13,000
IH 44 North of NW 32rd St	52,800
IH 35 North of Indian Hills Rd	119,800
Screenline 11	
IH 35 South of NE 10th St	87,800
Sooner Rd South of Reno Ave	15,600
Air Depot Blvd South of Reno Ave	23,500
S Douglas Blvd South of Reno Ave	26,300
Anderson Rd North of IH 40	8,300
Choctaw Rd North of IH 40	6,600
Peebly Rd North of IH 40	4,300
Screenline 12	
IH 35 South of IH 40	157,100
Sooner Rd South of Reno Ave	15,500
S Douglas Blvd South of IH 40	19,800
Southeast Expressway-SH 3 South of IH 40	20,300
Anderson Rd South of Southeast Expressway-SH 3	3,800
Choctaw Rd South of IH 40	5,900
Peebly Rd South of IH 40	5,000
Screenline 13	
JKT West of IH 35	39,700
IH 35 South of Turner Turnpike	88,200
IH 40 West of Sunny lane	88,900
IH 240 West of Air Depot Collector	41,200
Screenline 14	
S Council Rd North of SH 152	25,700
I-44 North of SW 134th St	53,800
Western Ave South of SW 164th St	6,900
S Telephone Rd South of SW 34th St	5,400
I-35 South of SW 34th St	119,800
S Broadway Ave North of Indian Hills Rd	2,500
S Sunnylane Rd North of E Indian Hills Rd	3,600
S Sooner Rd North of E Indian Hills Rd	12,400
72nd Ave South of E Indian Hills Rd	700
S Choctaw Rd South of SE 104th St	2,300
S Peebly Rd South of SE 104th St	3,200
Screenline 15	
H E Bailey Turnpike West of N Country Club Rd	20,100
N Main St North of NE 21st St	18,600
60th Ave NW South of W Franklin Rd	6,300
36th Ave NW South of W Franklin Rd	6,700
I-35 North of W Tecumseh Rd	97,900
US 77 South of Franklin Rd	27,400
N Porter Ave North of E Tecumseh Rd	5,400
12th Ave NE North of E Tecumseh Rd	14,600
48th St North of E Tecumseh Rd	1,500
Choctaw Rd North of SE 149th St	1,900
144th Ave NE North of S 134th St	3,200
S Peebly Rd North of SE 149th St	3,400

Speed and Travel Time

The evaluation of a toll facility's future traffic and revenue requires knowledge of the current travel time characteristics of the major roadways within the project area. For the current study, travel time data was collected by two methods. The primary source was historical travel data obtained from INRIX, Inc., a traffic data company based in Washington State that maintains an archive of travel speed data for thousands of roadways across the United States accumulated from global positioning system (GPS)-enabled devices along the highway network. INRIX is a Data as a Service (DaaS) company that monitors traffic flow along approximately 260,000 miles of major freeways, highways, urban and rural arterials, and side streets in the United States. This data provides historical as well as real-time traffic data seven days a week, 24 hours a day in as little as five-minute increments for all metro areas with a population of more than one million. They were engaged to provide a series of travel speed data for several roadways within the study area.

INRIX obtains its data via crowd sourcing and collects travel speed information from various probes, including anonymous cell phones/smartphones and vehicles equipped with GPS devices (trucks, delivery vans, transit vehicles, etc.). The collected data is then processed in real-time to create traffic speed information along most of the major roadways. The real-time travel speed data is normalized to account for parameters that affect traffic flow conditions such as weather forecasts, school schedules, special events, accidents, seasonal variation, and road construction. The procedure adopted by INRIX to obtain and distribute the crowd-sourced traffic data is illustrated in **Figure 3-3**.

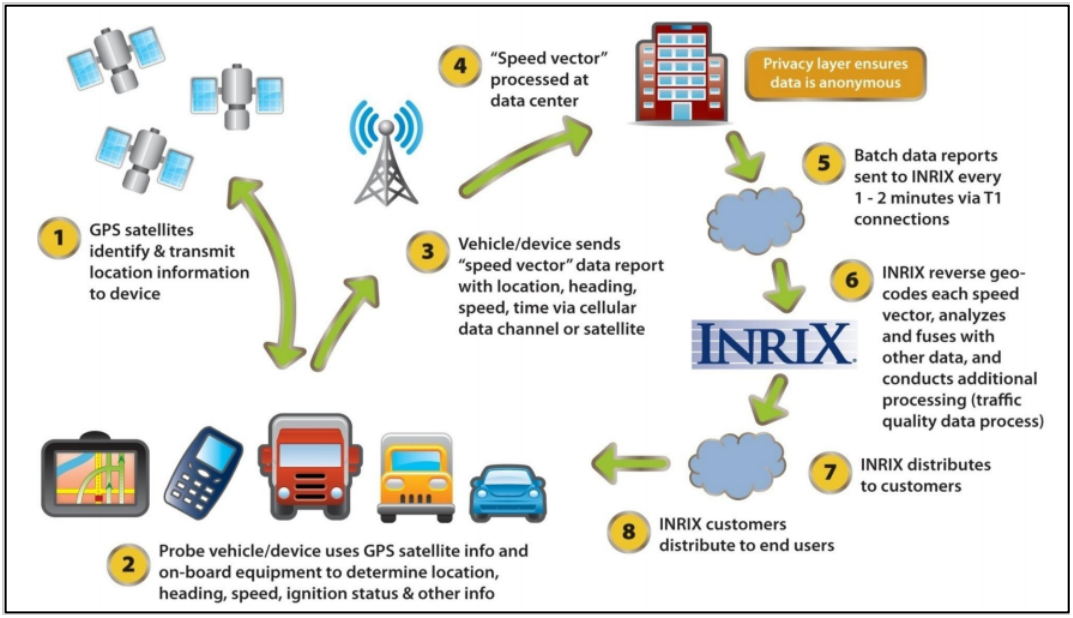

Figure 3-3. INRIX Traffic Data Collection and Distribution Process

Source: INRIX, Inc.

Figures 3-4 and **3-6** show the locations for which travel time data was obtained in the Oklahoma City and Tulsa areas and the average speeds observed at those locations. Major routes throughout the corridor were selected for analysis to provide a profile of the fluctuation in operating speed throughout the corridor and the relationship between demand and congestion levels. The data illustrated in **Figures 3-5** and **3-7** represents the average travel speeds as measured by INRIX in 2023.

The figures illustrate the daily profile of travel speeds by direction for each of the analysis locations. As expected, the slowest travel speeds typically occur during the morning or evening peak periods. However, some routes, such as SH 74, experience higher levels of congestion throughout much of the day.

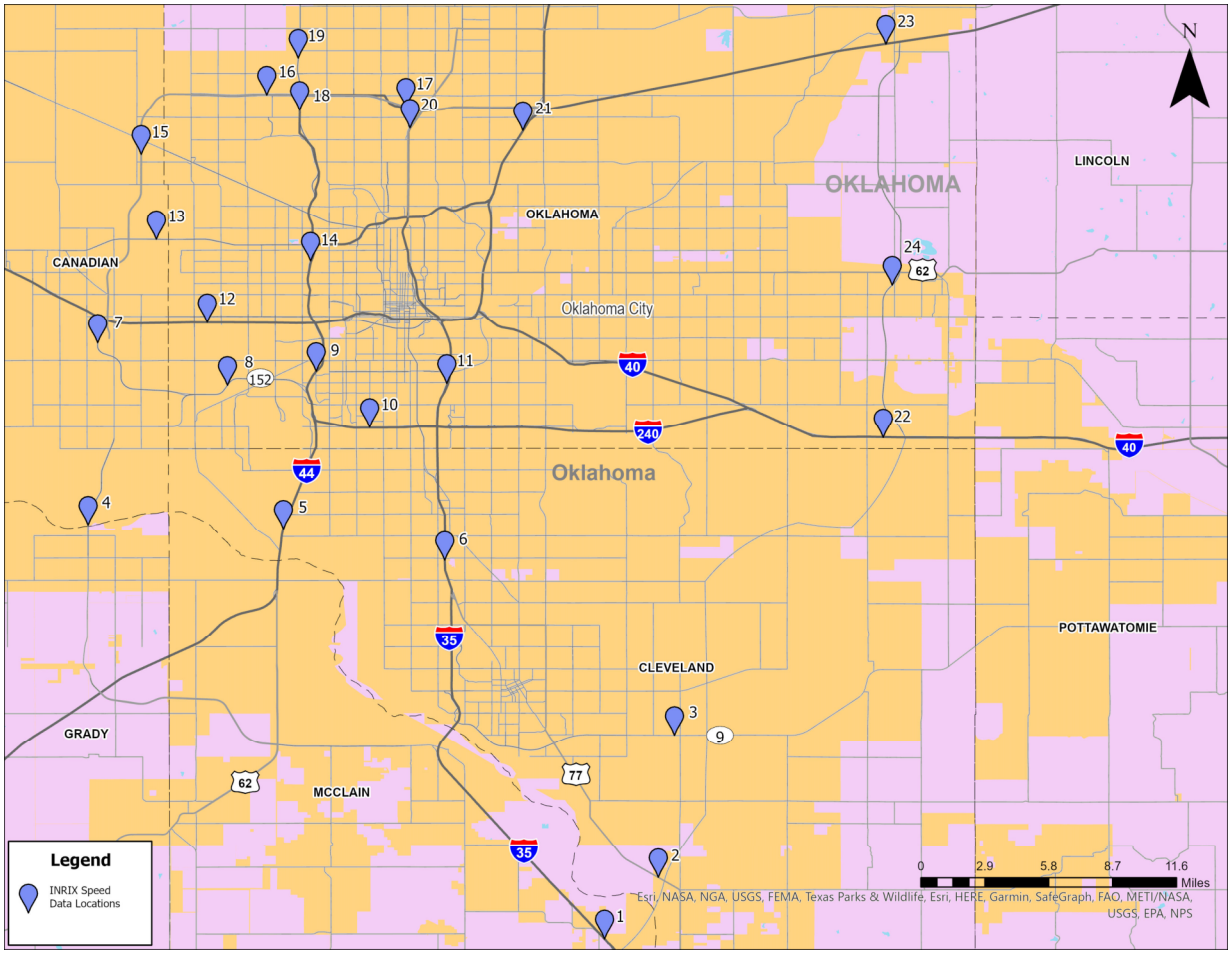

Figure 3-4. INRIX Speed Data Locations – Oklahoma City Area

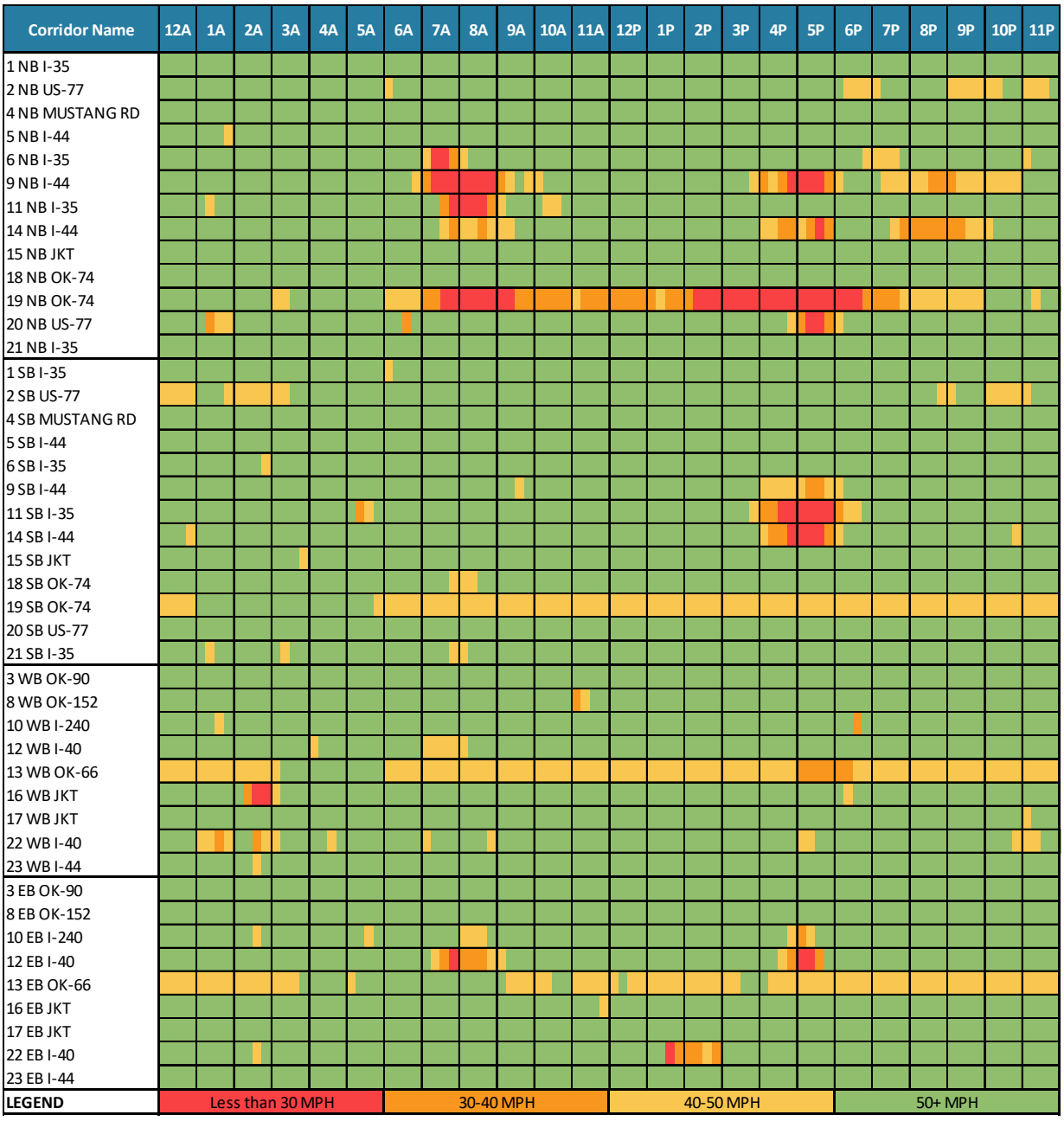

Figure 3-5. Average Weekday Travel Speeds – Oklahoma City Area

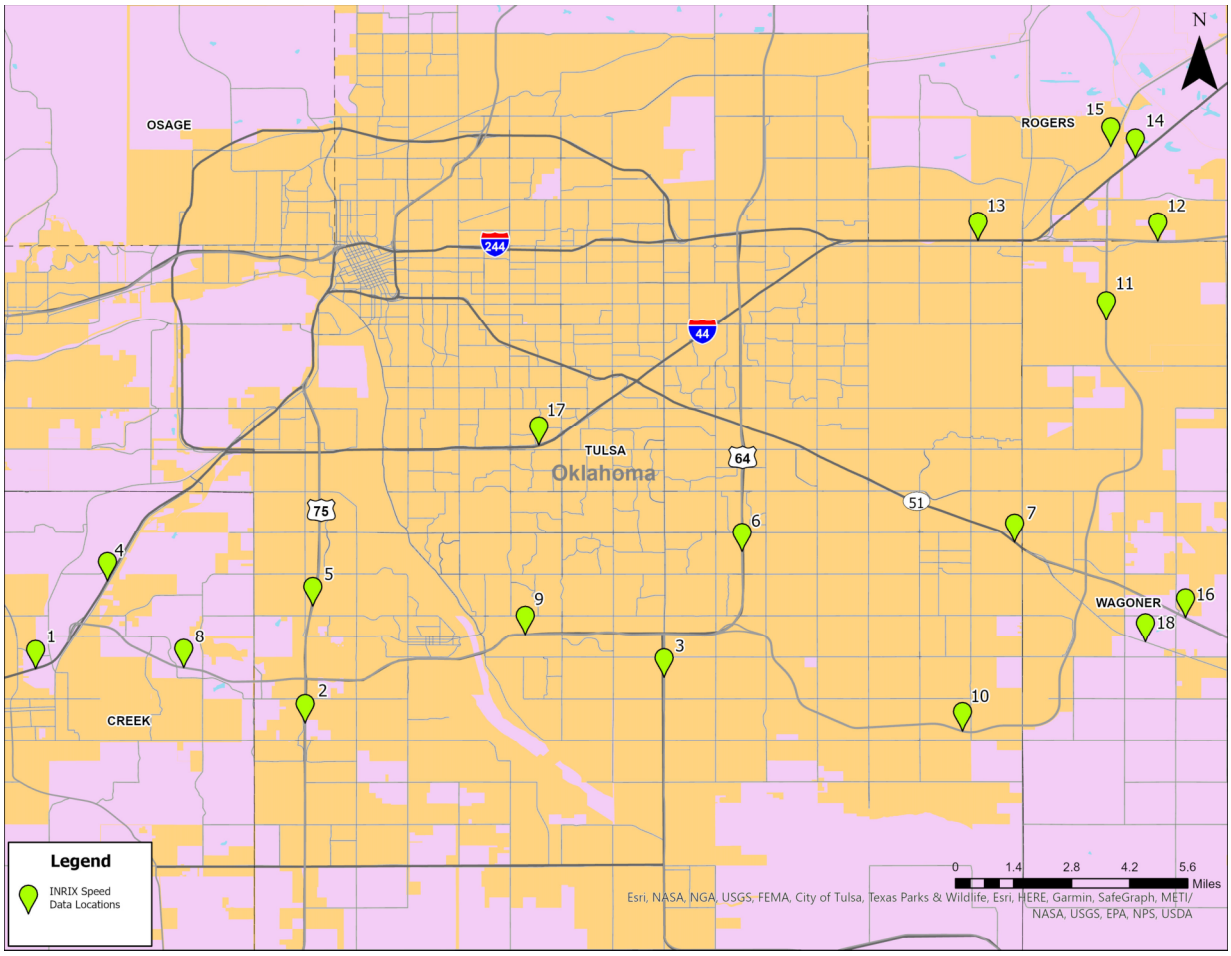

Figure 3-6. INRIX Speed Data Locations – Tulsa Area

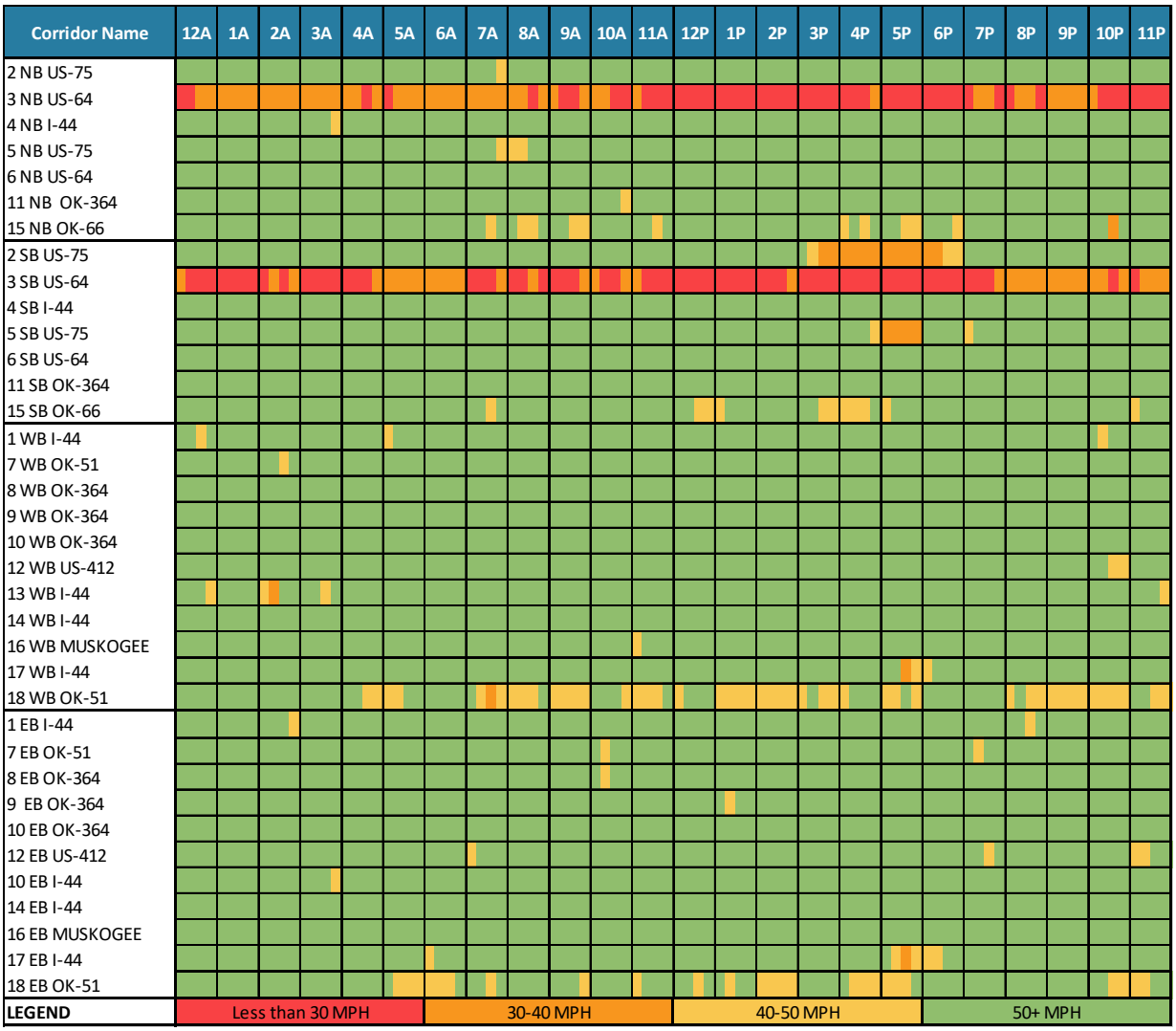

Figure 3-7. Average Weekday Travel Speeds – Tulsa Area

Regional Trip Patterns

In the Oklahoma City and Tulsa areas, an analysis of the origin-destination (O-D) patterns was undertaken by CDM Smith to investigate the travel patterns of the potential future users of OTA's turnpikes. To determine these patterns, CDM Smith engaged the services of StreetLight Data, Inc. to provide O-D data for the Oklahoma City and Tulsa areas by zone as shown in **Figures 3-8** and **3-10**. StreetLight uses the same base data utilized by INRIX to track daily trip movements throughout the country. The available data is comprehensive enough that trip patterns for specific roadways and locations can be analyzed.

Figures 3-9 and **3-11** show the zonal trip patterns for travelers within both the Oklahoma City and Tulsa areas. In each figure, the total share of trip origins and destinations per square mile is summarized. In the Oklahoma City region, zones 17 and 23 generated the greatest number of trips. Generally, the largest trip generating zones were in the central portion of the city. However, the areas of Edmond and Norman also generated large numbers of trips. In the Tulsa region, the downtown Tulsa zone generated the greatest number of trips per square mile. The southeastern portion of the region near Broken Arrow and Jenks was also among the largest trip generators.

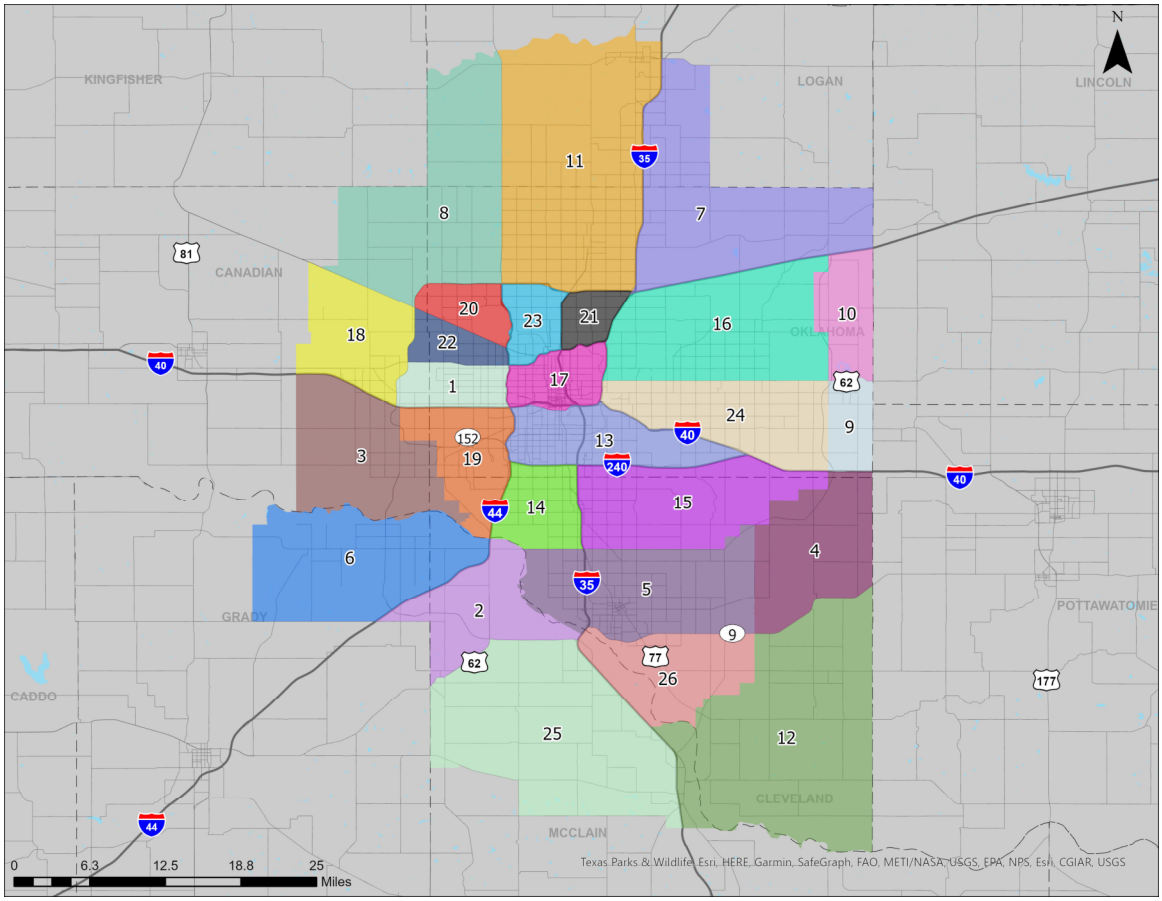

Figure 3-8. Oklahoma City Area Origin-Destination Analysis Locations

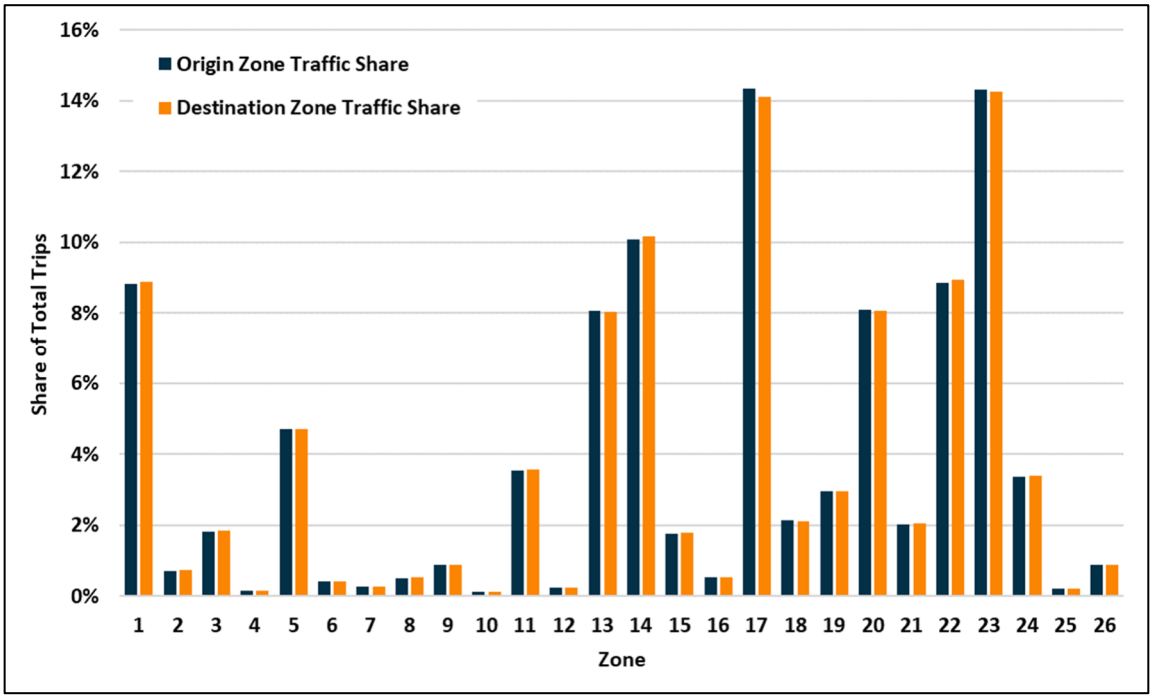

Figure 3-9. Oklahoma City Area Origin-Destination Results

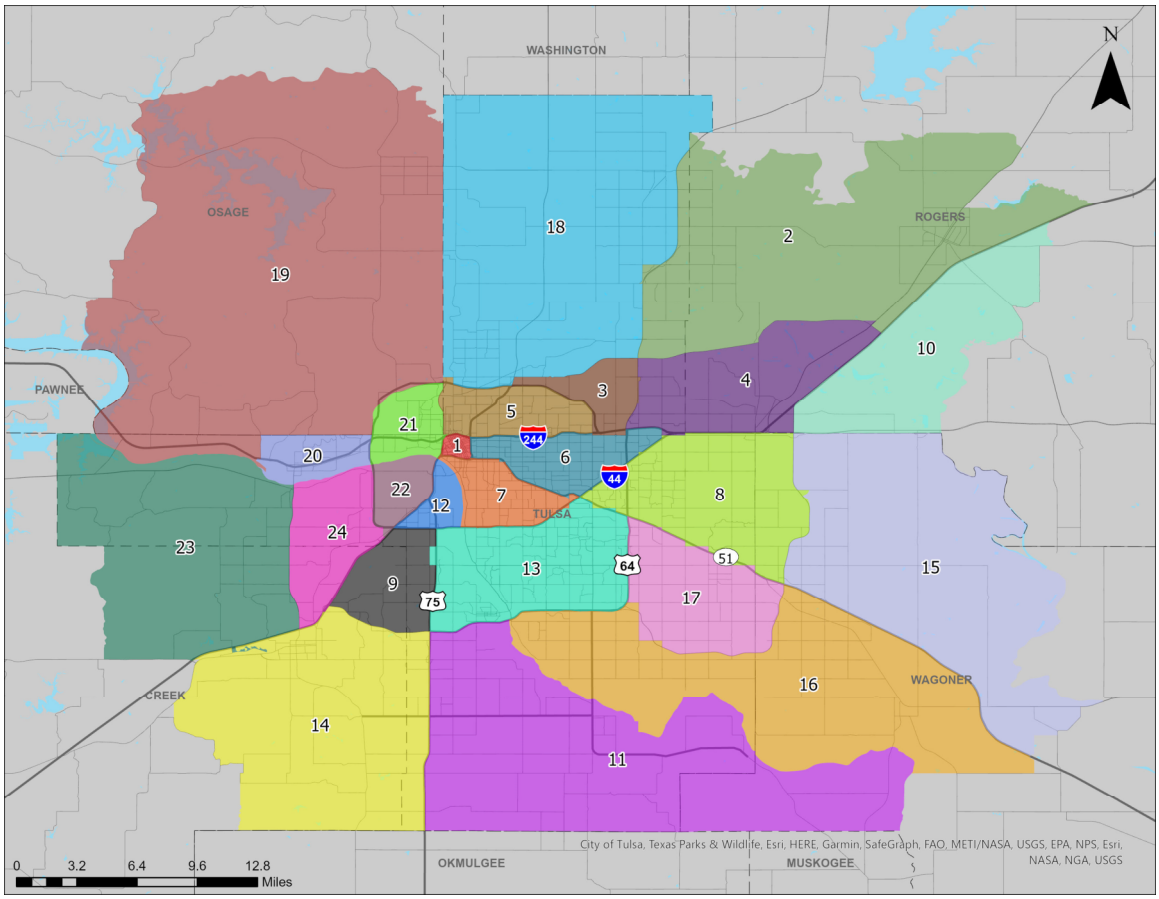

Figure 3-10. Tulsa Area Origin-Destination Locations

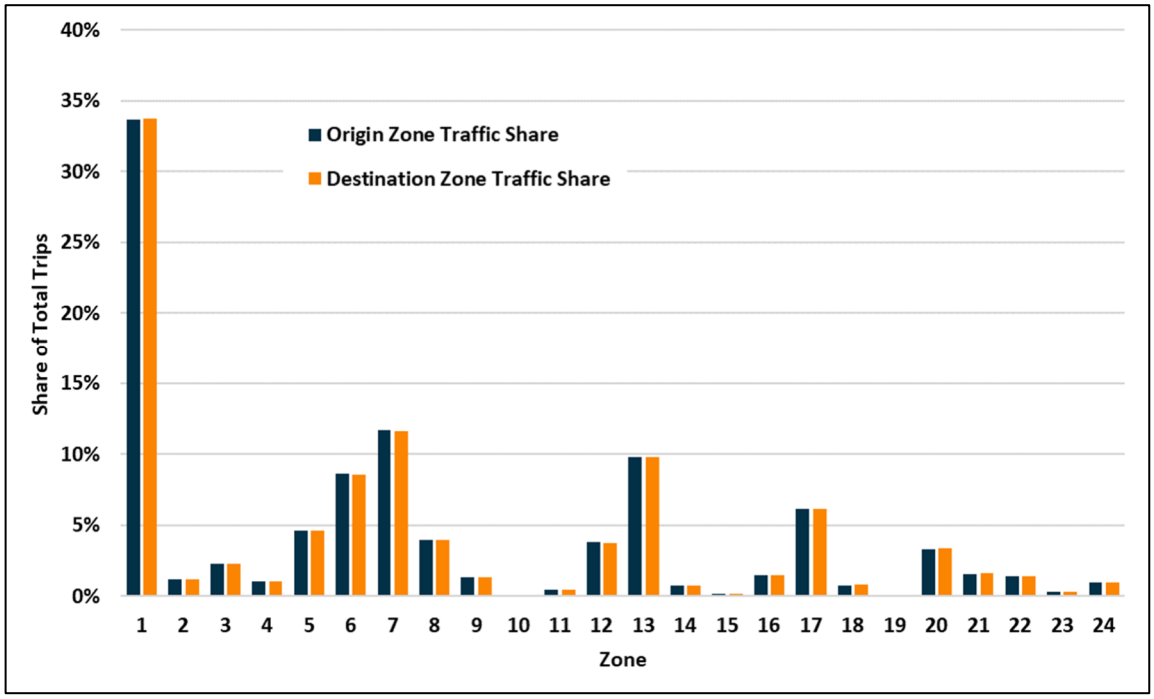

Figure 3-11. Tulsa Area Origin-Destination Results

Stated Preference Survey

Stated preference surveys were conducted in the Oklahoma City and Tulsa regions by Resource Systems Group (RSG), a subconsultant to CDM Smith, to capture the potential willingness-to-pay of travelers making trips near OTA corridors. Full details of the surveys, including questions asked, methodology and findings are provided in the RSG reports included as Appendices A and B of this report. An important element of these surveys includes the estimation of the potential willingness-to-pay that travelers in the area served by the new turnpikes will likely exhibit from imposing a toll along those routes. This behavioral characteristic provides a gauge to help determine likely market shares that will be captured by the new corridors. The most common method used to quantify the willingness-to-pay of a potential user group is a stated preference survey. Survey results facilitate the development of toll sensitivity curves and value of time parameters estimated through trade-off variable testing. These surveys focused on both the Oklahoma City and Tulsa regions and were completed in mid-2016.

The stated preference surveys were conducted using an internet-based self-interview technique. Postcards with links to the online survey were mailed to 20,000 residents within the study area. Additionally, email invitations to participate in the survey were sent to 20,000 PIKEPASS account holders within the study area. All survey invitees were provided with a unique anonymous password to access the web-based survey to prevent multiple responses. Based on the data collected by the survey, RSG was able to estimate values of time (VOTs) for travelers in both the Oklahoma City and Tulsa study areas. VOTs were estimated using a utility function that included

household income and travel time savings as variables. **Table 3-2** illustrates the mean VOTs for general work and non-work trips in both the Oklahoma City and Tulsa study areas. VOTs in each corridor increase with income, and VOTs in the Tulsa area were found to be slightly higher than those for respondents in the Oklahoma City area. All VOT values in the Oklahoma City and Tulsa areas were adjusted for actual and projected inflation using historical and assumed future changes in CPI.

Table 3-2. Stated Preference Survey Results (2016$)

Household Income	Oklahoma City Area		Tulsa Area	
	Work Trips	Non-Work Trips	Work Trips	Non-Work Trips
$10,000	$6.67	$7.71	$7.03	$8.06
$20,000	$7.68	$8.87	$8.09	$9.28
$30,000	$8.26	$9.55	$8.71	$9.99
$42,500	$8.77	$10.13	$9.24	$10.60
$62,500	$9.33	$10.77	$9.83	$11.27
$87,500	$9.81	$11.34	$10.34	$11.86
$112,500	$10.18	$11.76	$10.73	$12.30
$137,500	$10.47	$12.09	$11.03	$12.65
$175,000	$10.82	$12.50	$11.40	$13.07
$200,000	$11.01	$12.72	$11.61	$13.31

Source: RSG Oklahoma City and Tulsa Stated Preference Surveys, 2016

Section 4

Socioeconomic Characteristics

The historical and projected statewide demographic characteristics, as well as those within the ACOG and INCOG models areas were reviewed to support the traffic and toll revenue forecasting process. This section provides a summary of the historical and projected future growth across the state and also discusses the independent demographic forecast update conducted by Research and Demographic Solutions (RDS) for the Oklahoma City and Tulsa regions. The demographics evaluated ranged from the macro level (the entire state of Oklahoma) to the corridor level (Oklahoma City, Tulsa, and select counties). The demographic information is used by the trip generation model to estimate total trips for the travel demand model and serves as the foundation to support the development of the potential toll demand for the planned Tri-City Connector, East-West Connector, and South Extension Turnpike projects.

Historical and Forecasted Population

Population growth is the largest factor influencing travel demand, particularly in metropolitan areas. **Table 4-1** shows the historical population trends for the State of Oklahoma, the Oklahoma City MSA, the Tulsa MSA, and several counties in both the Oklahoma City and Tulsa areas. The total statewide population has increased at an average annual rate of 0.8 percent from 1990 to 2020, adding 812,000 more residents to the state. A similar growth trend was observed in the Tulsa region, but Oklahoma City saw a higher growth of 2.3 percent annually over that same period.

Oklahoma and Tulsa counties are the largest in the state in terms of population with approximately 796,000 and 669,000 residents, respectively, in 2020. Both counties experienced average annual population growth of approximately one percent from 1990 to 2020. The fastest growing counties during that time period were Canadian County in the Oklahoma City area and Rogers County in the Tulsa area. Those two counties grew at average annual rates of 2.3 percent and 2.0 percent, respectively. In terms of total population, the Oklahoma metropolitan area added 711,000 new residents between 1990 and 2020, with the Tulsa area adding 245,000.

Also included in **Table 4-1** are population forecasts for 2045 obtained from Woods & Poole Economics, Inc. as an independent source. Based on these independent forecasts, the total population of Oklahoma is expected to increase from 3.96 million in 2020 to 4.55 million by 2045, corresponding to an average annual growth rate of 0.6 percent. The Oklahoma City and

Tulsa areas are expected to grow at average annual rates of 0.8 percent and 0.6 percent, respectively. The Oklahoma City area is expected to reach a total population of 1.73 million by 2045, while the Tulsa area is anticipated to reach a population of 1.16 million.

Table 4-1. Population Trends and Projections (thousands)

Location		1990	2000	2010	2020	2045	Average Growth	
							1990-2020	2020-2045
State of Oklahoma		3,147	3,454	3,760	3,959	4,550	0.8%	0.6%
Oklahoma City Area	Canadian County	74	88	115	154	232	2.5%	1.7%
	Cleveland County	174	209	255	295	374	1.8%	1.0%
	Grady County	42	46	52	54	63	0.8%	0.6%
	Logan County	29	34	41	49	67	1.8%	1.3%
	McClain County	23	28	34	41	59	1.9%	1.5%
	Oklahoma County	600	662	718	796	900	0.9%	0.5%
Tulsa Area	Tulsa County	503	564	603	669	751	1.0%	0.5%
	Osage County	42	45	47	45	48	0.2%	0.3%
	Creek County	61	68	70	71	77	0.5%	0.3%
	Rogers County	55	71	87	95	122	1.8%	1.0%
	Wagoner County	48	58	73	80	109	1.7%	1.2%
Oklahoma City Metro Area		711	1,083	1,252	1,422	1,732	2.3%	0.8%
Tulsa Metro Area		761	860	940	1,006	1,159	0.9%	0.6%

Source: US Census Bureau, Woods & Poole Economics

Historical and Forecasted Employment

Employment statistics are typically used as relative indicators of trip attractions to a study area. The magnitude of employment growth influences the potential for an increase in the demand for transportation infrastructure within the region. The historical employment trends in Oklahoma are shown in **Table 4-2**. Between 1990 and 2020, total employment in the state increased at an average annual rate of 1.2 percent. The Oklahoma City area's employment grew at an average annual rate of 1.6 percent over that same period, while the Tulsa area grew at a rate of 1.1 percent annually. Oklahoma and Tulsa counties were the largest employment generators within the state in 2020, with employment totals of 648,000 and 624,000 jobs, respectively.

Figure 4-1 shows the historical unemployment rates in the Oklahoma City metropolitan statistical area (MSA), the State of Oklahoma, and the United States. Since 1990, unemployment

rates in Oklahoma have been consistently below the nationwide average. Although unemployment rose sharply in 2020 due to the effects of the COVID-19 pandemic, it has since fallen to its lowest levels in over twenty years. By 2023, unemployment rates had fallen below three percent in the Oklahoma City MSA and statewide.

Table 4-2 also shows the employment forecasts for 2045 generated by Woods & Poole Economics, Inc. as an independent source. The Oklahoma City MSA is expected to continue to be the largest employment center in the state and is projected to add an additional 343,000 jobs by 2045. Oklahoma City employment is expected to increase from 915,000 in 2020 to 1,258,000 in 2045 at an annual growth rate of 1.3 percent. In the Tulsa area, employment is anticipated to increase from 694,000 to 808,000 by 2045, representing an average annual growth rate of 0.6 percent and an additional 114,000 jobs. Total employment in the state is expected to reach 3.03 million jobs by 2045, representing an average annual growth rate of 0.9 percent.

Table 4-2. Employment Trends and Projections (thousands)

Location		1990	2000	2010	2020	2045	Average Growth	
							1990-2020	2020-2045
State of Oklahoma		1,655	1,994	2,133	2,396	3,032	1.2%	0.9%
Oklahoma City Area	Canadian County	26	35	44	60	99	2.8%	2.0%
	Cleveland County	61	88	115	136	197	2.7%	1.5%
	Grady County	17	20	22	22	27	0.9%	0.8%
	Logan County	10	14	21	16	22	1.5%	1.4%
	McClain County	7	10	13	19	31	3.1%	2.0%
	Oklahoma County	435	517	534	648	865	1.3%	1.2%
Tulsa Area	Tulsa County	431	533	553	624	731	1.2%	0.6%
	Osage County	10	12	19	15	20	1.3%	1.2%
	Creek County	21	29	29	30	33	1.2%	0.3%
	Rogers County	20	33	41	44	62	2.7%	1.4%
	Wagoner County	11	14	13	21	31	2.1%	1.5%
Oklahoma City Metro Area		568	698	763	915	1,258	1.6%	1.3%
Tulsa Metro Area		503	616	643	694	808	1.1%	0.6%

Source: Woods & Poole Economics

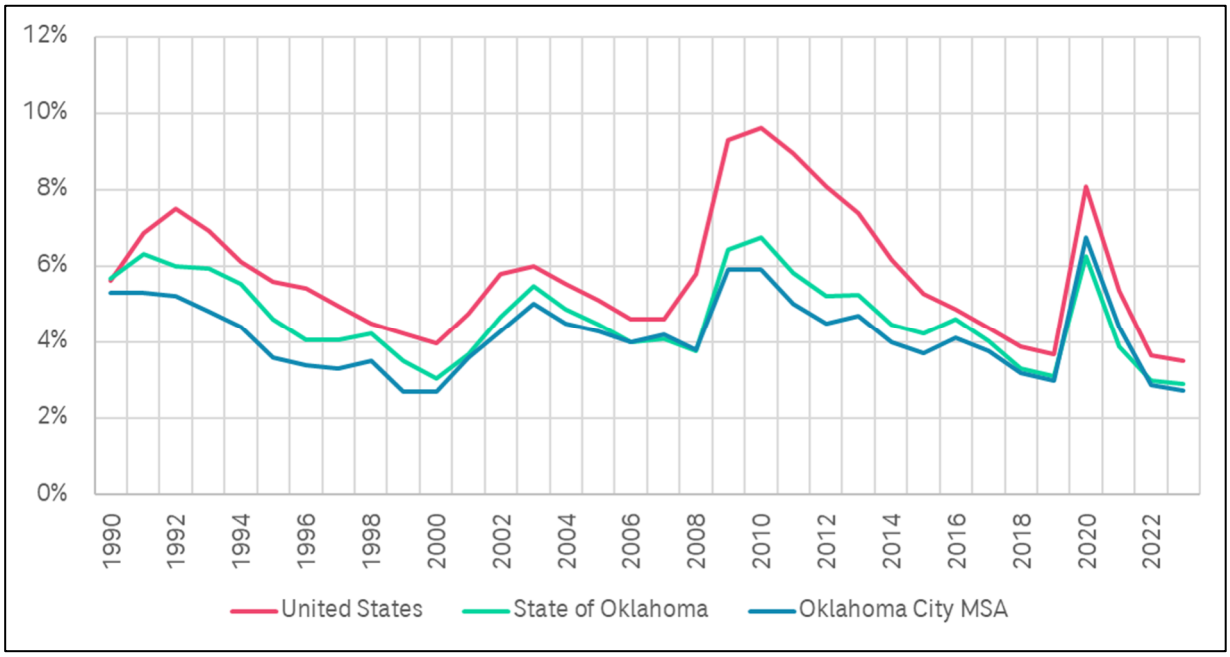

Figure 4-1. Historical Unemployment Rates

Source: US Bureau of Labor Statistics

Additional Economic Factors

Consumer Price Index

The consumer price index for all urban consumers (CPI-U) is the most widely used measure of inflation and serves as a key economic indicator. The CPI-U determines the aggregate price level of a specific market basket of goods and services that are consumed by typical urban households. This is derived by calculating the average going price of each item in a defined market basket. Food, clothing, housing, transportation (including tolls) and entertainment are all included in this basket. Income taxes and investment items such as stocks and bonds are not included. The Bureau of Labor and Statistics of the U.S. Department of Labor calculates the CPI-U every month.

Figure 4-2 illustrates the historical trends for CPI-U growth from 1990-2023 for Oklahoma and the United States. As shown in the graph, CPI-U growth in Oklahoma has closely mirrored nationwide trends. This indicates that the inflation rate in Oklahoma is consistent with the rate of inflation seen nationwide. In Oklahoma, CPI-U grew at an average annual rate of less than three percent between 2008 and 2020. CPI-U has grown sharply since 2020, with 2022 seeing annual growth over eight percent. However, CPI-U growth has reduced to approximately five percent through the first half of 2023.

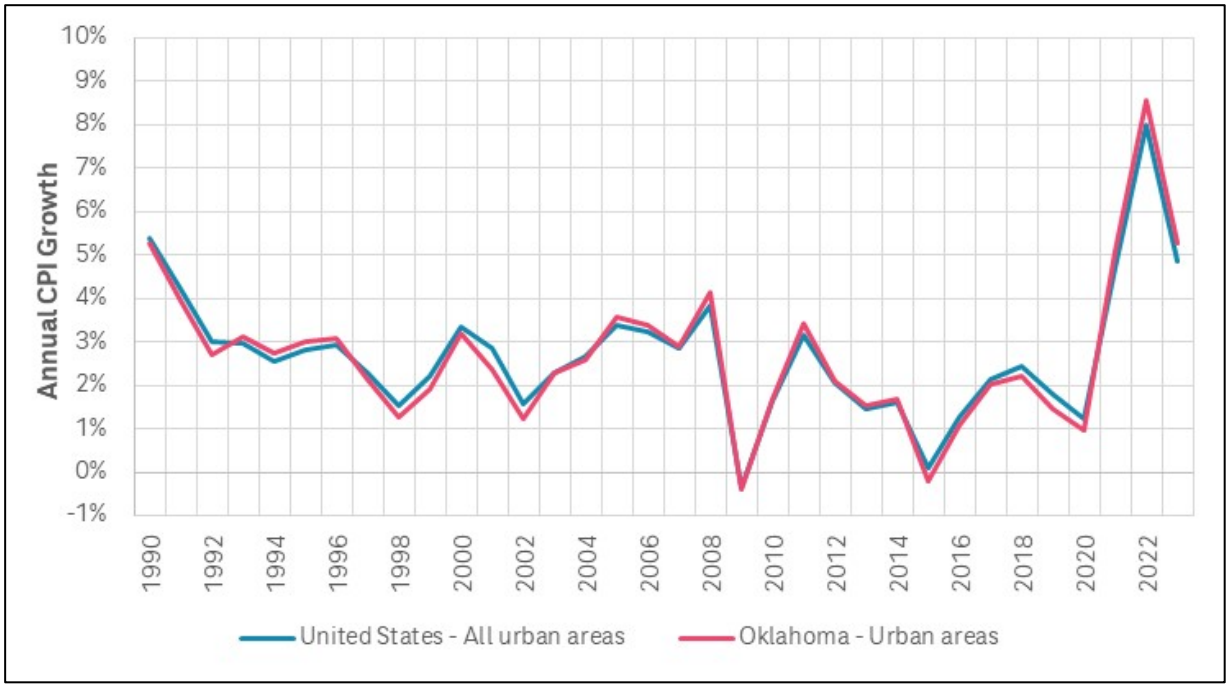

Figure 4-2. Consumer Price Index for All Urban Consumers

Source: US Bureau of Labor Statistics

Household Income

Household income is another key factor used in determining a traveler's willingness-to-pay tolls to utilize a roadway. **Table 4-3** summarizes the average historical household income at selected locations in Oklahoma and projected growth from the Woods & Poole data. As shown in the table, across the state, household income grew at an average annual rate of 1.9 percent between 1990 and 2020, and it is anticipated to grow 1.3 percent per year through 2045. Similar trends and forecasts were also evident for both the Oklahoma City and Tulsa areas.

Table 4-3. Historical and Forecasted Mean Household Income (thousands, 2009$)

Location		1990	2000	2010	2020	2045	Average Growth 1990-2020	Average Growth 2020-2045
State of Oklahoma		$61.1	$74.6	$88.7	$105.9	$145.6	1.9%	1.3%
Oklahoma City Area	Canadian County	68.5	84.8	94.1	111.4	144.6	1.6%	1.0%
	Cleveland County	62.8	80.2	89.0	103.2	135.1	1.7%	1.1%
	Grady County	51.7	66.3	80.6	94.2	119.0	2.0%	0.9%
	Logan County	57.4	72.3	91.2	101.1	131.8	1.9%	1.1%
	McClain County	58.9	72.9	89.2	108.9	151.5	2.1%	1.3%
	Oklahoma County	68.6	84.4	100.7	123.1	178.3	2.0%	1.5%
Tulsa Area	Tulsa County	68.2	86.2	99.7	125.1	164.9	2.0%	1.1%
	Osage County	49.0	66.0	74.7	80.1	113.2	1.7%	1.4%
	Creek County	55.0	67.6	83.8	97.1	128.4	1.9%	1.1%
	Rogers County	63.6	81.1	92.3	107.9	143.3	1.8%	1.1%
	Wagoner County	59.9	70.3	79.9	94.1	118.1	1.5%	0.9%
Oklahoma City Metro Area		65.9	81.7	95.5	114.5	158.2	1.9%	1.3%
Tulsa Metro Area		66.9	82.7	96.4	123.0	163.1	2.0%	1.1%

Source: Woods & Poole Economics

Fuel Prices

Another factor that can potentially influence travel behavior is vehicle fuel price. Historically, some amount of correlation has been noted between the price of motor vehicle fuel and overall roadway demand trends. **Figure 4-3** illustrates the historical trends in gasoline price in Oklahoma since 1993. After remaining fairly constant throughout the 1990s, prices began to rise steadily throughout the 2000s, eclipsing $4.00 per gallon by 2008. Prices fell in 2015 and remained below $3.00 per gallon until mid-2021. Prices in 2022 increased to almost $5.00 per gallon but have since remained consistently below $4.00. However, it should also be noted the traffic on the OTA System has been largely inelastic to fluctuations in fuel price over the long term.

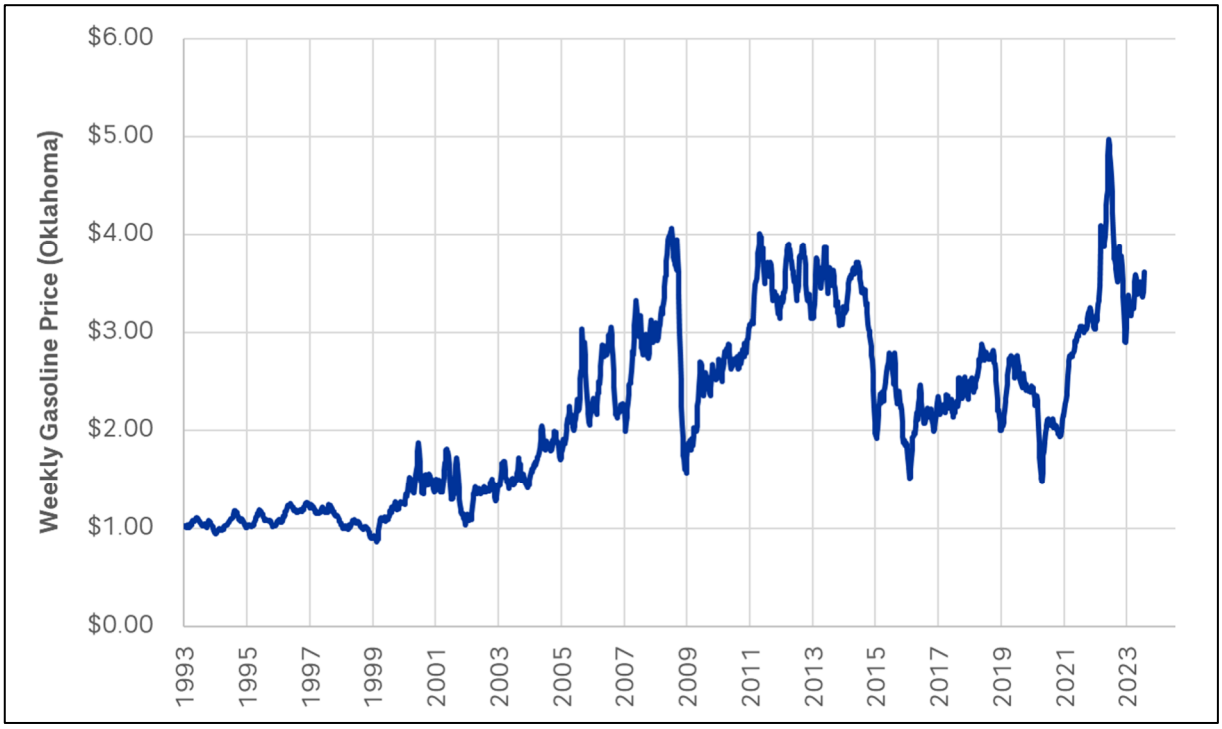

Figure 4-3. Historical Fuel Prices in Oklahoma

Source: US Energy Information Administration

Independent Demographic Review

Several existing and planned OTA System facilities lie within the greater Oklahoma City and Tulsa areas, which are the largest metropolitan areas in the state. Given the significant role that demographics play in the traffic and toll revenue forecasting process, an independent socioeconomic review was necessary to undertake a more detailed review of the demographics in these regions.

Base MPO Forecasts

The base demographic forecasts used in the independent demographic review were those developed by the local metropolitan planning organization (MPO) in both the Oklahoma City and Tulsa regions. For the Oklahoma City area, the base forecasts were those developed by the Association of Central Oklahoma Governments (ACOG) as part of their Encompass 2045 metropolitan transportation plan (MTP). In the Tulsa area, the base forecasts were those developed by the Indian Nations Council of Governments (INCOG) as part of the Connected 2045 MTP.

ACOG and INCOG serve as the metropolitan planning organization for the greater Oklahoma City and Tulsa regions, respectively. Each MTP details current and forecast conditions for population, employment, planned roadway network improvements, and system performance through 2045. Based on its identified system needs, they provide a guide to multimodal transportation system investments for the long-term and guide the development of short-range implementation of projects through the regional Transportation Improvement Program (TIP).

Demographic Forecast Update

CDM Smith engaged Research and Demographic Solutions (RDS) to perform an independent socioeconomic review and to update the demographic forecasts in each project area. The goal of the socioeconomic review was to develop a revised 2019 base year forecast and update the original 2045 forecasts in each area (from ACOG and INCOG) at the traffic analysis zone (TAZ) level to create a more refined demographic profile within the study areas. The TAZ locations that were reviewed and updated by RDS are shown in **Figures 4-4** and **4-5**.

The updated demographics forecasts reflect changes to the socioeconomic trends that RDS suggests based on their detailed review of development activity within the project areas. **Tables 4-4** and **4-5** summarize the demographic forecast revisions recommended by RDS for both the ACOG and INCOG review areas. Adjustments were made to the base forecasts to account for current and planned development in the study area and to align the base forecasts with available population and employment data. For the forecast year of 2045, the RDS revised population is 6.4 percent higher than the base forecast in the ACOG review area and 5.6 percent higher than the base forecast in the INCOG review area. For employment, the 2045 forecasts were decreased by 6.3 percent in the ACOG review area and increased by 4.3 percent in the INCOG review area.

For additional details regarding the independent socioeconomic review performed by RDS and the respective rationale behind the population and employment adjustments highlighted below, please refer to Appendix C of this report.

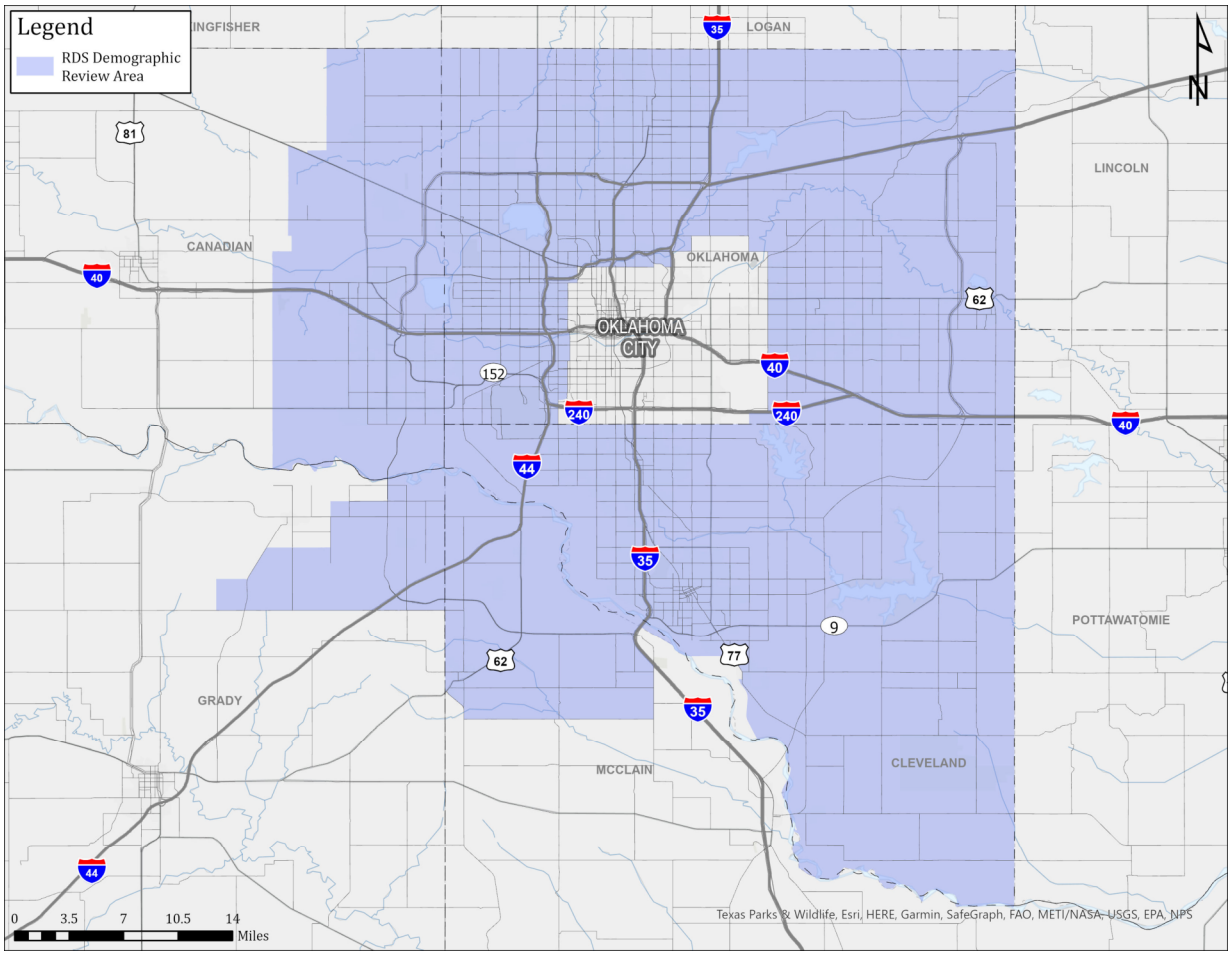

Figure 4-4. ACOG Demographic Review Area

Table 4-4. Revised Demographic Forecast – ACOG Modeling Area

Forecast	Population		Employment	
	2019	2045	2019	2045
ACOG	1,278,187	1,652,682	683,908	971,838
RDS	1,297,332	1,758,784	682,038	910,164
Total Change	1.5%	6.4%	-0.3%	-6.3%

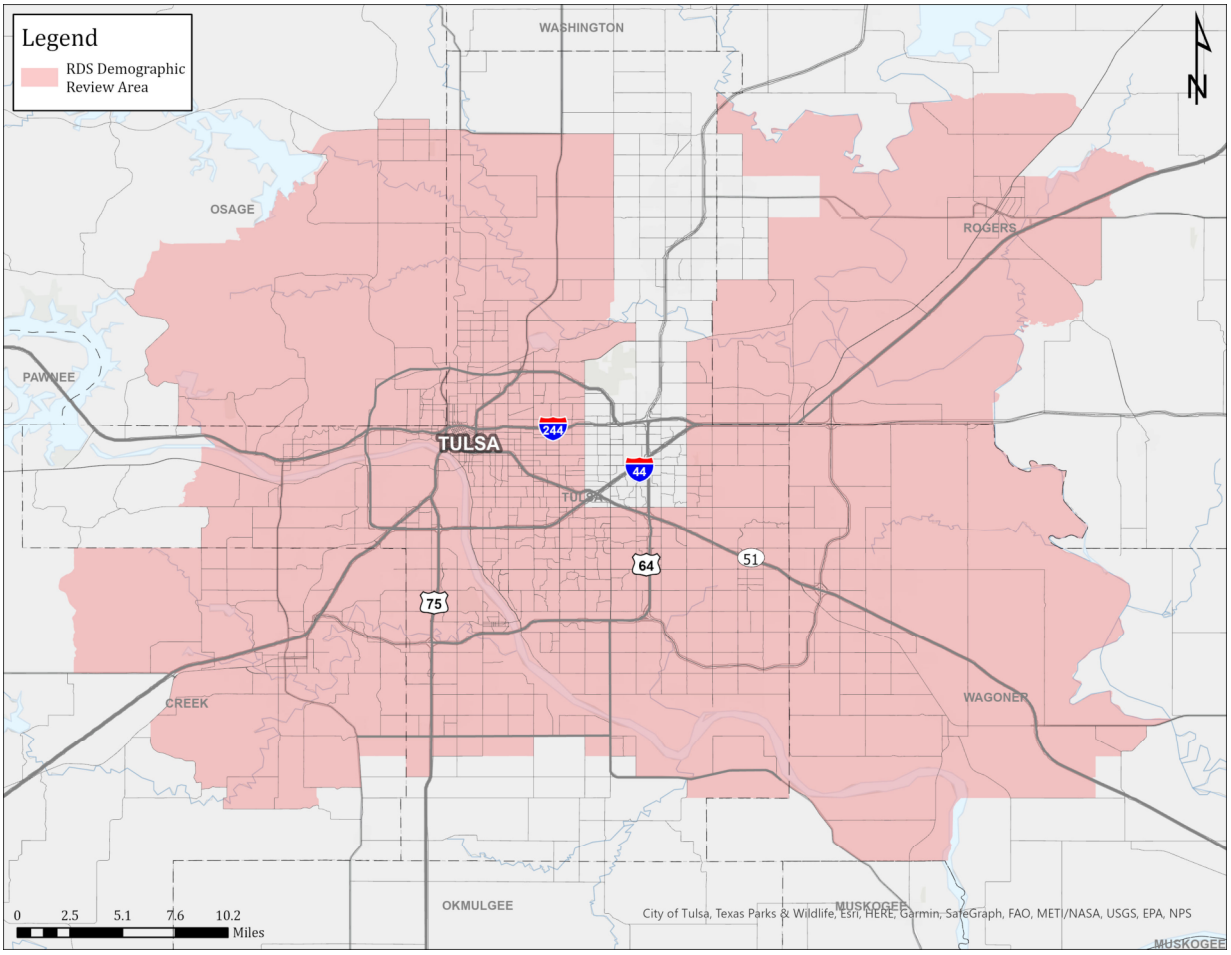

Figure 4-5. INCOG Demographic Review Area

Table 4-5. Revised Demographic Forecast – INCOG Modeling Area

Forecast	Population		Employment	
	2019	2045	2019	2045
INCOG	834,807	1,079,652	448,577	539,361
RDS	871,787	1,140,227	450,318	562,583
Total Change	4.4%	5.6%	0.4%	4.3%

Section 5

Traffic Forecasting Methodology

This section describes the travel demand estimation methodologies used to develop future year demand forecasts for the OTA System, Tri-City Connector, East-West Connector, and South Extension Turnpike. This effort included a multivariate regression analysis to evaluate the existing OTA System and the development of a travel demand model to evaluate the Tri-City Connector, East-West Connector, and South Extension Turnpike.

OTA System

Future year demand for the OTA System was estimated using a series of analyses including a multivariate regression analysis of historical traffic and toll revenue trends, and analysis of Oklahoma City and Tulsa area travel demand using local metropolitan planning organization (MPO) models. The resulting output of these analysis methodologies were used as collaborative factors to develop future year forecasts for each of the OTA System's eleven turnpikes.

Systemwide Multivariate Regression Analysis

Long-term demand forecasts for the OTA System were developed utilizing the historical traffic and toll revenue trends in conjunction with key socioeconomic variables that were correlated to the transactions and toll revenues. The identification of these key socioeconomic variables was to a large extent dependent on the availability of data and the reliability of the projection sources that could be used. Multivariate regression models were developed for each turnpike to test for relationships between turnpike usage and socioeconomic characteristics at the local, state, and national levels.

The multivariate regression models used to establish the relationship between the long-term transaction trends and the local socioeconomic characteristics were developed taking into account the quality of the socioeconomic inputs and the effectiveness of independent variables. Multivariate regression analysis is an econometric modeling technique used to determine the statistical relevancy of multiple independent and quantifiable variables to the dependent variable – namely, traffic demand along the respective OTA turnpikes. The analysis is an industry standard, well-recognized, and widely used modeling process to forecast long-term growth trends.

The multivariate regression application was used to forecast the turnpike traffic (dependent variable) as a function of projections of the identified independent/explanatory variables. This

approach provides a mechanism to weigh the influence that the identified independent variables' future growth may have on the corridor traffic volumes. A separate multivariate regression equation was developed for each turnpike and separated by user type (passenger and commercial vehicles) to determine their respective traffic volume growth.

Urban Analysis Using MPO Forecasts

Although the multivariate regression analysis of the historical observed OTA System transaction and toll revenue data provided the primary basis for the long-term toll revenue forecast, local MPO transportation plans in the Oklahoma City and Tulsa areas were also evaluated as an additional resource. This additional effort was particularly useful when analyzing the three turnpikes (John Kilpatrick, Kickapoo and Creek turnpikes) which lie in the Oklahoma City and Tulsa areas.

Oklahoma City Area

The Association of Central Oklahoma Governments (ACOG) serves as the MPO for the greater Oklahoma City area. The most recent long-range plan developed by ACOG, Encompass 2045, included long-range traffic forecasts for major roadways in the Oklahoma City metropolitan planning area. CDM Smith obtained the Encompass 2045 travel demand model as part of the current study. The ACOG model was used to estimate traffic growth trends for the John Kilpatrick Turnpike and Kickapoo Turnpike based upon ACOG's 2045 demographic forecast. The growth rates observed in the ACOG model were used in conjunction with the results of the multivariate regression model and recent transaction trends to develop thirty-year demand forecasts for the John Kilpatrick Turnpike and Kickapoo Turnpike.

Tulsa Area

The local MPO for the Tulsa region is the Indian Nations Council of Governments (INCOG). INCOG developed long-range traffic forecasts for the Tulsa area as part of its most recent long-range plan developed by ACOG, Connected 2045. The Connected 2045 travel demand model was obtained by CDM Smith as part of this analysis. The INCOG model and demographic forecast were used to estimate traffic growth trends for the Creek Turnpike through INCOG's 2045 forecast year. The growth rates observed in the INCOG model provided a supplemental resource to the multivariate regression results when developing thirty-year traffic forecasts for the Creek Turnpike.

ACCESS Oklahoma Projects

Future year toll revenue forecasts for the Tri-City Connector, East-West Connector, and South Extension Turnpike projects were developed using an updated and validated travel demand model for the greater Oklahoma City area. The travel demand model validation process included

database modifications and updates to the roadway network and socio-economic characteristics in the study area. **Figure 5-1** illustrates the travel demand process used by CDM Smith for developing the toll revenue forecasts for the Tri-City Connector, East-West Connector, and South Extension Turnpike projects.

Roadway Network Update

The base model used for this analysis was the Oklahoma City regional travel demand model developed by ACOG. The complete model (including networks, demographic forecasts and trip tables) was provided in Cube format to CDM Smith (including networks, demographic forecasts and trip tables). The base year network from the model was reviewed for consistency with existing conditions and validated based on the comprehensive data collected within the project areas as described in Section 3. The validated networks were then used to develop the traffic forecasts for the Tri-City Connector, East-West Connector, and South Extension Turnpike projects.

Model Validation Process

CDM Smith used extensive traffic count data for the Oklahoma City roadway network to validate the model and adjust the network characteristics where needed. The model validation process involved comparing the 2019 base year traffic assignment output volumes along each project corridor to the observed traffic count data. The model validation was completed across fifteen screenlines in the Oklahoma City area as shown in **Figure 5-2**. Additionally, output travel times and speeds from the travel demand model were compared to the actual travel speed information collected along project corridors. Model volumes were also compared to average daily traffic (ADT) counts available from OTA to test the base year travel demand model's ability to replicate existing turnpike traffic. Finally, the origin-destination patterns from the base year model were analyzed to ensure that they accurately reflected the travel patterns observed from the origin-destination data obtained for the region.

Travel demand modeling practitioners in the United States use "NCHRP 255: Highway Traffic Data for Urbanized Area Project Planning and Design," published by the Transportation Research Board to check the reasonableness of model validation. As shown in **Figure 5-3**, the percentage difference between the model volumes and traffic for both projects is within acceptable ranges for each screenline.

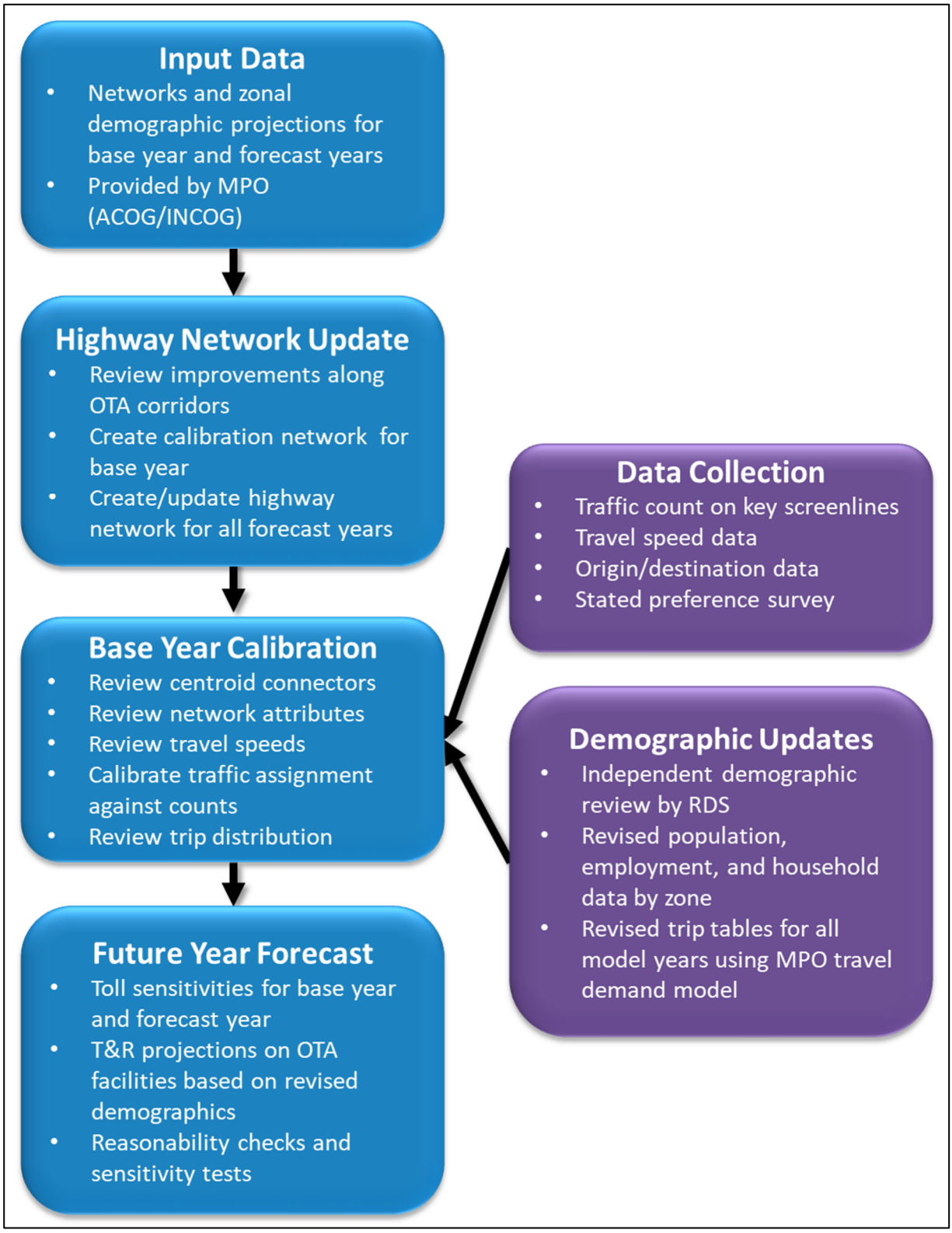

Figure 5-1. Travel Demand Modeling Process

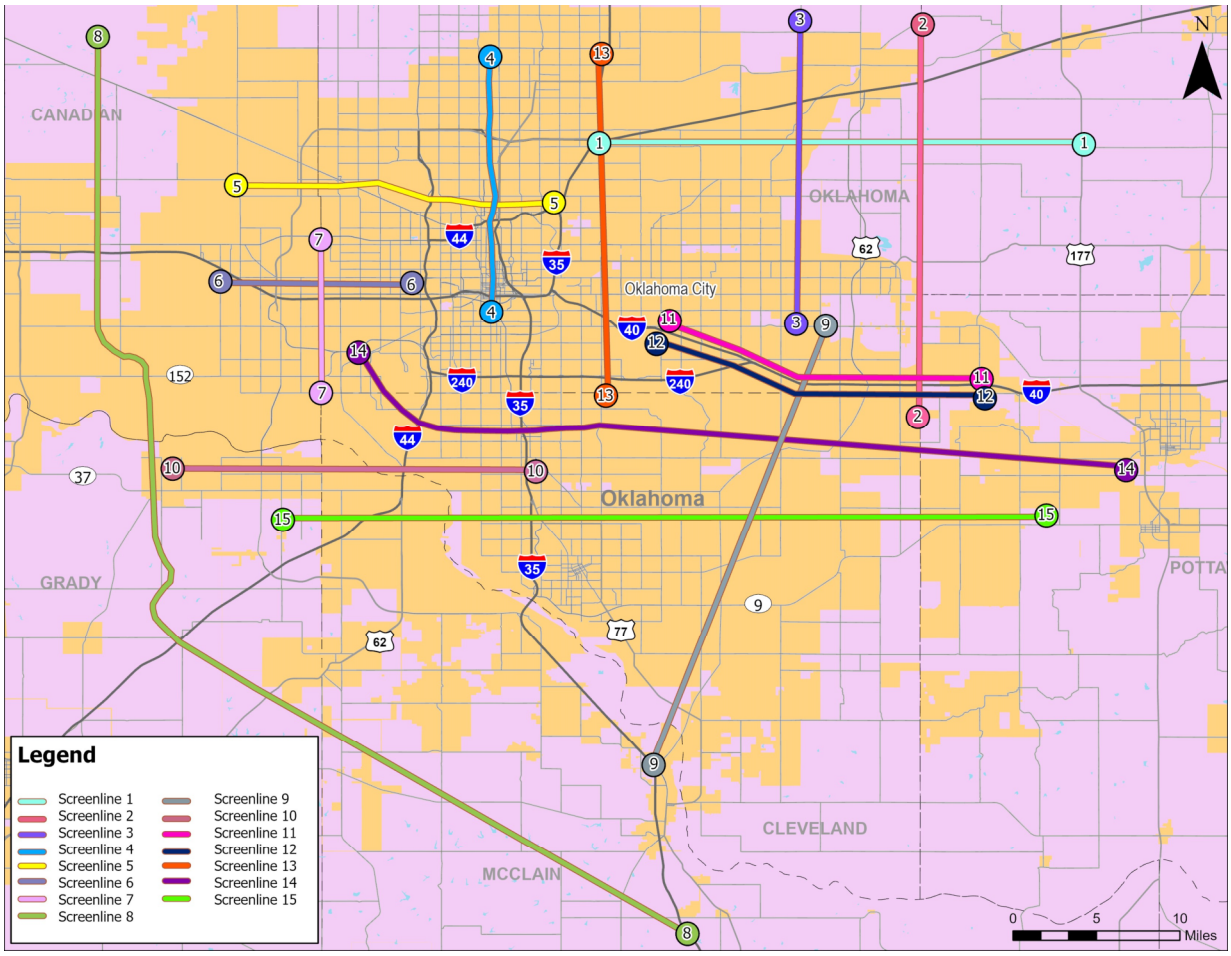

Figure 5-2. ACOG Model Screenline Locations

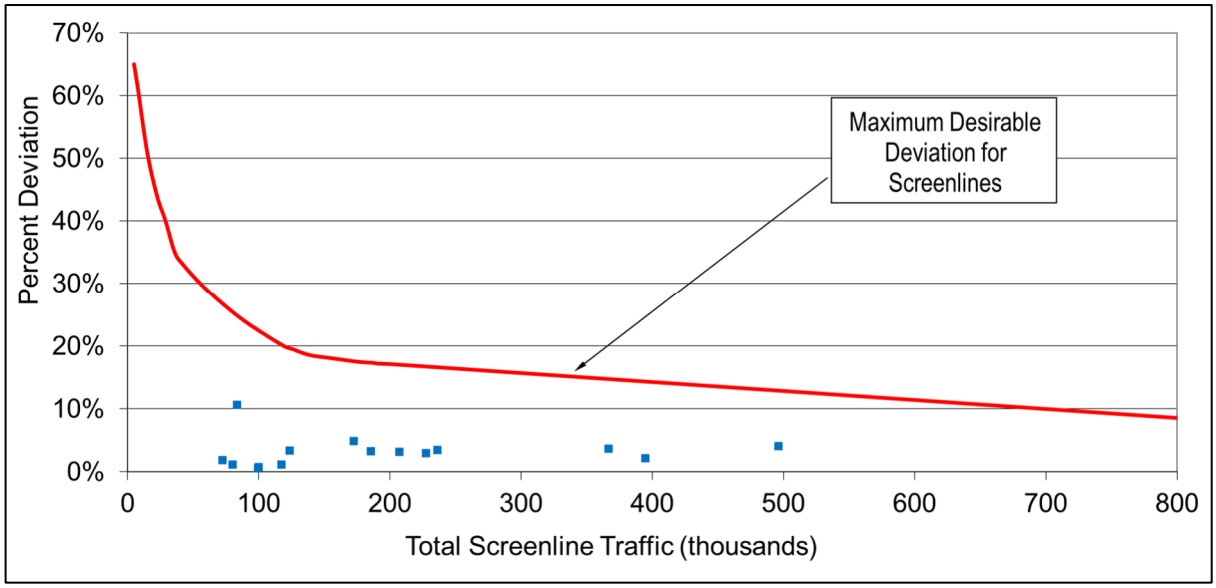

Figure 5-3. ACOG Model – Screenline Validation Results

Modeling Methodology

Professional practices and procedures were used in the development of the toll revenue forecasts for the Tri-City Connector, East-West Connector, and South Extension Turnpike. The CDM Smith market share diversion routines, designed specifically to emulate motorists' willingness to pay tolls at different toll levels and congestion conditions, were used to test the toll sensitivities within the corridor for the both the validation year and 2045 forecast year.

The toll diversion traffic assignments were run using an equilibrium diversion technique to evaluate the toll feasibility of the corridor. In the process, the travel model builds two paths between each pair of zones, one including the project mainlane links, and the other path excluding the project mainlane links. The travel cost associated with using both travel paths is computed, and the amount of trips using the toll facility is then estimated based on travel time savings between the two paths. This technique simulates the driver's decision to use a toll or toll-free route, which depends largely on the marginal differences in time and cost between the defined routes.

Time Cost and Vehicle Operating Costs

In addition to tolls, two other end-user costs are considered when calculating the total cost of a trip on Tri-City Connector, East-West Connector, and South Extension Turnpike: time cost and vehicle operating costs. The motorists' time cost is calculated using value of time estimates that are integrated into the modeling process. How travelers value their time helps them determine which route to use for a specified trip. The value of time parameter provides a measure to convert travel time into an equivalent monetary cost for inclusion in the toll diversion process. Vehicle operating costs include a multitude of additional costs to travelers such as wear and tear, maintenance, tires, oil, fuel, and other variable costs. Based on the results of the stated preference survey summarized in Section 3, average values of time (as a function of income) were used for the current study. Values of time were assumed to inflate at an average annual rate of two percent throughout the forecast period.

A vehicle operating cost of $0.23 per mile for passenger vehicles in 2022 was assumed based on estimates published by the American Automobile Association and inflated at the rate of two percent per year. This includes motor fuel and limited other perceived out-of-pocket costs that are well below the full cost of operation. These costs are generally not perceived by the drivers as variable costs that affect their route decision choices.

Demographics and Trip Tables

Toll revenue estimates along the Tri-City Connector, East-West Connector, and South Extension Turnpike corridors that are presented in Section 6 of this report are based on the base demographic datasets from ACOG as a starting point. However, the updated demographic

datasets developed by RDS as described in Section 4 were used as an input to generate an alternate set of trip tables and are referred to as the "revised" trip tables. These revised trip tables were used as the baseline for the toll revenue estimation and toll sensitivity evaluations completed for each of the Tri-City Connector, East-West Connector, and South Extension Turnpike projects.

General Assumptions

The forecasted traffic volumes and estimated toll revenues from this study are based on the following general assumptions, which CDM Smith believes are reasonable for the purposes of this study (more project specific assumptions can be found in Section 6):

- Assumed opening dates for the three new turnpikes are as follows:
    - East-West Connector (I-44 to I-35): September 1, 2027
    - East-West Connector (I-35 to I-40): September 1, 2030
    - Tri-City Connector: August 1, 2032
    - South Extension Turnpike (E-W Connector to SH 9): October 1, 2034
    - South Extension Turnpike (SH 9 to I-35): January 1, 2037
- Alignment of the East-West Connector, Tri-City Connector, and South Extension Turnpike are assumed to be as described in Section 1 of this report
- No additional competing limited-access highways will be constructed within the East-West Connector, Tri-City Connector, and South Extension Turnpike corridors at any time during the forecast period.
- A combination PIKEPASS/PlatePay toll collection system will be used, and toll collection policies and rates for the OTA System, East-West Connector, Tri-City Connector, and South Extension Turnpike will be adopted as mentioned in Section 6 of this report
    - The Turner Turnpike, Will Rogers Turnpike, Indian Nation Turnpike, and Muskogee Turnpike all currently utilize a PIKEPASS/Cash toll collection system, but are assumed to convert to PIKEPASS/PlatePay by January 1, 2025
- The OTA System, East-West Connector, Tri-City Connector, and South Extension Turnpike will be well-maintained, efficiently operated, and effectively signed to encourage maximum usage
- Economic growth in project corridors will follow the assumptions described in Section 4
- Growth in vehicle operating costs (which include fuel, maintenance, and tires) will not significantly deviate from the assumed inflation rate
- No local, regional, or national emergency will arise which would abnormally restrict the use of motor vehicles

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Section 6

Revenue Forecasts

This section presents thirty-year revenue estimates for the OTA System as well as the Tri-City Connector, East-West Connector, and South Extension Turnpike projects. The long-term forecasts are based on the modeling methodologies and background assumptions described in Section 5 and other assumptions presented in this section. In addition, this section describes the toll sensitivity analyses that were performed to estimate the impact of toll rate changes on revenue generation. The results of various sensitivity tests performed to assess the impact on revenue of the various key influential variables are also presented.

Input Assumptions

The forecasted traffic volumes and estimated toll revenues from this study are based on the following general assumptions, several of which were derived through coordination with OTA staff, that CDM Smith believes are reasonable for the purposes of this study:

Toll Rates and Tolling Configuration

- Average per mile toll rates on Tri-City, East-West, and Southern Extension will be consistent with those on Kilpatrick and Kickapoo, and toll rates will be calculated as a function of distance and the base per mile rate
- No toll rate increases are assumed during the forecast period
- Kilpatrick, Kickapoo, H.E. Bailey, Cimarron, Chickasaw, Creek and Cherokee currently operate under an AET toll collection configuration
- Muskogee Turnpike is assumed to convert to AET by September 1, 2023
- Turner Turnpike, Will Rogers Turnpike and Indian Nation Turnpike are assumed to convert to AET by January 1, 2025
- Tri-City, East-West, and South Extension: will open with AET in place
- East-West Connector will open to traffic by September 1, 2027 (I-44 to I-35) and September 1, 2030 (I-35 to I-40)
- Tri-City Connector will open to traffic by August 1, 2032

- South Extension Turnpike will open to traffic by October 1, 2034 (E-W Connector to SH 9) and January 1, 2037 (SH 9 to I-35)
- Demographic growth along OTA System corridors will follow the forecasts described in this report
- Truck toll rates on Tri-City, East-West, and Southern Extension will be set as follows:
    - 3-axle vehicles: 1.5 times the 2-axle rate
    - 4-axle vehicles: 2.0 times the 2-axle rate
    - 5-axle vehicles: 3.5 times the 2-axle rate
    - 6-axle vehicles: 4.5 times the 2-axle rate

Toll Sensitivity Analysis

A toll sensitivity analysis was performed to test the impact of changes to toll rates on the revenue generated by the OTA System. It is advisable that the planned toll rates on all OTA System facilities be less than that required to maximize revenue as determined by the toll sensitivity analysis. Future flexibility should be maintained to increase tolls, if necessary, to generate additional revenue. Toll sensitivity curves are based on changes in traffic characteristics along OTA System corridors such as congestion levels, values of time and attractiveness of competing facilities. These curves are essential in estimating the viability of planned toll rate increases.

In general, the toll sensitivity curve suggests that when the toll rate increases, a portion of travelers will leave the toll facility and choose other routes. Therefore, as the toll rate increases, demand for the toll facilities will decrease. However, as the toll rate increases, the toll revenue increases until it reaches the highest revenue point where an additional toll rate increment would reduce demand enough to result in less revenue.

A toll sensitivity analysis was conducted for the year 2022, and the resulting toll sensitivity curve for the OTA System is illustrated in **Figure 6-1**. The curve was developed using toll rates up to 600 percent of the base toll rate. Toll sensitivity results for the OTA System indicate that rates could be increased up to 250 percent before total revenues begin to fall below the revenue maximization point. These results indicate that current toll rates are below the revenue maximization points, demonstrating that, if needed, there is potential for revenue enhancement through toll increases above current rates for traffic and revenue forecasting purposes.

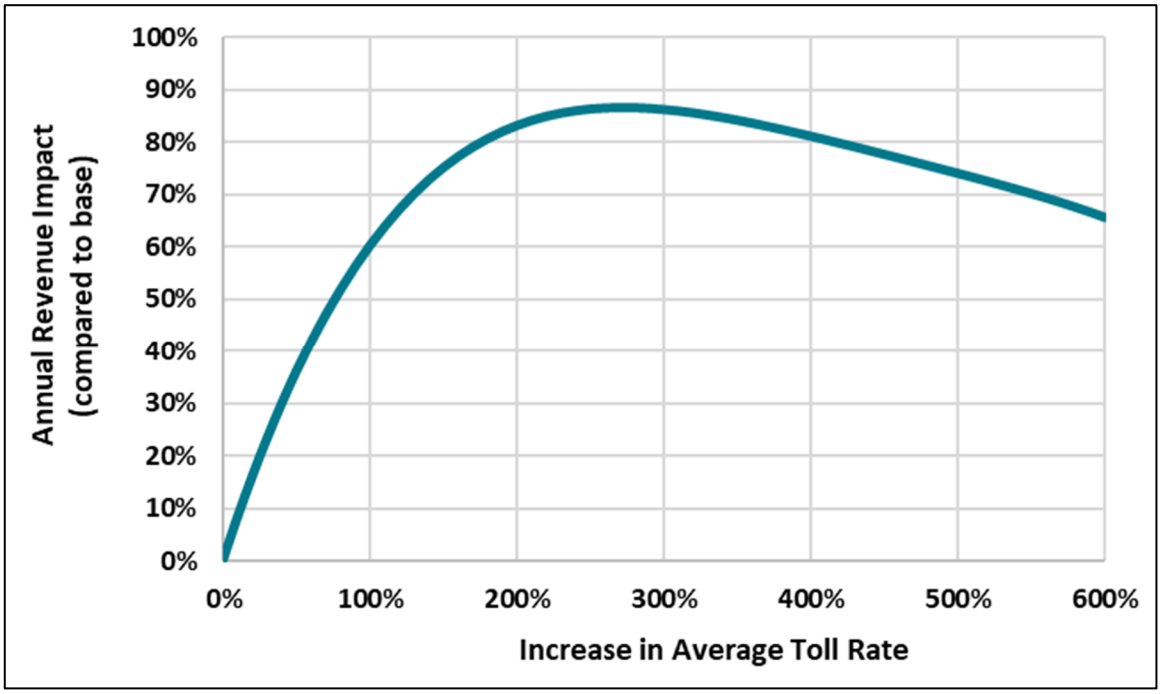


Figure 6-1. Toll Sensitivity Results – OTA System

Corridor Share Analysis

As part of the analysis of the future traffic on the ACCESS projects, the corridor share of both the East-West Connector and South Extension were evaluated under both tolled and toll-free conditions. As shown in **Figures 6-2** and **6-3**, two screenlines were analyzed to determine what percentage of the total overall demand is expected to use the new turnpikes.

Table 6-1 shows the results of the corridor share analysis for the East-West Connector project area. The East-West Connector accounts for 15.3 percent of the corridor throughput in 2045 under a toll-free scenario. The addition of tolls drops that share to 10.7 percent. The results of the South Extension corridor share analysis are shown in **Table 6-2**. The South Extension accounts for 17.2 percent of the 2045 traffic without tolls and 10.1 percent with tolls.

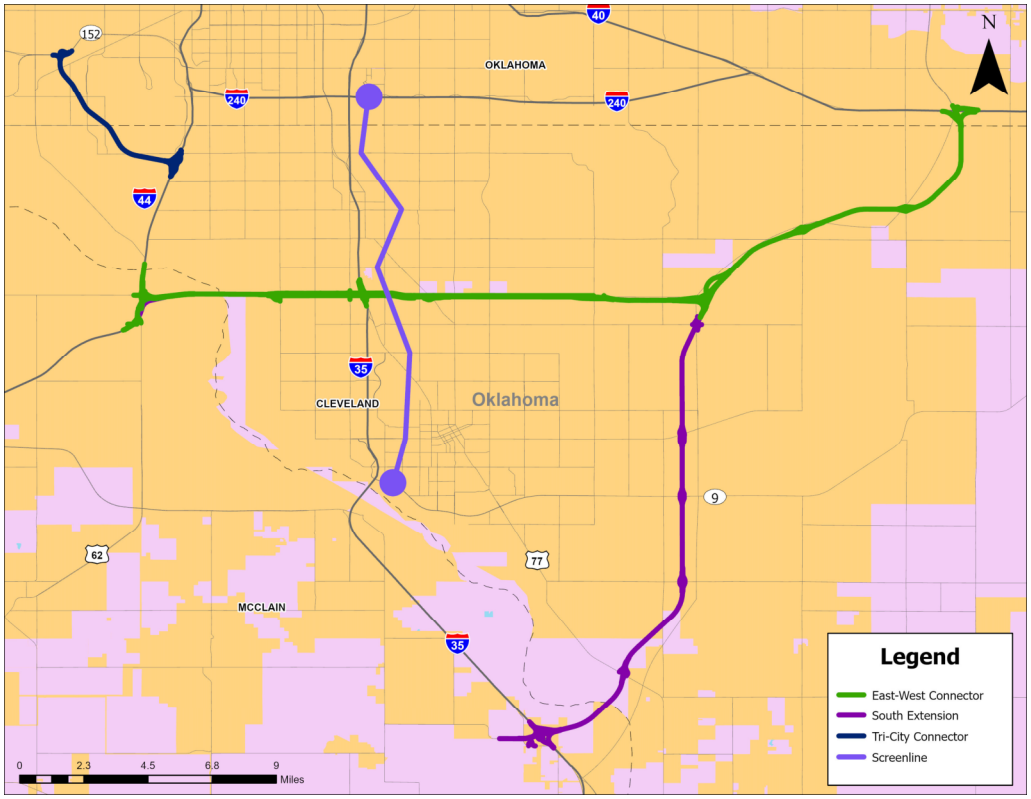


Figure 6-2. Corridor Share Analysis Screenline – East-West Connector

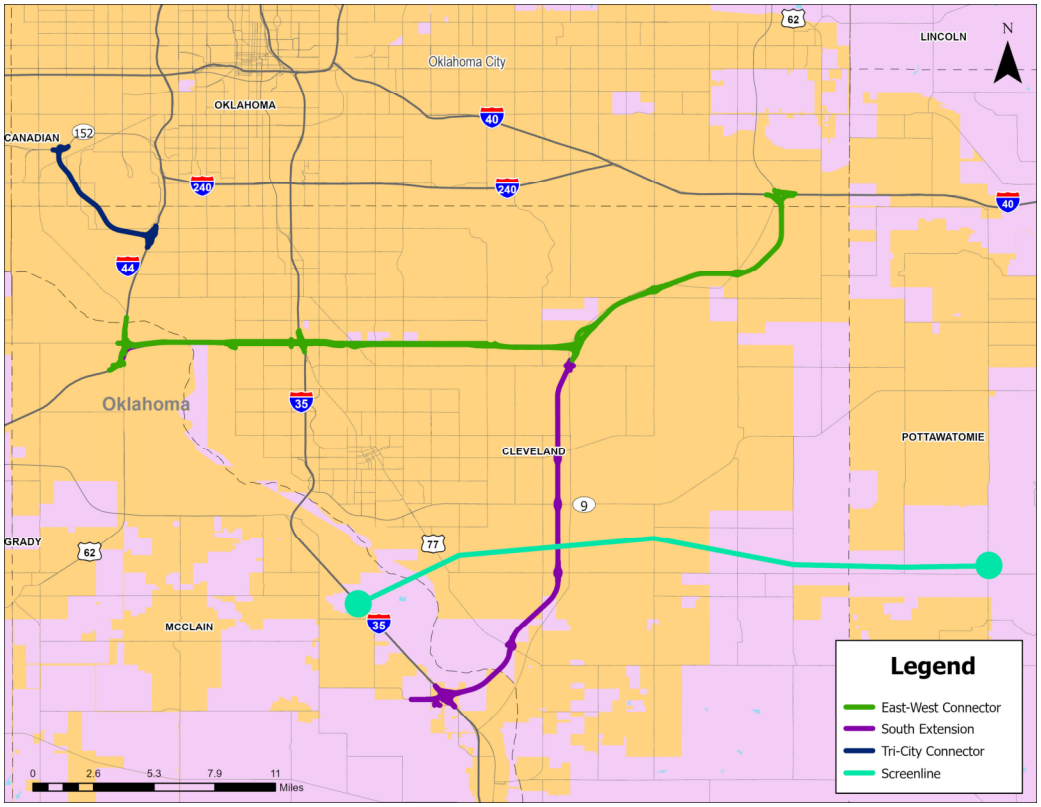


Figure 6-3. Corridor Share Analysis Screenline – South Extension

Table 6-1. Corridor Share Analysis – East-West Connector

Screenline Location	2045	
	Toll Free	Toll
I-240	15.0%	15.7%
89th St.	2.2%	2.3%
27th St.	4.5%	4.7%
12th St.	4.9%	5.1%
SH 37	3.9%	4.2%
19th St.	5.0%	5.9%
34th St.	2.1%	2.3%
E-W Connector	**15.3%**	**10.7%**
Franklin Rd.	2.2%	2.5%
US 77	5.5%	5.8%
Tecumseh Rd.	6.8%	7.0%
Robinson St.	4.6%	4.8%
Main St.	13.9%	14.2%
Lindsey St.	5.7%	6.0%
SH 9	8.4%	8.9%

Table 6-2. Corridor Share Analysis – South Extension

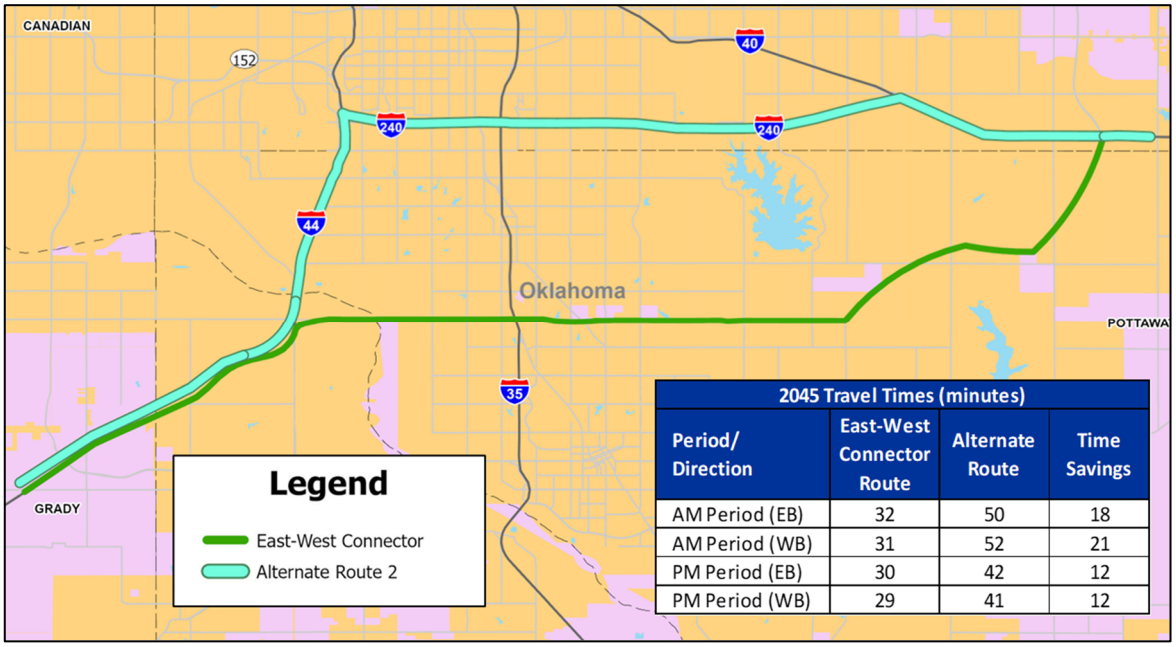
Screenline Location	2045	
	Toll Free	Toll
I-35	55.4%	59.2%
US 77/Classen Blvd.	16.6%	17.6%
36th St.	2.9%	3.0%
48th St.	2.6%	3.1%
60th St.	1.8%	2.5%
72nd Ave.	0.4%	0.5%
South Extension	**17.2%**	**10.1%**
84th Ave.	1.2%	1.9%
108th Ave.	1.5%	1.8%
120th Ave.	0.3%	0.3%

Travel Time Savings Analysis

An important part of the decision to use a toll facility is the potential time savings that is offered to the traveler. This section illustrates the travel time savings associated with using the East-West Connector and South Extension rather than alternative routes in the study area for the year 2045. Two origin-destination pairs were evaluated for both the morning and evening peak periods, as illustrated in **Figures 6-4** and **6-5**.

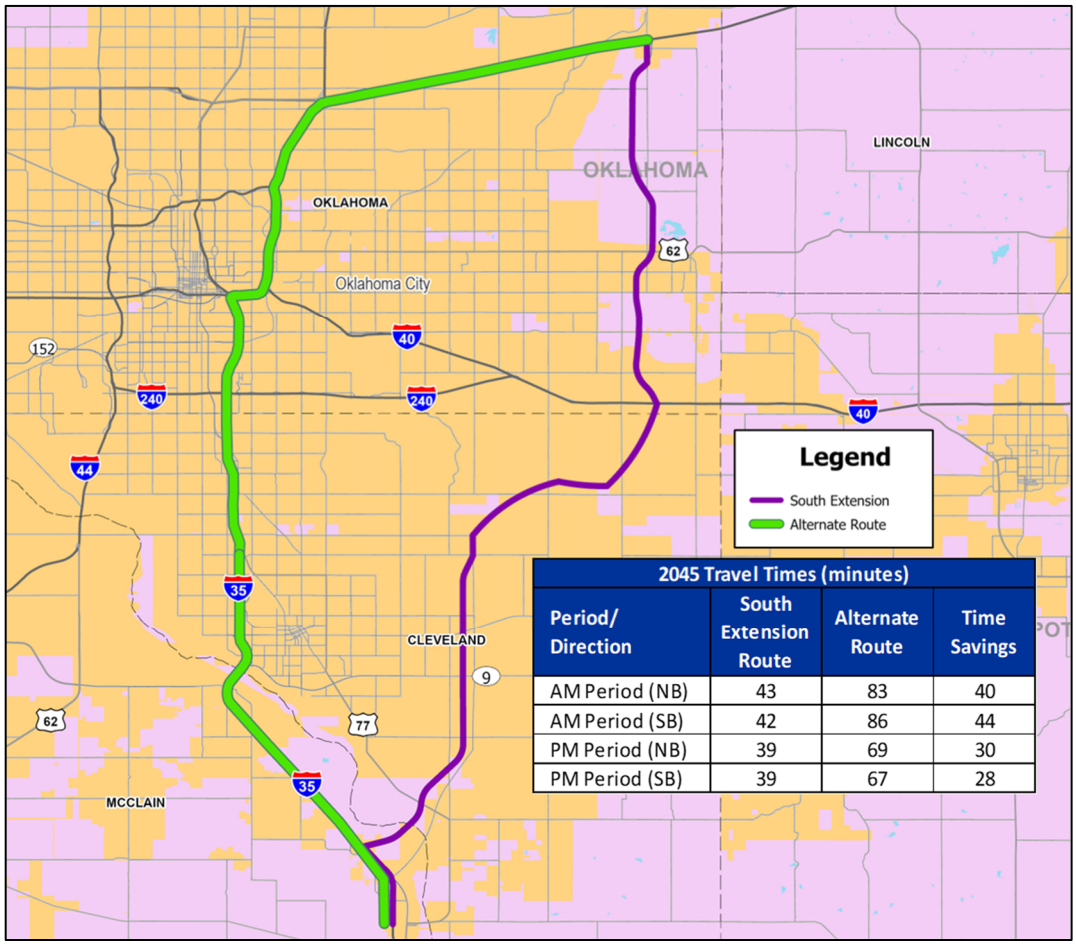
For the East-West Connector, a trip between Bridge Creek and Harrah was evaluated. Two alternative routes were considered: one that utilizes the East-West Connector, and one that uses I-44 and I-240. The two analyzed routes are shown in **Figure 6-4**. The routes were evaluated in future year 2045 for both the morning peak period and evening peak period. The maximum observed travel time savings for each are summarized in **Figure 6-4**. In 2045, the East-West Connector offers time savings of 18-21 minutes during the morning peak period over the alternate route and a time savings of 12 minutes during the evening period.

For the South Extension, a trip between Purcell and Luther was evaluated, and two routes were again measured. One route was assumed to use the South Extension and Kickapoo Turnpike, and the second route was assumed to use I-35 and a portion of the Turner Turnpike. The two analyzed routes are shown in **Figure 6-5**. The routes were evaluated in future year 2045 for the morning peak period and evening peak period. The maximum observed travel time savings for each are summarized in **Figure 6-5**. In 2045, the South Extension route offers time savings of 40-44 minutes during the morning peak period over the alternate route, depending on the direction traveled. The time savings during the evening peak period is 28-30 minutes.



2045 Travel Times (minutes)			
Period/ Direction	East-West Connector Route	Alternate Route	Time Savings
AM Period (EB)	32	50	18
AM Period (WB)	31	52	21
PM Period (EB)	30	42	12
PM Period (WB)	29	41	12

Figure 6-4. Travel Time Comparison – East-West Connector



2045 Travel Times (minutes)			
Period/ Direction	South Extension Route	Alternate Route	Time Savings
AM Period (NB)	43	83	40
AM Period (SB)	42	86	44
PM Period (NB)	39	69	30
PM Period (SB)	39	67	28

Figure 6-5. Travel Time Comparison – South Extension Turnpike

Estimated Annual Toll Revenue

Using the forecasting methodologies described in Section 5, revenue estimates were developed for the thirty-year period between 2023 and 2052. Revenue estimates were developed independently for each of OTA's existing eleven turnpikes as well as the proposed ACCESS projects.

OTA System

The final multivariate regression functions developed for each turnpike and vehicle type were used in concert with the models to first validate against the previous forecasts established for the turnpikes to ensure that there was a level of consistency in the new models, and to ensure that the explanatory variables were not yielding results that were too sensitive to any one of the independent variables' forecasted fluctuations.

The forecast of the independent variables was also reviewed to ensure that the cyclical fluctuations that are evident from historical trends were also significantly addressed in the future projections. As such, dampening factors for the passenger and commercial vehicle markets were applied to the model forecast based on observed historical growth trends to normalize the results. Recently observed trends over the past several years for each respective turnpike were used to generate the baseline growth profiles between 2023 and 2052.

Table 6-3 presents the forecasted annual revenues over a thirty-year period for each OTA System turnpike. As shown in the table, the OTA System is expected to generate $364.2 million in 2023 and is forecasted to reach $425.9 million by 2045, representing an average annual growth rate of 0.7 percent between 2023 and 2045. The Turner and Will Rogers turnpikes are expected to remain as the highest revenue earning facilities in the OTA System throughout the forecast period.

ACCESS Projects

An equilibrium diversion technique was used to carry out traffic assignment runs for four periods, AM peak, PM peak, midday and night. The model runs were conducted for the base year and forecast year 2045. Traffic volumes were estimated by using the revised demographics trip tables, which were adjusted based on the base year model validation process, as described in Section 5. All other years were interpolated or extrapolated between or beyond the modeled years to obtain the yearly T&R estimates.

The traffic assignment results in each of the analysis years were reviewed for reasonableness and post-model adjustments were made as necessary. This included adjustments to reflect model validation results along each corridor. Based on forecasted traffic along each project, annual

forecasts for each were prepared through 2052. Estimates beyond year 2045 are based on nominal assumptions regarding future traffic growth. As shown in **Table 6-4**, the East-West Connector is expected to generate $5.3 million in its first full year of operation, increasing to $29.0 million by 2045. The Tri-City Connector is anticipated to produce $4.2 million in its first full year of operation, increasing to $8.4 million in 2045. Revenue on the South Extension is expected to grow from $1.5 million in 2035 to $11.5 million by 2045.

Table 6-3. OTA System Revenue Forecast

Year	Annual Turnpike Revenue (millions)											
	Turner	Will Rogers	H.E. Bailey	Indian Nation	Muskogee	Cimarron	Cherokee	Chickasaw	John Kilpatrick	Creek	Kickapoo	TOTAL
2023	$83.97	$75.92	$34.89	$18.54	$22.92	$12.78	$10.50	$0.97	$61.63	$36.33	$5.73	**$364.17**
2024	$84.83	$76.47	$35.34	$18.62	$23.14	$12.84	$10.53	$0.98	$62.87	$36.80	$6.44	**$368.87**
2025	$85.66	$77.01	$35.77	$18.72	$23.35	$12.90	$10.57	$1.00	$64.12	$37.27	$6.84	**$373.21**
2026	$86.48	$77.53	$36.19	$18.81	$23.55	$12.95	$10.60	$1.02	$65.37	$37.72	$7.25	**$377.47**
2027	$87.28	$78.04	$36.60	$18.89	$23.75	$13.01	$10.63	$1.03	$66.70	$38.16	$7.72	**$381.80**
2028	$88.04	$78.53	$36.99	$18.97	$23.95	$13.06	$10.66	$1.04	$67.74	$38.58	$8.28	**$385.84**
2029	$88.77	$79.00	$37.37	$19.05	$24.13	$13.10	$10.69	$1.06	$68.63	$38.98	$8.72	**$389.51**
2030	$89.47	$79.45	$37.73	$19.13	$24.31	$13.15	$10.72	$1.07	$69.42	$39.37	$9.49	**$393.31**
2031	$90.14	$79.88	$38.08	$19.20	$24.48	$13.19	$10.75	$1.08	$70.13	$39.73	$10.42	**$397.08**
2032	$90.78	$80.29	$38.40	$19.27	$24.62	$13.23	$10.78	$1.10	$72.12	$40.08	$10.75	**$401.41**
2033	$91.38	$80.67	$38.71	$19.34	$24.75	$13.27	$10.80	$1.11	$72.74	$40.41	$11.10	**$404.29**
2034	$91.95	$81.04	$39.00	$19.41	$24.87	$13.31	$10.83	$1.12	$73.27	$40.73	$11.52	**$407.03**
2035	$92.48	$81.39	$39.27	$19.47	$24.98	$13.35	$10.85	$1.13	$73.73	$41.02	$11.84	**$409.50**
2036	$92.97	$81.72	$39.52	$19.53	$25.08	$13.38	$10.87	$1.14	$74.20	$41.29	$12.17	**$411.85**
2037	$93.43	$82.02	$39.76	$19.58	$25.17	$13.41	$10.89	$1.15	$74.68	$41.53	$12.81	**$414.43**
2038	$93.84	$82.30	$39.97	$19.64	$25.25	$13.44	$10.91	$1.16	$74.91	$41.76	$13.10	**$416.28**
2039	$94.22	$82.56	$40.16	$19.69	$25.32	$13.47	$10.93	$1.17	$75.14	$41.97	$13.39	**$418.02**
2040	$94.56	$82.80	$40.33	$19.73	$25.39	$13.49	$10.95	$1.18	$75.37	$42.15	$13.68	**$419.63**
2041	$94.86	$83.01	$40.49	$19.78	$25.44	$13.52	$10.97	$1.18	$75.60	$42.31	$13.98	**$421.13**
2042	$95.12	$83.20	$40.62	$19.82	$25.50	$13.54	$10.98	$1.19	$75.83	$42.45	$14.27	**$422.51**
2043	$95.34	$83.37	$40.72	$19.85	$25.55	$13.55	$11.00	$1.19	$76.06	$42.56	$14.56	**$423.77**
2044	$95.52	$83.51	$40.81	$19.89	$25.59	$13.57	$11.01	$1.20	$76.29	$42.66	$14.86	**$424.90**
2045	$95.65	$83.63	$40.88	$19.92	$25.63	$13.58	$11.02	$1.20	$76.52	$42.72	$15.15	**$425.92**
2046	$95.78	$83.75	$40.94	$19.95	$25.67	$13.60	$11.04	$1.21	$76.75	$42.79	$15.43	**$426.89**
2047	$95.91	$83.86	$41.00	$19.97	$25.70	$13.61	$11.05	$1.21	$76.96	$42.85	$15.71	**$427.82**
2048	$96.02	$83.96	$41.05	$20.00	$25.74	$13.62	$11.06	$1.21	$77.17	$42.90	$15.97	**$428.70**
2049	$96.13	$84.05	$41.10	$20.02	$25.77	$13.63	$11.07	$1.22	$77.37	$42.96	$16.22	**$429.53**
2050	$96.23	$84.14	$41.15	$20.04	$25.80	$13.64	$11.09	$1.22	$77.56	$43.00	$16.46	**$430.32**
2051	$96.32	$84.22	$41.19	$20.06	$25.82	$13.65	$11.10	$1.22	$77.75	$43.05	$16.68	**$431.06**

Table 6-4. ACCESS Projects Revenue Forecasts

Year	East-West Connector	Tri-City Connector	South Extension
2023	$0	$0	$0
2024	$0	$0	$0
2025	$0	$0	$0
2026	$0	$0	$0
2027	$1,778,000	$0	$0
2028	$5,336,000	$0	$0
2029	$6,320,000	$0	$0
2030	$10,265,000	$0	$0
2031	$16,510,000	$0	$0
2032	$19,478,000	$1,772,000	$0
2033	$21,226,000	$4,231,000	$0
2034	$22,709,000	$5,011,000	$370,000
2035	$24,543,000	$5,829,000	$1,490,000
2036	$25,025,000	$6,672,000	$1,781,000
2037	$25,078,000	$7,513,000	$6,545,000
2038	$25,568,000	$7,622,000	$7,692,000
2039	$26,059,000	$7,731,000	$8,887,000
2040	$26,549,000	$7,840,000	$9,695,000
2041	$27,040,000	$7,949,000	$10,528,000
2042	$27,530,000	$8,057,000	$10,770,000
2043	$28,021,000	$8,166,000	$11,011,000
2044	$28,511,000	$8,275,000	$11,253,000
2045	$29,001,000	$8,384,000	$11,494,000
2046	$29,472,000	$8,486,000	$11,729,000
2047	$29,922,000	$8,581,000	$11,958,000
2048	$30,349,000	$8,668,000	$12,178,000
2049	$30,754,000	$8,747,000	$12,391,000
2050	$31,133,000	$8,819,000	$12,595,000
2051	$31,487,000	$8,882,000	$12,790,000
2052	$31,830,000	$8,937,000	$12,975,000
Total	**$611,494,000**	**$156,172,000**	**$178,132,000**

Combined Revenue Forecast

Figure 6-6 illustrates the combined revenue forecasts of the OTA System, East-West Connector, Tri-City Connector, and South Extension projects. As shown in the figure, the three new turnpikes are expected to comprise a relatively small portion of total revenues throughout the forecast period. The new turnpikes are anticipated to generate seven percent of all OTA revenues in 2035, with this share increasing to eleven percent by the end of the forecast period. Combined revenues from all facilities are projected to grow from $364.2 million in 2023 to $485.5 million by 2052.

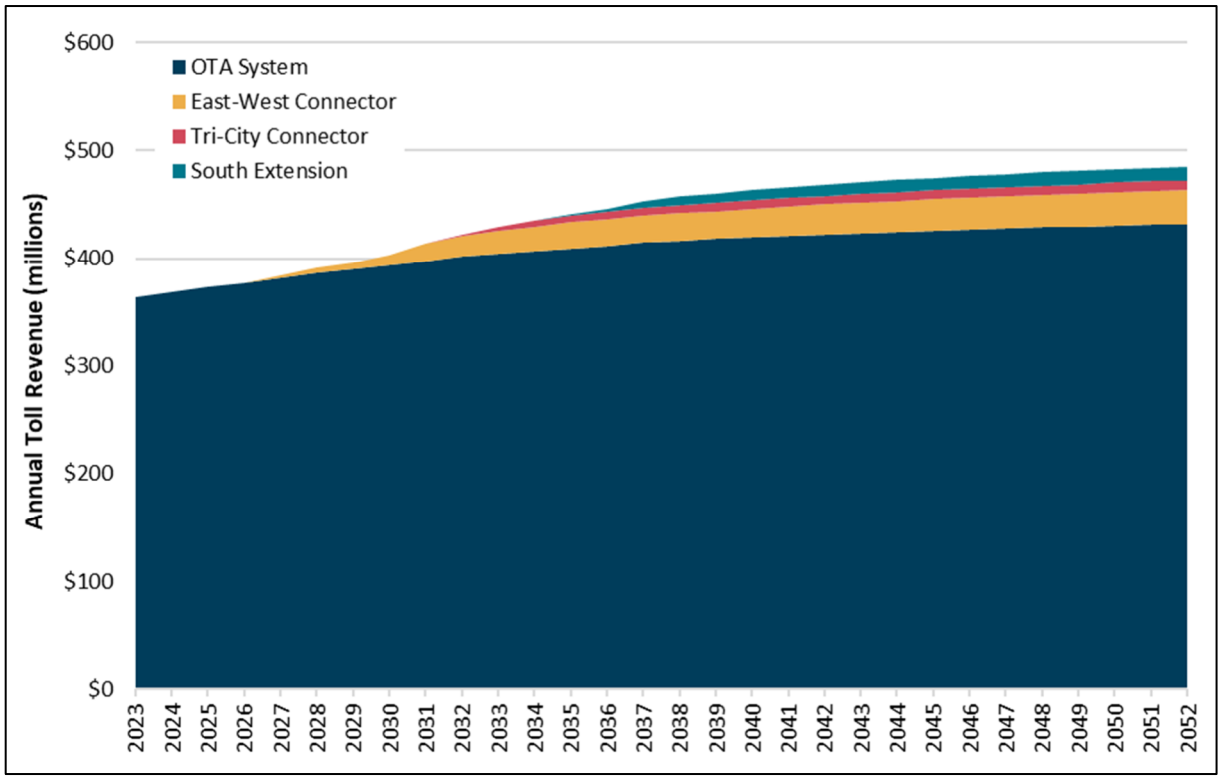


Figure 6-6. Combined Revenue Forecast

Sensitivity Tests

The base case forecasts for the South Extension, East-West Connector, and Tri-City Connector projects shown above are based on several assumptions, as described previously. As any forecast of the future is subject to considerable uncertainty, most traffic and revenue forecasts to be used in support of project financing typically include sensitivity tests. In general, these are intended to provide a general measure of the potential impact on the revenue forecasts associated with hypothetical changes in certain basic assumptions. These sensitivity tests provide a comparison with the previously presented base case toll revenue forecasts. Each sensitivity test is described in more detail below.

Demographic Growth

The base revenue forecasts were tested to determine the impact of changes in demographic growth in the South Extension, East-West Connector, and Tri-City Connector project areas. Two demographic growth alternative scenarios were tested. In the first comparison, the baseline revenue forecasts were tested with a 50 percent reduction in demographic growth assumed throughout the forecast period. The impact on traffic and revenue estimates on the South Extension, East-West Connector, and Tri-City Connector are shown for 2045. As can be seen in **Table 6-5**, the reduced demographic growth results in a revenue decrease on the South Extension of 26 percent and a revenue decrease of 22 percent on the East-West Connector. The impact the Tri-City Connector is an 18 percent decrease in 2045.

The second test looked at the impacts on revenue if population and employment were to stay at current levels throughout the forecast period. The resulting revenue impacts under this condition were compared to the base revenues for the year 2045. As shown in **Table 6-5**, the "zero growth" scenario results in revenue decreases of 48 percent and 43 percent on the South Extension and East-West Connector, respectively. The impact on the Tri-City Connector is a 38 percent decrease in 2045.

Table 6-5. Revenue Sensitivity to Demographic Growth

Facility	2045 Sensitivity		
	Base	50 Percent Growth	Zero Growth
South Extension	1.00	0.74	0.52
East-West Connector	1.00	0.78	0.57
Tri-City Connector	1.00	0.82	0.62

Value-of-Time

Values-of-time (VOT) assumed to yield revenue forecasts for the South Extension, East-West Connector, and Tri-City Connector projects are summarized in Section 3. Two alternative scenarios with low VOT and high VOT were created to test the sensitivity of the revenue forecasts to VOT assumptions. The alternative VOTs were created by assuming a 15 percent decrease and increase for the low and high VOT scenarios, respectively. The scenarios were tested for year 2045, and the revenue impact comparison is shown in **Table 6-6**.

As shown in **Table 6-6**, for a fifteen percent increase in VOT on South Extension, revenue is expected to increase by approximately three percent. A fifteen percent reduction in VOT is expected to reduce revenue by approximately three percent. On the East-West Connector, a fifteen percent increase in VOT is expected to increase revenue by three percent, while a fifteen percent VOT decrease would be anticipated to reduce revenue by four percent. On the Tri-City Connector, a fifteen percent increase in VOT would increase revenue by four percent, and a fifteen percent VOT decrease would reduce revenue by five percent.

Table 6-6. Revenue Sensitivity to Value-of-Time

Facility	2045 Sensitivity		
	Base	VOT +15%	VOT -15%
South Extension	1.00	1.03	0.97
East-West Connector	1.00	1.03	0.96
Tri-City Connector	1.00	1.04	0.95

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Appendix A

Stated Preference Survey – Oklahoma City

This appendix contains the documentation of the Oklahoma City area stated preference survey as provided by the subconsultant, Resource Systems Group. This report was provided to CDM Smith in September 2016.

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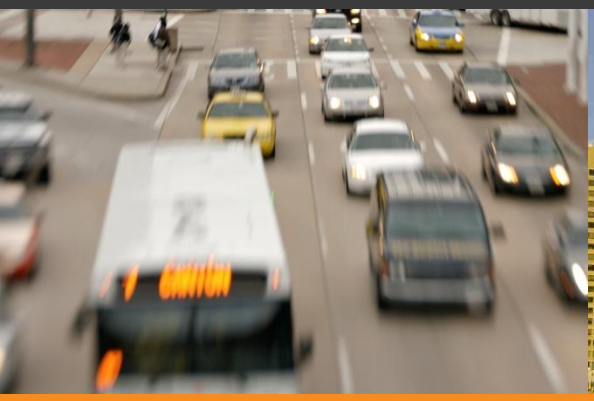
FINAL REPORT

OKLAHOMA CITY STATED PREFERENCE SURVEY

RSG
the science of insight

9.14.2016



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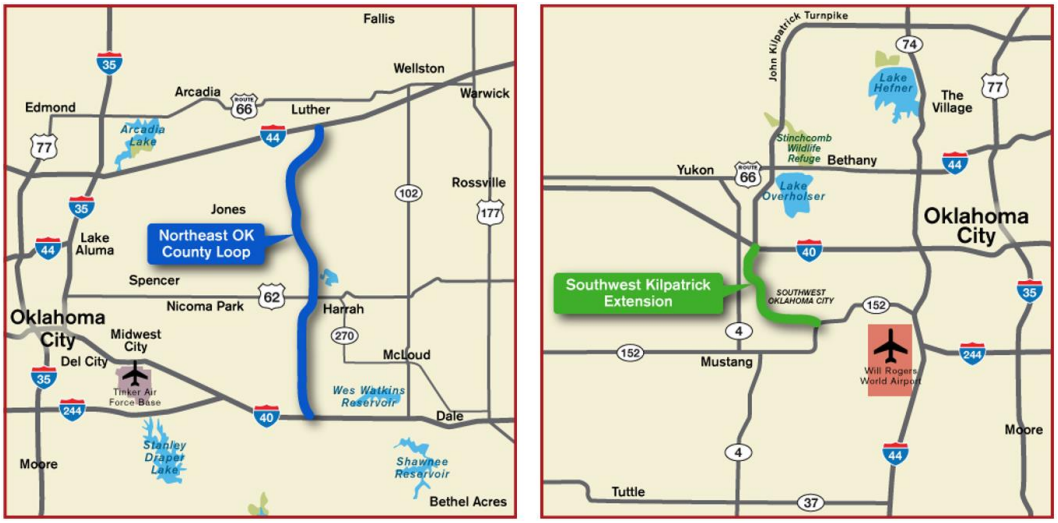
1.0 EXECUTIVE SUMMARY

CDM Smith, on behalf of the Oklahoma Turnpike Authority (OTA), is preparing a traffic and revenue forecast for the proposed Northeast OK County Loop (OK Loop) and the Southwest Kilpatrick Extension (Kilpatrick Extension) projects. The OK Loop will be a 21-mile newly-built highway connecting I-40 to I-44 in eastern Oklahoma County—it will permit faster travel times between Tulsa and Oklahoma City. The Kilpatrick Extension will add to the Kilpatrick Turnpike between I-40 and SH 152 southwest of downtown Oklahoma City, and will provide better access to Will Rogers Airport. Figure 1-1 shows the approximate alignments of both proposed facilities. As part of this work, Resource Systems Group, Inc. (RSG) conducted a stated preference (SP) survey in the greater Oklahoma City area. RSG collaborated with CDM Smith to design and conduct the survey, the results of which will be used in CDM Smith's travel demand forecasting model for the region.

FIGURE 1-1: PROPOSED ALIGNMENTS OF THE OK LOOP AND THE KILPATRICK EXTENSION



The primary purpose of the Oklahoma City Travel Study was to estimate the willingness to pay for travel time savings, or value of time (VOT), of passenger vehicle travelers who are candidates for using either of the proposed facilities, or who make automobile trips on other highways in the Oklahoma City area. Based on respondents' answers in the SP experiments, these estimates of travelers' values of time will be used to support highway traffic and toll revenue projections. In preparation for the SP experiments, the questionnaire also collected data on respondents' current travel behaviors (known as "revealed preferences") and presented respondents with information about the proposed facilities.

The web-based survey approach employed a computer-assisted self-interview (CASI) technique developed by RSG. The SP survey instrument was customized for each respondent by presenting questions and modifying language based on respondents' previous answers. These dynamic survey features provided an accurate and efficient means of data collection and allowed the presentation of realistic future conditions that corresponded with

the respondents' reported experiences. RSG's proprietary software was customized for online administration to targeted audiences in the study region.

Respondents were recruited from a selection of ZIP codes in or around the study corridors and in the larger Oklahoma City region through the following methods:

- E-mail invitations sent to PIKEPASS transponder customers
- Postcard invitations mailed to 20,000 residents

A total of 1,278 surveys were collected in May and June of 2016. Stated preference data from the survey were analyzed using accepted statistical techniques to estimate the coefficients of a set of multinomial logit (MNL) models. The model coefficients provide estimates of travelers' sensitivities to travel time and toll cost and can be used to calculate values of time.

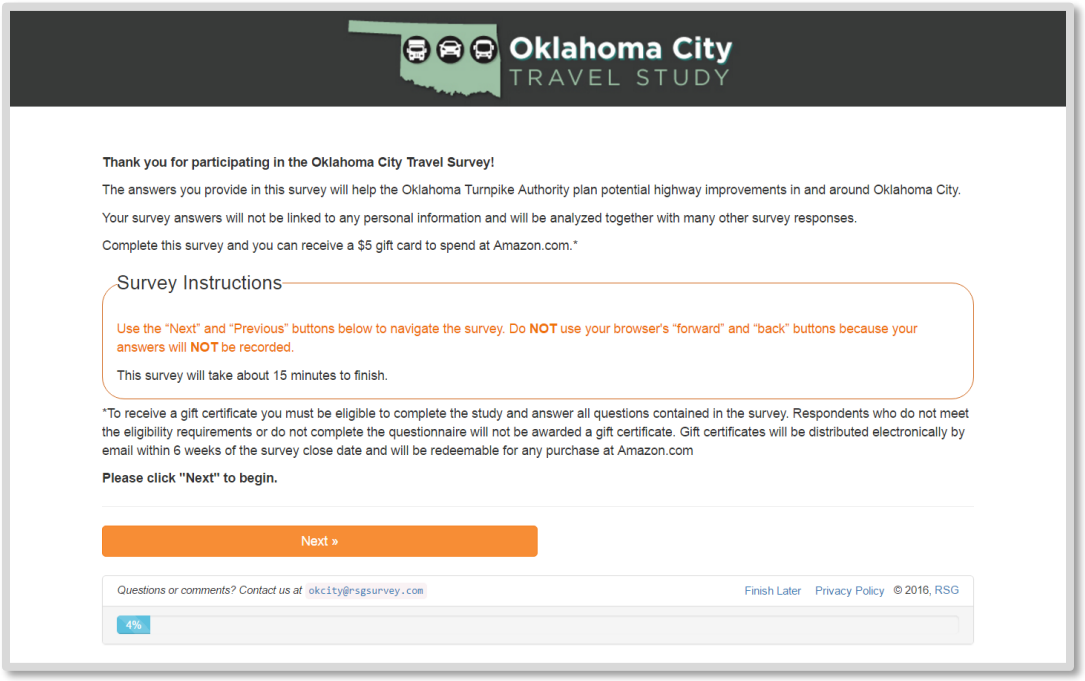
This report documents the development and administration of the survey questionnaire, presents survey results, and summarizes the discrete choice model estimation methodology and findings. The complete questionnaire as it appeared to respondents and response tabulations are presented in the final sections of this report.

2.0 QUESTIONNAIRE

RSG worked closely with CDM Smith and the project team to develop a stated preference questionnaire to meet the objectives of the study. The questionnaire collected information necessary to estimate values of time for various traveler market segments who make trips within the proposed corridor or on other highways in the greater Oklahoma City area.

Respondents were presented with an introduction screen at the beginning of the survey that described the purpose of the survey, the time required to complete it, and instructions for navigating the online instrument (Figure 2-1). Respondents were also able to contact a member of the survey team with any technical questions via e-mail using the "Contact Us" option included at the bottom of all survey screens.

FIGURE 2-1: SAMPLE SURVEY SCREEN – INTRODUCTION AND INSTRUCTIONS



The survey was designed to collect information about a recent trip that a respondent made within, through, or into the proposed corridor of either the OK Loop or the Kilpatrick Extension. If a respondent did not make such a trip but did use highways within the greater Oklahoma City area, information about that recent trip was collected. Once data about a recent qualifying trip was collected, the survey then explored how drivers might alter their travel behavior given hypothetical future travel routes. Opinion and demographic information was also collected, with the survey instrument ultimately consisting of five main sections:

1. Qualification questions, which determined respondent eligibility

2. Trip detail questions, which collected details about a recent one-way trip into, within, or through one of the two proposed facility corridors or a trip that used other highways in the Oklahoma City area
3. Stated preference questions, which were designed to reveal respondents' sensitivities to travel time savings and toll costs
4. Debrief and opinion questions, which were designed to identify the reasons behind choices made in the SP questions and to understand respondents' attitudes toward tolling and possible transportation improvements in the area
5. Demographic questions, which sought to ensure that a diverse sample of the traveling population had been reached and also to facilitate comparisons between different demographic groups

The complete set of survey questions (as they appeared to respondents on-screen) is included in as figures at the end of this report.

2.1 | QUALIFICATION QUESTIONS

Following the survey introduction, respondents were shown either two or three trip qualification questions to determine if they were eligible to participate in the survey. To be eligible, respondents needed to have made a trip that met the following conditions:

- The trip was made in the past month (30 days) – This timeframe was selected to include respondents who make less frequent trips while also ensuring trips were recent enough for respondents to accurately recall specific details.
- The trip took at least ten minutes – A ten-minute minimum helped ensure trips that could reasonably use highways and allowed meaningful travel time variations to be shown in the stated preference choice experiments.
- The trip was made on a weekday (Monday-Friday).
- The trip traveled through certain areas of (or used the highways around) Oklahoma City. The first of the three screener questions assessed whether the respondent's trip could have used the proposed OK Loop (Figure 2-2). The second screener question assessed eligibility for using the proposed Kilpatrick Extension (Figure 2-3). If a respondent traveled in neither of these areas, then they were shown a third screener question (Figure 2-4). This more general screener question confirmed they had made a trip that used a highway in the Oklahoma City area and met the other study criteria.

FIGURE 2-2: SAMPLE SURVEY SCREEN – TRIP QUALIFICATION (EAST/OK LOOP STUDY AREA)

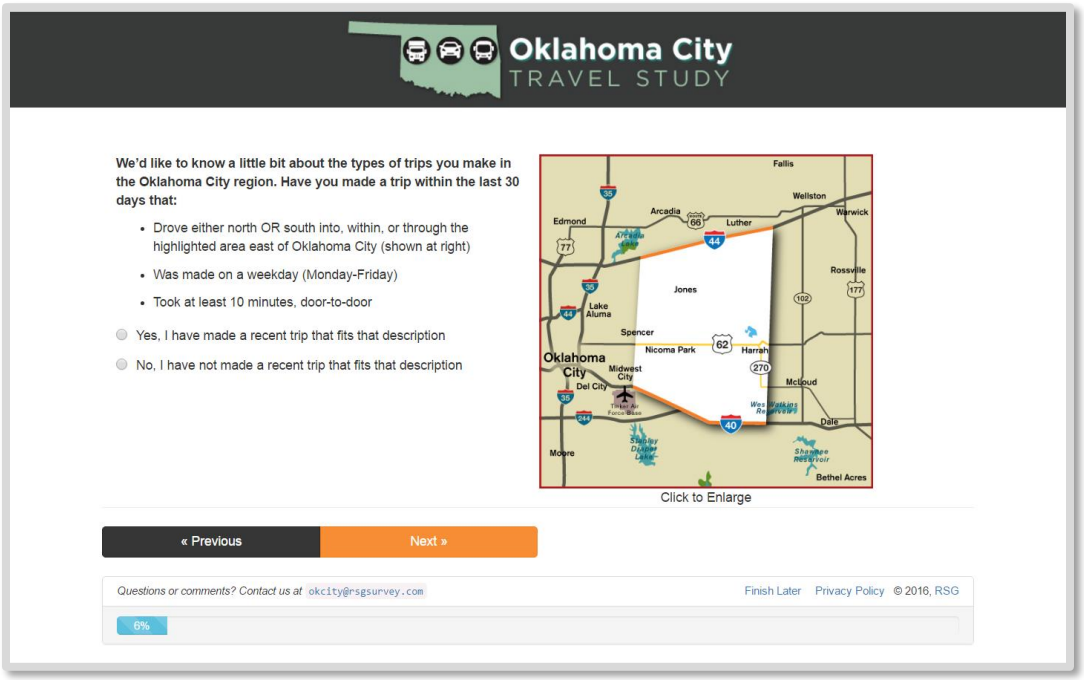
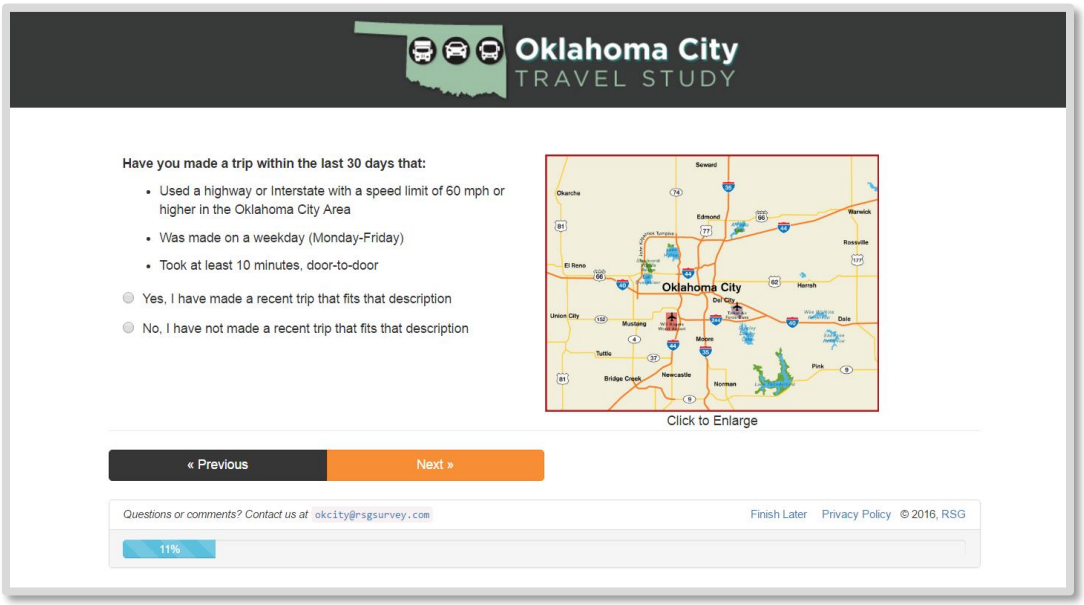


FIGURE 2-3: SAMPLE SURVEY SCREEN – TRIP QUALIFICATION (WEST/KILPATRICK EXTENSION STUDY AREA)

FIGURE 2-4: SAMPLE SURVEY SCREEN – TRIP QUALIFICATION (GENERAL STUDY AREA)



To collect an approximately even number of completed surveys from potential users of both proposed facilities, a balancing algorithm assigned respondents who had recently traveled in both corridors to recall the details of traveling through one area or the other. If a respondent did not make a trip in either of the study corridors, but did make a trip using other highways in the Oklahoma City area, they were assigned to a General Trip segment and asked about their most recent trip that used other highways around the Oklahoma City area.

2.2 | TRIP DETAIL QUESTIONS

Qualifying respondents were asked to focus for the duration of the survey on their most recent trip that met the criteria outlined above. The survey specified their most recent trip (and not a typical or average trip that they might make) to obtain a representative sample of trip types made in the region. This most recent trip (referred to as the respondent's "reference trip") formed the basis for the trip detail questions. Focusing on their most recent trip also gave respondents a more concrete frame of reference when considering the stated preference scenarios later in the survey.

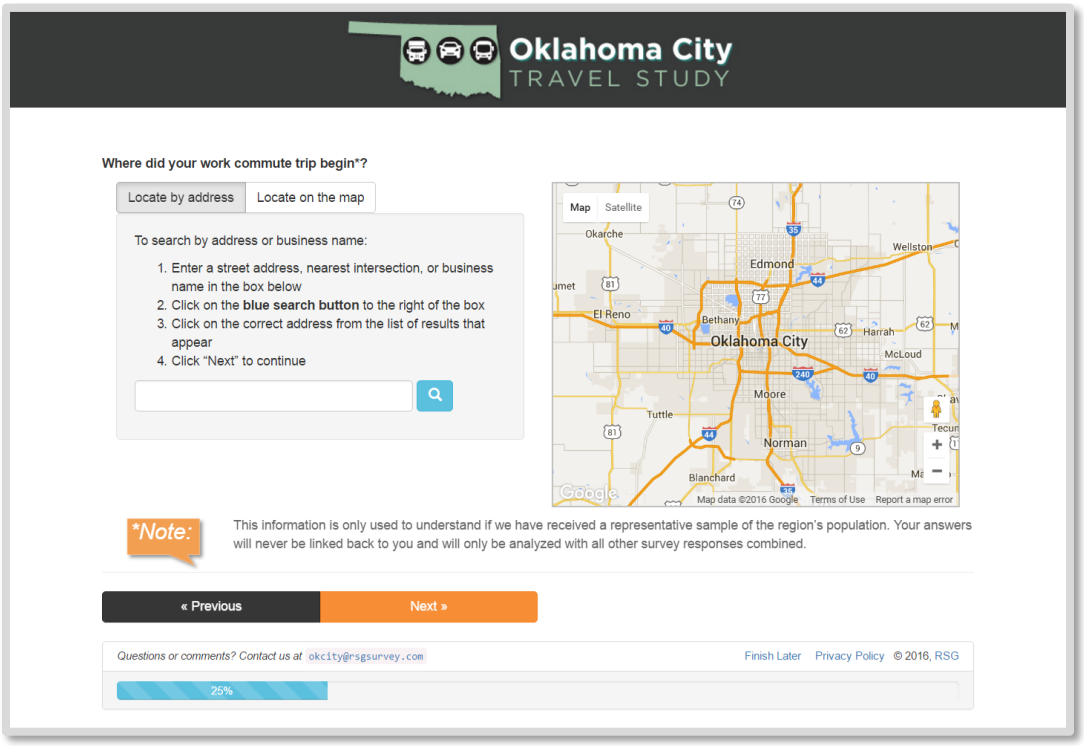
Respondents were instructed to think about a one-way trip (rather than an entire round trip) and were then asked a series of questions regarding the specific details of that reference trip including:

- Day of week traveled
- Trip purpose
- Beginning and ending location types (e.g., home, work, other)
- Trip origin and destination locations

- Trip departure time
- Door-to-door travel time
- Delays encountered (with duration, if any)
- Tolls paid (with amount, if any)
- Vehicle occupancy
- Trip frequency
- Transponder ownership (or reason for not owning)

Respondents used a Google Maps-based geocoder developed by RSG to identify the specific location of their trip's origin and destination. This tool allowed respondents to text-search for a business name, street intersection, or full address, or alternatively, to click on an interactive map (Figure 2-5). Origin and destination locations were geocoded using a Google Maps application-programming interface (API) to record latitude and longitude values for both the trip origin and destination. These coordinates were used to verify that the trip began and ended in two different locations (i.e. was not a round trip), that the trip could have reasonably traveled through one of the relevant study areas, and to measure the potential distance the respondent may have traveled on the proposed facilities. The geocoding application was also used to estimate travel time for comparison to respondents' reported travel times. If the locations of a trip's origin and destination suggested an invalid trip, respondents were reminded to describe a one-way portion of the trip and asked if they needed to change their beginning or ending location.

FIGURE 2-5: SAMPLE SURVEY SCREEN – ORIGIN ADDRESS AND MAP INTERFACE



2.3 | STATED PREFERENCE QUESTIONS

After respondents provided detailed information about their most recent trip, that information was used to construct stated preference exercises involving hypothetical variations based on that reference trip. Depending on their answers to the screener questions, respondents were provided with an introduction to either the proposed OK Loop (Figure 2-6), the proposed Kilpatrick Extension (Figure 2-7), or (if they indicated they had not traveled through an area for which either of these would be relevant, but had used highways in the area) a general introduction to possible new highways in the area that may be used for future trips (Figure 2-8).

FIGURE 2-6: SAMPLE SURVEY SCREEN – NORTHEAST OKLAHOMA COUNTY LOOP SP INTRODUCTION

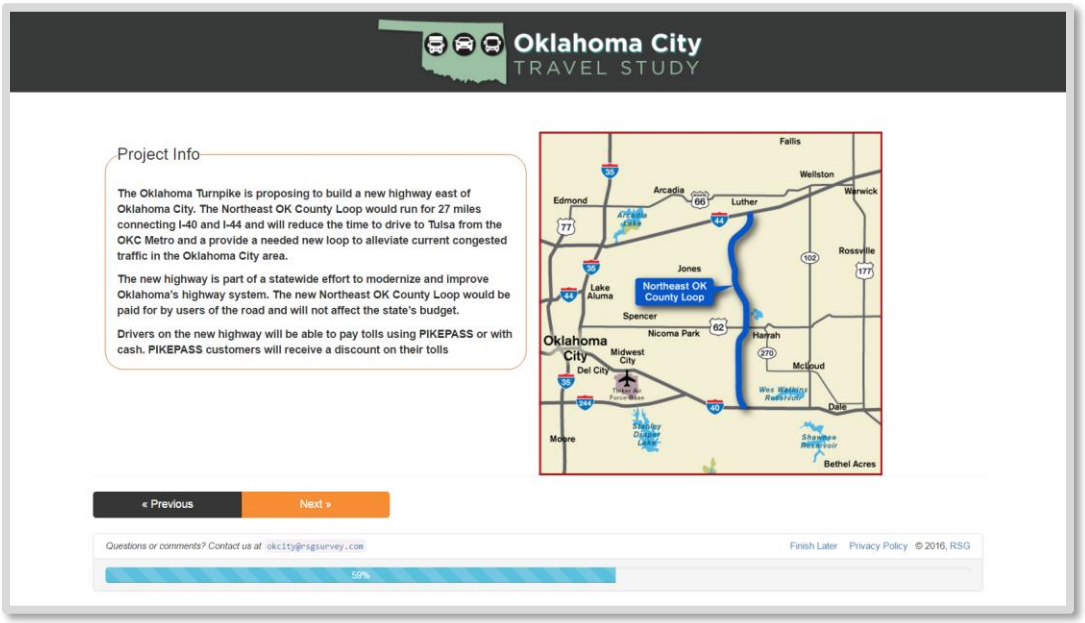


FIGURE 2-7: SAMPLE SURVEY SCREEN – SOUTHWEST KILPATRICK EXTENSION SP INTRODUCTION

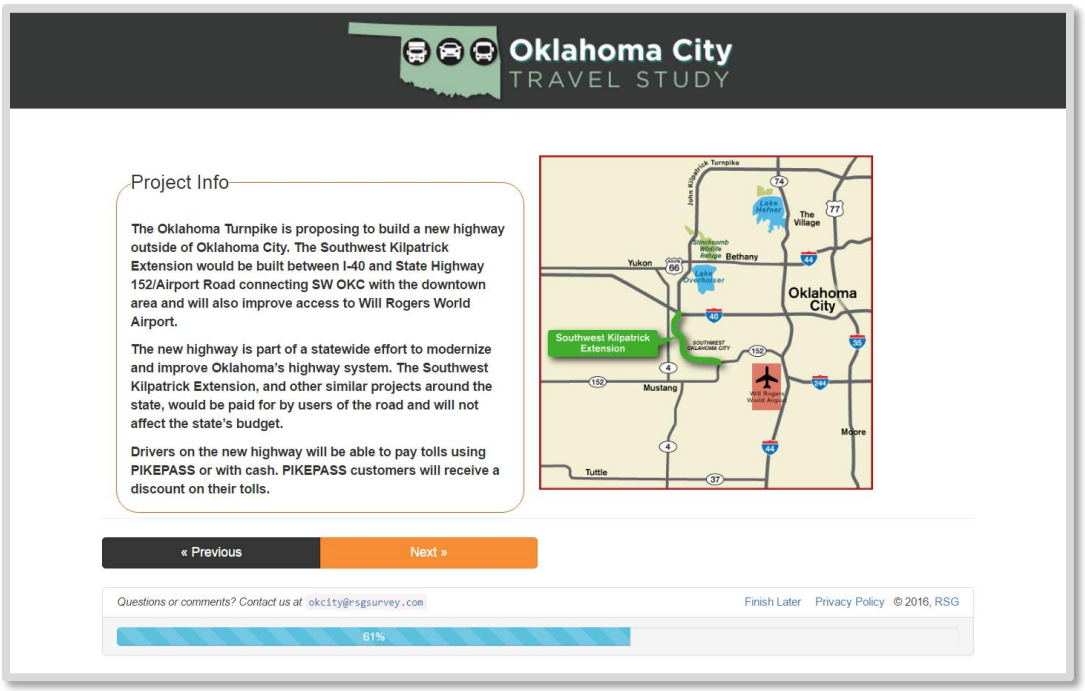
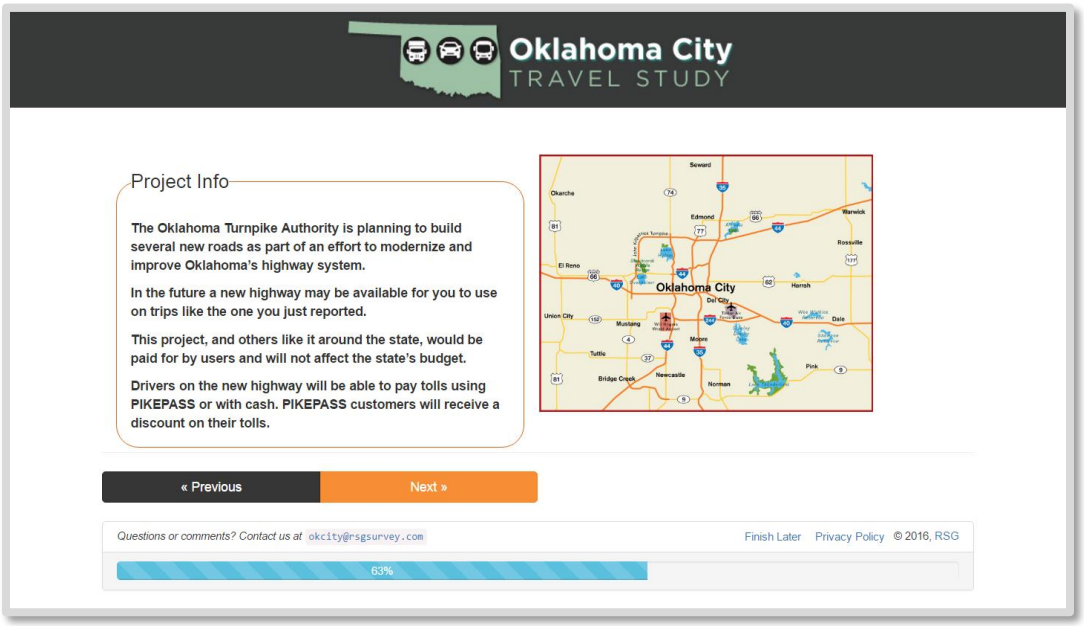
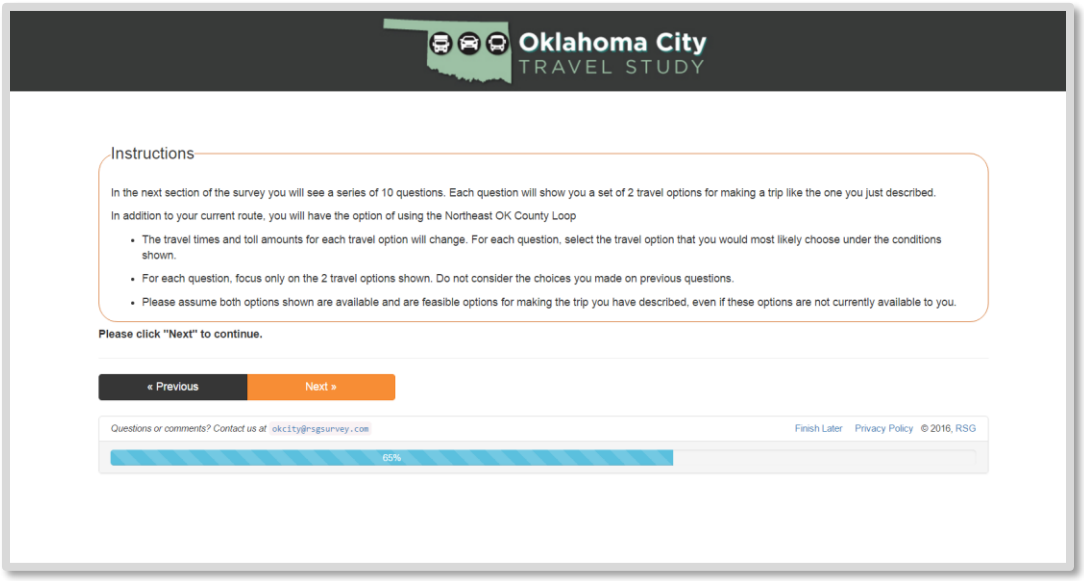


FIGURE 2-8: SAMPLE SURVEY SCREEN – GENERAL SP INTRODUCTION



Respondents were next shown instructions for navigating the stated preference experiments (Figure 2-9), which were followed immediately by the series of SP questions.

FIGURE 2-9: SAMPLE SURVEY SCREEN – SP INSTRUCTIONS



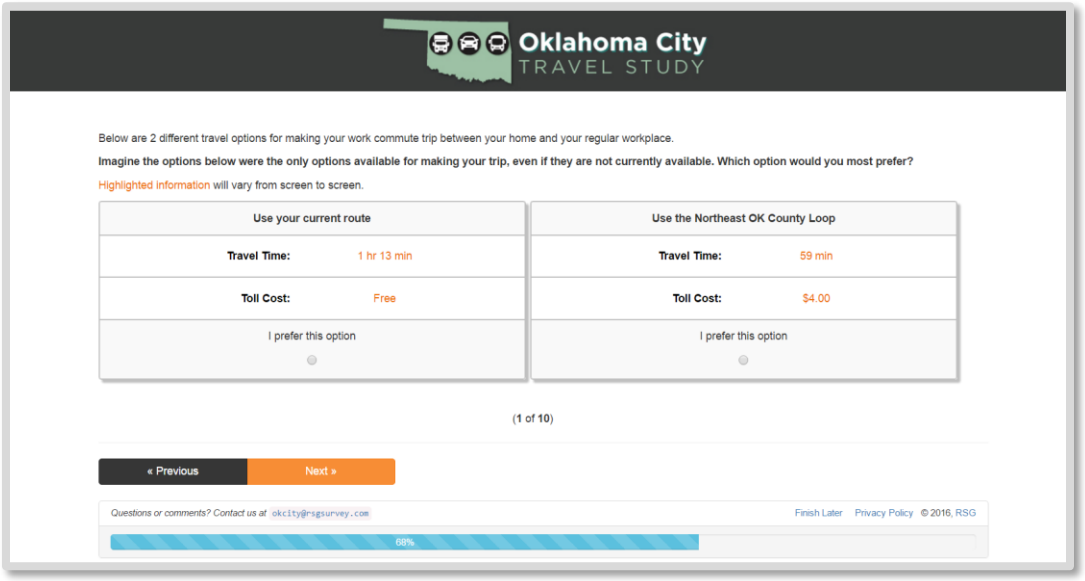
The objective of stated preference questions is to collect quantitative data that can be used to estimate respondents' travel preferences and behavioral responses under hypothetical future conditions. The details of each respondent's reference trip were used to build a set of ten stated preference scenarios, each of which included two travel alternatives for making their trip in the future. Travelers were presented with the following two alternatives:

1. Make the trip using their current route

2. Make the trip using the new Northeast Oklahoma County Loop/using the new Kilpatrick Extension/using a new highway (the version of this alternative for all experiments was dictated by the study area to which a given respondent was assigned)

Each alternative was distinguished by two varying attributes: travel time and toll cost. The values of the attributes varied across the ten questions and respondents were asked to select the alternative they most preferred under the conditions presented. Figure 2-10 shows an example stated preference experiment. In order to avoid potential bias associated with the layout of the alternatives, the order of the two alternatives (current route vs. future tolled alternative) was randomized for each respondent. Additional examples of stated preference exercises (as they appeared to respondents on-screen) are presented as figures in Section 7.0.

FIGURE 2-10: SAMPLE SURVEY SCREEN – SP EXPERIMENT



The attribute values presented in each scenario varied around a set of base values. Trip characteristics of each respondent's reference trip were used to pivot the base time and toll cost values to ensure that the scenarios were realistic. These pivoted base values were varied, according to an experimental design, to give a unique set of attribute values for each stated preference experiment.

The amount of variation for each attribute depended on the potential distance traveled on the assigned proposed facility, or for users who had not made a trip through either corridor, the calculated distance of their trip from start to finish. The distance traveled along the proposed corridor was estimated by calculating the closest projected entrance and exit interchanges to potential users' trip starting and ending locations. The calculated distance (or overall distance traveled) was used to generate a factor to multiply the specific base value shown in the experiments. Table 2-1 shows how the factors were calculated for each respondent's assigned corridor or trip type. The distance factors were applied differently depending on the assigned corridor or trip type to account for the different length of the

corridors. Table 2-2 shows the base attribute levels that were multiplied by assigned factors and then used to generate the experiments.

TABLE 2-1: STATED PREFERENCE ATTRIBUTE FACTORS BY ASSIGNED CORRIDOR

Distance	OK Loop	Kilpatrick Extension	New Highway
Less than 5 miles		1.5	
5 to 9 miles	1	2.5	1
10 to 19 miles	2	N/A	2
20 or more miles	3	N/A	3

TABLE 2-2: STATED PREFERENCE BASE ATTRIBUTE LEVELS

Attribute	Level #	Alternative 1: Current Route		Alternative 2: OK Loop/Kilpatrick Extension/ New Highway	
		Description	Level	Description	Level
Travel Time	1	Reported Travel Time + (Factor * Level)	0	Reported Travel Time - (Factor * Level)	5
	2		2		4
	3		3		3
	4		4		2
	5		5		1
Toll Cost	1			(Factor * Level) + Toll(s) Paid	$0.25
	2				$0.50
	3				$0.75
	4				$1.00
	5				$1.25
	6				$1.50
	7				$1.75
	8				$2.00
	9				$2.25
	10				$2.50

The specific levels used in each stated preference experiment were determined using an orthogonal experimental design. Orthogonal designs are commonly used for this type of research to ensure that the attribute values vary independently and to minimize correlation between attribute values. The experimental design used to generate the stated preference experiments in the survey included 100 total experiments divided into ten groups of ten. A respondent was randomly assigned to one of the ten blocks and then shown each of the ten experiments from that block in a random order.

By varying the travel time and cost of the new highways in each experiment, respondents were faced with different times savings for different costs, allowing them to demonstrate their travel preferences across a range of values of time.

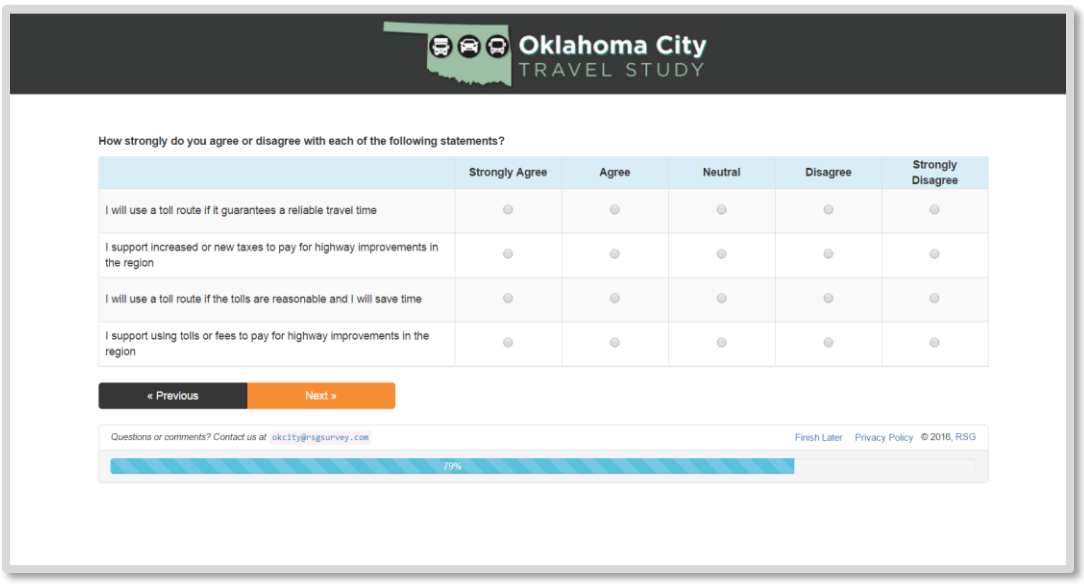
2.4 | DEBRIEF AND OPINION QUESTIONS

After completing the ten stated preference experiments, respondents answered a series of questions to assess the rationale underlying their choices and to identify any potential strategic bias in their responses.

Respondents who never selected the toll alternative were asked to select a reason for always choosing their current route. Next, respondents were asked their opinion of the proposed project (or new highways in the Oklahoma City area in general) based on the information presented in the survey. A respondent's opinion of the project is an important indicator of the choices they might be expected to make in the stated preference experiments. Those who indicated they were in favor of or opposed to the project (not neutral) were asked a follow up question to explain their reasoning.

Finally, all respondents were asked to indicate the extent to which they agree or disagree with a set of attitude statements about tolls as shown in Figure 2-11.

FIGURE 2-11: SAMPLE SURVEY SCREEN – TOLL ATTITUDE STATEMENTS



2.5 | DEMOGRAPHIC QUESTIONS

The final section of the survey included a series of demographic questions in which respondents were asked for the following information:

- ZIP Code
- Gender
- Age
- Employment status
- Household size

- Household number of vehicles
- 2015 household income, before taxes

These screens included a note that responses would be analyzed in aggregate, and not linked back to individuals (as shown in Figure 2-12).

FIGURE 2-12: SAMPLE SURVEY SCREEN – DEMOGRAPHIC QUESTION WITH NOTE ABOUT PERSONAL INFORMATION

Answers to the demographic questions were used to classify respondents, identify possible behavioral differences across demographics, and to confirm that the sample contained a diverse group of drivers that travel in the study regions.

At the conclusion of the survey, participants recruited through the postcard administration were asked for their e-mail address if they were among the first 1,000 respondents (and thus eligible to receive a $5 Amazon.com gift card). Finally, all respondents were given the opportunity to leave comments about the project or the survey itself.

3.0 SURVEY ADMINISTRATION

RSG worked closely with the project team to design an administration plan to produce a generally representative sample of drivers in the Oklahoma City area. The sampling plan was designed to include a sufficient range of travelers and trip types to support the statistical estimation of coefficients of a discrete choice model. By collecting data from a range of traveler and trip types, it is possible to identify the ways in which different characteristics affect route choice behavior. These differences can then be reflected in the structure and coefficients of the resulting choice model. In general, stated preference survey samples do not need to be strictly population proportional as long as any demographic or other dimensions along which they are non-proportional either do not significantly affect the choice being modeled or are represented as variables in the model and the model equations are applied (in any forecasting or market simulations) to proper population proportions.

The targeted population for the survey sample included potential users of the proposed Northeast OK County Loop (OK Loop), potential users of the Southwest Kilpatrick Extension (Kilpatrick Extension), and other users of highways in the Oklahoma City region. Travelers were recruited to participate in the stated preference survey using two methods:

1. E-mail outreach to a random sample of 20,000 PIKEPASS customers in a targeted selection of ZIP codes in and around the study region
2. Postcard mailing to 20,000 random residential addresses in a targeted selection of ZIP codes in and around the study region

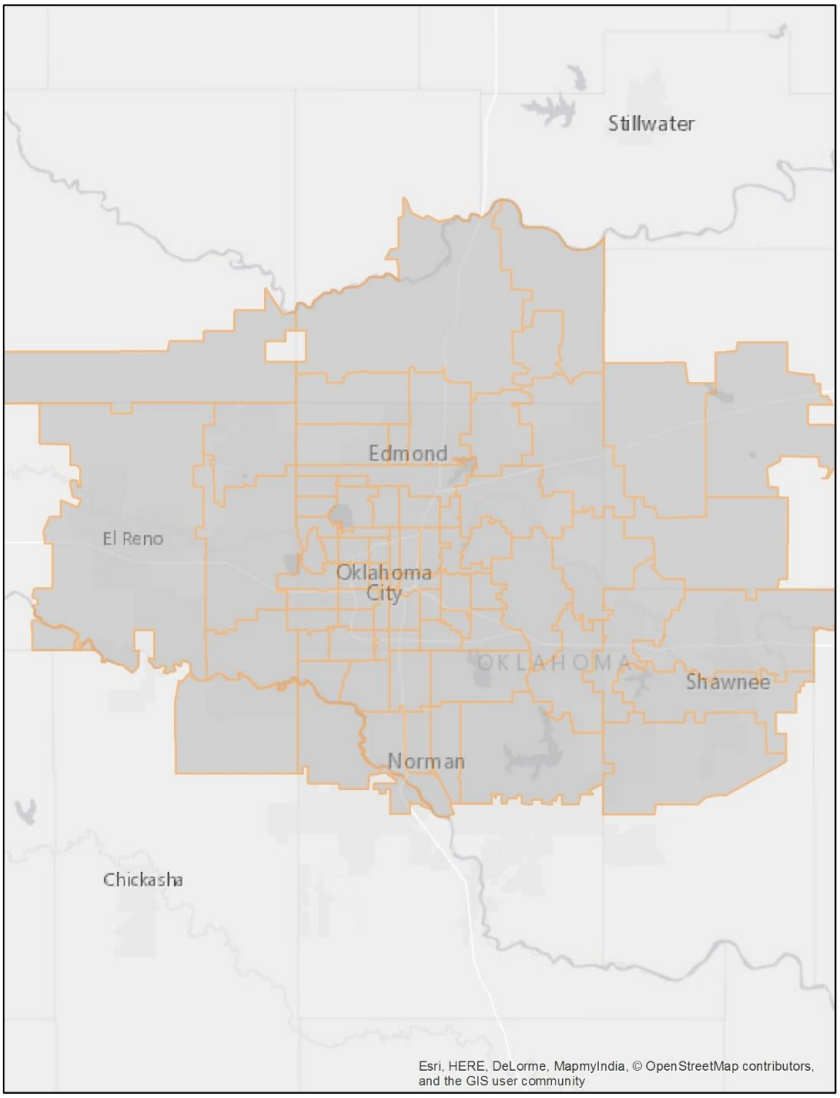
The survey was administered entirely online through a proprietary online survey platform. The survey administration began on May 22, 2015 and concluded on June 27, 2015. The administration methods and number of completed surveys are presented in Table 3-1.

TABLE 3-1: SURVEY COMPLETION BY ADMINISTRATION METHOD

Data Source	Number of Completed Surveys	Percent of Total Sample	Completion Rate
PIKEPASS Customer E-mail Outreach	1,004	79%	5.0%
Postcard Mailing	274	21%	1.4%
Total	**1,278**	**100%**	**--**

With assistance from the project team, RSG coordinated an outreach plan to a random sample of residents who reside in specific ZIP codes in the Oklahoma City area. The ZIP codes from which respondents were recruited to participate are shown in Figure 3-1. Both the postcards and PIKEPASS e-mail outreach were administered proportionally to the number of households in each ZIP code.

FIGURE 3-1: SURVEYED ZIP CODES



3.1 | PIKEPASS CUSTOMER E-MAIL OUTREACH

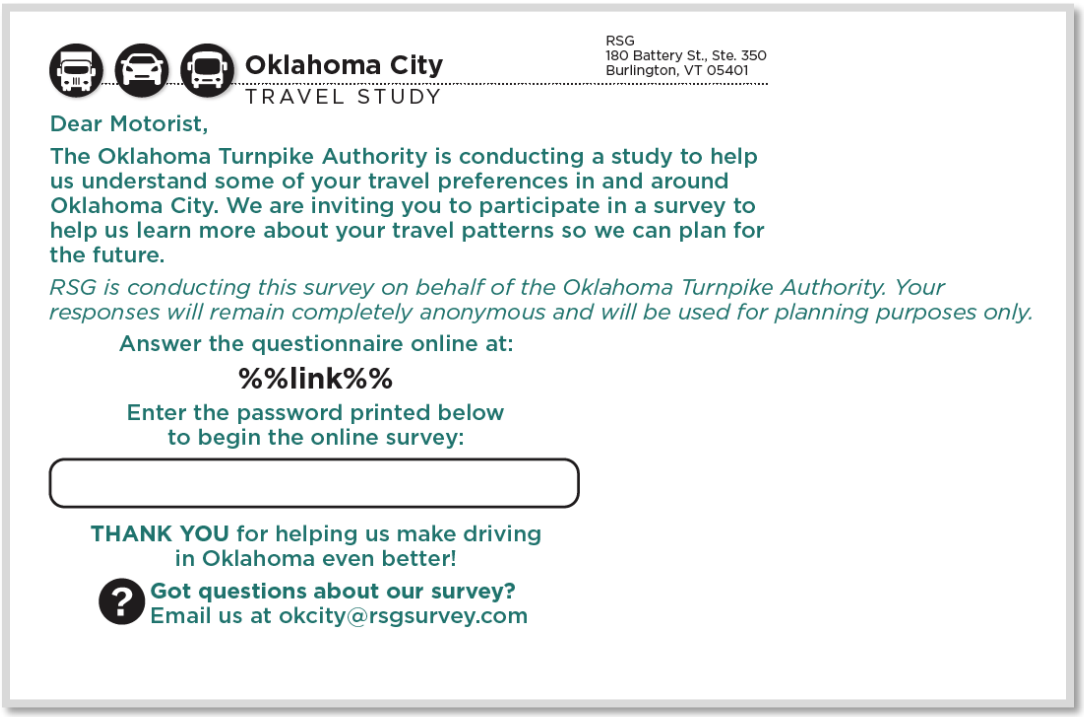
The OTA provided the contact information of approximately 300,000 PIKEPASS transponder customers living within the surveyed ZIP codes (Figure 3-1) to recruit for participation in the study. From this list, RSG distributed e-mail invitations to 20,000 random customers, with each ZIP code sampled proportionally to its overall contribution to the study area's population. Each e-mail invitation contained information about the study and an open link to access the survey webpage. One thousand and four (1,004) completed surveys were collected from PIKEPASS customers in the Oklahoma City region, resulting in a completion rate of approximately 5.0%.

3.2 | POSTCARD INVITATION TO HOUSEHOLDS

Customized postcards designed by RSG were mailed to approximately 20,000 home addresses within the sampled ZIP codes (Figure 3-1), distributed proportionally to the total number of households in each ZIP code. The postcard (Figure 3-2 and Figure 3-3) contained information about the study and offered a $5 electronic gift card incentive that would be sent to the first 1,000 respondents who completed the survey. Each postcard contained a link to access the survey webpage, and a personalized password to control access to the questionnaire and the survey incentive. Two hundred and seventy-four (274) completed surveys were collected from this recruitment method, resulting in a completion rate of approximately 1.4%.

FIGURE 3-2: POSTCARD INVITATION – FRONT

FIGURE 3-3: POSTCARD INVITATION – BACK



4.0 SURVEY ANALYSIS

Summary tabulations and statistics are presented in the following sections for select survey questions. A complete set of survey tabulations for each question can be found in Section 8.0. Before finalizing the dataset and beginning choice model estimation, the data were screened for outliers. This screening process is outlined below.

4.1 | IDENTIFICATION OF OUTLIERS

The survey data were screened to ensure that all observations included in the data analysis and model estimation represented realistic trips in the study area and reasonable tradeoffs in the stated preference exercises. Variables such as trip origin and destination, travel speed, and choice behavior were reviewed during the screening process.

During the data collection phase of the project, 1,278 respondents completed the stated preference survey. After viewing different variables and their impact on model results, it was determined that respondents who met the following conditions should be excluded from the final analysis. The categories listed below are not mutually exclusive; some respondents were excluded for more than one of the data checks listed:

- Respondents whose origin and destination coordinates implied their trip could not make reasonable use of the assigned corridor for their reference trip (14 respondents)
- Respondents whose implied speed (60 * Google-calculated trip distance / reported travel time) for their trip was greater than 120 mph or less than 3 mph (10 respondents)
- Respondents whose trip distance was less than 3 miles or more than 400 miles (22 respondents)
- Respondents who completed the survey in less than 6 minutes (11 respondents)
- Respondents who indicated they paid more than $10 in tolls on their trip (3 respondents)
- Respondents demonstrating inconsistent or irrational choice behavior in the stated preference exercises. For example, respondents who established a certain dollar amount for willingness to pay for time savings and then rejected paying less money for equal or greater time savings (12 respondents)

Based on the analysis described above, 50 distinct records were removed and 1,228 respondents (12,280 choice observations) were included in the final dataset and used to estimate the models presented in this report.

4.2 | SURVEY RESULTS

The descriptive analysis of the survey data presented in this section of the report is based on the 1,228 valid responses and is provided in four sections: trip details, stated preference, debrief and opinion, and demographic questions.

Respondents who indicated they had made a recent trip within or through either the proposed Northeast OK County Loop or the Southwest Kilpatrick Extension corridors were asked to recount the details of their the most recent trip through their assigned corridor. Respondents who had not traveled through either corridor were asked if they had made any trips within the Oklahoma City area that used a highway—those who had were assigned to the General Trip segment. Table 4-1 shows the count and percentage of respondents who traveled through the corridors or made a qualifying General Trip in the Oklahoma City area, as well as the count and percentage of respondents who were subsequently assigned to each corridor. Respondents were about equally likely to have made a recent trip though the OK Loop corridor and the Kilpatrick Extension. Forty percent of respondents had not traveled through either corridor, but had made a General Trip using a highway within or through the region.

TABLE 4-1: CORRIDOR/TRIP TYPE ASSIGNMENT

Corridor Selection & Survey Assignment	Selected Corridor(s)		Assigned Corridor	
	Count	Percent	Count	Percent of Respondents
OK Loop	467	38%	367	30%
Kilpatrick Extension	485	39%	366	30%
General Trip	495	40%	495	40%
Total	**1,447**	**--**	**1,228**	**100%**

TRIP DETAILS

Figure 4-1 shows primary trip purposes for all respondents. The most commonly reported trip purpose was travel to or from work (28% of trips). Trips made for other personal business comprised 25% of all trips while social and recreational trips made up approximately 21% of all reported trip purposes. Respondents who made a General Trip were more likely to report a trip to or from work (41%), while and equal proportion of respondents (19%) who made a trip in the OK Loop corridor or in the Kilpatrick Extension corridor reported a work trip (see Section 8.0). Trips that were made for work-related business or commuting comprised 40% of all reported trip purposes across all respondents.

FIGURE 4-1: PRIMARY TRIP PURPOSE

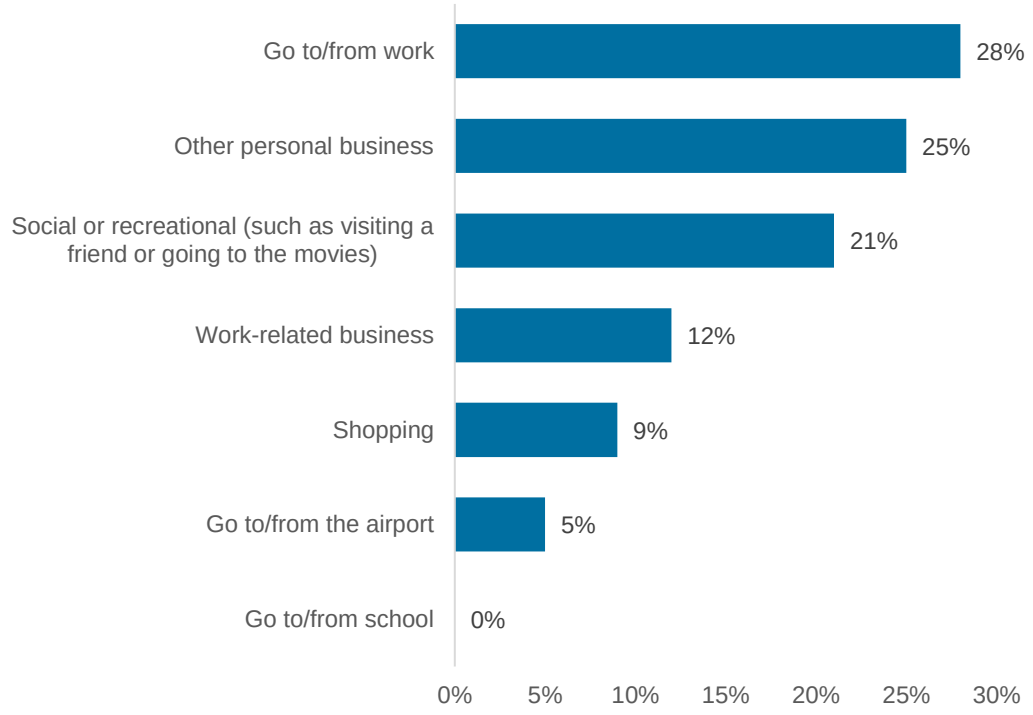


Table 4-2 summarizes the distribution of beginning and ending trip locations for all respondents. Most reported trip origins were people's homes, while most destinations were somewhere other than home or work. Correspondingly, the single most commonly reported trip combination originated at home and ended at a place other than home or work (55%). Twenty-four percent of trips started at home and ended at a regular workplace.

TABLE 4-2: TRIP ORIGINS AND DESTINATIONS

Origin & Destinations		Destination			
		My home	My regular workplace	Another place	Total
Origin	**My home**	3%	24%	55%	**82%**
	My regular workplace	4%	1%	7%	**11%**
	Another place	4%	0%	2%	**7%**
	Total	**11%**	**25%**	**64%**	**100%**

Table 4-3 presents trip departure periods by assigned corridor. Reported trip departure times were distributed fairly evenly across daytime hours, with 33% of trips beginning in the morning peak period, 37% beginning in the midday period, and 24% beginning in the afternoon peak period. The morning peak period is defined as weekday mornings between 6:00 and 8:59 AM, and the afternoon peak period is defined as weekday afternoons between 3:00 and 6:59 PM.

TABLE 4-3: TRIP DEPARTURE TIME PERIOD BY ASSIGNED CORRIDOR

Time Period	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Morning Peak (6:00-8:59 AM)	99	27%	106	29%	199	40%	**404**	**33%**
Midday (9:00 AM-2:59 PM)	154	42%	121	33%	178	36%	**453**	**37%**
Afternoon Peak (3:00-6:59 PM)	99	27%	101	28%	90	18%	**290**	**24%**
Night (7:00 PM-5:59 AM)	15	4%	38	10%	28	6%	**81**	**7%**
Total	**367**	**100%**	**366**	**100%**	**495**	**100%**	**1,228**	**100%**

The latitude and longitude coordinates for each trip's origin-destination pair were used to estimate trip distances using a Google Maps route-planning algorithm. The average calculated distance traveled for all respondents was 30 miles and the median distance was 19 miles. The average reported travel time for all respondents was 43 minutes and the median travel time was 30 minutes. Table 4-4 shows calculated trip distances and reported travel times (mean and median) by assigned corridor, as well as for all respondents together. Drivers who reported a trip in the OK Loop corridor typically took the longest trips by distance and duration, while General Trips tended to be the shortest.

TABLE 4-4: MEAN AND MEDIAN TRIP DISTANCE AND TRAVEL TIME BY ASSIGNED CORRIDOR

Trip Distance & Times	OK Loop		Kilpatrick Extension		General Trip		Total	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Google Distance (miles)	44	26	26	19	23	17	**30**	**19**
Reported Time (minutes)	55	40	41	30	35	30	**43**	**30**

Figure 4-2 shows the cumulative distribution of Google-calculated trip distances for all respondents and Figure 4-3 shows the cumulative distribution of reported travel times for all respondents.

FIGURE 4-2: CUMULATIVE TRIP DISTANCES

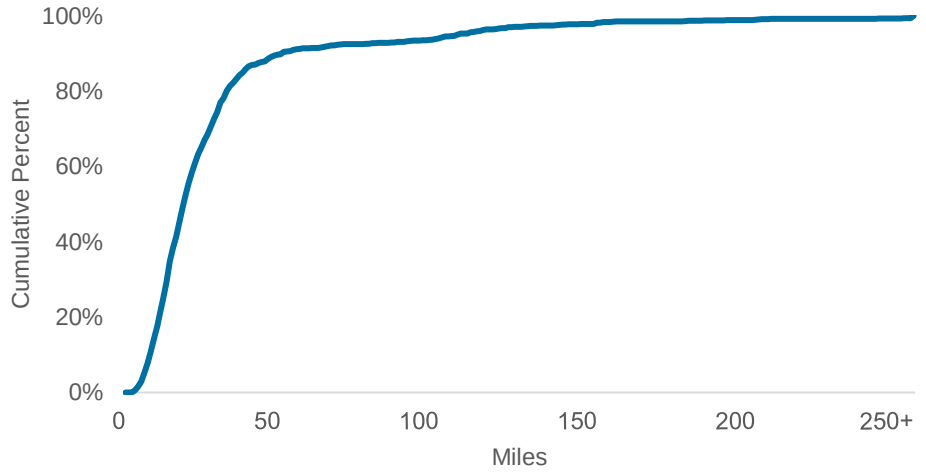
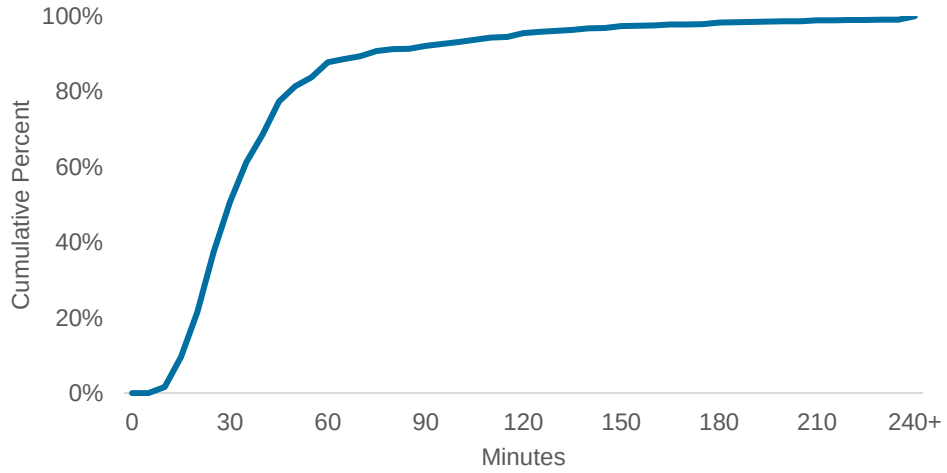


FIGURE 4-3: CUMULATIVE TRAVEL TIMES



Trip origins and destinations, stratified by assigned corridor, are shown in Figure 4-4 and Figure 4-5.

FIGURE 4-4: TRIP ORIGINS BY ASSIGNED CORRIDOR

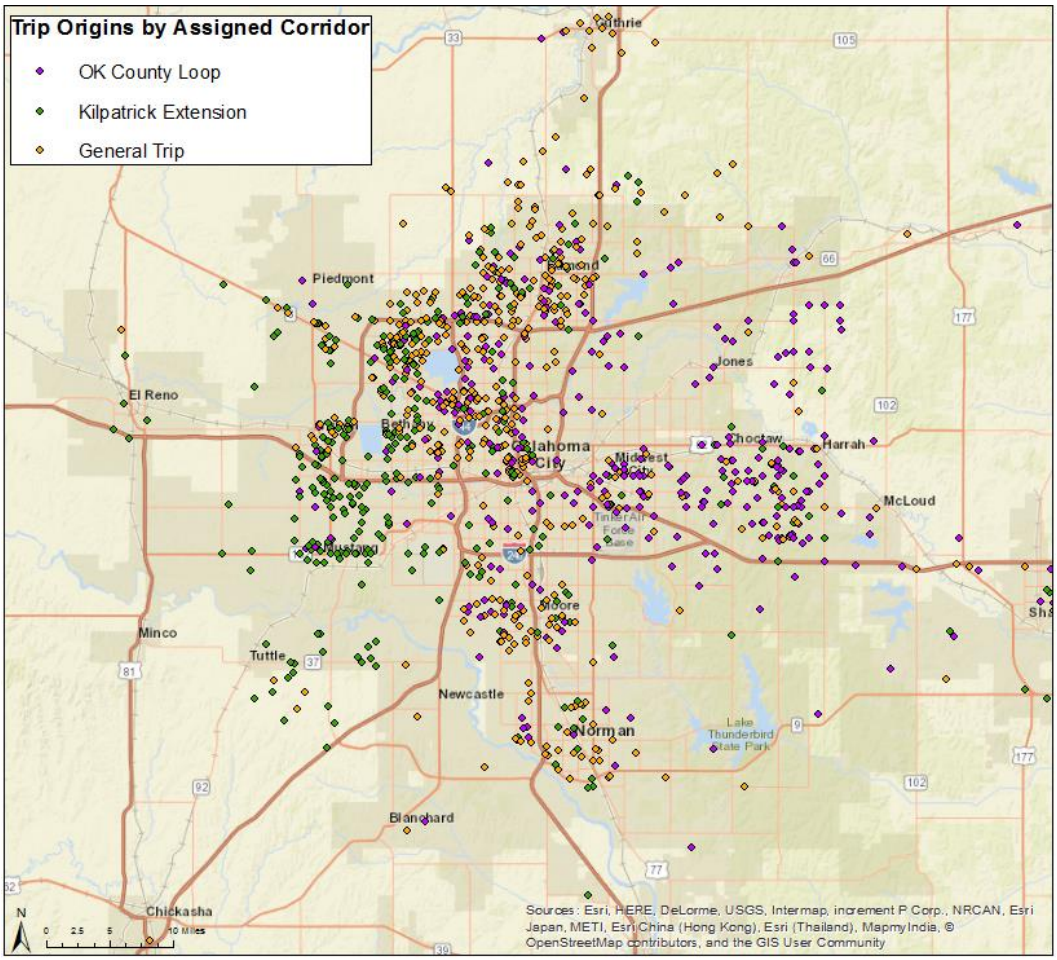


FIGURE 4-5: TRIP DESTINATIONS BY ASSIGNED CORRIDOR

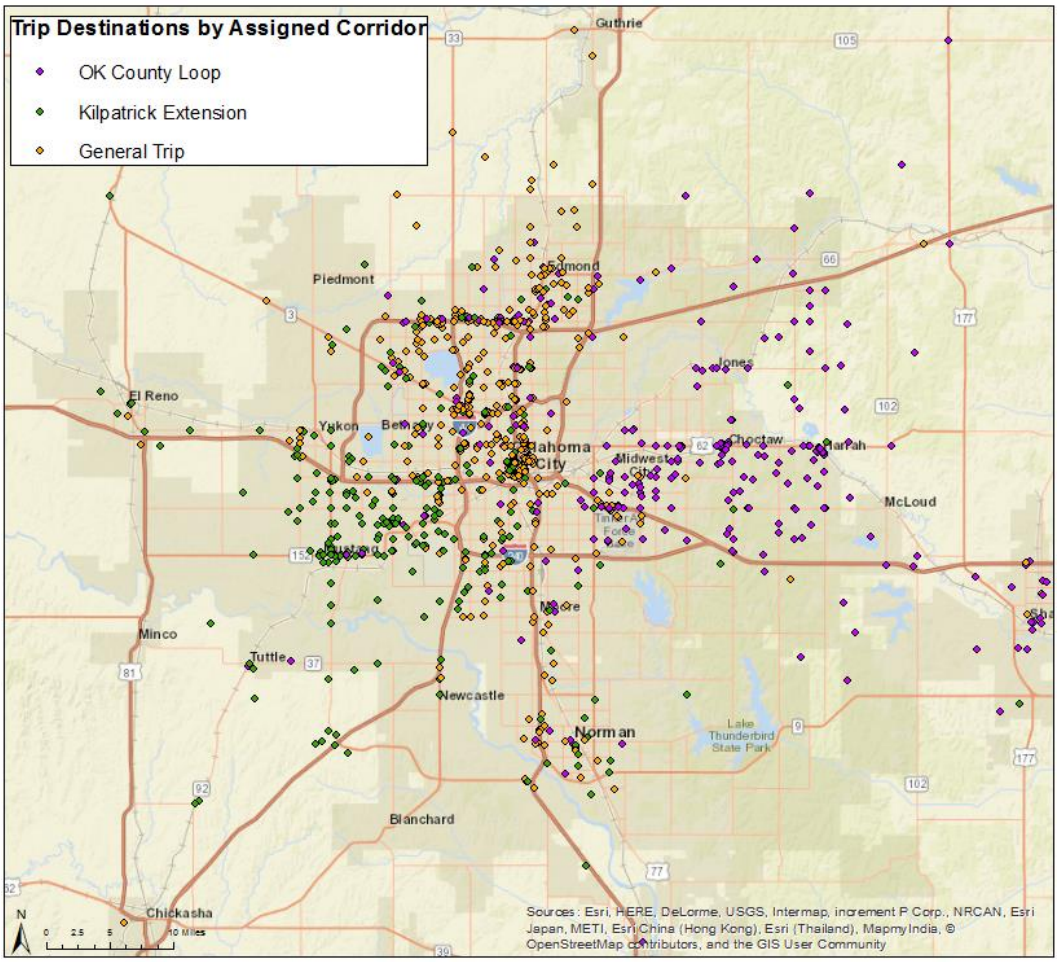
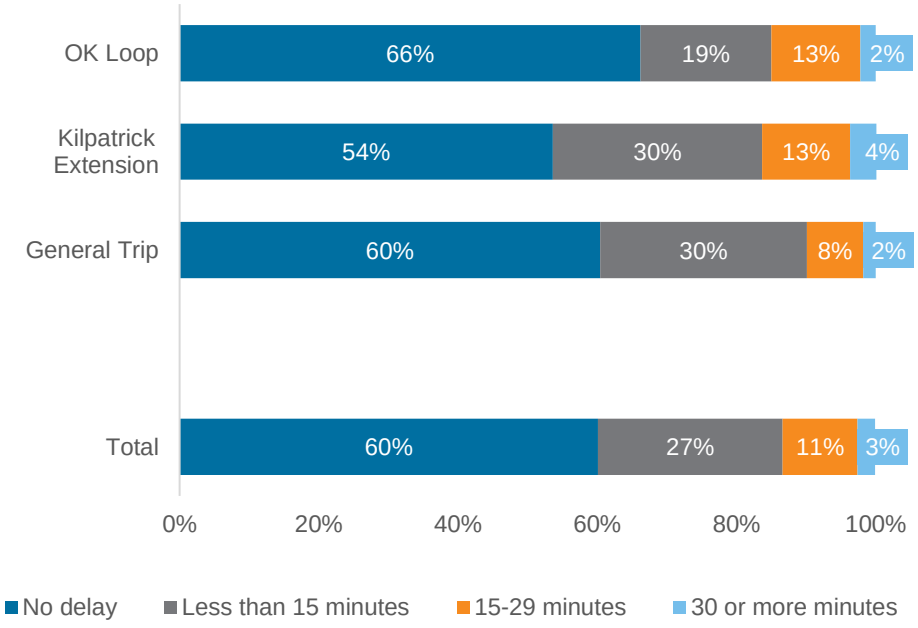


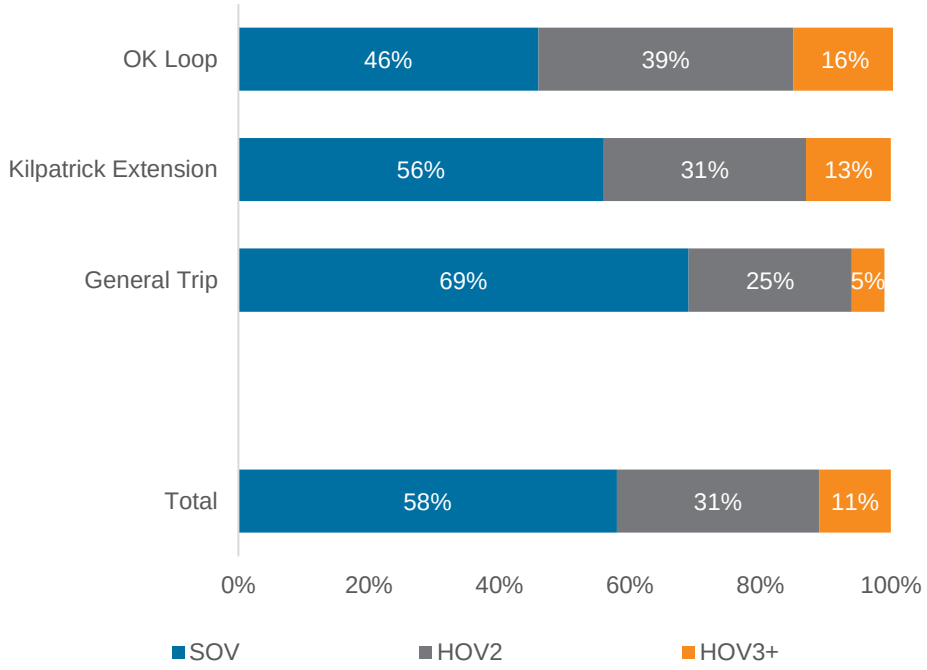
Figure 4-6 shows the categorized amount of delay experienced by respondents in each study corridor, and for all respondents. Approximately 40% of all respondents reported experiencing at least some delay on their trip. Twenty-seven percent of all respondents experienced a delay of less than 15 minutes, with a smaller group experiencing longer delays. Respondents assigned to recount a trip they made in the Kilpatrick Extension corridor were more likely to report experiencing at least some delay on their trip.

FIGURE 4-6: AMOUNT OF DELAY BY ASSIGNED CORRIDOR



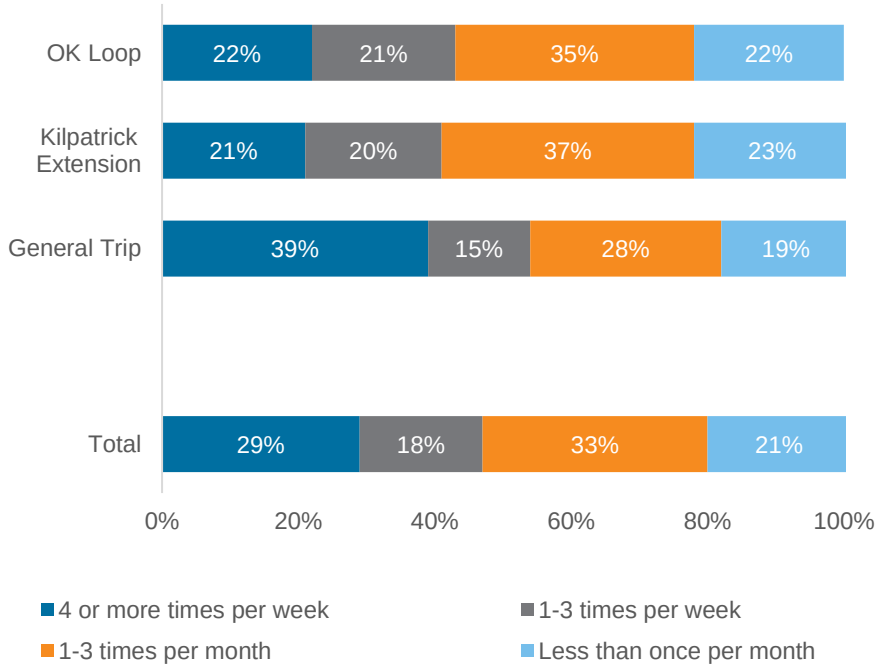
Most respondents (58%) reported making their trip in a single occupant vehicle (SOV). Thirty-one percent of trips were made in a vehicle with two occupants (HOV2), and 11% were made in a vehicle with three or more occupants (HOV3+). Travelers in the OK Loop corridor were most likely to report a trip with more than one occupant. Figure 4-7 shows vehicle occupancy by assigned corridor and for all respondents.

FIGURE 4-7: VEHICLE OCCUPANCY BY ASSIGNED CORRIDOR



Twenty-nine percent of all trips were made four or more times per week, closely tracking the number of trips that were made to or from work (28% in Figure 4-1). General Trips tended to show the highest frequency, with 39% of these respondents making their reference trip four or more times per week, while reference trips in the Kilpatrick Extension corridor were made this frequently by only 21% of respondents. Trip frequency by assigned corridor and for all respondents is shown in Figure 4-8.

FIGURE 4-8: TRIP FREQUENCY BY ASSIGNED CORRIDOR



Respondents were asked whether they owned a PIKEPASS transponder or other type of transponder for electronic toll collection. A large majority of respondents indicated that they owned a PIKEPASS transponder (86%). Table 4-5 shows transponder ownership by assigned corridor and for all respondents.

TABLE 4-5: TRANSPONDER OWNERSHIP BY ASSIGNED CORRIDOR (SELECT ALL THAT APPLY)

Transponder Ownership	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
PIKE PASS	280	76%	334	91%	442	89%	**1,056**	**86%**
Other transponder	4	1%	2	1%	10	2%	**16**	**1%**
None	85	23%	32	9%	46	9%	**163**	**13%**
Total	**369**	**--**	**368**	**--**	**498**	**--**	**1,235**	**--**

STATED PREFERENCE QUESTIONS

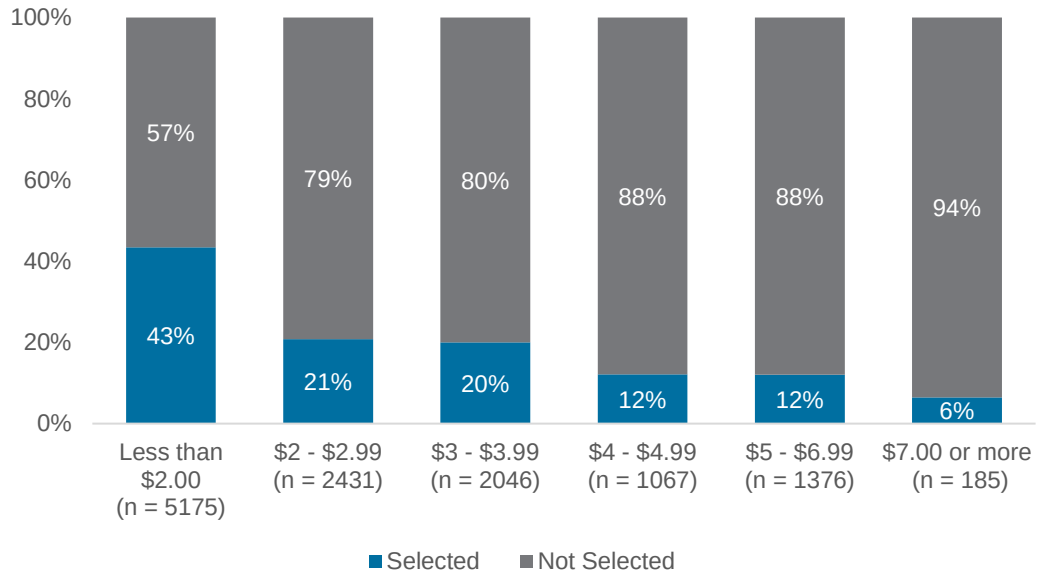
After completing the trip details portion of the survey, respondents answered a series of ten stated preference tradeoff exercises tailored to their reference trip. Survey respondents chose their current route in 72% of experiments, and the alternative toll option in 28% of experiments (Table 4-6).

TABLE 4-6: STATED PREFERENCE CHOICES

Alternative	Number of Experiments Shown	Number of Times Selected	Percent of All Choices
Use Current Route	12,280	8,812	72%
Use Alternate Tolled Route	12,280	3,468	28%

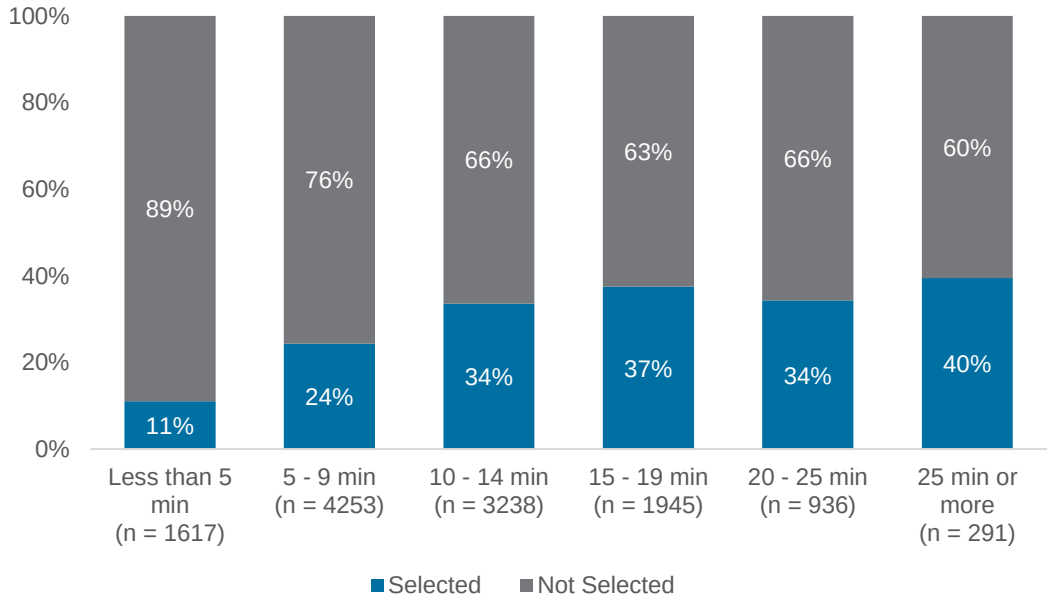
Respondents became less likely to choose the toll alternative tailored to their reference trip as the toll cost increased. Figure 4-9 shows the percentage of time the toll alternative was chosen in the stated preference experiments at different toll costs. The first bar on the left in Figure 4-9 shows that when the presented toll costs were less than $2.00, the toll option was selected 43% of the time, while the last bar on the right shows that when the presented toll costs were more than $7.00, the toll option was selected only 6% of the time. In general, Figure 4-9 shows that the likelihood of respondents choosing the toll option decreased considerably as the toll amount increased. Since each respondent was presented with ten questions, the total number of choice observations is 12,280.

FIGURE 4-9: SP TOLL OPTION SELECTION BY TOLL COST



Alternatively, respondents were generally more likely to choose the tolled option tailored to their reference trip as the travel time savings increased. Figure 4-10 shows the percentage of time the toll alternative was chosen in the stated preference experiments at different levels of travel time savings. The first bar on the left in Figure 4-10 shows that when the presented travel time savings was less than five minutes, the toll option was selected 11% of the time, while the last bar on the right shows that when the presented travel time savings was 25 minutes or more, the toll option was selected 40% of the time. In general, Figure 4-10 shows that the likelihood of respondents choosing the toll option increased considerably as the travel time savings increased.

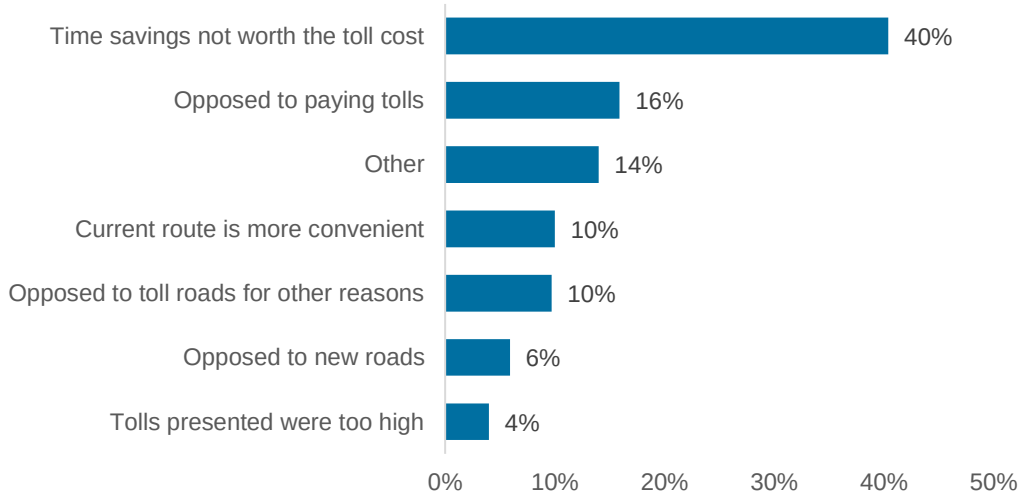
FIGURE 4-10: SP TOLL OPTION SELECTION BY TRAVEL TIME SAVINGS



DEBRIEF AND OPINION QUESTIONS

If a respondent never chose an option that had tolls during the stated preference section (30% of respondents), they were asked to indicate their primary reason for this. The reason most frequently cited (40% of all respondents who never selected the tolled alternative) was that the time savings presented in the experiments was not high enough to justify the toll cost (Figure 4-11).

FIGURE 4-11: PRIMARY REASON FOR NEVER SELECTING TOLLED OPTIONS



Approximately 45% of respondents were in favor of the project (20% strongly in favor and 25% somewhat in favor). Twenty-three percent of respondents were neutral in their project

opinion, while approximately 33% were either strongly (20%) or somewhat (13%) opposed to the project. Table 4-7 shows project opinion by assigned corridor and for all respondents. It should be noted that General Trip respondents were asked for their opinion of toll facilities in the Oklahoma City region in general, not related to a specific corridor.

TABLE 4-7: PROJECT OPINION BY ASSIGNED CORRIDOR

Project Opinion	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Strongly opposed	113	31%	53	14%	76	15%	**242**	**20%**
Somewhat opposed	40	11%	33	9%	84	17%	**157**	**13%**
Neutral	76	21%	78	21%	129	26%	**283**	**23%**
Somewhat favor	65	18%	109	30%	133	27%	**307**	**25%**
Strongly favor	73	20%	93	25%	73	15%	**239**	**20%**
Total	**367**	**100%**	**366**	**100%**	**495**	**100%**	**1,228**	**100%**

If a respondent reported a non-neutral opinion about the project, they were asked to indicate the main reason for that opinion. Table 4-8 and Table 4-9 show the main reasons for supporting or opposing the project by assigned corridor. Of the 45% of respondents who supported the project, the most common reason was faster travel times, followed closely by a need for investment in infrastructure. Of the 33% of respondents who opposed the project, the most common reason was opposition to toll roads.

TABLE 4-8: PRIMARY REASON FOR PROJECT SUPPORT BY ASSIGNED CORRIDOR

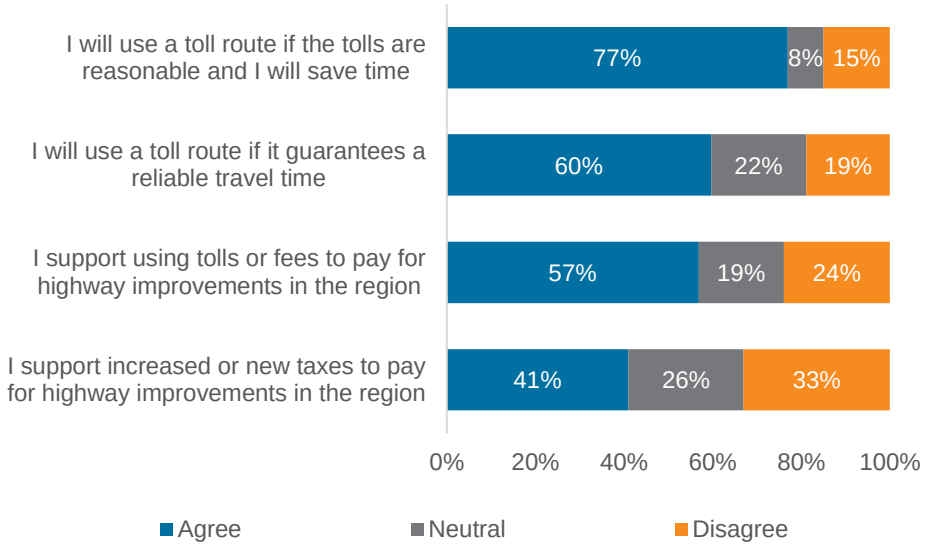
Primary Reason for Supporting	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Shorter travel times once completed	39	28%	111	55%	133	65%	283	52%
Needed investment in infrastructure	37	27%	34	17%	28	14%	99	18%
Safer road conditions	17	12%	16	8%	36	17%	69	13%
More direct travel route	25	18%	31	15%	0	0%	56	10%
Other reason	19	14%	9	4%	9	4%	37	7%
Reduced emissions & improved air quality	1	1%	1	0%	0	0%	2	0%
Total	**138**	**100%**	**202**	**100%**	**206**	**100%**	**546**	**100%**

TABLE 4-9: PRIMARY REASON FOR PROJECT OPPOSITION BY ASSIGNED CORRIDOR

Primary Reason for Opposing	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Opposed to toll roads	51	33%	25	29%	90	56%	166	42%
Other reason	53	35%	23	27%	37	23%	113	28%
Opposed to where the highway would be built	36	24%	27	31%	0	0%	63	16%
Rather see more investments in alternative transportation	8	5%	10	12%	28	18%	46	12%
Opposed to new highways	4	3%	0	0%	3	2%	7	2%
Opposed to spending money on road construction	1	1%	1	1%	2	1%	4	1%
Total	**153**	**100%**	**86**	**100%**	**160**	**100%**	**399**	**100%**

To gauge respondents' opinions about issues related to the proposed new roads, levels of agreement were measured for a series of attitude statements (Figure 4-12). Of the statements presented, respondents were mostly likely to agree with the statement "I will use a toll route if the tolls are reasonable and I will save time" and least likely to agree with the statement "I support increased or new taxes to pay for highway improvements in the region."

FIGURE 4-12: TOLL ATTITUDE STATEMENTS



DEMOGRAPHIC QUESTIONS

To conclude the survey, respondents were asked a series of demographic questions. Fifty-two percent of respondents identified as male and forty-eight percent identified as female. The median age of the sample fell in the 45-54-year-old category. Almost half (48%) of respondents reported living in a two-person household and 49% of respondents reported living in a household with two vehicles. Approximately two-thirds (62%) of respondents indicated they were employed full-time and 21% reported being retired.

When reporting income, respondents could select a 'Prefer not to answer' option, and approximately 16% of all respondents selected this option. The median household income of those respondents who chose to report their income was in the $75,000-$99,999 income category (Table 4-10).

TABLE 4-10: ANNUAL HOUSEHOLD INCOME BY ASSIGNED CORRIDOR

Income Category	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Less than $15,000	3	1%	6	2%	3	1%	12	1%
$15,000-$24,999	4	1%	8	3%	10	3%	22	2%
$25,000-$34,999	11	4%	14	4%	19	5%	44	4%
$35,000-$49,999	31	10%	28	9%	43	11%	102	10%
$50,000-$74,999	69	23%	60	19%	87	22%	216	21%
$75,000-$99,999	69	23%	61	19%	68	17%	198	19%
$100,000-$124,999	43	14%	61	19%	61	15%	165	16%
$125,000-$149,999	19	6%	36	11%	39	10%	94	9%
$150,000-$199,999	37	12%	27	8%	31	8%	95	9%
$200,000 or more	20	7%	22	7%	38	10%	80	8%
Total	**306**	**100%**	**323**	**100%**	**399**	**100%**	**1,028**	**100%**

5.0 MODEL ESTIMATION

The primary purpose of the Oklahoma City Travel Study was to estimate the willingness to pay for travel time savings, or VOT, of passenger vehicle travelers who are candidates for using either of the proposed facilities or who make automobile trips on highways in the Oklahoma City area. These VOT estimates will support estimates of future traffic and revenue for the facilities. The ten choice observations for each respondent were compiled into a dataset with 12,280 observations to support the estimations of VOT.

5.1 | METHODOLOGY

Statistical analysis and discrete choice model estimation were conducted using the stated preference survey data. The statistical estimation and specification testing were completed using a conventional maximum likelihood procedure that estimated coefficients for a set of MNL models. The MNL models were used to identify systematic differences in preference heterogeneity—for example, the difference in VOT by trip purpose, time of day or income. The model coefficients provide information about the respondents' sensitivities to the attributes that were tested in the tradeoff scenarios and can be used to calculate VOT for travelers in the corridors and the larger Oklahoma City region. The model specification and results are discussed in more detail in the following sections.

5.2 | MULTINOMIAL LOGIT (MNL) MODEL SPECIFICATION

In each SP experiment, respondents were presented with two alternatives, with the label of the second alternative contingent on the corridor/trip type to which the respondent was assigned:

1. Make the trip using their current route
2. Make the trip using the new Northeast Oklahoma County Loop/using the new Kilpatrick Extension/using a new toll highway

More information about the stated preference experimental design can be found in Section 2.3. The MNL model estimates a choice probability for each alternative presented in the stated preference tradeoff exercises. The alternatives are represented in the model by observed utility equations of the form described in Equation 1.

EQUATION 1: OBSERVED UTILITY EQUATION

$$\cup_1 = \boldsymbol{\beta_1 X_1} + \boldsymbol{\beta_2 X_2} \ldots + \boldsymbol{\beta_n X_n}$$

In Equation 1, each X represents a variable specified by the researcher and each β is a coefficient estimated by the model that represents the sensitivity of the respondents in the sample to the corresponding variable.

Several utility equation structures were tested using different variables from the collected data. In addition to the travel times and toll costs presented in the stated preference experiments, tested variables included trip characteristic and demographic variables. These

variables were introduced, one at a time, to test potential interactions with the toll cost and travel time coefficients and to determine whether respondents' trip or personal characteristics significantly influenced their choices in the stated preference scenarios. Interaction variables include:

- Assigned corridor/trip type
- Time of day
- Trip purpose
- Income
- Transponder ownership
- Trip distance
- Travel time
- Travel delay
- Project opinion

After reviewing the significance of each variable, the final model specification was chosen based on model fit, the intuitiveness and reasonableness of the model coefficients, and the expected application of the model results. The final specification included variables for travel time and travel cost applied to both alternatives. In addition to time and cost, dummy variables, or constants, were included on the toll alternative for those respondents who own a transponder, respondents who experienced delay, and for those respondents who indicated they were strongly opposed to new highways or either of the new facilities. Along with the alternative specific constant, these dummy variables capture the additional utility (or disutility) for the toll alternative that cannot be attributed to time and cost alone. Several different transformations of the cost coefficient by household income were tested in order to capture any systematic relationship between cost sensitivity and income. To capture the relationship between cost sensitivity and household income, the toll cost coefficient was divided by the natural log of household income in the utility equation as described in Equation 2.

EQUATION 2: TOLL COST INTERACTION WITH INCOME

$$V_i = \cdots + \beta Cost * TC_i * \frac{1}{LN(\frac{income}{100})}$$

5.3 | MNL MODEL: COEFFICIENT ESTIMATES

The result of the final model specification is presented below and includes coefficients segmented by corridor and trip purpose. The model segmentation details are shown in Table 5-1.

TABLE 5-1: MODEL SEGMENTS BY ASSIGNED CORRIDOR/TRIP PURPOSE

Segment	Count	Percent
OK Loop - Work Trips	121	10%
OK Loop – Non-Work Trips	246	20%
Kilpatrick - Work Trips	123	10%
Kilpatrick – Non-Work Trips	243	20%
General - Work Trips	243	20%
General – Non-Work Trips	252	21%
Total	**1,228**	**100%**

Table 5-2 presents the variables included in the final model specification and the alternatives to which each variable applies.

TABLE 5-2: FINAL MODEL SPECIFICATION

Coefficient	Units	Alt 1: Current Route	Alt 2: Alternate Toll Route
Travel Time			
OK Loop - Work Trips	Minutes	X	X
OK Loop - Non-Work Trips	Minutes	X	X
Kilpatrick - Work Trips	Minutes	X	X
Kilpatrick - Non-Work Trips	Minutes	X	X
General - Work Trips	Minutes	X	X
General - Non-Work Trips	Minutes	X	X
Travel Cost			
OK Loop - Work Trips	$	X	X
OK Loop - Non-Work Trips	$	X	X
Kilpatrick - Work Trips	$	X	X
Kilpatrick - Non-Work Trips	$	X	X
General - Work Trips	$	X	X
General - Non-Work Trips	$	X	X
Dummy Variables			
Strongly Opposed to Project/New Facility	1,0		X
Experienced Delay	1,0		X
Possess a transponder	1,0		X
Alternative Specific Constant			
Alternative 2 - Toll Route	1,0		X

Table 5-3 contains coefficient values, robust standard errors, robust t-statistics, and general model statistics. The coefficient values are the values estimated by the choice model that represent the relative importance of each of the variables. It should be noted that these values are unit-specific and the units must be accounted for when comparing coefficients.

The sign of the coefficient indicates a positive or negative relationship between utility and the associated variable. For example, a negative travel time coefficient implies that utility for a given travel alternative will decrease as the travel time associated with that alternative increases.

The standard error is a measure of error around the mean coefficient estimate. The t-statistic is the coefficient estimate divided by the standard error, which can be used to evaluate statistical significance. A t-statistic greater/less than ±1.96 indicates whether the coefficient is statistically significantly different from 0 (unless otherwise reported) at the 95% level.

The model fit statistics presented below include the number of observations, the number of estimated parameters, the initial log-likelihood, the log-likelihood at convergence, rho-squared, and adjusted rho-squared. The log-likelihood is a model fit measure that indicates how well the model predicts the choices observed in the data. The null log-likelihood is the measure of the model fit with coefficient values of zero. The final log-likelihood is the measure of model fit with the final coefficient values at model convergence. A value closer to zero indicates better model fit. The log-likelihood cannot be evaluated independently, as it is a function of the number of observations, the number of alternatives, and the number of parameters in the choice model. The rho-square model fit measure accounts for this to some degree by evaluating the difference between the null log-likelihood and the final log-likelihood at convergence. The adjusted rho-square value takes into account the number of parameters estimated in the model.

TABLE 5-3: FINAL MNL MODEL COEFFICIENTS AND STATISTICS

Coefficient	Units	Value	Rob. Std. Error	Rob. T-stat
Travel Time				
OK Loop - Work Trips	Minutes	-0.163	0.0218	-7.48
OK Loop - Non-Work Trips	Minutes	-0.162	0.0183	-8.86
Kilpatrick - Work Trips	Minutes	-0.16	0.0151	-10.53
Kilpatrick - Non-Work Trips	Minutes	-0.179	0.0123	-14.51
General - Work Trips	Minutes	-0.155	0.0127	-12.19
General - Non-Work Trips	Minutes	-0.147	0.0116	-12.68
Travel Cost*				
OK Loop - Work Trips	$	-5.21	0.841	-6.2
OK Loop - Non-Work Trips	$	-5.69	0.64	-8.9
Kilpatrick - Work Trips	$	-4.58	0.532	-8.62
Kilpatrick - Non-Work Trips	$	-5.69	0.429	-13.28
General - Work Trips	$	-6.42	0.507	-12.66
General - Non-Work Trips	$	-5.27	0.524	-10.06
Dummy Variables				
Strongly Opposed to Project/New Facility	1,0	-3.04	0.212	-14.34
Experienced Delay	1,0	0.577	0.104	5.57
Possess a transponder	1,0	0.751	0.177	4.24
Alternative Specific Constant				
Alternative 2 - Use New Highway	1,0	-1.47	0.193	-7.6
Model Statistics				
Number of parameters				16
Number of observations				12280
Number of individuals				1228
Initial log-likelihood				-8511.847
Final log-likelihood				-5221.167
Rho-square				0.387
Adjusted rho-square				0.385

5.4 | MNL MODEL: WILLINGNESS TO PAY FOR TRAVEL TIME SAVINGS

One way to evaluate the sensitivities that are estimated in the MNL models is to calculate the marginal rates of substitution for different attributes of interest. In economic theory, the marginal rate of substitution is the amount of one good (e.g., money) that a person would exchange for a second good (e.g., travel time), while maintaining the same level of utility or satisfaction. In this analysis, the marginal rate of substitution of the travel time and toll cost coefficients provides the implied toll value that travelers would be willing to pay for a given

amount of travel time savings offered by using the proposed facilities or a new highway in the Oklahoma City area.

The willingness to pay for travel time savings, or VOT, can be calculated by dividing the travel time coefficient by the toll cost coefficient after accounting for the income transformation that was applied in the model specification. The resulting VOT is in units of dollars per minute; multiplying by 60 will convert this into the more commonly cited units of dollars per hour (Equation 3).

EQUATION 3: WILLINGNESS TO PAY FOR TRAVEL TIME SAVINGS

$$VOT = 60 \times \frac{\beta Time}{\left[\frac{\beta Cost}{LN(income/100)}\right]}$$

In Equation 3, βTime is the value of the travel time coefficient (with units of 1/min), βCost is the value of the toll cost coefficient (with units of 1/$), and the log transformation controls for nonlinear income effects.

TABLE 5-4: VALUE OF TIME BY CORRIDOR/TRIP TYPE AND PURPOSE

Household Income	OK Loop - Work Trips	OK Loop – Non-Work Trips	Kilpatrick - Work Trips	Kilpatrick – Non-Work Trips	General - Work Trips	General – Non-Work Trips
$10,000	$8.64	$7.87	$9.65	$8.69	$6.67	$7.71
$20,000	$9.95	$9.05	$11.11	$10.00	$7.68	$8.87
$30,000	$10.71	$9.74	$11.96	$10.77	$8.26	$9.55
$42,500	$11.36	$10.34	$12.69	$11.42	$8.77	$10.13
$62,500	$12.08	$11.00	$13.49	$12.15	$9.33	$10.77
$87,500	$12.72	$11.57	$14.20	$12.79	$9.81	$11.34
$112,500	$13.19	$12.00	$14.73	$13.26	$10.18	$11.76
$137,500	$13.56	$12.34	$15.15	$13.64	$10.47	$12.09
$175,000	$14.02	$12.76	$15.65	$14.09	$10.82	$12.50
$200,000	$14.27	$12.98	$15.93	$14.35	$11.01	$12.72

6.0 CONCLUSION

RSG successfully developed and implemented a stated preference survey that gathered information from 1,278 automobile travelers in the Oklahoma City area. The purpose of the survey was to measure the VOT of travelers who could potentially use the proposed Northeast OK County Loop or Southeast Kilpatrick Extension, as well as drivers who make general highway trips in the region. The questionnaire collected data on current travel behaviors, presented respondents with information about the proposed facilities, and engaged the travelers in a series of stated preference questions to measure their propensity to use tolled routes in the Oklahoma City area.

Multinomial logit choice models were developed to provide estimates of VOT for potential travelers on both of the proposed facilities and for travelers in the general region, both for work-related and non-work-related trips. The magnitude and signs of the sensitivity estimates are reasonable and intuitively correct, and the VOT for work trips and non-work trips at each segment's median income category ranged from $9.81 to $14.20 per hour. These values are within the range of other similar studies across the country and in Oklahoma.

These estimates of VOT will serve as inputs into the travel demand model used to forecast traffic and revenue for future highway construction in the Oklahoma City area.

7.0 SURVEY SCREEN CAPTURES

7.1 | INTRODUCTION AND QUALIFICATION QUESTIONS

FIGURE 7-1: SURVEY INTRODUCTION AND INSTRUCTIONS

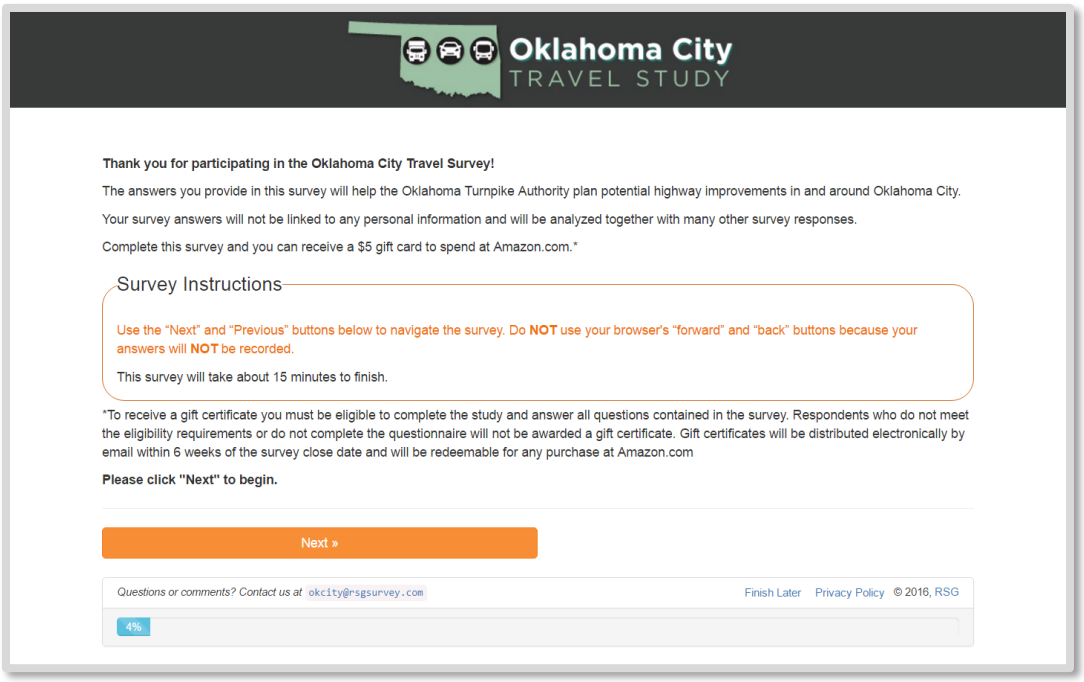


FIGURE 7-2: TRIP QUALIFICATION (EAST STUDY AREA)

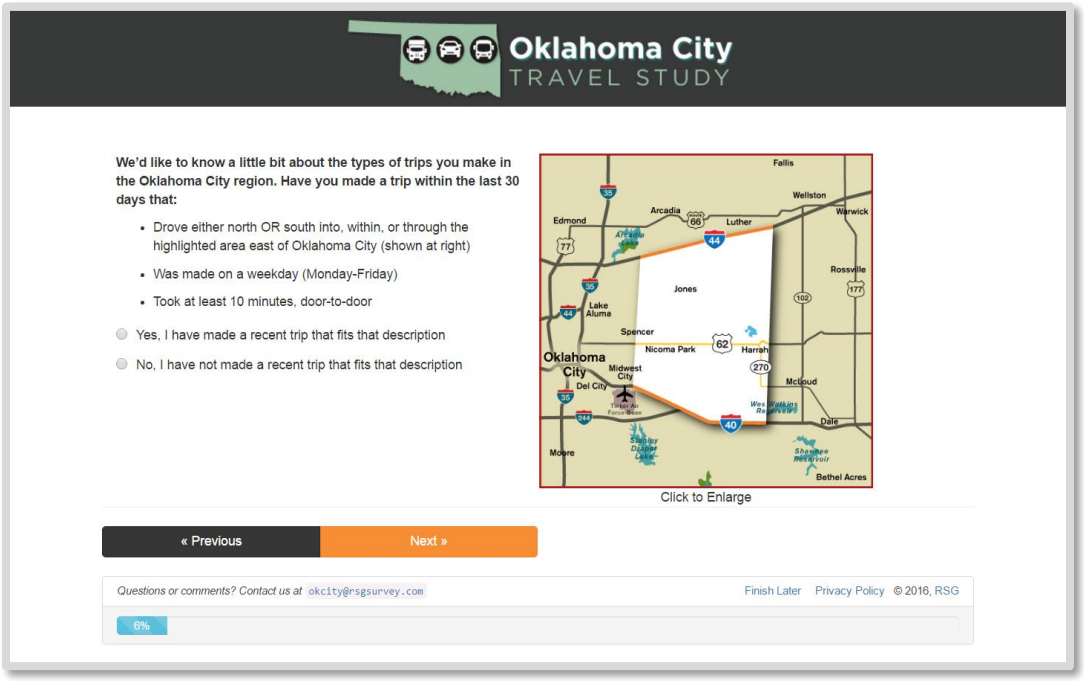


FIGURE 7-3: TRIP QUALIFICATION (WEST STUDY AREA)

FIGURE 7-4: TRIP QUALIFICATION (GENERAL)

If respondent has not made a trip through either the east or west study areas

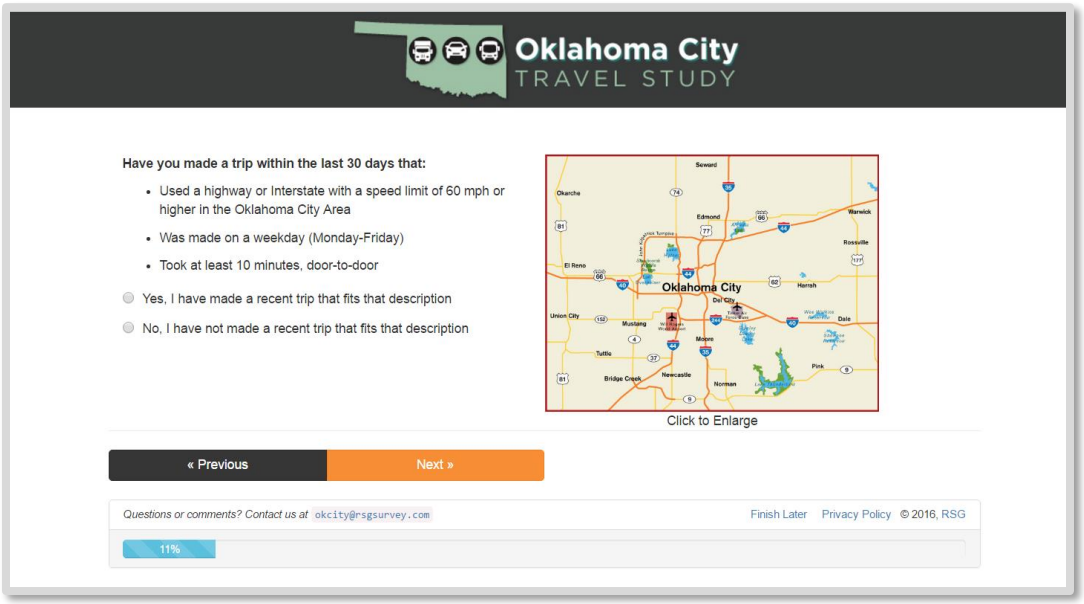
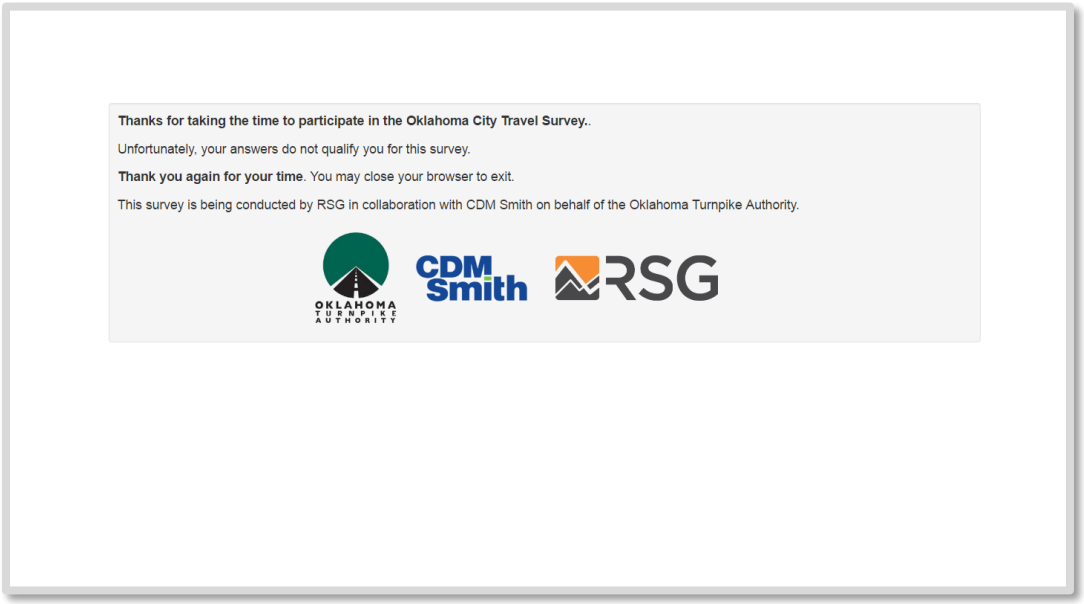


FIGURE 7-5: TERMINATION
If respondent has not made a qualifying trip



7.2 | TRIP DETAIL QUESTIONS

FIGURE 7-6: DEFINITION OF QUALIFYING ONE-WAY TRIP
Figures 6-8 show east study area version

FIGURE 7-7: DAY OF WEEK

FIGURE 7-8: PURPOSE

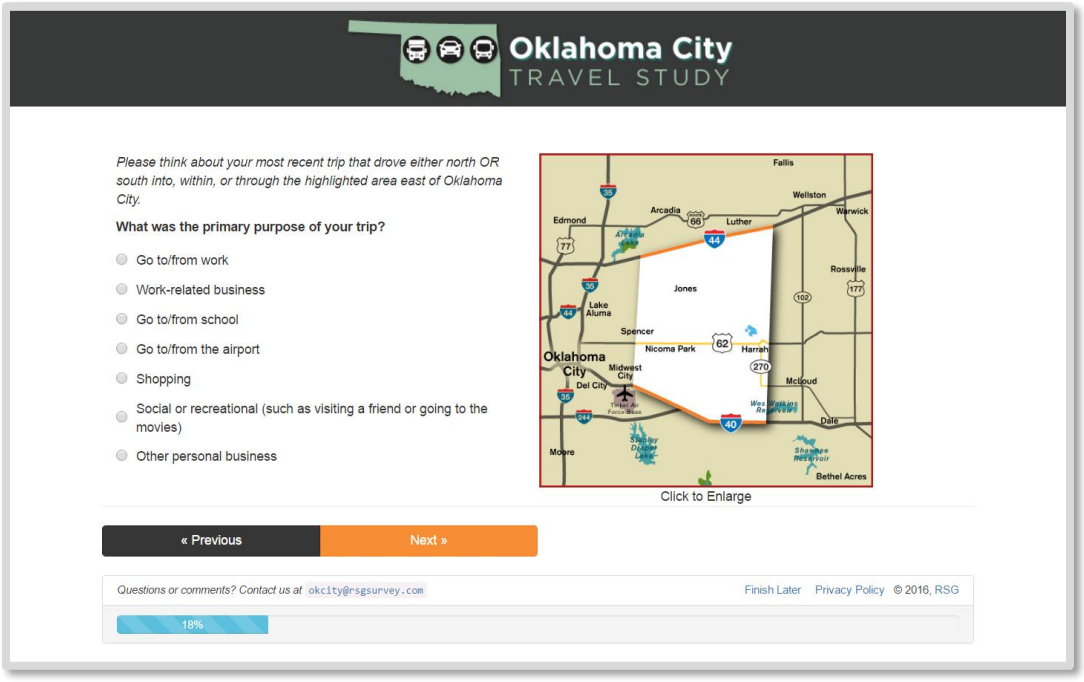


FIGURE 7-9: BEGINNING AND ENDING LOCATIONS

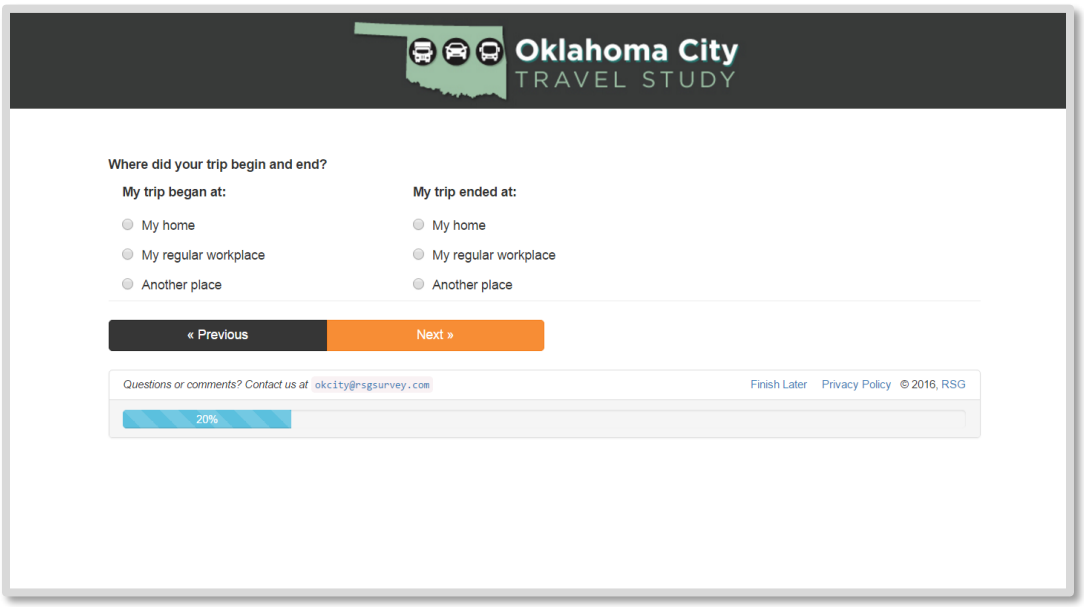


FIGURE 7-10: TRIP CONFIRMATION

If respondent's beginning and ending locations are both home or both work

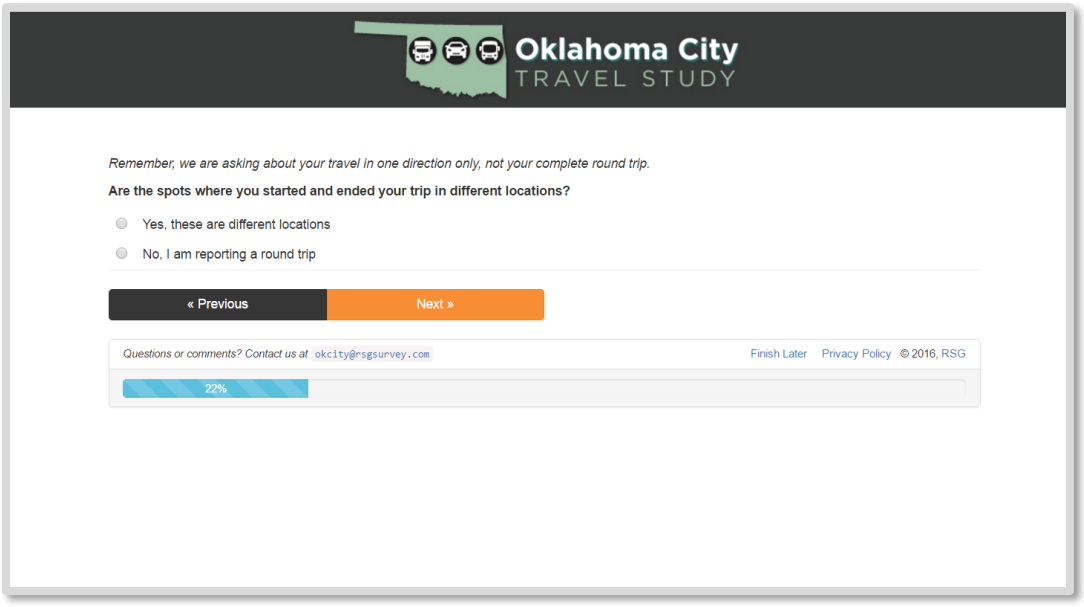


FIGURE 7-11: ORIGIN

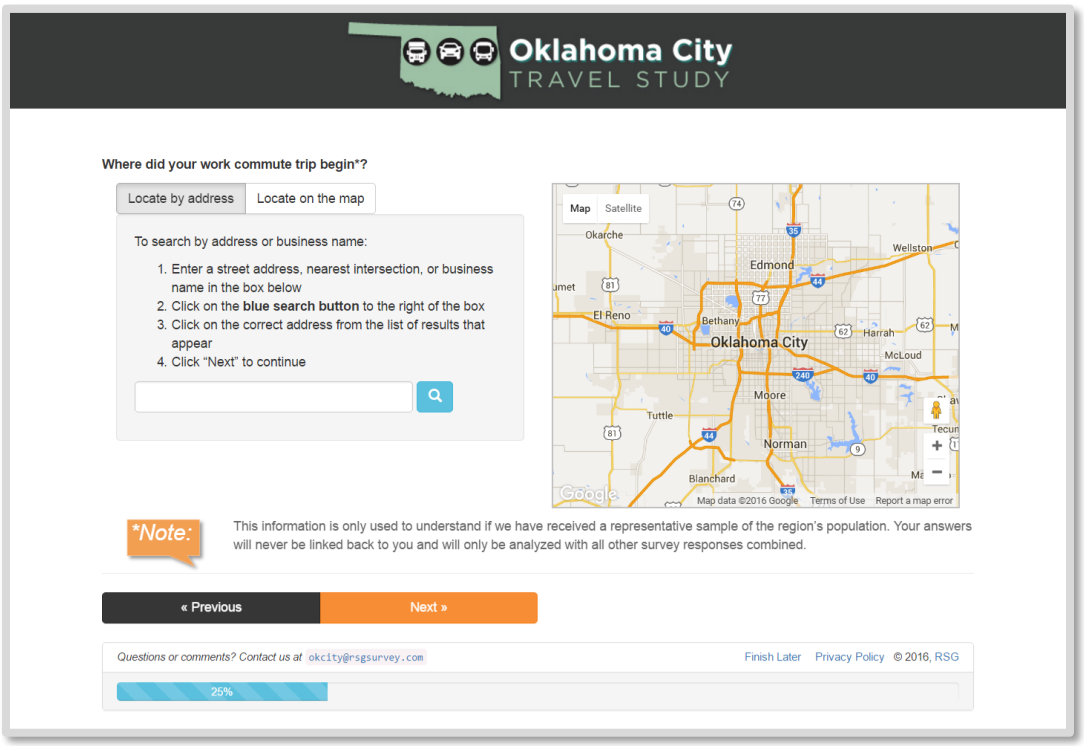


FIGURE 7-12: DESTINATION

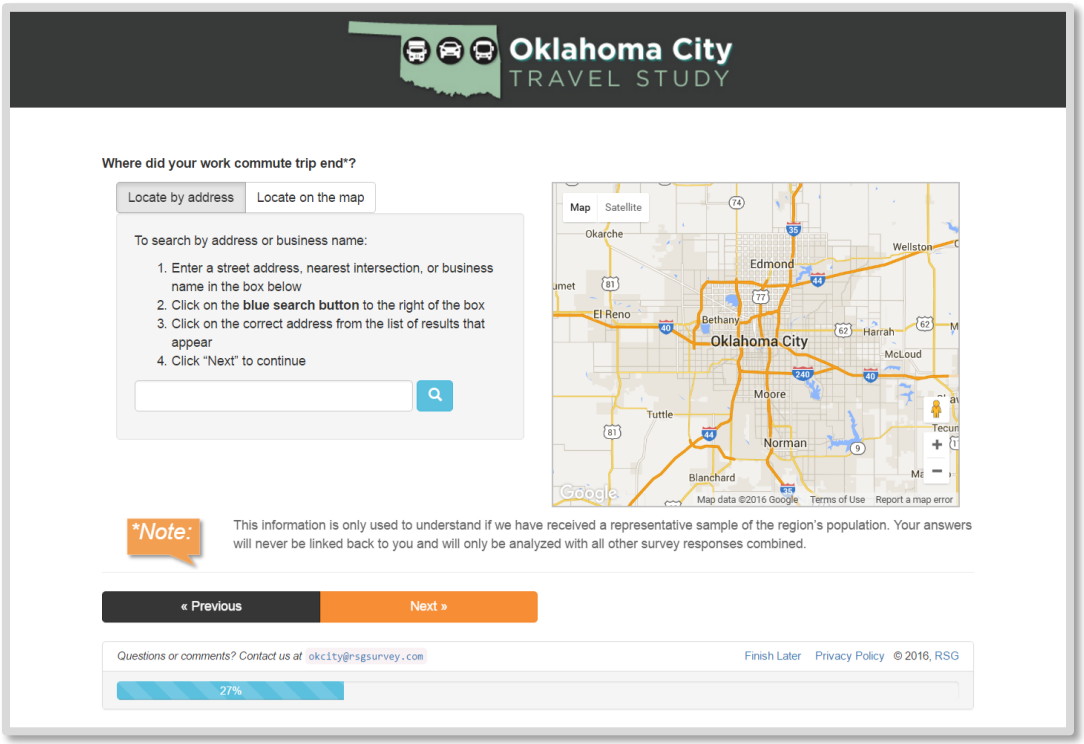


FIGURE 7-13: INVALID TRIP

If respondent's origin and destination indicate an invalid trip

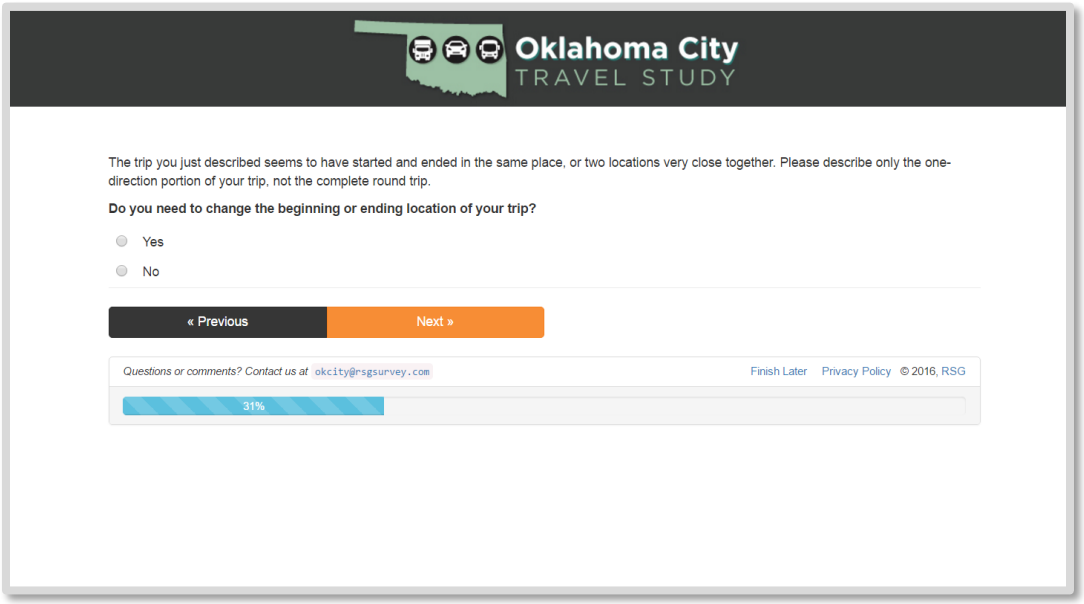


FIGURE 7-14: ORIGIN AND DESTINATION CONFIRMATION

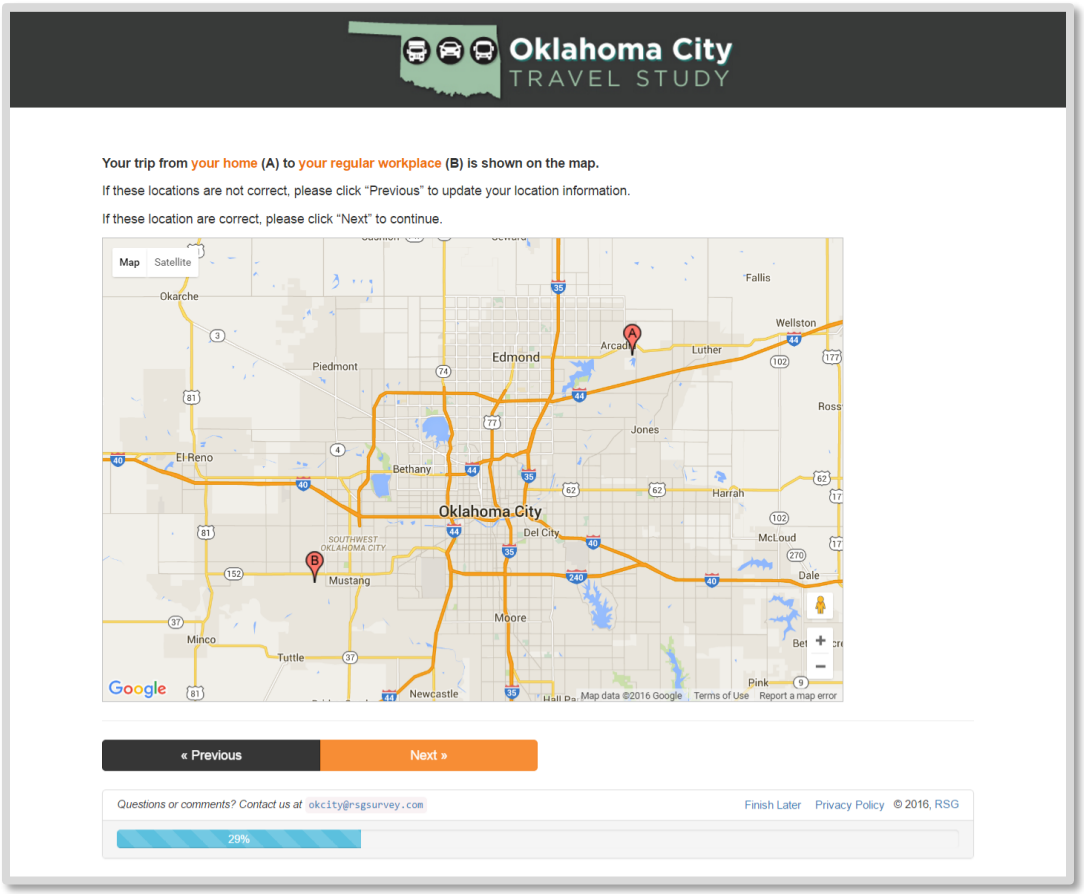


FIGURE 7-15: DEPARTURE TIME

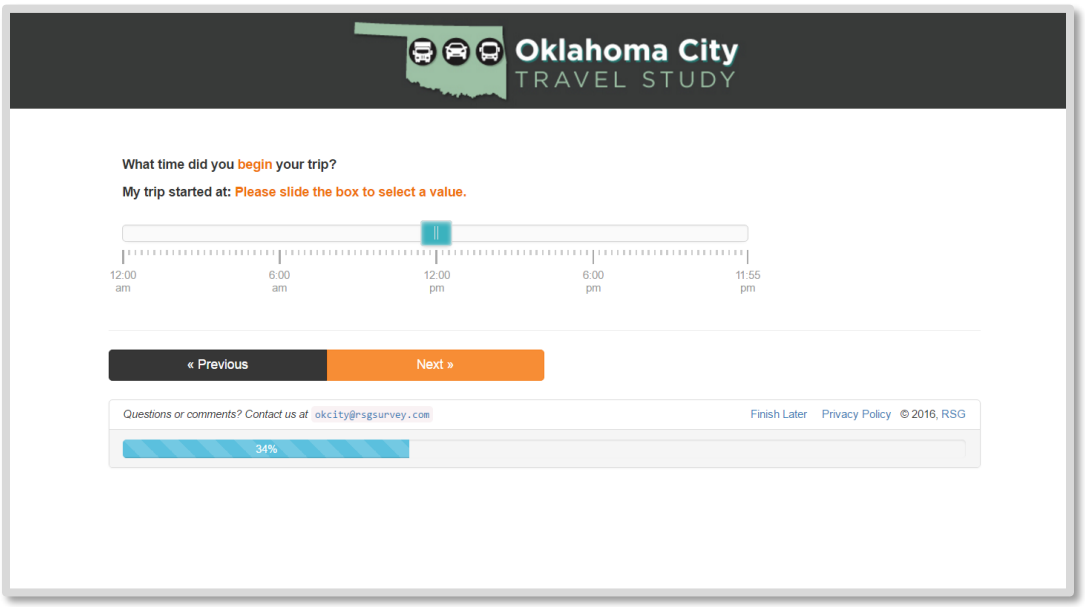


FIGURE 7-16: TRAVEL TIME

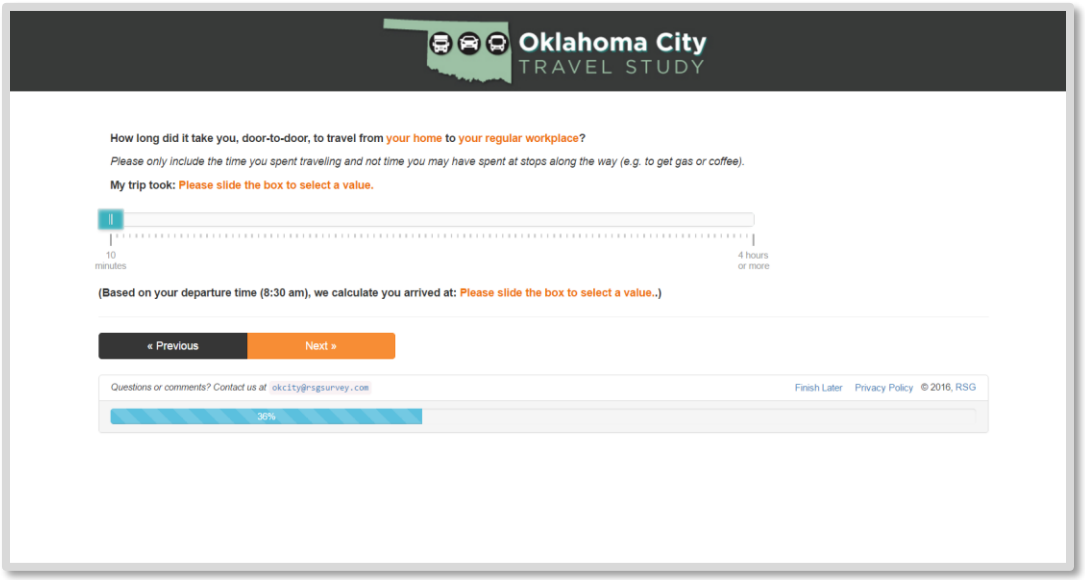


FIGURE 7-17: TRAVEL TIME CONFIRMATION

If stated travel time divided by Google calculated trip time is .75 (shorter) or 2.5 (longer)

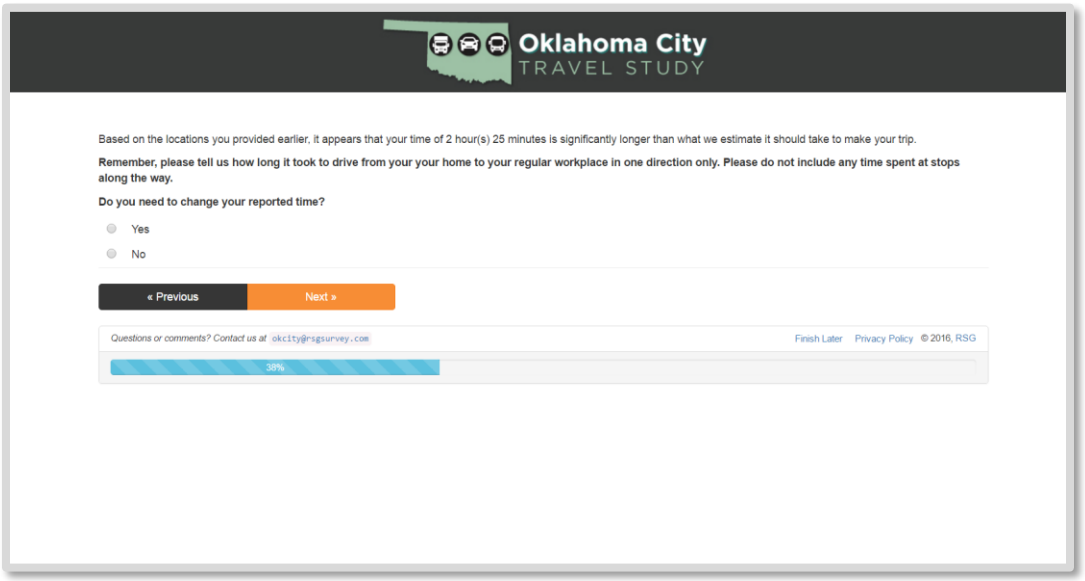


FIGURE 7-18: DELAY

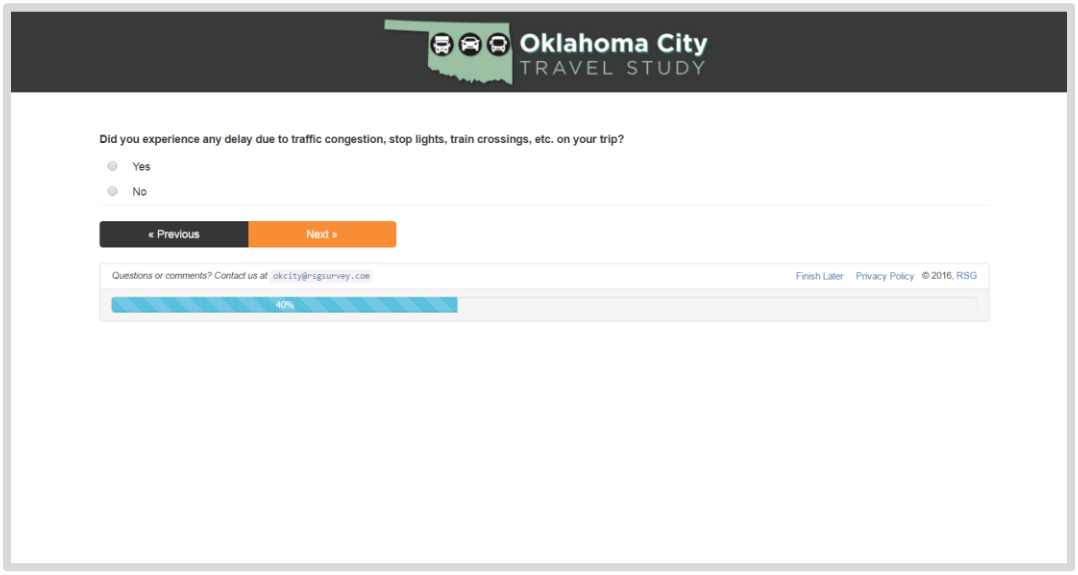


FIGURE 7-19: TRAVEL TIME WITHOUT DELAY

If respondent experienced delay due to traffic congestion

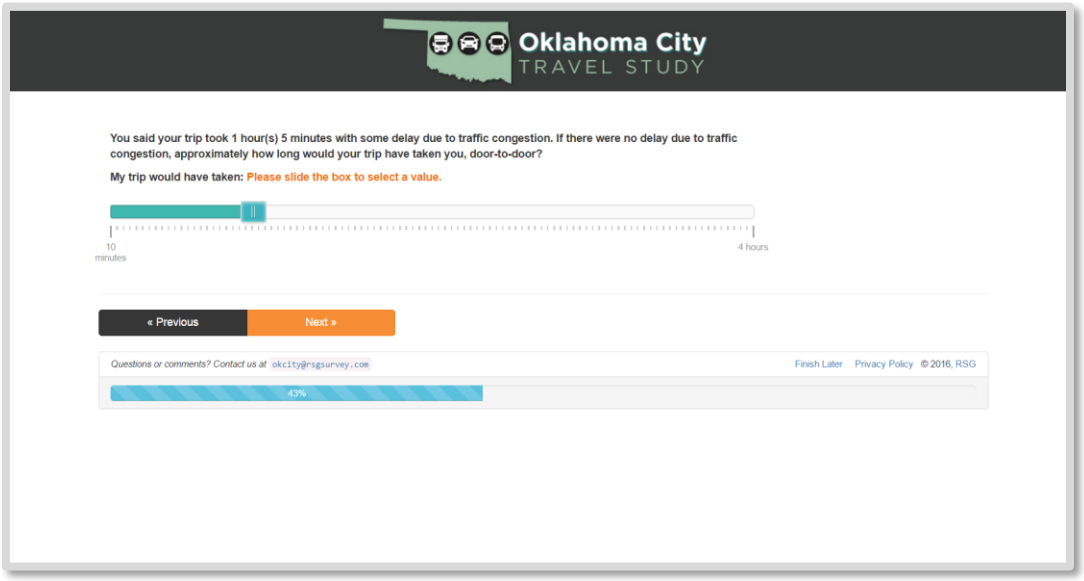


FIGURE 7-20: TOLL(S) PAID

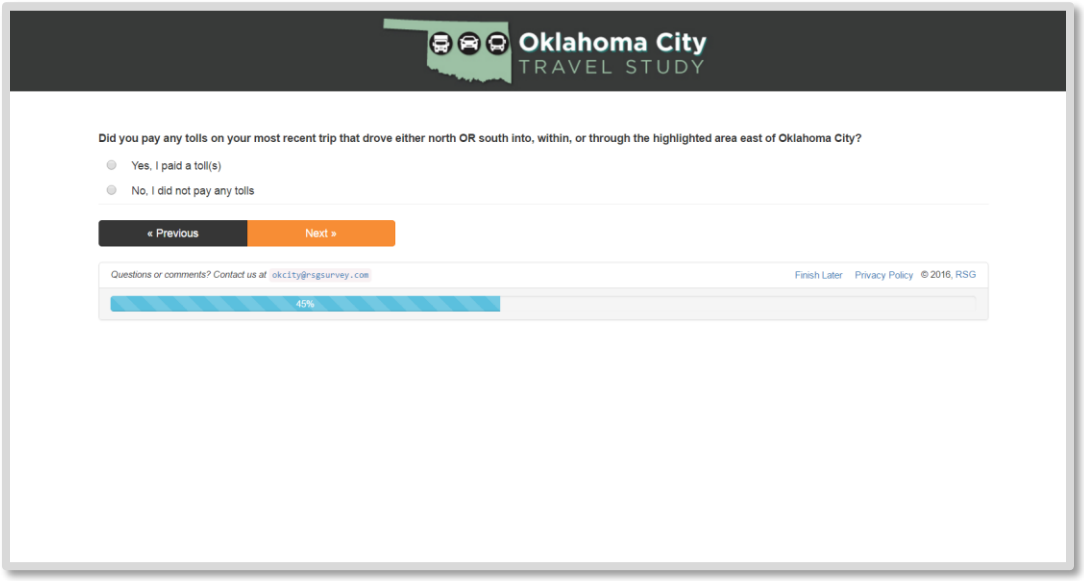


FIGURE 7-21: TOLL AMOUNT(S) PAID
If respondent paid toll(s)

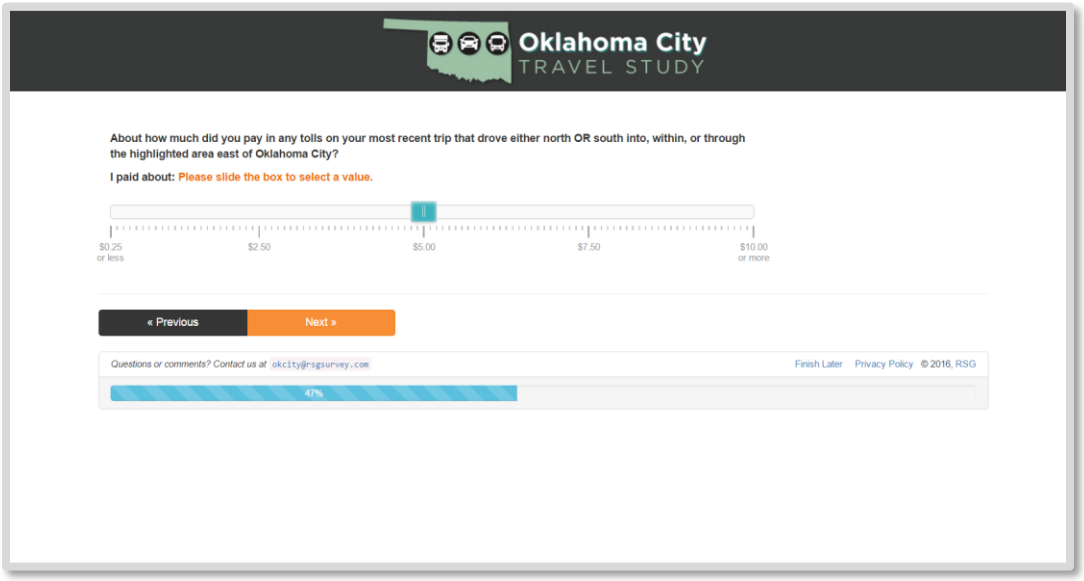


FIGURE 7-22: VEHICLE OCCUPANCY

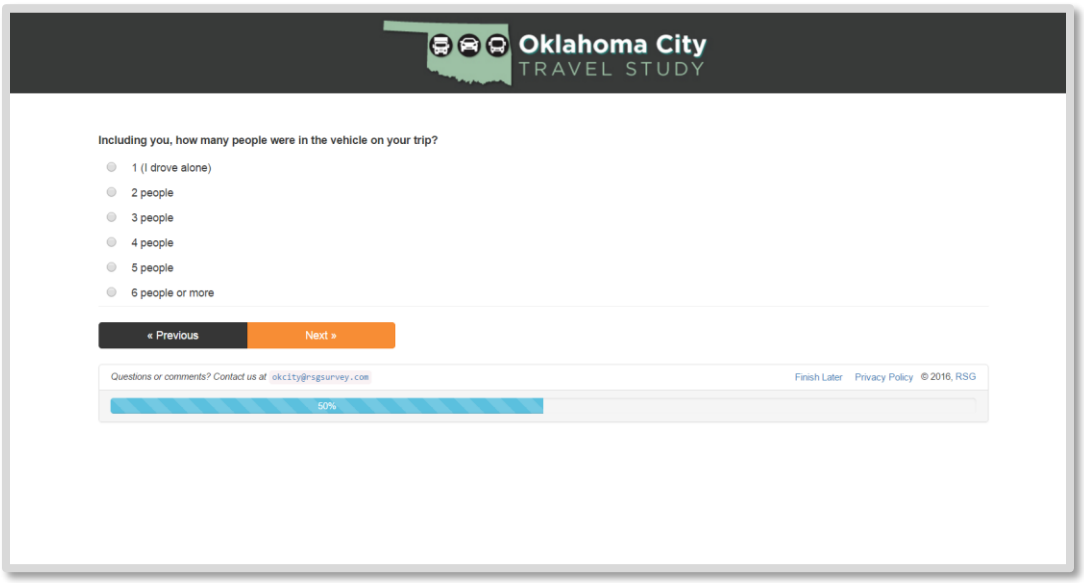


FIGURE 7-23: TRIP FREQUENCY

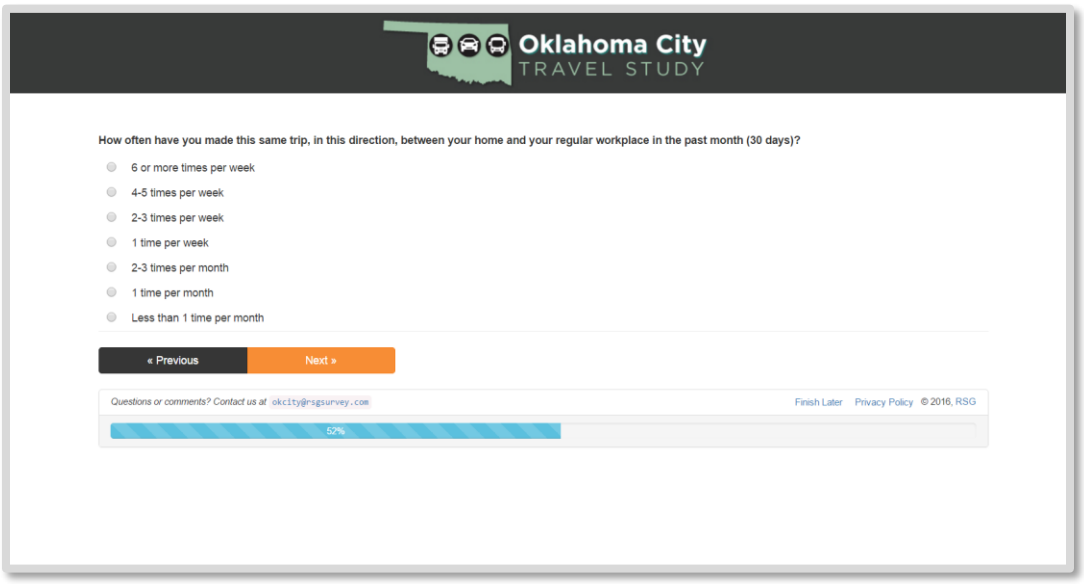


FIGURE 7-24: TRANSPONDER OWNERSHIP

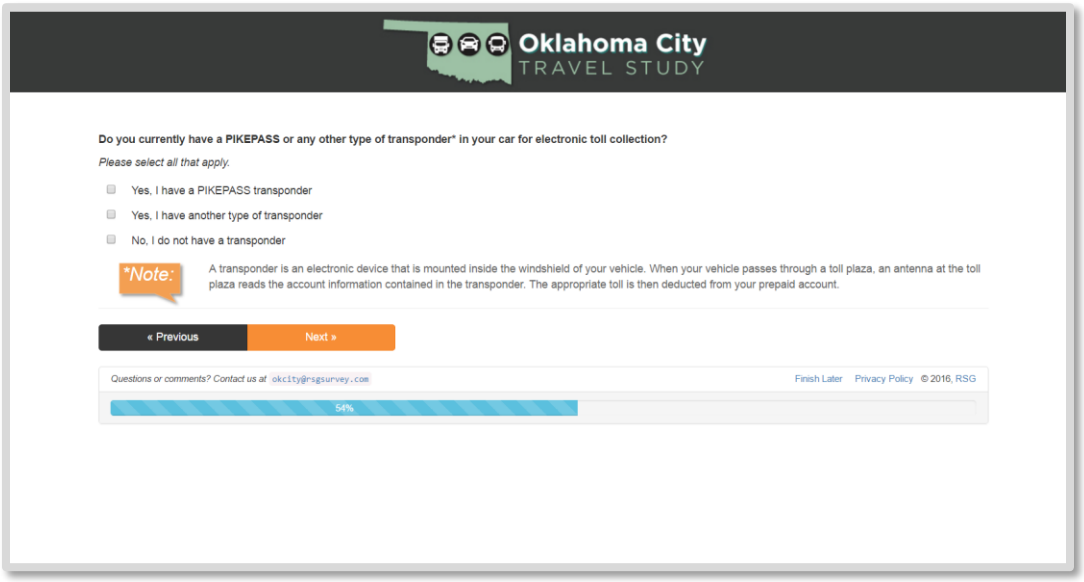
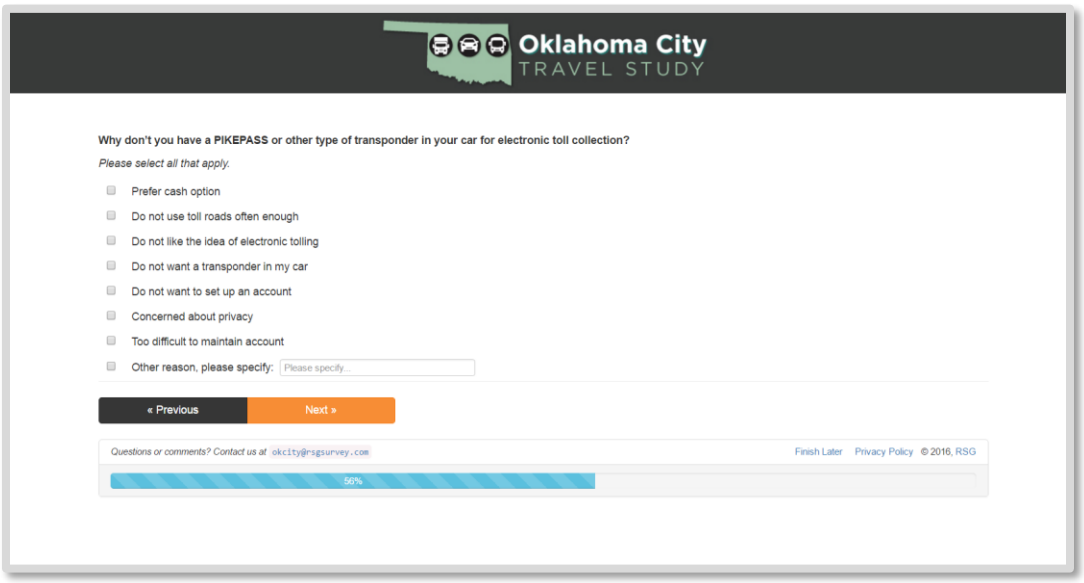


FIGURE 7-25: REASON(S) FOR NOT OWNING A TRANSPONDER
If respondent has no transponder



7.3 | STATED PREFERENCE QUESTIONS

FIGURE 7-26: PROJECT INTRODUCTION (NORTHEAST OK COUNTY LOOP VERSION)

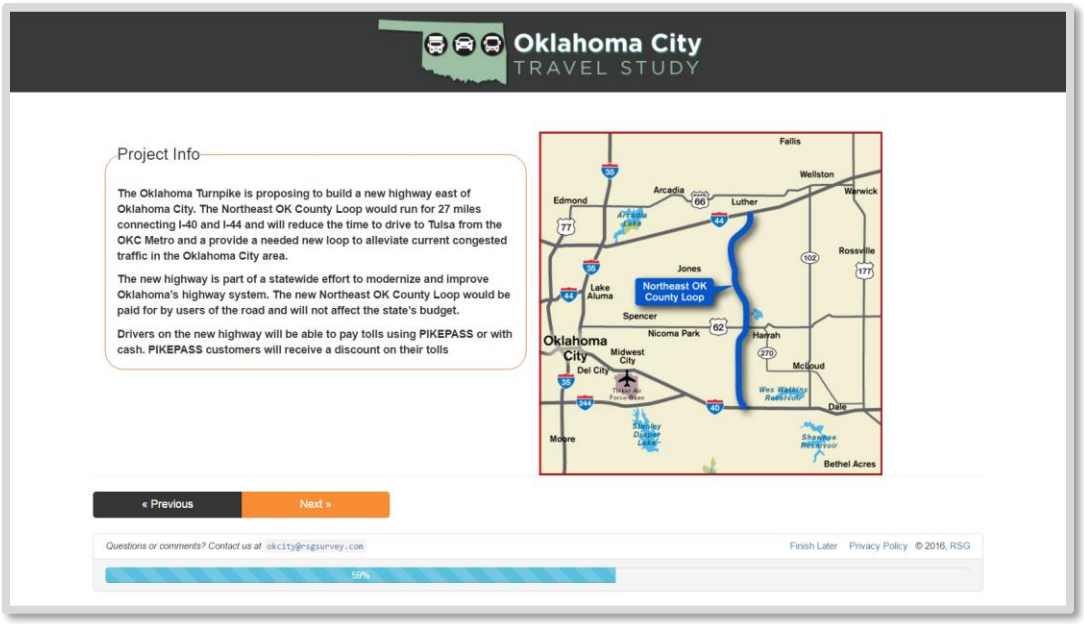


FIGURE 7-27: PROJECT INTRODUCTION (SOUTHWEST KILPATRICK EXTENSION VERSION)

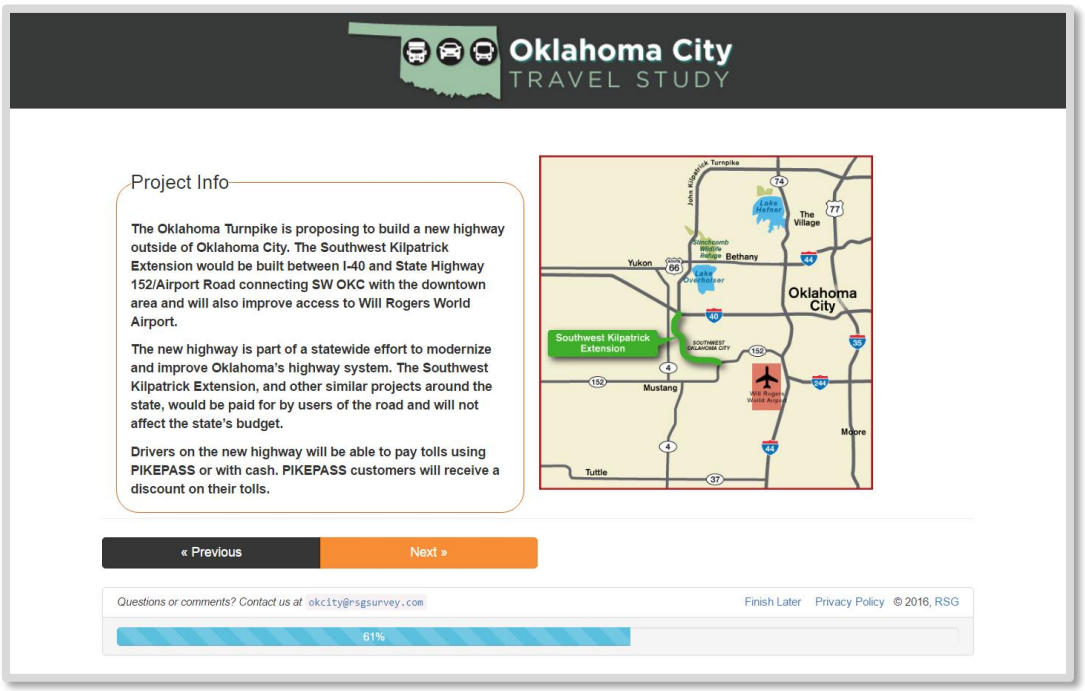


FIGURE 7-28: PROJECT INTRODUCTION (GENERAL VERSION)

FIGURE 7-29: STATED PREFERENCE (SP) INSTRUCTIONS

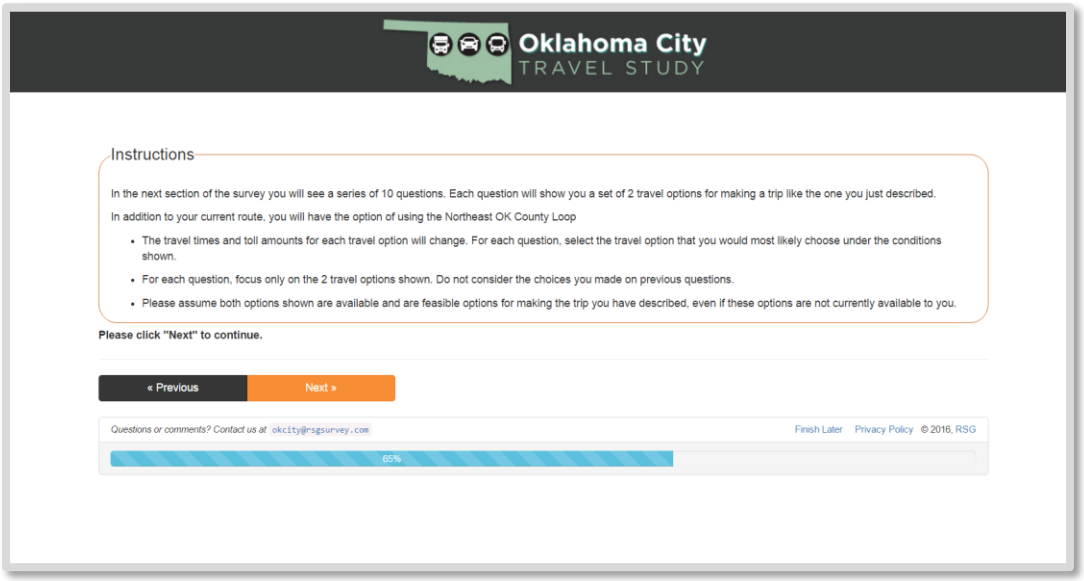


FIGURE 7-30: SP EXPERIMENT EXAMPLE #1 (NORTHEAST OK COUNTY LOOP VERSION)

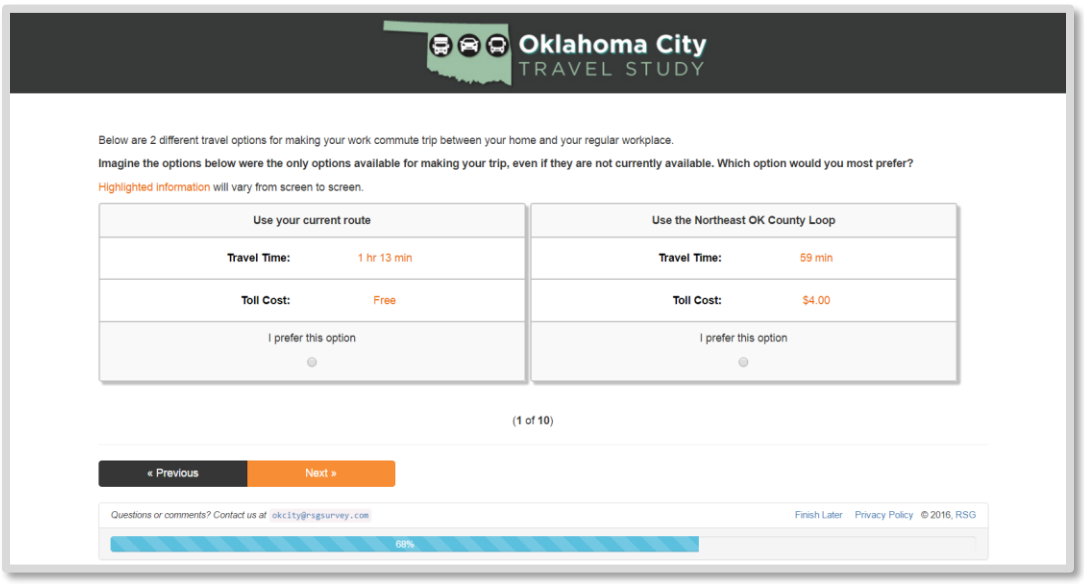


FIGURE 7-31: SP EXPERIMENT EXAMPLE #1 (SOUTHWEST KILPATRICK EXTENSION VERSION)

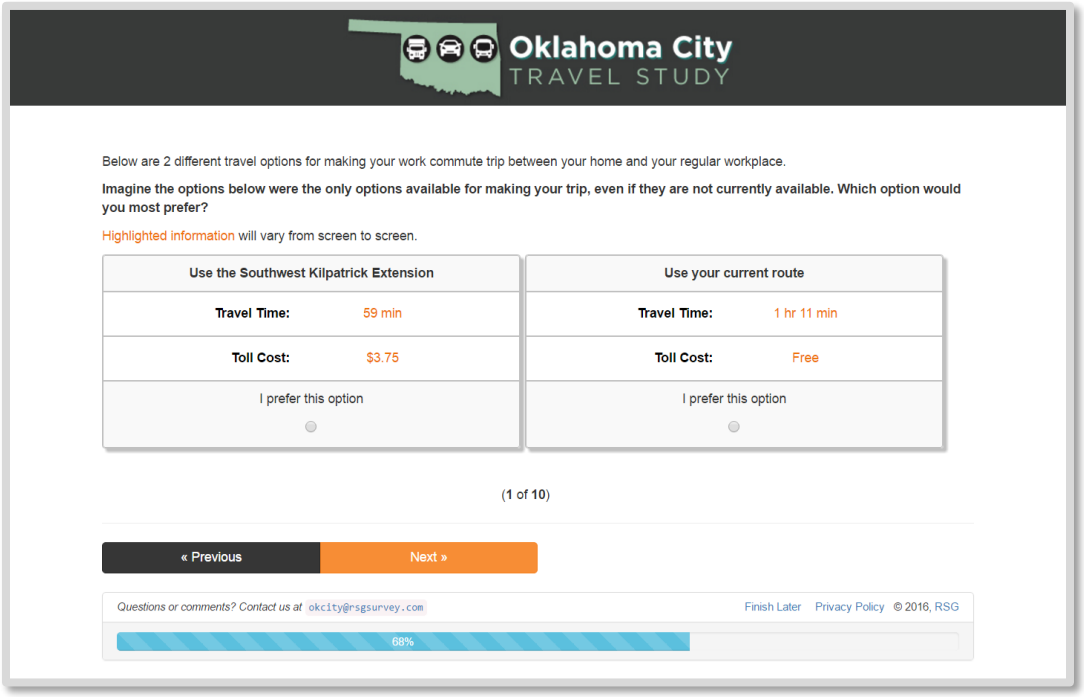


FIGURE 7-32: SP EXPERIMENT EXAMPLE #1 (GENERAL VERSION)

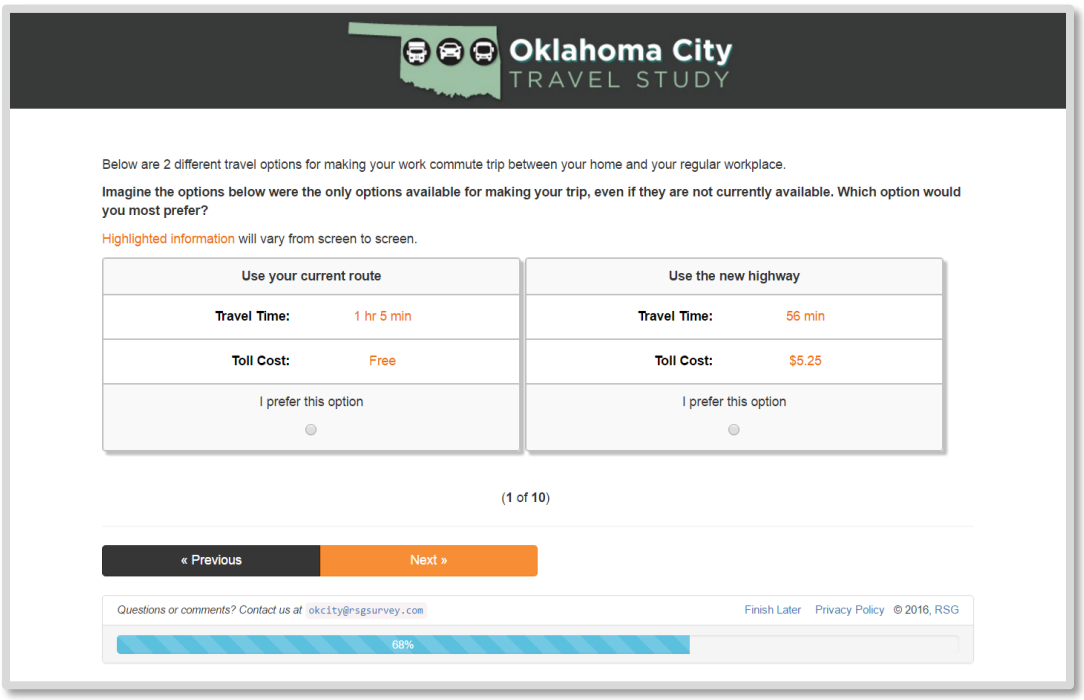


FIGURE 7-33: SP EXPERIMENT EXAMPLE #2

Examples #2-10 show the general version

FIGURE 7-34: SP EXPERIMENT EXAMPLE #3

FIGURE 7-35: SP EXPERIMENT EXAMPLE #4

FIGURE 7-36: SP EXPERIMENT EXAMPLE #5

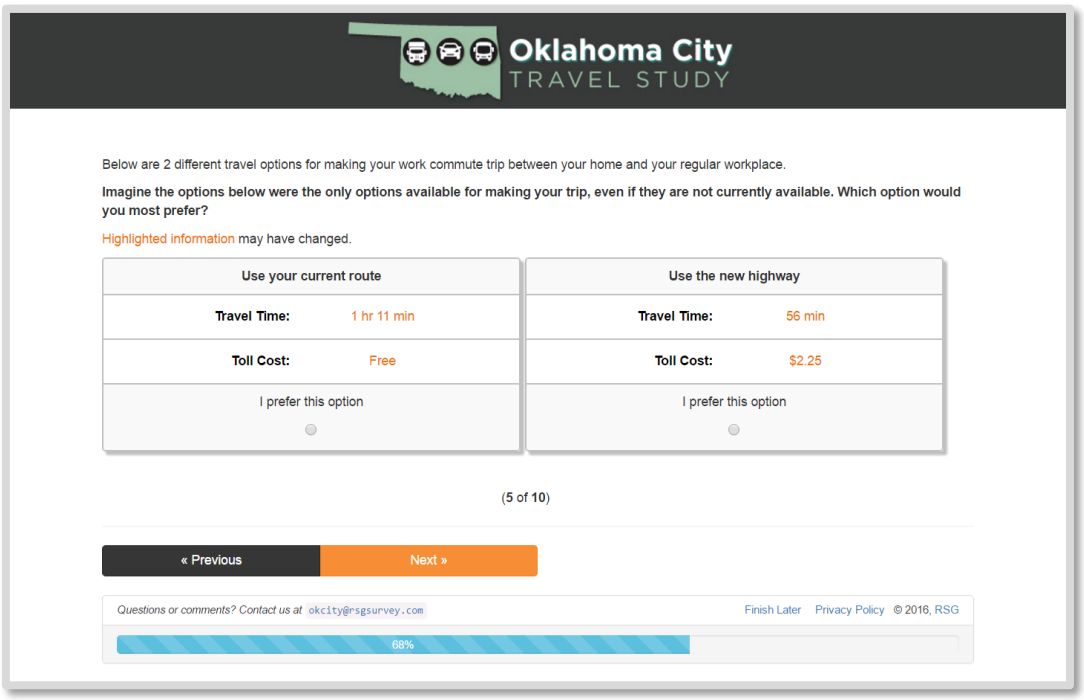


FIGURE 7-37: SP EXPERIMENT EXAMPLE #6

FIGURE 7-38: SP EXPERIMENT EXAMPLE #7

FIGURE 7-39: SP EXPERIMENT EXAMPLE #8

FIGURE 7-40: SP EXPERIMENT EXAMPLE #9

FIGURE 7-41: SP EXPERIMENT EXAMPLE #10

7.4 | DEBRIEF AND OPINION QUESTIONS

FIGURE 7-42: REASON FOR NOT SELECTING TOLLED OPTION

If never selected a tolled option in the stated preference section

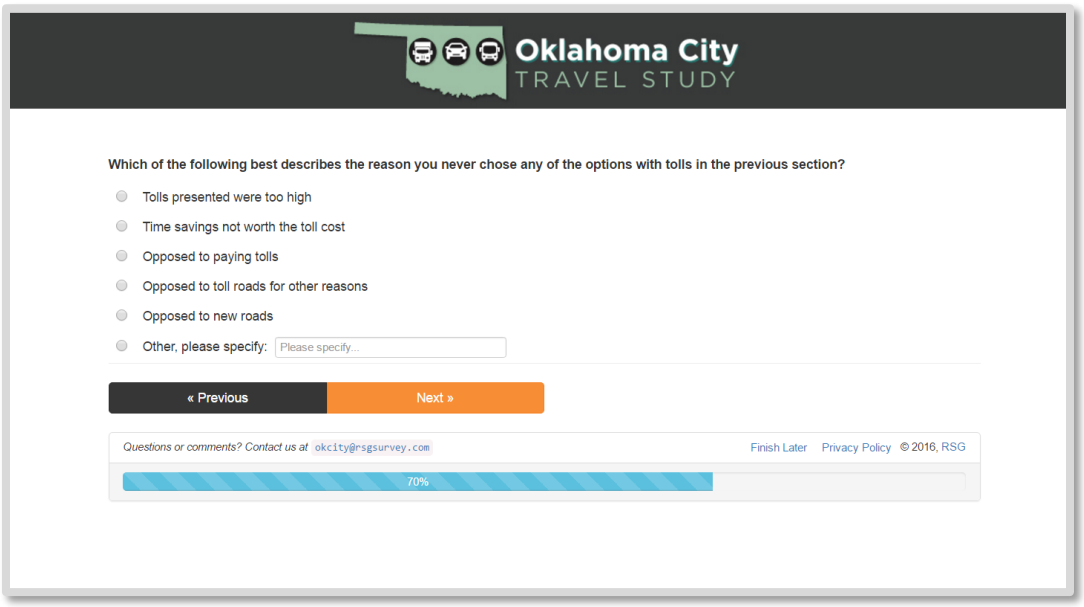


FIGURE 7-43: PROJECT OPINION

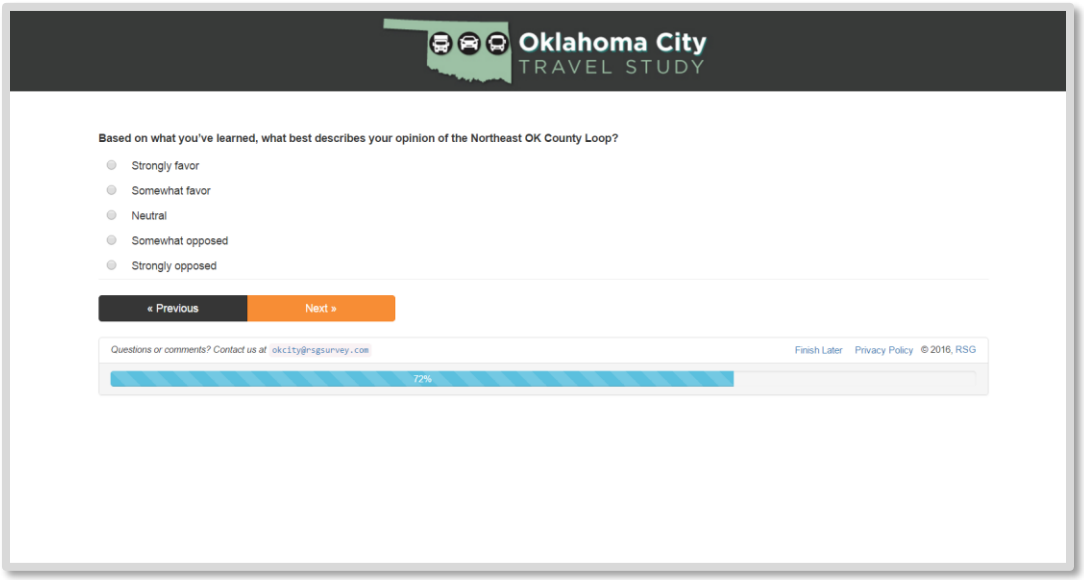


FIGURE 7-44: REASON FOR OPPOSING THE PROJECT
If somewhat or strongly opposes the project

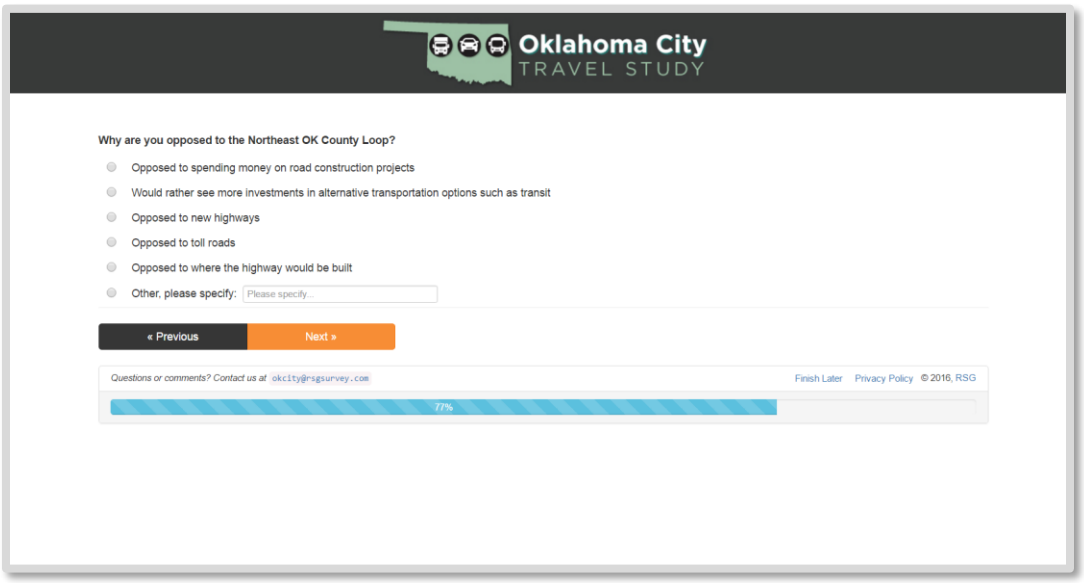


FIGURE 7-45: REASON FOR SUPPORTING THE PROJECT
If somewhat or strongly favors the project

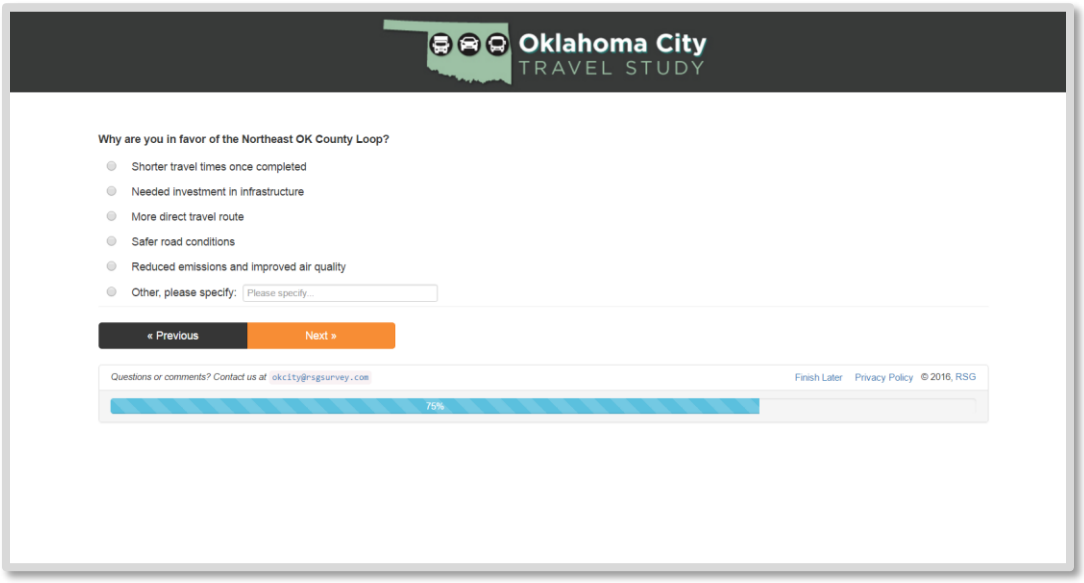
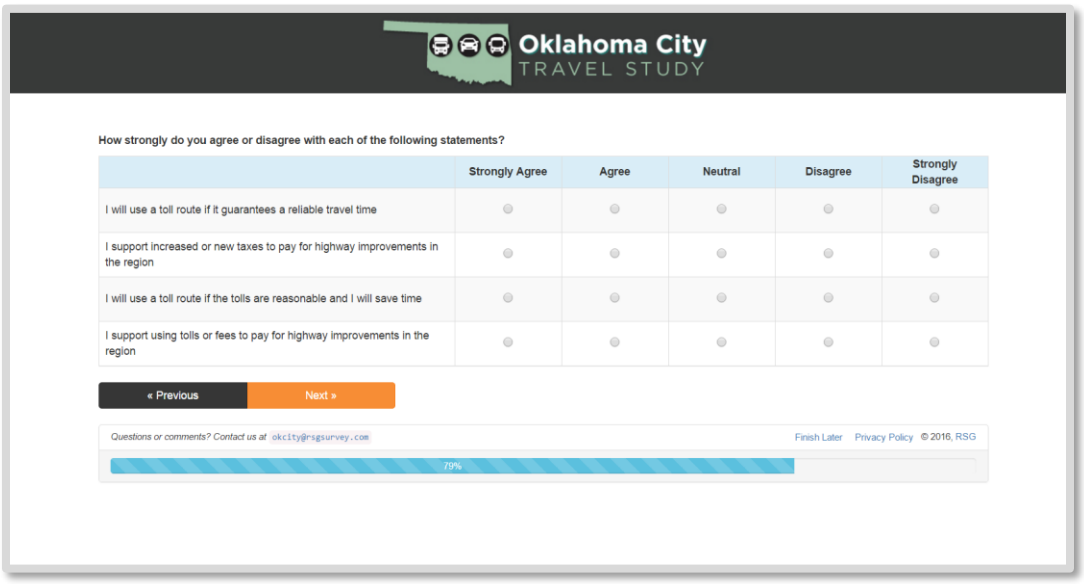


FIGURE 7-46: TOLL ATTITUDE STATEMENTS



7.5 | DEMOGRAPHIC QUESTIONS

FIGURE 7-47: ZIP CODE

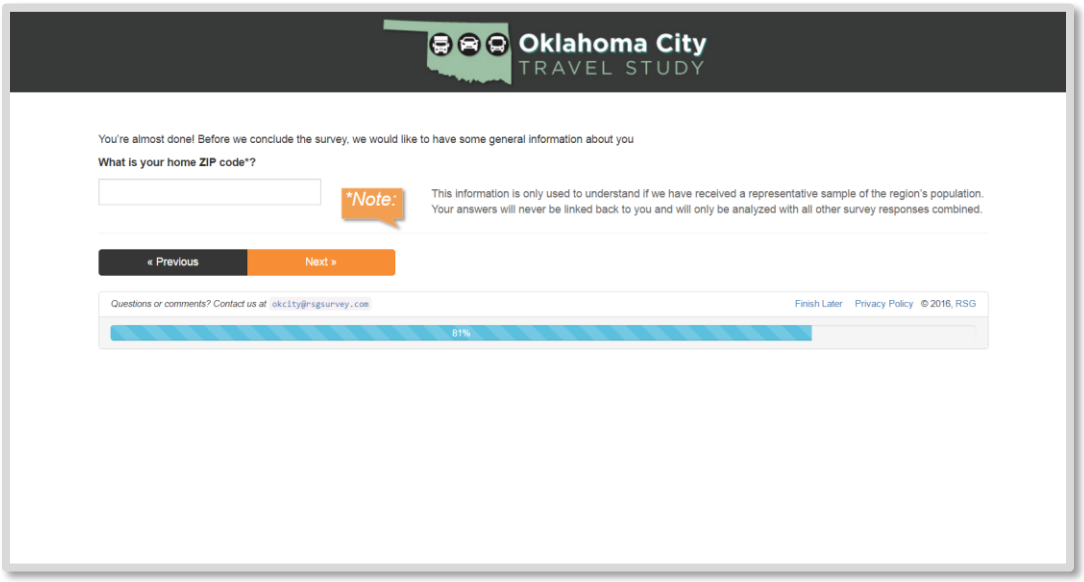


FIGURE 7-48: GENDER

FIGURE 7-49: AGE

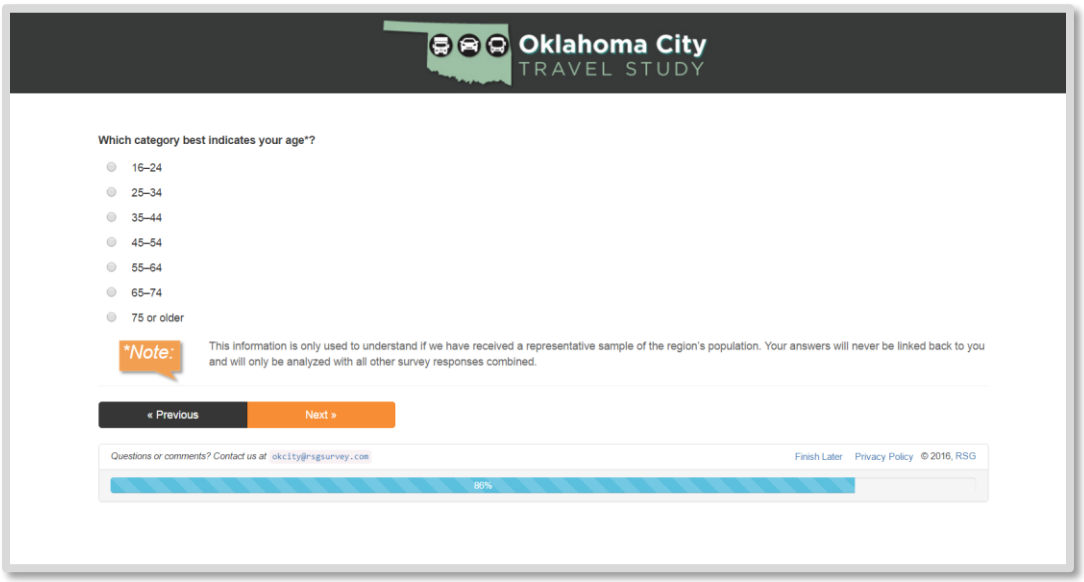


FIGURE 7-50: EMPLOYMENT STATUS

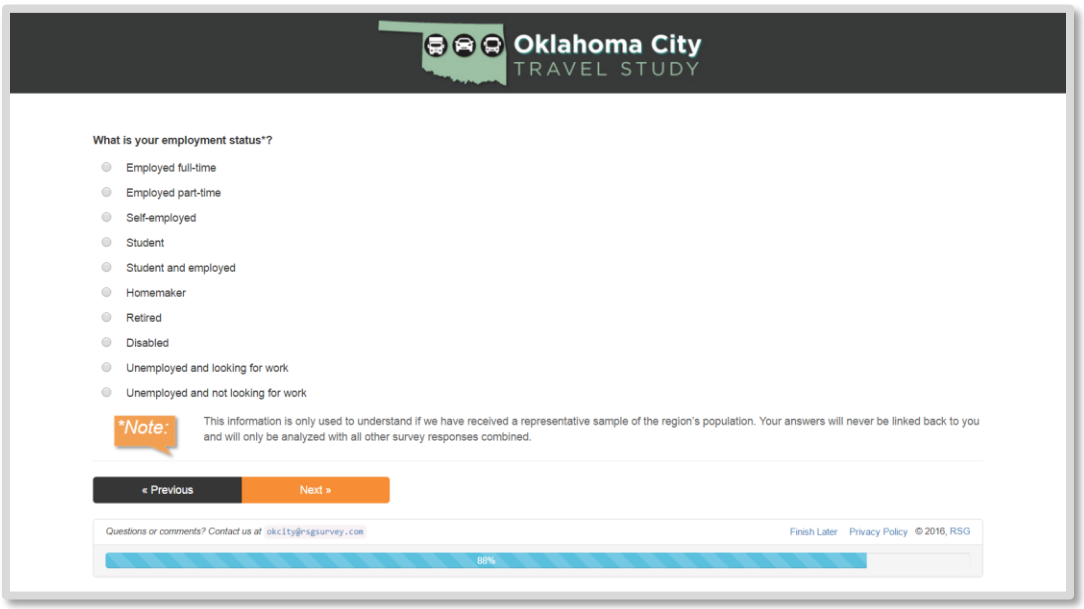


FIGURE 7-51: HOUSEHOLD SIZE

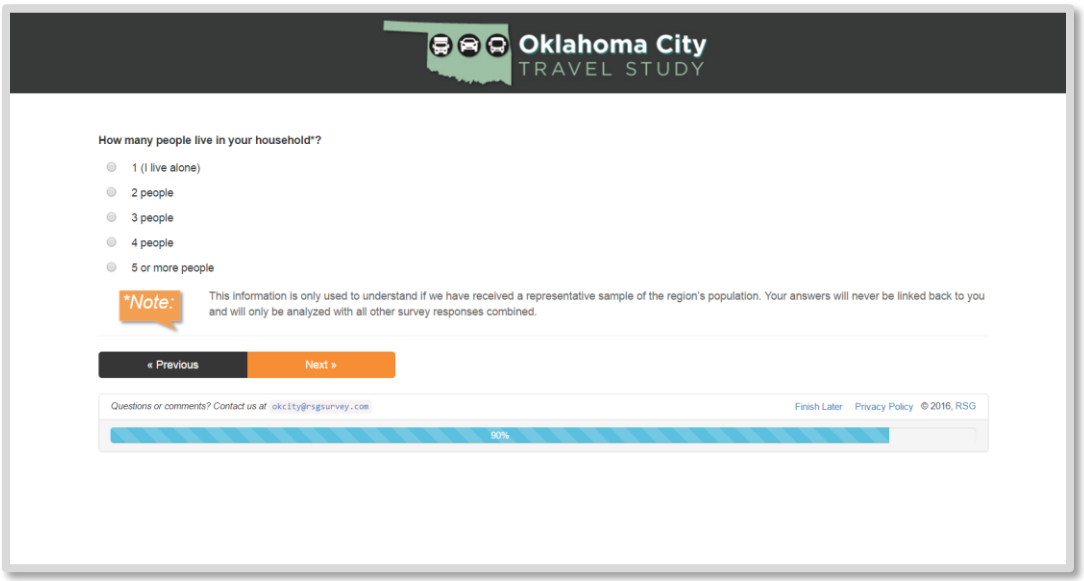


FIGURE 7-52: HOUSEHOLD VEHICLES

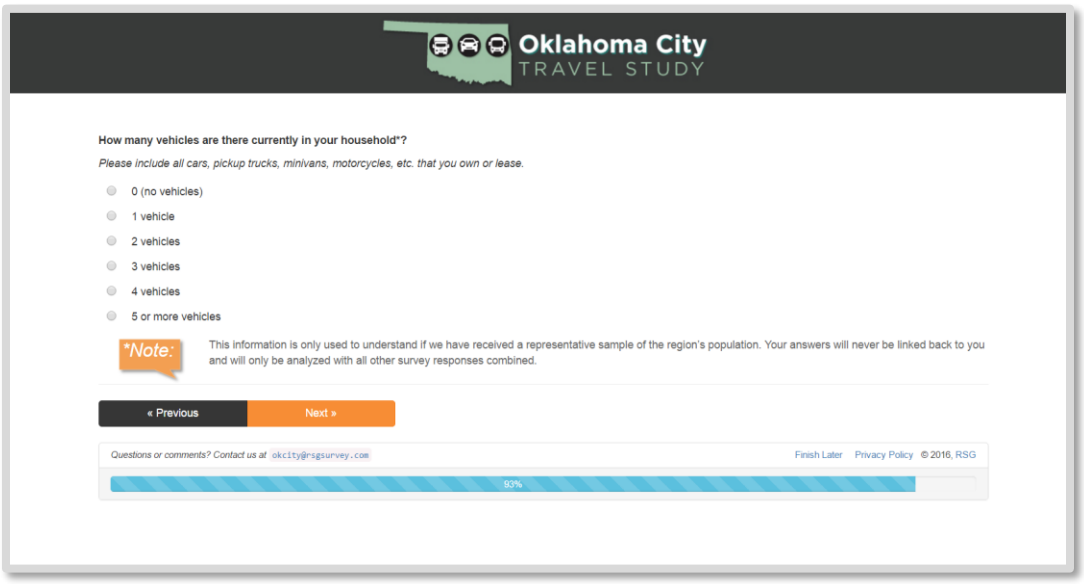


FIGURE 7-53: ANNUAL HOUSEHOLD INCOME

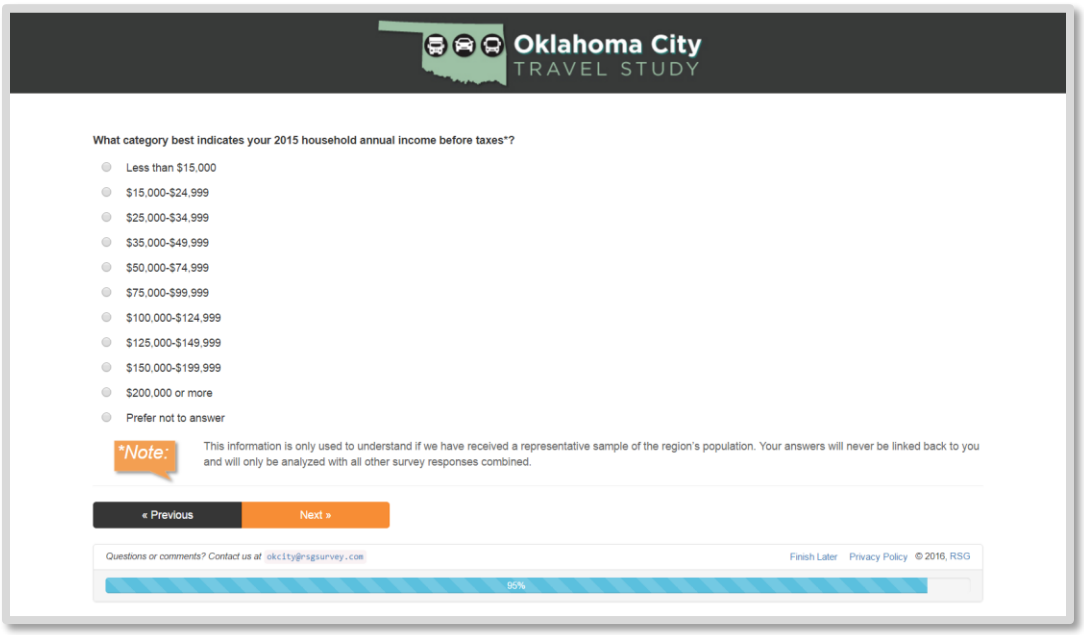
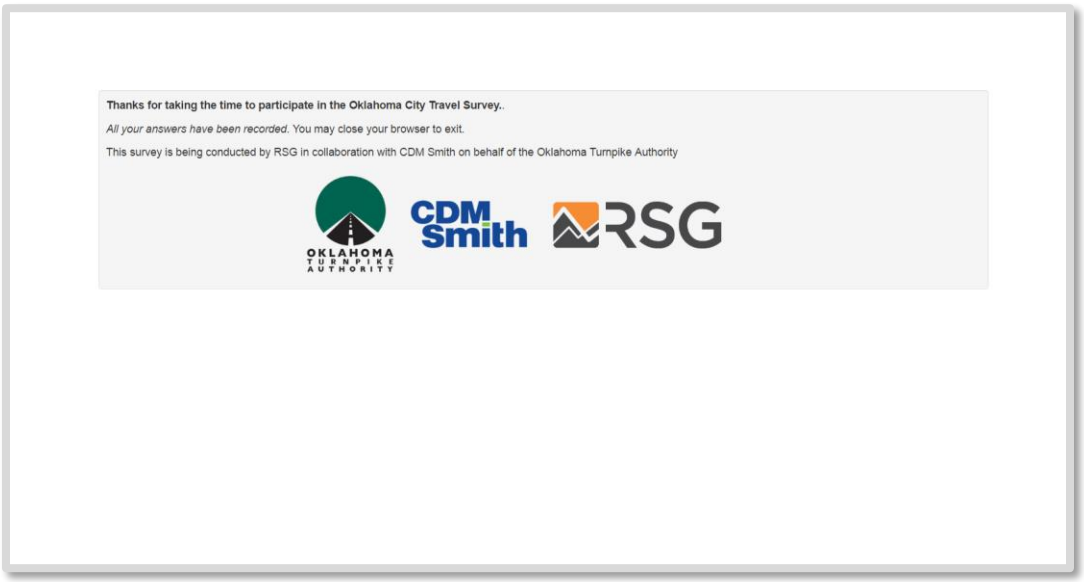


FIGURE 7-54: EMAIL ADDRESS AND SURVEY COMMENTS

FIGURE 7-55: SURVEY END



8.0 SURVEY TABULATIONS

8.1 | TRIP DETAIL QUESTIONS

TABLE 8-1: RECRUITMENT METHOD

Recruitment Method

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Postcard respondent	99	27.0%	56	15.3%	109	22.0%	264	21.5%
PIKEPASS Email respondent	268	73.0%	310	84.7%	386	78.0%	964	78.5%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-2: OK LOOP CORRIDOR

Selected OK Loop

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Yes, I have made a recent trip that fits that description	367	100.0%	100	27.3%	0	0.0%	467	38.0%
No, I have not made a recent trip that fits that description	0	0.0%	266	72.7%	495	100.0%	761	62.0%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-3: KILPATRICK EXTENSION CORRIDOR

Selected Kilpatrick Extension

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Yes, I have made a recent trip that fits that description	119	32.4%	366	100.0%	0	0.0%	485	39.5%
No, I have not made a recent trip that fits that description	248	67.6%	0	0.0%	495	100.0%	743	60.5%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-4: GENERAL TRIP

Selected General Trip

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Yes, I have made a recent trip that fits that description	0	0.0%	0	0.0%	495	100.0%	495	100.0%
No, I have not made a recent trip that fits that description	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total	0	0.0%	0	0.0%	495	100.0%	495	100.0%

If did not make a recent OK Loop or Kilpatrick Extension trip

TABLE 8-5: DAY OF WEEK

On what day of the week did you make your most recent trip?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Monday	70	19.1%	51	13.9%	94	19.0%	215	17.5%
Tuesday	60	16.3%	59	16.1%	75	15.2%	194	15.8%
Wednesday	52	14.2%	64	17.5%	80	16.2%	196	16.0%
Thursday	80	21.8%	89	24.3%	147	29.7%	316	25.7%
Friday	105	28.6%	103	28.1%	99	20.0%	307	25.0%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-6: TRIP PURPOSE

What was the primary purpose of your trip?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Go to/from work	70	19.1%	71	19.4%	204	41.2%	345	28.1%
Work-related business	51	13.9%	52	14.2%	39	7.9%	142	11.6%
Go to/from school	2	0.5%	3	0.8%	1	0.2%	6	0.5%
Go to/from the airport	5	1.4%	46	12.6%	9	1.8%	60	4.9%
Shopping	41	11.2%	32	8.7%	43	8.7%	116	9.4%
Social or recreational (such as visiting a friend or going to the movies)	94	25.6%	79	21.6%	84	17.0%	257	20.9%
Other personal business	104	28.3%	83	22.7%	115	23.2%	302	24.6%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-7: BEGIN LOCATION

Where did your trip begin?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
My home	309	84.2%	287	78.4%	407	82.2%	1003	81.7%
My regular workplace	38	10.4%	42	11.5%	59	11.9%	139	11.3%
Another place	20	5.4%	37	10.1%	29	5.9%	86	7.0%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-8: END LOCATION

Where did your trip end?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
My home	38	10.4%	40	10.9%	58	11.7%	136	11.1%
My regular workplace	60	16.3%	71	19.4%	171	34.5%	302	24.6%
Another place	269	73.3%	255	69.7%	266	53.7%	790	64.3%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-9: DEPARTURE TIME

What time did you start your trip?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
12AM - 12:59AM	0	0.0%	1	0.3%	0	0.0%	1	0.1%
1AM - 1:59AM	0	0.0%	0	0.0%	0	0.0%	0	0.0%
2AM - 2:59AM	0	0.0%	2	0.5%	0	0.0%	2	0.2%
3AM - 3:59AM	0	0.0%	2	0.5%	1	0.2%	3	0.2%
4AM - 4:59AM	3	0.8%	5	1.4%	1	0.2%	9	0.7%
5AM - 5:59AM	4	1.1%	15	4.1%	10	2.0%	29	2.4%
6AM - 6:59AM	31	8.4%	19	5.2%	52	10.5%	102	8.3%
7AM - 7:59AM	36	9.8%	49	13.4%	90	18.2%	175	14.3%
8AM - 8:59AM	32	8.7%	38	10.4%	57	11.5%	127	10.3%
9AM - 9:59AM	42	11.4%	28	7.7%	45	9.1%	115	9.4%
10AM - 10:59AM	30	8.2%	18	4.9%	27	5.5%	75	6.1%
11AM - 11:59AM	22	6.0%	17	4.6%	41	8.3%	80	6.5%
12PM - 12:59PM	16	4.4%	7	1.9%	20	4.0%	43	3.5%
1PM - 1:59PM	21	5.7%	29	7.9%	27	5.5%	77	6.3%
2PM - 2:59PM	23	6.3%	22	6.0%	18	3.6%	63	5.1%
3PM - 3:59PM	24	6.5%	24	6.6%	18	3.6%	66	5.4%
4PM - 4:59PM	24	6.5%	30	8.2%	28	5.7%	82	6.7%
5PM - 5:59PM	29	7.9%	33	9.0%	28	5.7%	90	7.3%
6PM - 6:59PM	22	6.0%	14	3.8%	16	3.2%	52	4.2%
7PM - 7:59PM	5	1.4%	5	1.4%	8	1.6%	18	1.5%
8PM - 8:59PM	2	0.5%	1	0.3%	7	1.4%	10	0.8%
9PM - 9:59PM	1	0.3%	3	0.8%	0	0.0%	4	0.3%
10PM - 10:59PM	0	0.0%	1	0.3%	1	0.2%	2	0.2%
11PM - 11:59PM	0	0.0%	3	0.8%	0	0.0%	3	0.2%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-10: TRAVEL TIME

Approximately how long did it take you, door-to-door, to drive from where your trip started to where it ended?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Less than 30 minutes	99	27.0%	139	38.0%	222	44.8%	460	37.5%
30 to 44 minutes	96	26.2%	109	29.8%	178	36.0%	383	31.2%
45 to 59 minutes	70	19.1%	61	16.7%	55	11.1%	186	15.1%
60 to 74 minutes	28	7.6%	26	7.1%	15	3.0%	69	5.6%
75 to 89 minutes	13	3.5%	6	1.6%	5	1.0%	24	2.0%
90 to 119 minutes	20	5.4%	10	2.7%	9	1.8%	39	3.2%
Two hours or more	41	11.2%	15	4.1%	11	2.2%	67	5.5%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-11: DELAY

Did you experience any delay due to traffic congestion, stop lights, train crossings, etc. on your trip?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Yes	124	33.8%	170	46.4%	196	39.6%	490	39.9%
No	243	66.2%	196	53.6%	299	60.4%	738	60.1%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-12: AMOUNT OF DELAY

Amount of delay experienced due to traffic congestion

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
No delay	243	66.2%	196	53.6%	299	60.4%	738	60.1%
Less than 15 minutes	69	18.8%	110	30.1%	147	29.7%	326	26.5%
15-29 minutes	47	12.8%	46	12.6%	40	8.1%	133	10.8%
30 or more minutes	8	2.2%	14	3.8%	9	1.8%	31	2.5%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-13: TOLL(S) PAID

Did you pay any tolls on your most recent trip?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Yes	85	23.2%	85	23.2%	165	33.3%	335	27.3%
No	282	76.8%	281	76.8%	330	66.7%	893	72.7%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-14: TOLL AMOUNT(S) PAID

Toll Amount Categories

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
$0.25 - $1.00	9	10.6%	24	28.2%	79	47.9%	112	33.4%
$1.01 - $2.00	16	18.8%	35	41.2%	55	33.3%	106	31.6%
$2.01 - $3.00	14	16.5%	16	18.8%	22	13.3%	52	15.5%
$3.01 - $4.00	16	18.8%	5	5.9%	4	2.4%	25	7.5%
$4.01 - $5.00	16	18.8%	3	3.5%	1	0.6%	20	6.0%
Greater than $5.00	14	16.5%	2	2.4%	4	2.4%	20	6.0%
Total	85	100.0%	85	100.0%	165	100.0%	335	100.0%

If respondent paid a toll on most recent trip

TABLE 8-15: VEHICLE OCCUPANCY

Including you, how many people were in the vehicle on your trip?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
1 (I drove alone)	167	45.5%	205	56.0%	342	69.1%	714	58.1%
2 people	143	39.0%	114	31.1%	126	25.5%	383	31.2%
3 people	30	8.2%	28	7.7%	18	3.6%	76	6.2%
4 people	17	4.6%	15	4.1%	8	1.6%	40	3.3%
5 people	4	1.1%	1	0.3%	1	0.2%	6	0.5%
6 people or more	6	1.6%	3	0.8%	0	0.0%	9	0.7%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-16: TRIP FREQUENCY

How often have you made this same trip, in this direction, in the past month (30 days)?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
6 or more times per week	25	6.8%	16	4.4%	29	5.9%	70	5.7%
4-5 times per week	56	15.3%	61	16.7%	163	32.9%	280	22.8%
2-3 times per week	44	12.0%	47	12.8%	49	9.9%	140	11.4%
1 time per week	32	8.7%	25	6.8%	23	4.6%	80	6.5%
2-3 times per month	79	21.5%	83	22.7%	72	14.5%	234	19.1%
1 time per month	49	13.4%	51	13.9%	66	13.3%	166	13.5%
Less than 1 time per month	82	22.3%	83	22.7%	93	18.8%	258	21.0%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-17: TRANSPONDER OWNERSHIP

Do you currently have a transponder?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Yes, I have a PIKEPASS transponder	280	76.3%	334	91.3%	442	89.3%	1056	86.0%
Yes, I have another type of transponder	4	1.1%	2	0.5%	10	2.0%	16	1.3%
No, I do not have a transponder	85	23.2%	32	8.7%	46	9.3%	163	13.3%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-18: REASON(S) FOR NOT OWNING A TRANSPONDER

Why don't you have a transponder?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Prefer cash option	8	9.4%	4	12.5%	2	4.3%	14	8.6%
Do not use toll roads often enough	53	62.4%	19	59.4%	31	67.4%	103	63.2%
Do not like the idea of electronic tolling	16	18.8%	2	6.3%	1	2.2%	19	11.7%
Do not want a transponder in my car	14	16.5%	1	3.1%	1	2.2%	16	9.8%
Do not want to set up an account	14	16.5%	2	6.3%	3	6.5%	19	11.7%
Concerned about privacy	8	9.4%	2	6.3%	2	4.3%	12	7.4%
Too difficult to maintain account	6	7.1%	2	6.3%	3	6.5%	11	6.7%
Other reason, please specify:	26	30.6%	12	37.5%	13	28.3%	51	31.3%
Total	85	100.0%	32	100.0%	46	100.0%	163	100.0%

If respondent does not own a transponder

8.2 | DEBRIEF AND OPINION QUESTIONS

TABLE 8-19: REASON FOR NOT SELECTING TOLLED OPTION

Which of the following best describes the reason you never chose any of the options with tolls in the previous section?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Tolls presented were too high	1	0.6%	7	9.1%	7	5.8%	15	4.0%
Time savings not worth the toll cost	63	36.4%	29	37.7%	58	47.9%	150	40.4%
Opposed to paying tolls	25	14.5%	5	6.5%	29	24.0%	59	15.9%
Opposed to toll roads for other reasons	18	10.4%	7	9.1%	11	9.1%	36	9.7%
Current route is more convenient	23	13.3%	14	18.2%	0	0.0%	37	10.0%
Opposed to new roads	12	6.9%	6	7.8%	4	3.3%	22	5.9%
Other, please specify:	31	17.9%	9	11.7%	12	9.9%	52	14.0%
Total	173	100.0%	77	100.0%	121	100.0%	371	100.0%

If respondent never selected a toll alternative in stated preference experiments

TABLE 8-20: PROJECT OPINION

Based on what you've learned, what best describes your opinion of the toll road?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Strongly opposed	113	30.8%	53	14.5%	76	15.4%	242	19.7%
Somewhat opposed	40	10.9%	33	9.0%	84	17.0%	157	12.8%
Neutral	76	20.7%	78	21.3%	129	26.1%	283	23.0%
Somewhat favor	65	17.7%	109	29.8%	133	26.9%	307	25.0%
Strongly favor	73	19.9%	93	25.4%	73	14.7%	239	19.5%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-21: REASON FOR SUPPORTING THE PROJECT

Why are you in favor of the new road?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Shorter travel times once completed	39	28.3%	111	55.0%	133	64.6%	283	51.8%
Needed investment in infrastructure	37	26.8%	34	16.8%	28	13.6%	99	18.1%
More direct travel route	25	18.1%	31	15.3%	0	0.0%	56	10.3%
Safer road conditions	17	12.3%	16	7.9%	36	17.5%	69	12.6%
Reduced emissions and improved air quality	1	0.7%	1	0.5%	0	0.0%	2	0.4%
Other, please specify:	19	13.8%	9	4.5%	9	4.4%	37	6.8%
Total	138	100.0%	202	100.0%	206	100.0%	546	100.0%

If respondent "strongly" or "somewhat" favors project

TABLE 8-22: REASON FOR OPPOSING THE PROJECT

Why are you opposed to the new road?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Opposed to spending money on road construction projects	1	0.7%	1	1.2%	2	1.3%	4	1.0%
Would rather see more investments in alternative transportation options such as transit	8	5.2%	10	11.6%	28	17.5%	46	11.5%
Opposed to new highways	4	2.6%	0	0.0%	3	1.9%	7	1.8%
Opposed to toll roads	51	33.3%	25	29.1%	90	56.3%	166	41.6%
Opposed to where the highway would be built	36	23.5%	27	31.4%	0	0.0%	63	15.8%
Other, please specify:	53	34.6%	23	26.7%	37	23.1%	113	28.3%
Total	153	100.0%	86	100.0%	160	100.0%	399	100.0%

If respondent "strongly" or "somewhat" opposes project

TABLE 8-23: TOLL ATTITUDE STATEMENT 1

I will use a toll route if the tolls are reasonable and I will save time

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Strongly Disagree	59	16.1%	24	6.6%	27	5.5%	110	9.0%
Disagree	32	8.7%	11	3.0%	30	6.1%	73	5.9%
Neutral	32	8.7%	27	7.4%	40	8.1%	99	8.1%
Agree	126	34.3%	123	33.6%	210	42.4%	459	37.4%
Strongly Agree	118	32.2%	181	49.5%	188	38.0%	487	39.7%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-24: TOLL ATTITUDE STATEMENT 2

I will use a toll route if it guarantees a reliable travel time

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Strongly Disagree	63	17.2%	25	6.8%	25	5.1%	113	9.2%
Disagree	35	9.5%	24	6.6%	56	11.3%	115	9.4%
Neutral	64	17.4%	74	20.2%	127	25.7%	265	21.6%
Agree	117	31.9%	147	40.2%	191	38.6%	455	37.1%
Strongly Agree	88	24.0%	96	26.2%	96	19.4%	280	22.8%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-25: TOLL ATTITUDE STATEMENT 3

I support using tolls or fees to pay for highway improvements in the region

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Strongly Disagree	89	24.3%	35	9.6%	40	8.1%	164	13.4%
Disagree	36	9.8%	27	7.4%	68	13.7%	131	10.7%
Neutral	57	15.5%	64	17.5%	116	23.4%	237	19.3%
Agree	115	31.3%	149	40.7%	183	37.0%	447	36.4%
Strongly Agree	70	19.1%	91	24.9%	88	17.8%	249	20.3%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-26: TOLL ATTITUDE STATEMENT 4

I support increased or new taxes to pay for highway improvements in the region

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Strongly Disagree	85	23.2%	57	15.6%	54	10.9%	196	16.0%
Disagree	51	13.9%	72	19.7%	90	18.2%	213	17.3%
Neutral	81	22.1%	98	26.8%	140	28.3%	319	26.0%
Agree	111	30.2%	96	26.2%	149	30.1%	356	29.0%
Strongly Agree	39	10.6%	43	11.7%	62	12.5%	144	11.7%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

8.3 | DEMOGRAPHIC QUESTIONS

TABLE 8-27: GENDER

What is your gender*?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Female	185	50.4%	167	45.6%	238	48.1%	590	48.0%
Male	182	49.6%	199	54.4%	257	51.9%	638	52.0%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-28: AGE

Which category best indicates your age*?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
16–24	7	1.9%	7	1.9%	7	1.4%	21	1.7%
25–34	59	16.1%	48	13.1%	72	14.5%	179	14.6%
35–44	71	19.3%	76	20.8%	70	14.1%	217	17.7%
45–54	76	20.7%	69	18.9%	83	16.8%	228	18.6%
55–64	91	24.8%	99	27.0%	132	26.7%	322	26.2%
65–74	53	14.4%	53	14.5%	108	21.8%	214	17.4%
75 or older	10	2.7%	14	3.8%	23	4.6%	47	3.8%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-29: EMPLOYMENT STATUS

What is your employment status*?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Employed full-time	217	59.1%	234	63.9%	304	61.4%	755	61.5%
Employed part-time	8	2.2%	12	3.3%	21	4.2%	41	3.3%
Self-employed	34	9.3%	29	7.9%	32	6.5%	95	7.7%
Student	1	0.3%	4	1.1%	0	0.0%	5	0.4%
Student and employed	3	0.8%	3	0.8%	5	1.0%	11	0.9%
Homemaker	20	5.4%	8	2.2%	15	3.0%	43	3.5%
Retired	72	19.6%	71	19.4%	115	23.2%	258	21.0%
Disabled	8	2.2%	1	0.3%	1	0.2%	10	0.8%
Unemployed and looking for work	4	1.1%	4	1.1%	2	0.4%	10	0.8%
Unemployed and not looking for work	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-30: HOUSEHOLD SIZE

How many people live in your household*?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
1 (I live alone)	37	10.1%	51	13.9%	94	19.0%	182	14.8%
2 people	165	45.0%	177	48.4%	250	50.5%	592	48.2%
3 people	72	19.6%	59	16.1%	75	15.2%	206	16.8%
4 people	58	15.8%	41	11.2%	49	9.9%	148	12.1%
5 or more people	35	9.5%	38	10.4%	27	5.5%	100	8.1%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-31: NUMBER OF VEHICLES

How many vehicles are there currently in your household*?

	OK Loop		Kilpatrick Extension		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
0 (no vehicles)	0	0.0%	0	0.0%	0	0.0%	0	0.0%
1 vehicle	41	11.2%	50	13.7%	98	19.8%	189	15.4%
2 vehicles	169	46.0%	182	49.7%	253	51.1%	604	49.2%
3 vehicles	83	22.6%	79	21.6%	85	17.2%	247	20.1%
4 vehicles	51	13.9%	29	7.9%	40	8.1%	120	9.8%
5 or more vehicles	23	6.3%	26	7.1%	19	3.8%	68	5.5%
Total	367	100.0%	366	100.0%	495	100.0%	1228	100.0%

TABLE 8-32: ANNUAL HOUSEHOLD INCOME

Annual household income before taxes

	OK Loop		Kilpatrick		General		Total	
	Count	Percent	Count	Percent	Count	Percent	Count	Percent
Less than $15,000	3	1.0%	6	1.9%	3	0.8%	12	1.2%
$15,000-$24,999	4	1.3%	8	2.5%	10	2.5%	22	2.1%
$25,000-$34,999	11	3.6%	14	4.3%	19	4.8%	44	4.3%
$35,000-$49,999	31	10.1%	28	8.7%	43	10.8%	102	9.9%
$50,000-$74,999	69	22.5%	60	18.6%	87	21.8%	216	21.0%
$75,000-$99,999	69	22.5%	61	18.9%	68	17.0%	198	19.3%
$100,000-$124,999	43	14.1%	61	18.9%	61	15.3%	165	16.1%
$125,000-$149,999	19	6.2%	36	11.1%	39	9.8%	94	9.1%
$150,000-$199,999	37	12.1%	27	8.4%	31	7.8%	95	9.2%
$200,000 or more	20	6.5%	22	6.8%	38	9.5%	80	7.8%
Total	306	100.0%	323	100.0%	399	100.0%	1028	100.0%

Appendix B

Stated Preference Survey – Tulsa

This appendix contains the documentation of the Tulsa area stated preference survey as provided by the subconsultant, Resource Systems Group. This report was provided to CDM Smith in September 2016.

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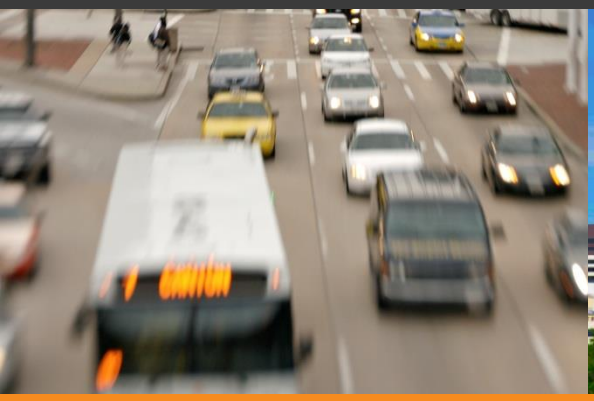
FINAL REPORT

TULSA STATED PREFERENCE SURVEY

RSG
the science of insight

9.14.2016



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1.0 EXECUTIVE SUMMARY

CDM Smith, in collaboration with the Oklahoma Turnpike Authority (OTA), is preparing a traffic and revenue forecast for the proposed extension of the Gilcrease Expressway. The newly-constructed roadway would cross the Arkansas River west of downtown Tulsa and connect L.L. Tisdale to I-44, relieving congestion during peak periods and providing a more direct route to Tulsa's urban core. Figure 1-1 shows the approximate alignment of the Gilcrease Expressway extension. As part of this work, Resource Systems Group, Inc. (RSG) conducted a stated preference (SP) survey in the greater Tulsa area. RSG collaborated with CDM Smith to design and conduct the survey, the results of which will be used in CDM Smith's travel demand forecasting model for the region.

FIGURE 1-1: PROPOSED ALIGNMENT OF THE GILCREASE EXPRESSWAY

The primary purpose of the Tulsa Travel Study was to estimate the willingness to pay for travel time savings, or value of time (VOT), of passenger vehicle travelers who are candidates for using the proposed facility, or who make automobile trips on other highways in the greater Tulsa area. Based on respondents' answers in the SP experiments, these estimates of travelers' values of time will be used to support highway traffic and toll revenue projections. In preparation for the SP experiments, the questionnaire also collected data on respondents' current travel behaviors (known as "revealed preferences") and presented respondents with information about the proposed facility.

The web-based survey approach employed a computer-assisted self-interview (CASI) technique developed by RSG. The stated preference survey instrument was customized for each respondent by presenting questions and modifying language based on respondents' previous answers. These dynamic survey features provided an accurate and efficient means of data collection and allowed the presentation of realistic future conditions that

corresponded with the respondents' reported experiences. RSG's proprietary software was customized for online administration to targeted audiences in the study region.

Respondents from a selection of ZIP codes in or around the study corridor and the larger Tulsa region were contacted through the following methods:

- E-mail invitations sent to PIKEPASS transponder customers
- Postcard invitations mailed to 20,000 residents

A total of 1,143 surveys were collected in May and June of 2016. Stated preference data from the survey were analyzed using accepted statistical techniques to estimate the coefficients of a set of multinomial logit (MNL) models. The model coefficients provide estimates of travelers' sensitivities to varying travel times and toll costs and can be used to calculate values of time.

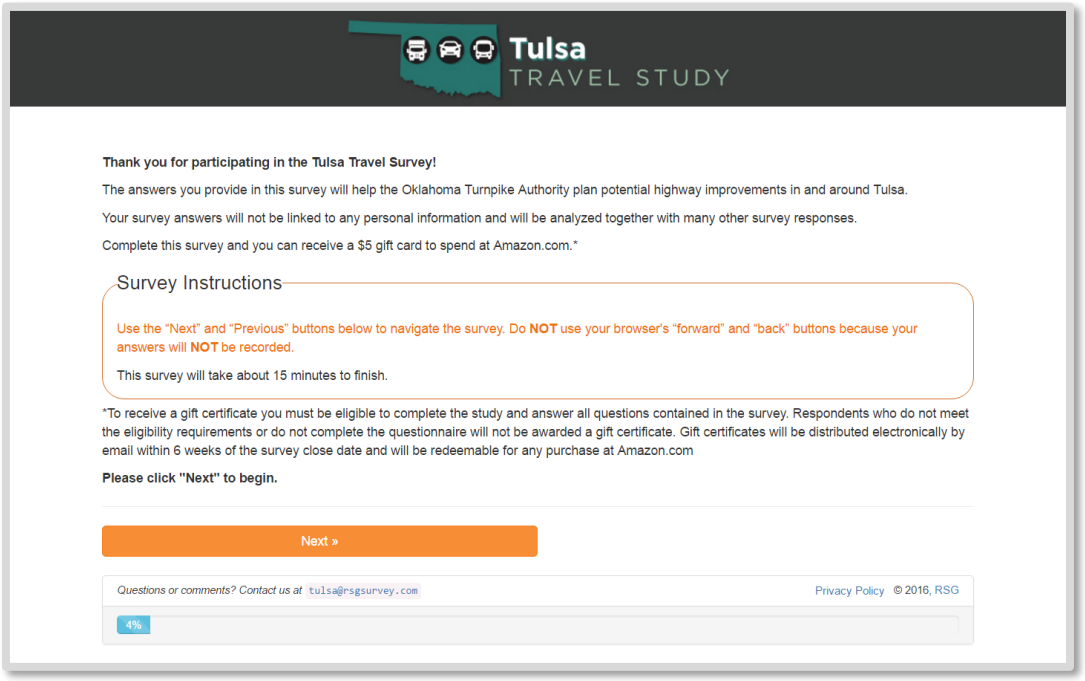
This report documents the development and administration of the survey questionnaire, presents survey results, and summarizes the discrete choice model estimation methodology and findings. The questions in survey screen captures and response tabulations are presented in the final sections of this report.

2.0 QUESTIONNAIRE

RSG worked closely with CDM Smith and the project team to develop a stated preference questionnaire to meet the objectives of the study. The questionnaire collected information necessary to estimate values of time for various traveler market segments who make trips within the proposed corridor or on other highways in the greater Tulsa area.

Respondents were presented with an introduction screen at the beginning of the survey that described the purpose of the survey, the time required to complete it, and instructions for navigating the online instrument (Figure 2-1). Respondents were also able to contact a member of the survey team with any technical questions via e-mail using the "Contact Us" option included at the bottom of all survey screens.

FIGURE 2-1: SAMPLE SURVEY SCREEN – INTRODUCTION AND INSTRUCTIONS



The survey was designed to collect information about a recent trip that a respondent made within, through, or into the proposed corridor of the Gilcrease Expressway or using other highways in the greater Tulsa area. Once data about a recent qualifying trip was collected, the survey then explored how drivers might alter their travel behavior given hypothetical future travel routes. Opinion and demographic information was also collected, with the survey instrument ultimately consisting of five main sections:

1. Qualification questions, which determined respondent eligibility
2. Trip detail questions, which collected details about a recent one-way trip made in the Gilcrease Expressway corridor or a trip that used other highways within the Tulsa area

3. Stated preference questions, which were designed to reveal respondents' sensitivities to travel time savings and toll costs
4. Debrief and opinion questions, which were designed to identify the reasons behind choices made in the SP questions and to understand respondents' attitudes toward tolling and possible transportation improvements in the area
5. Demographic questions, which sought to ensure that a diverse sample of the traveling population had been reached and also to facilitate comparisons between different demographic groups

The complete set of survey questions (as they appeared to respondents on-screen) is included in Section 7.0.

2.1 | QUALIFICATION QUESTIONS

Following the survey introduction, respondents were shown either one or two trip qualification questions to determine if they were eligible to participate in the survey. To be eligible, respondents needed to have made a trip that met the following conditions:

- The trip was made in the past month (30 days) – This timeframe was selected to include respondents who make less frequent trips while also ensuring trips were recent enough for respondents to accurately recall specific details.
- The trip took at least ten minutes – A ten-minute minimum helped ensure trips that could reasonably use highways and allowed meaningful travel time variations to be shown in the stated preference choice experiments.
- The trip was made on a weekday (Monday-Friday).
- The trip traveled through certain areas of (or used the highways around) Tulsa. The first screener question assessed whether the respondent's trip could have used the proposed Gilcrease Expressway (Figure 2-2). If a respondent did not travel in this area, then they were shown a second screener question (Figure 2-3). This more general screener question confirmed the respondent had made a trip that used a highway in the Tulsa area and met the other study criteria.

FIGURE 2-2: SAMPLE SURVEY SCREEN – TRIP QUALIFICATION (GILCREASE EXPRESSWAY STUDY AREA)

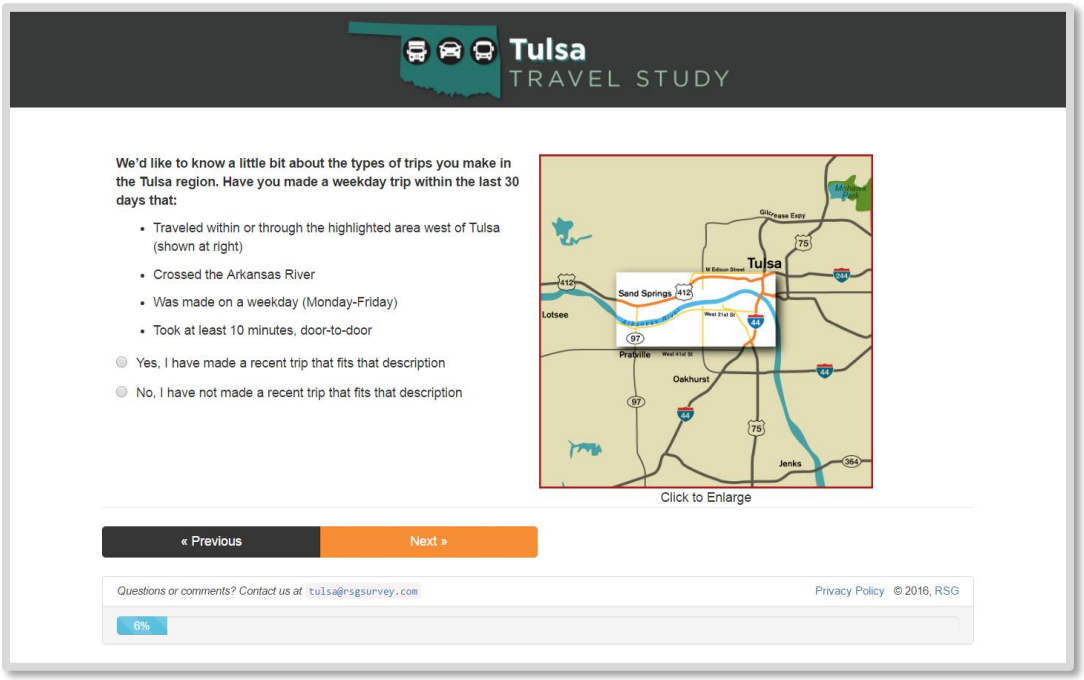
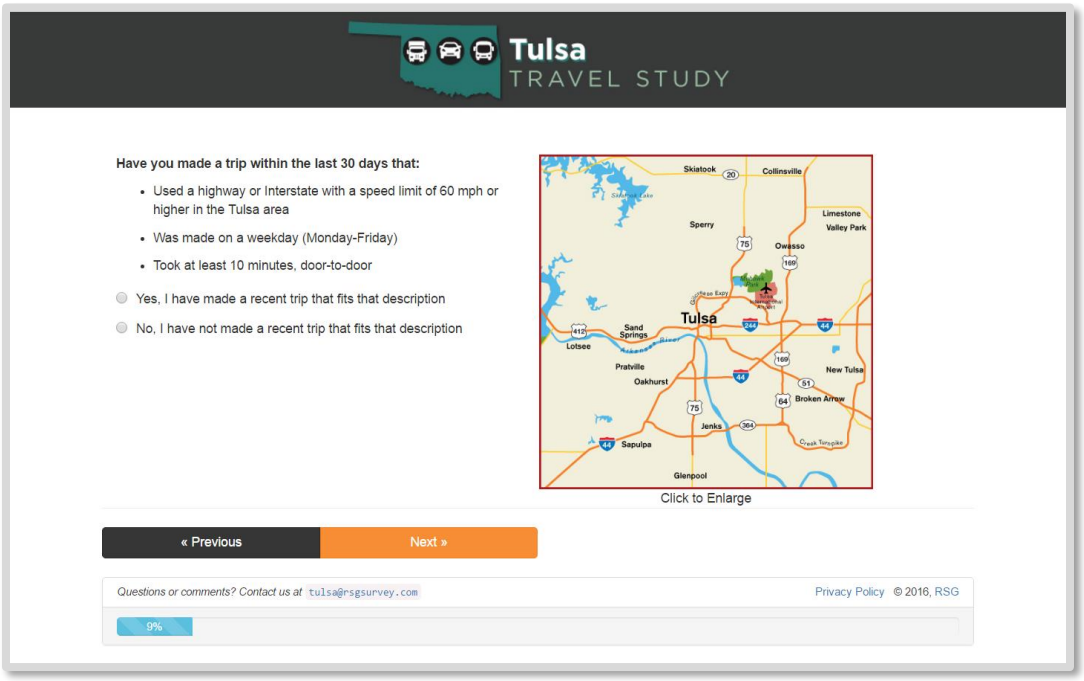


FIGURE 2-3: SAMPLE SURVEY SCREEN – TRIP QUALIFICATION (GENERAL STUDY AREA)



2.2 | TRIP DETAIL QUESTIONS

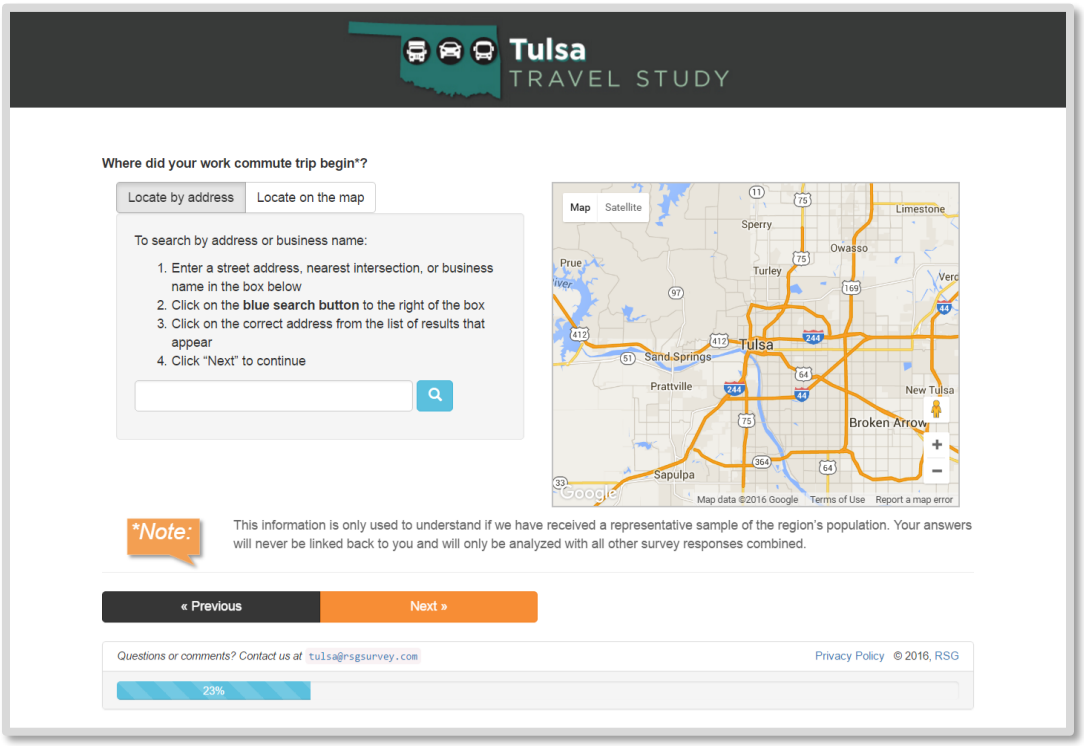
Qualifying respondents were asked to focus for the duration of the survey on their most recent trip that met the criteria outlined above. The survey specified their most recent trip (and not a typical or average trip that they might make) to obtain a representative sample of trip types made in the region. This most recent trip (referred to as the respondent's "reference trip") formed the basis for the trip detail questions. Focusing on their most recent trip also gave respondents a more concrete frame of reference when considering the stated preference scenarios later in the survey.

Respondents were instructed to think about a one-way trip (rather than an entire round trip) and were then asked a series of questions regarding the specific details of that reference trip including:

- Day of week traveled
- Trip purpose
- Beginning and ending location types (e.g., home, work, other)
- Trip origin and destination locations
- Trip departure time
- Door-to-door travel time
- Delays encountered (with duration, if any)
- Tolls paid (with amount, if any)
- Vehicle occupancy
- Trip frequency
- Transponder ownership (or reason for not owning)

Respondents used a Google Maps-based geocoder developed by RSG to identify the specific location of their trip's origin and destination. This tool allowed respondents to text-search for a business name, street intersection, or full address, or alternatively, to click on an interactive map (Figure 2-4). Origin and destination locations were geocoded using a Google Maps application-programming interface (API) to record latitude and longitude values for both the trip origin and destination. These coordinates were used to verify that the trip began and ended in two different locations (i.e. was not a round trip) and that the trip could have reasonably traveled through the relevant study area, as well as to measure the potential distance the respondent may have traveled on the proposed facilities. The geocoding application was also used to estimate travel time for comparison to respondents' reported travel times. If the locations of a trip's origin and destination suggested an invalid trip, respondents were reminded to describe a one-way portion of the trip and asked if they needed to change their beginning or ending location.

FIGURE 2-4: SAMPLE SURVEY SCREEN – ORIGIN ADDRESS AND MAP INTERFACE



2.3 | STATED PREFERENCE QUESTIONS

After respondents provided detailed information about their most recent trip, that information was used to construct stated preference exercises involving hypothetical variations based on that reference trip. Depending on their answers to the screener questions, respondents were provided with an introduction to either the proposed Gilcrease Expressway (Figure 2-5), or (if they indicated not having traveled through the study corridor, but having made a trip using other highways) a general introduction to possible new highways in the area that may be used for future trips (Figure 2-6).

FIGURE 2-5: SAMPLE SURVEY SCREEN – GILCREASE EXPRESSWAY SP INTRODUCTION

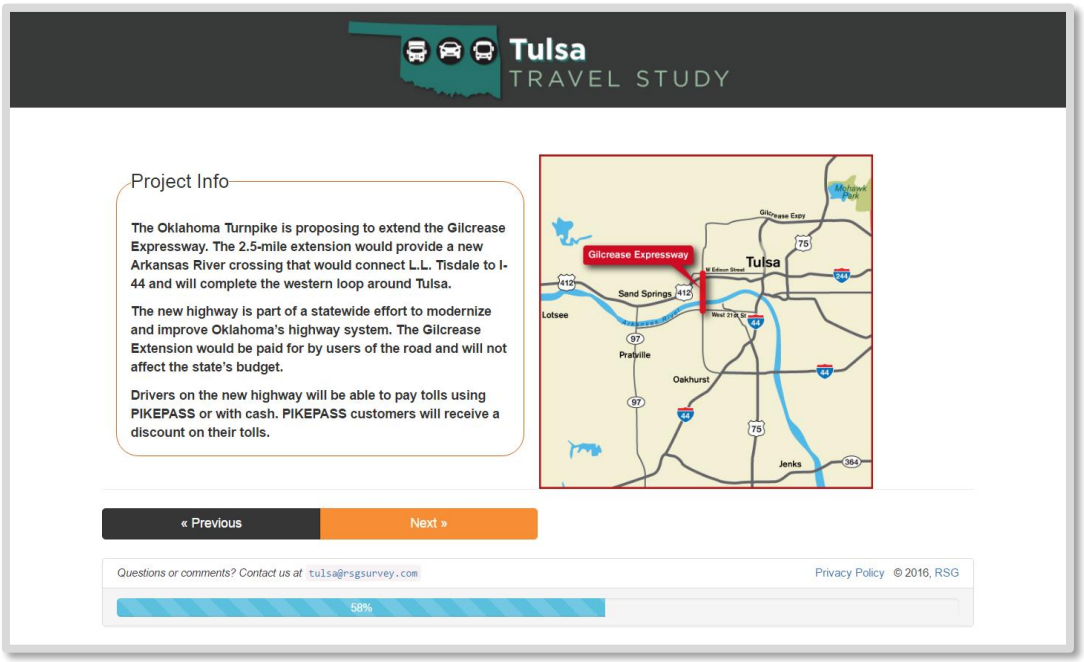
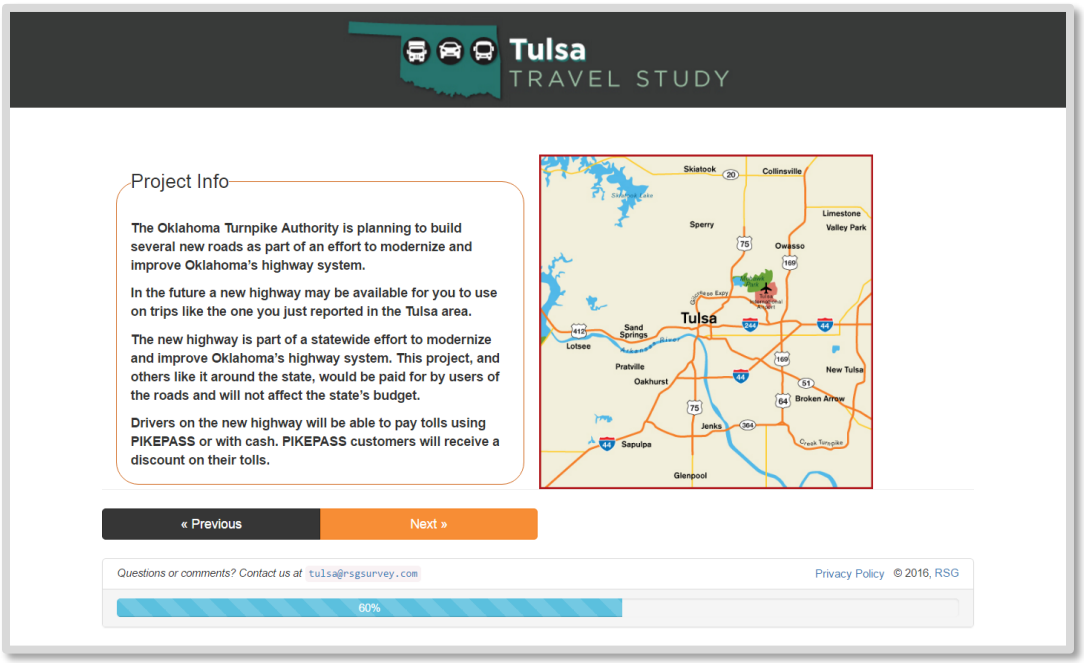
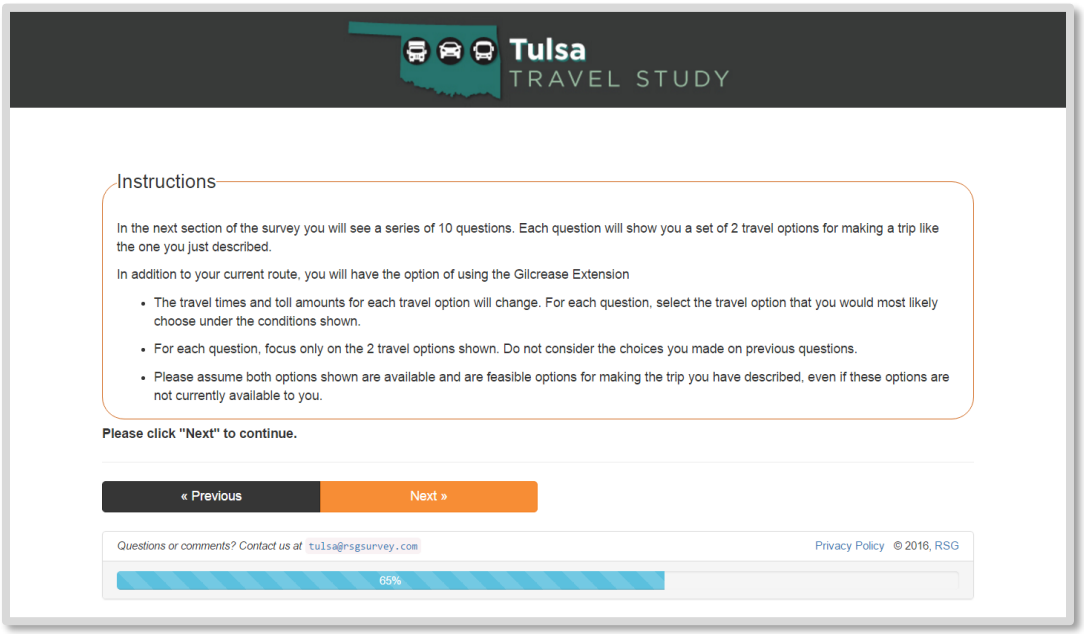


FIGURE 2-6: SAMPLE SURVEY SCREEN – GENERAL SP INTRODUCTION



Respondents were next shown instructions for navigating the stated preference experiments (Figure 2-7), which were followed immediately by the series of SP questions.

FIGURE 2-7: SAMPLE SURVEY SCREEN – SP INSTRUCTIONS

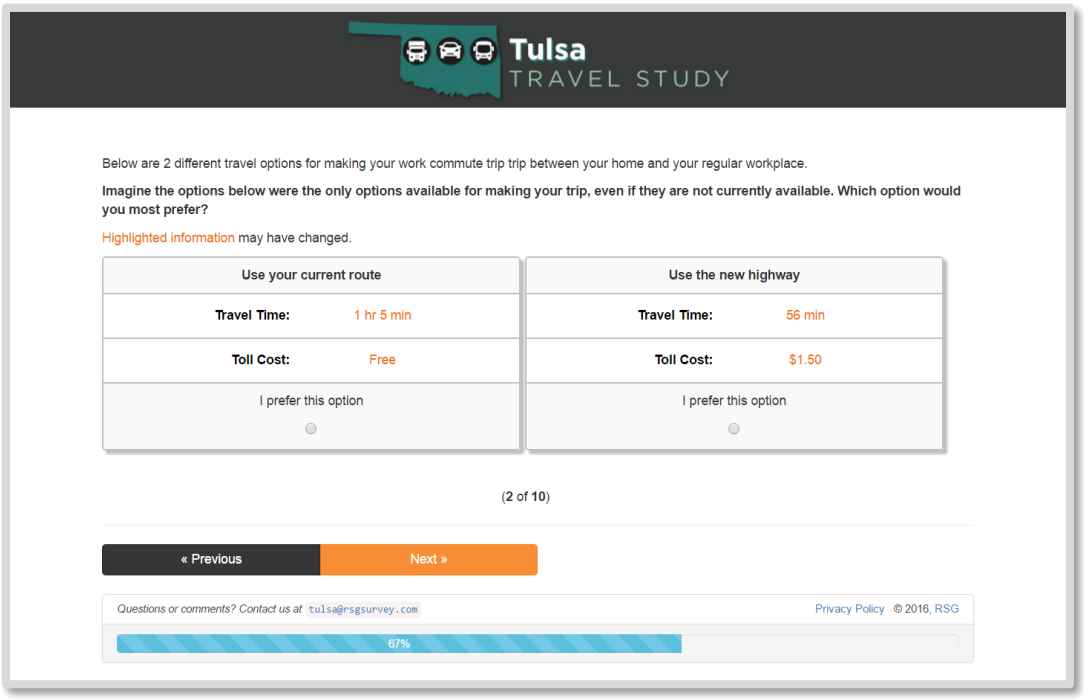


The objective of stated preference questions is to collect quantitative data that can be used to estimate respondents' travel preferences and behavioral responses under hypothetical future conditions. The details of each respondent's reference trip were used to build a set of ten stated preference scenarios, each of which included two travel alternatives for making their trip in the future. Travelers were presented with the following two alternatives:

1. Make the trip using their current route
2. Make the trip using the Gilcrease Expressway/using a new highway (the version of this alternative for all experiments was dictated by the study area to which a given respondent was assigned)

Each alternative was distinguished by two varying attributes: travel time and toll cost. The values of the attributes varied across the ten questions and respondents were asked to select the alternative they most preferred under the conditions presented. Figure 2-8 shows an example stated preference experiment. In order to avoid potential bias associated with the layout of the alternatives, the order of the two alternatives (current route vs. future tolled alternative) was randomized for each respondent. Additional examples of stated preference exercises (as they appeared to respondents on-screen) are presented in Section 7.0.

FIGURE 2-8: SAMPLE SURVEY SCREEN – SP EXPERIMENT



The attribute values presented in each scenario varied around a set of base values. Trip characteristics of each respondent's reference trip were used to pivot the base time and toll cost values to ensure that the scenarios were realistic. These pivoted base values were varied, according to an experimental design, to give a unique set of attribute values for each stated preference experiment.

The amount of variation for each attribute depended on the potential distance traveled on the Gilcrease Expressway, or for users who had not made a trip through the corridor, the calculated distance of their trip from start to finish. The distance traveled along the proposed corridor was estimated by calculating the closest projected entrance and exit interchanges to potential users' trip start and end locations. The calculated distance or overall distance traveled was used to generate a factor to multiply the specific base value shown in the experiments. Table 2-1 shows how the factors were calculated for each respondent's selected trip type. The distance factors were applied differently depending on the selected corridor or trip type to account for the relatively short length of the Gilcrease Expressway. Table 2-2 shows the base attribute levels that were multiplied by assigned factors and then used to generate the experiments.

TABLE 2-1: STATED PREFERENCE ATTRIBUTE FACTORS BY CORRIDOR

Distance	Gilcrease Expressway	New Highway
Less than 5 miles	1.5	
5 to 9 miles	2.5	1
10 to 19 miles	N/A	2
20 or more miles	N/A	3

TABLE 2-2: STATED PREFERENCE BASE ATTRIBUTE VALUES

Attribute	Level #	Alternative 1: Current Route		Alternative 2: Gilcrease Expressway/New Highway	
		Description	Level	Description	Level
Travel Time	1	Reported Travel Time + (Factor * Level)	0	Reported Travel Time - (Factor * Level)	5
	2		2		4
	3		3		3
	4		4		2
	5		5		1
Toll Cost	1			(Factor * Level) + Toll(s) Paid	$0.25
	2				$0.50
	3				$0.75
	4				$1.00
	5				$1.25
	6				$1.50
	7				$1.75
	8				$2.00
	9				$2.25
	10				$2.50

The specific levels used in each stated preference experiment were determined using an orthogonal experimental design. Orthogonal designs are commonly used for this type of research to ensure that the attribute values vary independently and to minimize correlation between attribute values. The experimental design used to generate the stated preference experiments in the survey included 100 total experiments divided into ten groups of ten. A respondent was randomly assigned to one of the ten blocks and then shown each of the ten experiments from that block in a random order.

By varying the travel time and cost of the new highways in each experiment, respondents were faced with different times savings for different costs, allowing them to demonstrate their travel preferences across a range of values of time.

2.4 | DEBRIEF AND OPINION QUESTIONS

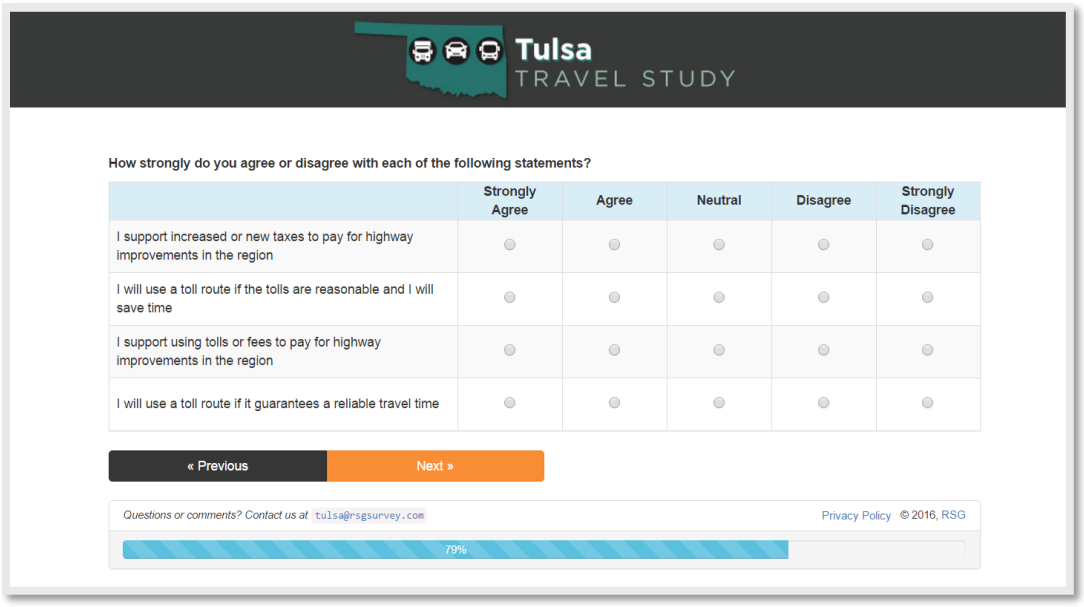
After completing the ten stated preference experiments, respondents answered a series of questions to assess the rationale underlying their choices and to identify any potential strategic bias in their responses.

Respondents who never selected the toll alternative were asked to choose a reason for always choosing their current route. Next, respondents were asked their opinion of the proposed project (or new highways in the Tulsa region in general) based on the information presented in the survey. A respondent's opinion of the project is an important indicator of the choices they might be expected to make in the stated preference experiments. Those

who indicated they were in favor of or opposed to the project (not neutral) were asked a follow up question to explain their reasoning.

Finally, all respondents were asked to indicate the extent to which they agree or disagree with a set of attitude statements about tolls as shown in Figure 2-9.

FIGURE 2-9: SAMPLE SURVEY SCREEN – TOLL ATTITUDE STATEMENTS



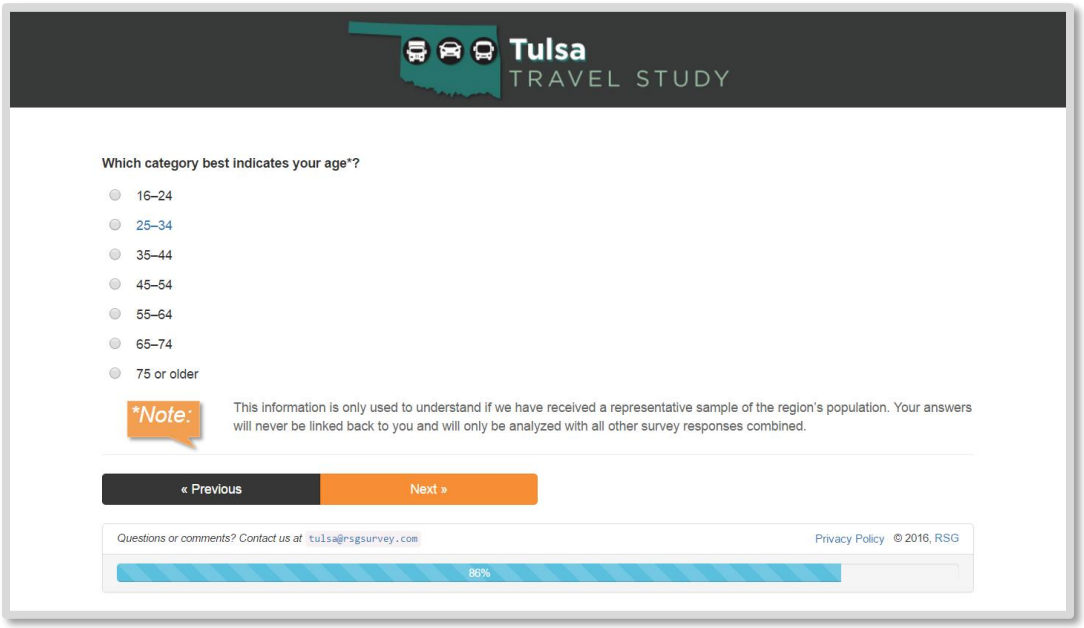
2.5 | DEMOGRAPHIC QUESTIONS

The final section of the survey included a series of demographic questions in which respondents were asked for the following information:

- ZIP Code
- Gender
- Age
- Employment status
- Household size
- Household number of vehicles
- 2015 household income, before taxes

These screens included a note that responses would be analyzed in aggregate, and not linked back to individuals (as shown in Figure 2-10).

FIGURE 2-10: SAMPLE SURVEY SCREEN – DEMOGRAPHIC QUESTION WITH NOTE ABOUT PERSONAL INFORMATION



Answers to the demographic questions were used to classify respondents, identify possible behavioral differences across demographics, and to confirm that the sample contained a diverse group of drivers that travel in the study region.

At the conclusion of the survey, participants recruited through the postcard administration were asked for their e-mail address if they were among the first 600 respondents (and thus eligible to receive a $5 Amazon.com gift card). Finally, all respondents were given the opportunity to leave comments about the project or the survey itself.

3.0 SURVEY ADMINISTRATION

RSG worked closely with the project team to design an administration plan to produce a generally representative sample of highway users in the Tulsa area. The sampling plan was designed to include a sufficient range of travelers and trip types to support the statistical estimation of coefficients of a discrete choice model. By collecting data from a range of traveler and trip types, it is possible to identify the ways in which different characteristics affect route choice behavior. These differences can then be reflected in the structure and coefficients of the resulting choice model. In general, stated preference survey samples do not need to be strictly population proportional as long as any demographic or other dimensions along which they are non-proportional either do not significantly affect the choice being modeled or are represented as variables in the model and the model equations are applied (in any forecasting or market simulations) to proper population proportions.

The targeted population for the survey sample included potential users of the proposed Gilcrease Expressway as well as other users of highways in the Tulsa region. Travelers were recruited to participate in the stated preference survey using two methods:

1. E-mail outreach to a random sample of 20,000 PIKEPASS customers in a targeted selection of ZIP codes in and around the study region
2. Postcard mailing to 20,000 random residential addresses in a targeted selection of ZIP codes in and around the study region

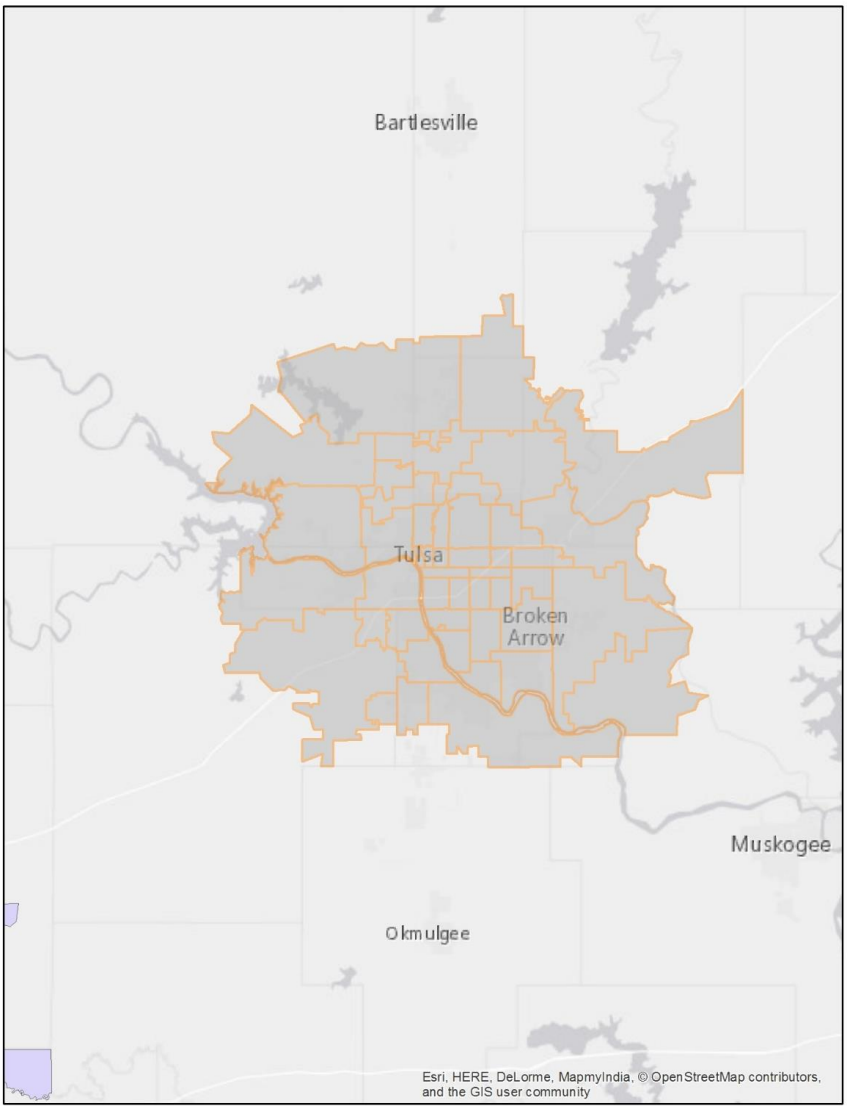
The survey was administered entirely online through RSG's proprietary online survey platform. The survey administration began on May 22, 2015 and concluded on June 27, 2015. The administration methods and number of completed surveys are presented in Table 3-1.

TABLE 3-1: SURVEY COMPLETION BY ADMINISTRATION METHOD

Data Source	Number of Completed Surveys	Percent of Total Sample	Completion Rate
PIKEPASS Customer E-mail Outreach	846	74%	4.2%
Postcard Mailing	297	26%	1.5%
Total	**1,143**	**100%**	**--**

With assistance from the project team, RSG coordinated an outreach to a random sample of residents who reside in specific ZIP codes in the Tulsa area. The ZIP codes from which respondents were recruited to participate are shown in Figure 3-1. Both the postcards and PIKEPASS e-mail outreach were administered proportionally to the number of households in each ZIP code.

FIGURE 3-1: SURVEYED ZIP CODES



3.1 | PIKEPASS CUSTOMER E-MAIL OUTREACH

The OTA provided the contact information of approximately 300,000 PIKEPASS transponder customers living within the surveyed ZIP codes (Figure 3-1) to recruit for participation in the study. From this list, RSG distributed e-mail invitations to 20,000 random customers, with each ZIP code sampled proportionally to its overall contribution to the study area's population. Each e-mail invitation contained information about the study and an open link to access the survey webpage. Eight hundred and forty-six (846) completed surveys were collected from PIKEPASS customers in the Tulsa region, resulting in a completion rate of approximately 4.2%.

3.2 | POSTCARD INVITATION TO HOUSEHOLDS

Customized postcards designed by RSG were mailed to approximately 20,000 home addresses in the same ZIP code areas, again distributed proportionally to the number of households in each ZIP code. The postcard (Figure 3-2 and Figure 3-3) contained information about the study as well as the $5 electronic gift card incentive that would be sent to the first 600 respondents who completed the survey. Each postcard contained a link to access the survey webpage and a personalized password to control access to the questionnaire and the survey incentive. Two hundred and ninety-seven (297) respondents completed the survey from this recruitment method, resulting in a completion rate of approximately 1.5%.

FIGURE 3-2: POSTCARD INVITATION – FRONT

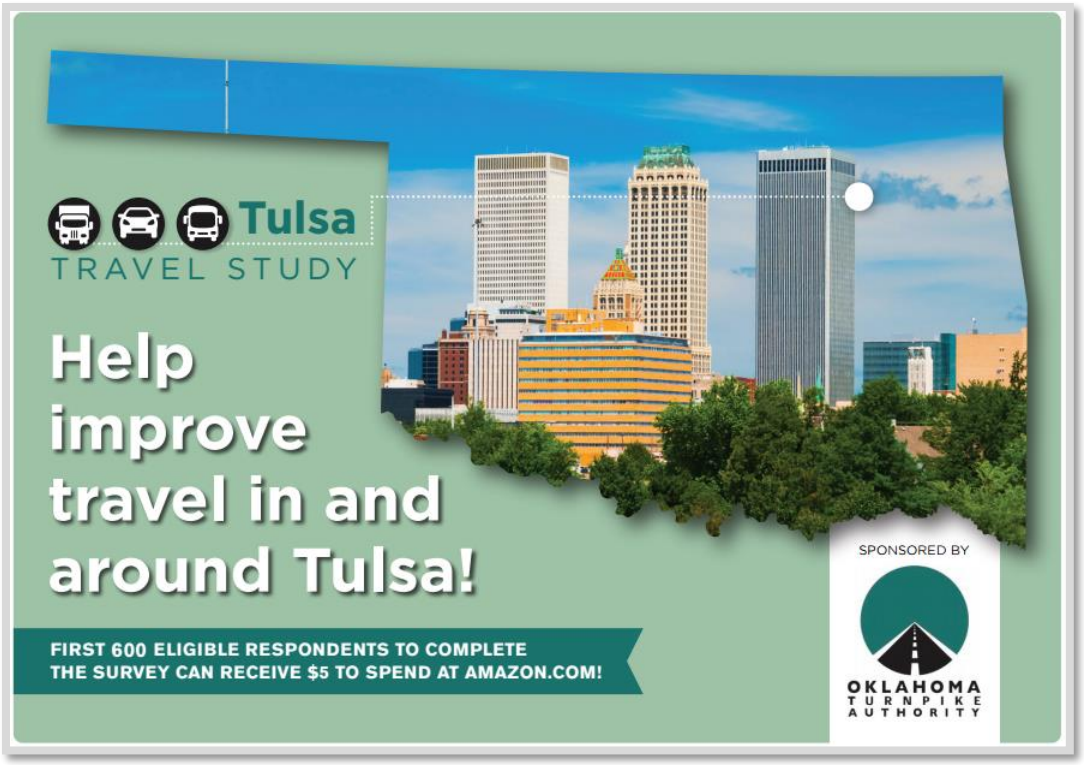
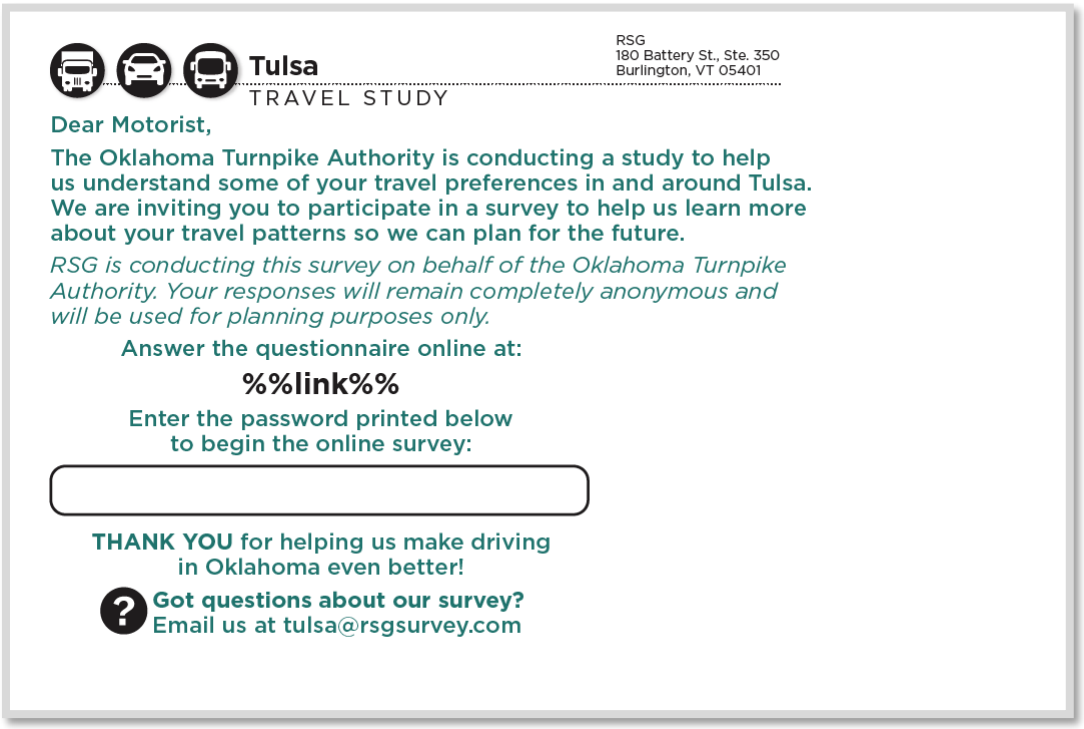


FIGURE 3-3: POSTCARD INVITATION – BACK



4.0 SURVEY ANALYSIS

Summary tabulations and statistics are presented in the following sections for select survey questions. A complete set of survey tabulations for each question can be found in Section 8.0. Before finalizing the dataset and beginning choice model estimation, the data were screened for outliers. This screening process is outlined below.

4.1 | IDENTIFICATION OF OUTLIERS

The survey data were screened to ensure that all observations included in the data analysis and model estimation represented realistic trips in the study area and reasonable tradeoffs in the stated preference exercises. Variables such as trip origin and destination, travel speed, and choice behavior were reviewed during the screening process.

During the data collection phase of the project, 1,143 respondents completed the stated preference survey. After viewing different variables and their impact on model results, it was determined that respondents who met the following conditions should be excluded from the final analysis. The categories listed below are not mutually exclusive; some respondents were excluded for more than one of the data checks listed:

- Respondents whose origin and destination coordinates implied their trip could not make reasonable use of the selected corridor for their reference trip (9 respondents)
- Respondents whose implied speed (60 * Google-calculated trip distance / reported travel time) for their trip was greater than 120 mph or less than 3 mph (18 respondents)
- Respondents whose trip distance was less than 3 miles or more than 400 miles (36 respondents)
- Respondents who completed the survey in less than 6 minutes (15 respondents)
- Respondents who indicated they paid more than $10 in tolls on their trip (7 respondents)
- Respondents demonstrating inconsistent or irrational choice behavior in the stated preference exercises. For example, respondents who established a certain dollar amount for willingness to pay for time savings and then rejected paying less money for equal or greater time savings (10 respondents)

Based on the analysis described above, 68 distinct records were removed and 1,075 respondents (10,750 choice observations) were included in the final dataset and used to estimate the models presented in this report.

4.2 | SURVEY RESULTS

The descriptive analysis of the survey data presented in this section of the report is based on the 1,075 valid responses and is provided in four sections: trip details, stated preference, debrief and opinion, and demographic questions.

Respondents who indicated that they had recently made a trip that crossed the Arkansas River west of Tulsa were asked to recount the details of their the most recent trip through the corridor (66% of respondents). The remaining 34% of respondents who had not traveled through the Gilcrease Expressway corridor, but had made a recent highway trip in the Tulsa area, were assigned to the General Trip segment (Table 4-1).

TABLE 4-1: CORRIDOR/TRIP TYPE

Corridor	Count	Percent
Gilcrease Expressway	705	66%
General Trip	370	34%
Total	**1,075**	**100%**

TRIP DETAILS

Figure 4-1 shows primary trip purposes for all respondents. The most commonly reported trip purpose was travel to or from work (27% of trips). Trips made for social or recreational purposes comprised 24% of all trips, while trips for other personal business (not for work, social, or recreational purposes) made up approximately 23% of all reported trip purposes. Respondents who made a General Trip were more likely to report a trip to or from work (42%), while 18% of respondents who made a trip in the Gilcrease Expressway corridor reported a work trip (see Section 8.0). Trips that were made for work-related business or commuting comprised 42% of all reported trip purposes across all respondents.

FIGURE 4-1: PRIMARY TRIP PURPOSE

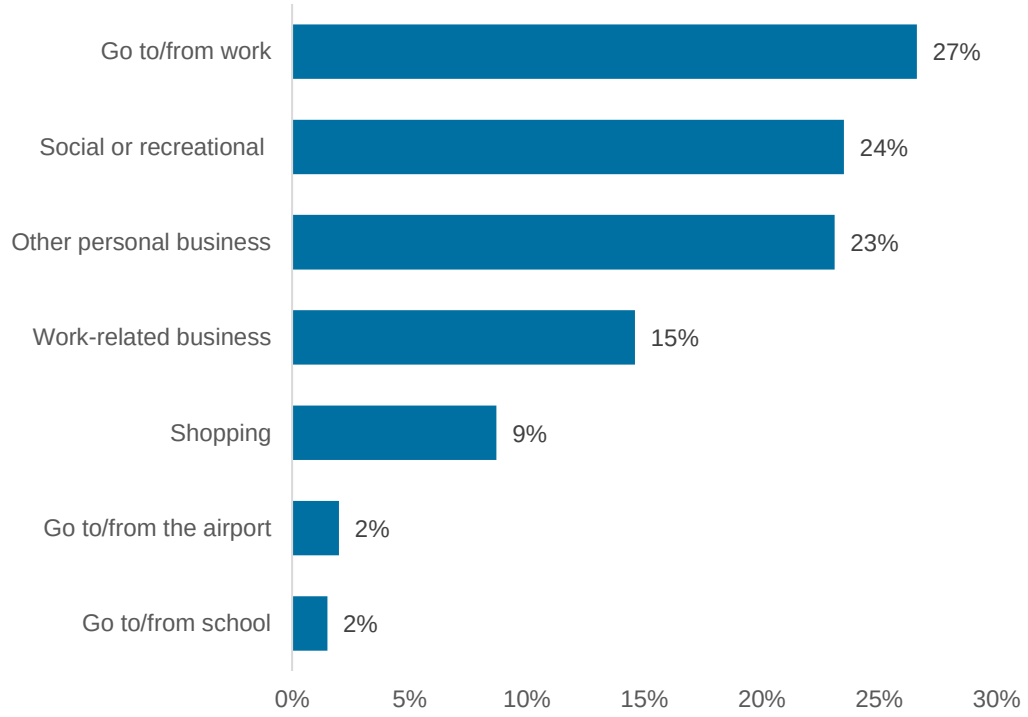


Table 4-2 summarizes the distribution of beginning and ending locations for all respondents. The majority of trips began at home and ended at a place other than home or work. Correspondingly, the single most commonly reported trip combination originated at home and ended at a place other than home or work (56%). Twenty-two percent of trips started at home and ended at a regular workplace.

TABLE 4-2: TRIP ORIGINS AND DESTINATIONS

Origin & Destinations		Destination			
		My home	My regular workplace	Another place	**Total**
Origin	My home	2%	22%	56%	**80%**
	My regular workplace	4%	0%	8%	**13%**
	Another place	4%	1%	3%	**7%**
	Total	**10%**	**23%**	**67%**	**100%**

Table 4-3 presents trip departure periods by corridor. The highest percentage of trips made in the Gilcrease Expressway corridor (42%) were made in the midday period (between morning and afternoon peak, or between 9:00 AM and 2:59 PM), while respondents who reported a General Trip within the region were most likely to report a trip that occurred in the morning peak period (42%). The morning peak period is defined as weekday mornings between 6:00 and 8:59 AM, and the afternoon peak period is defined as weekday afternoons between 3:00 and 6:59 PM.

TABLE 4-3: TRIP DEPARTURE TIME PERIOD BY CORRIDOR

Time Period	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Morning Peak (6:00-8:59 AM)	215	30%	154	42%	**369**	**34%**
Midday (9:00 AM-2:59 PM)	296	42%	129	35%	**425**	**40%**
Afternoon Peak (3:00-6:59 PM)	161	23%	61	16%	**222**	**21%**
Night (7:00 PM-5:59 AM)	33	5%	26	7%	**59**	**5%**
Total	**705**	**100%**	**370**	**100%**	**1,075**	**100%**

The latitude and longitude coordinates for each trip's origin-destination pair were used to estimate trip distances using a Google Maps route-planning algorithm. The average calculated distance traveled for all respondents was 32 miles and the median distance was 17 miles. The average reported travel time for all respondents was 43 minutes and the median travel time was 30 minutes. Respondents who reported a General Trip within the Tulsa region reported shorter trips by distance and duration than those who reported trips in the Gilcrease Expressway corridor. Table 4-4 shows calculated trip distances and reported travel times (mean and median) by corridor, as well as for all respondents together.

TABLE 4-4: MEAN AND MEDIAN TRIP DISTANCE AND TRAVEL TIME BY CORRIDOR

	Gilcrease Expressway		General Trip		Total	
	Mean	Median	Mean	Median	Mean	Median
Google Distance (miles)	36	18	23	15	**32**	**17**
Reported Time (minutes)	49	30	33	25	**43**	**30**

Figure 4-2 shows the cumulative distribution of Google-calculated trip distances for all respondents and Figure 4-3 shows the cumulative distribution of reported travel times for all respondents.

FIGURE 4-2: CUMULATIVE TRIP DISTANCES

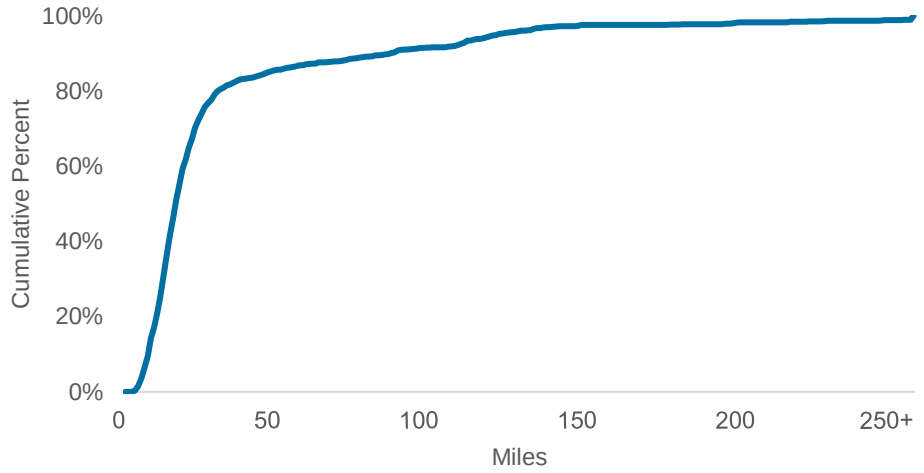
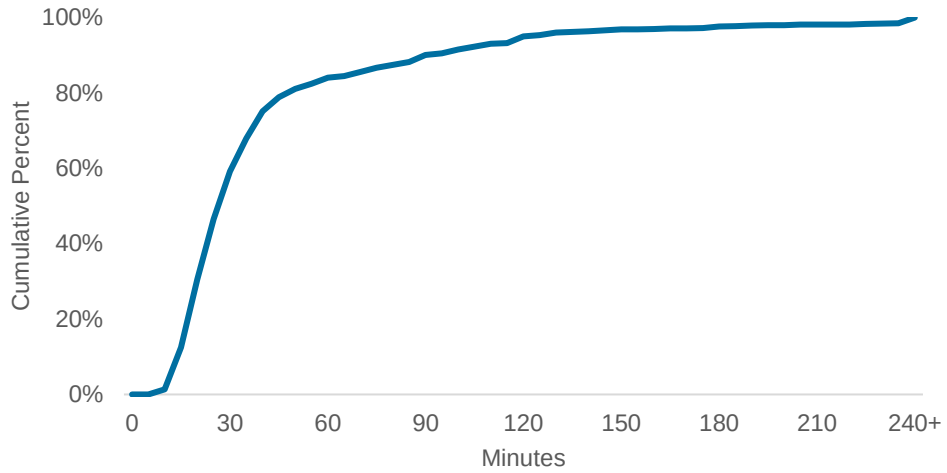


FIGURE 4-3: CUMULATIVE TRAVEL TIMES



Trip origins and destinations, stratified by corridor, are shown in Figure 4-4 and Figure 4-5. Figure 4-4 shows that trip origins are scattered throughout the Tulsa region, and Figure 4-5 shows that Gilcrease Expressway trip destinations tend to coalesce near the proposed Gilcrease corridor.

FIGURE 4-4: TRIP ORIGINS BY CORRIDOR

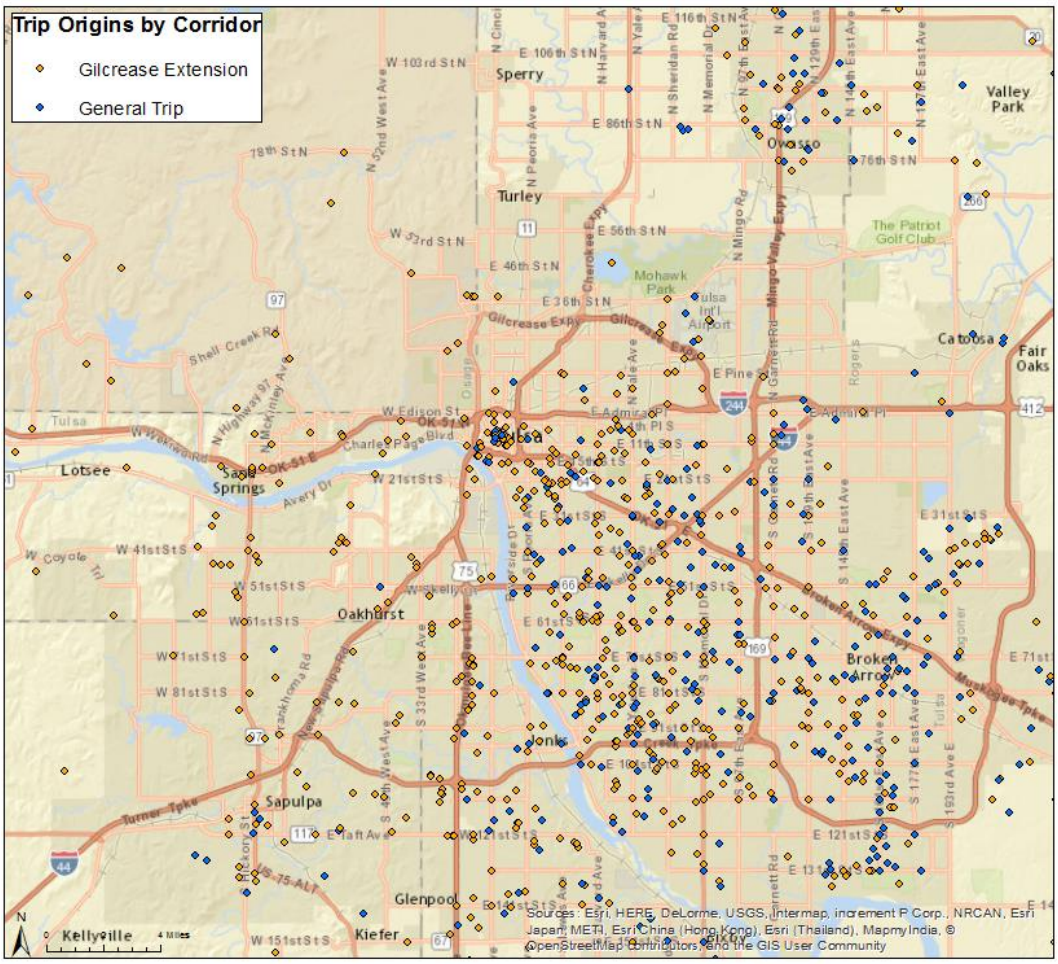


FIGURE 4-5: TRIP DESTINATIONS BY CORRIDOR

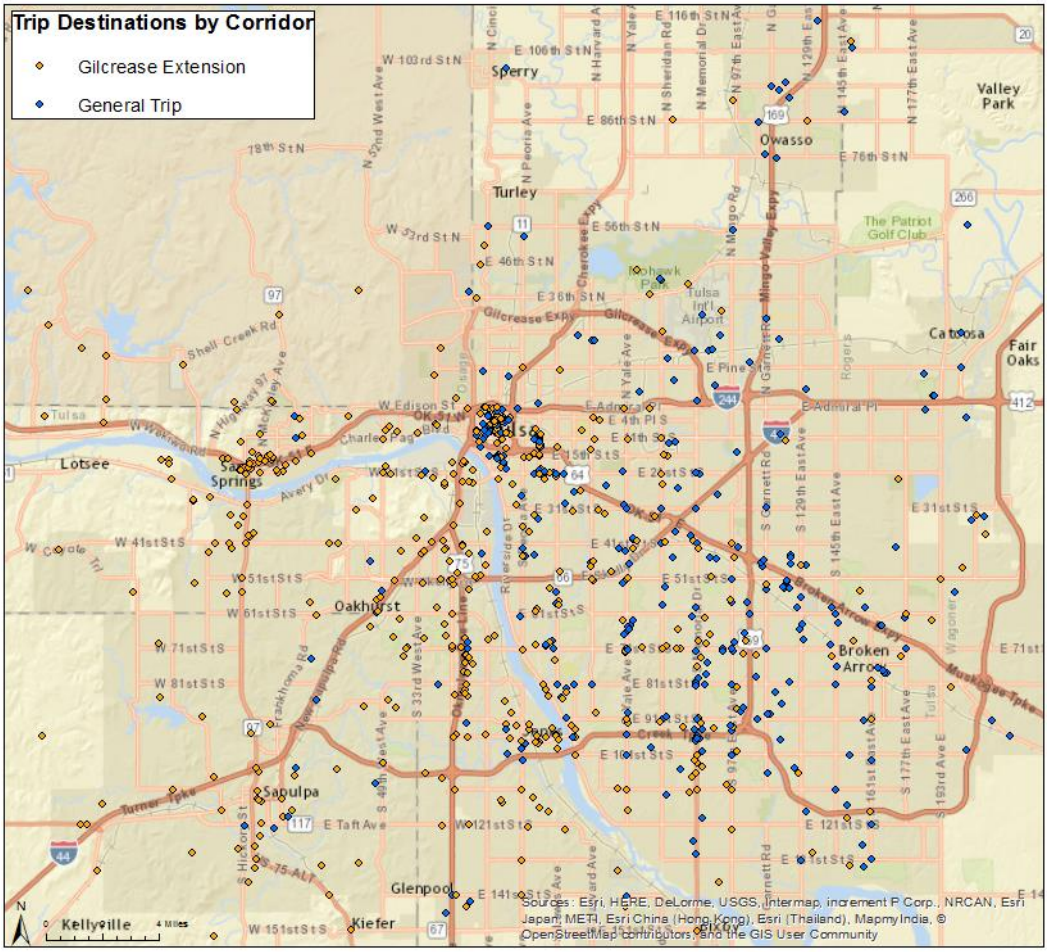
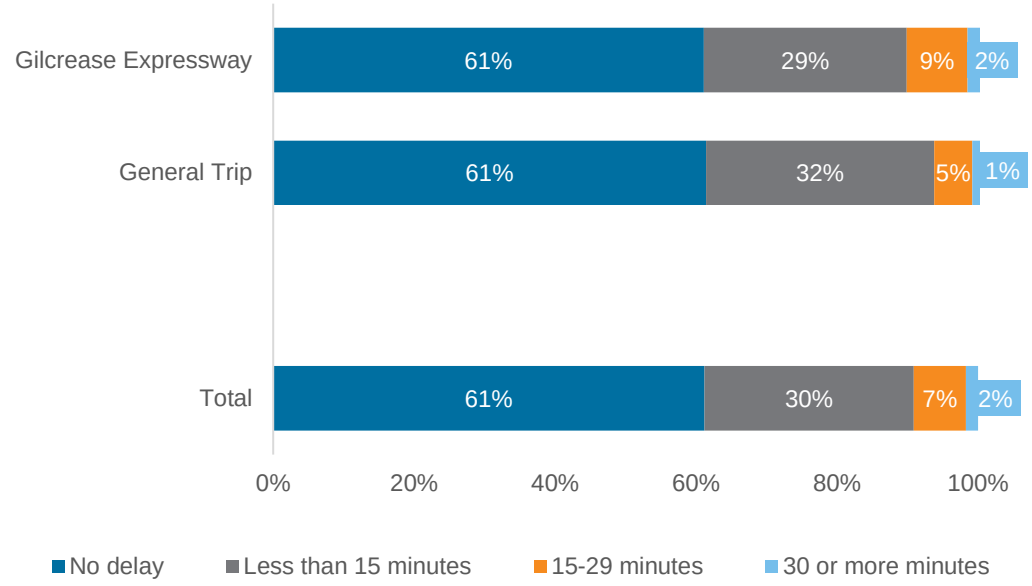


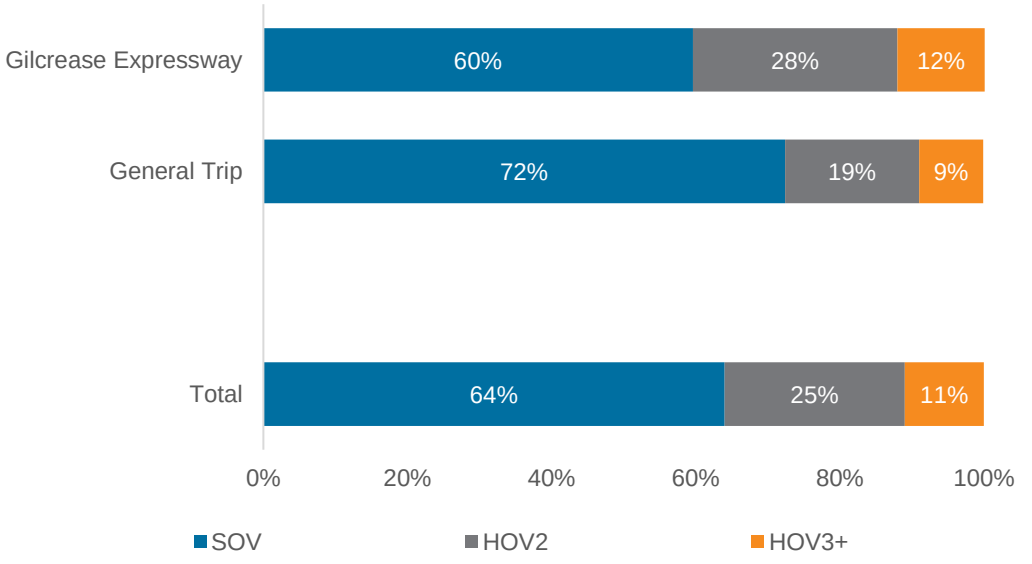
Figure 4-6 shows the categorized amount of delay experienced by respondents in each study area, as well as for all respondents. Approximately 39% of all respondents reported experiencing at least some delay on their trip. Thirty percent of all respondents experienced a delay of less than 15 minutes, with a smaller group experiencing longer delays. Reported amount of delay was similar between selected corridor or trip type, with respondents who made a trip through the Gilcrease Expressway corridor slightly more likely to report spending more time delayed by congestion.

FIGURE 4-6: AMOUNT OF DELAY BY CORRIDOR



Most respondents (64%) reported making their trip in a single occupant vehicle (SOV). Twenty-five percent of all trips were made in a vehicle with two occupants (HOV2), and 11% were made in a vehicle with three or more occupants (HOV3+). Respondents who reported a General Trip within the Tulsa region were somewhat less likely to have made a trip in a vehicle with additional occupants. Figure 4-7 shows vehicle occupancy by selected corridor and for all respondents.

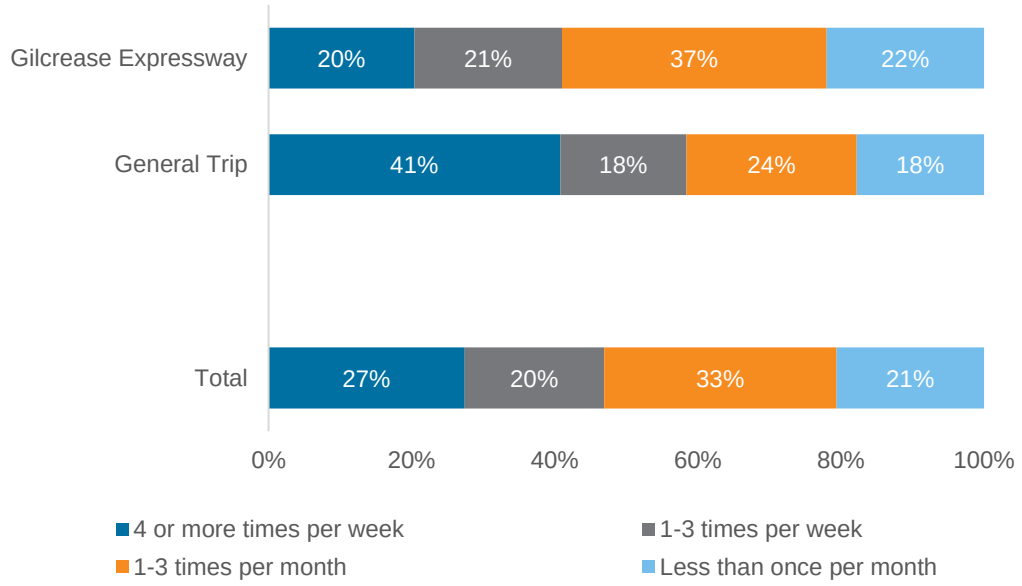
FIGURE 4-7: VEHICLE OCCUPANCY BY CORRIDOR



Twenty-seven percent of all trips were made four or more times per week, closely tracking the number of trips that were made to or from work (27% in Figure 4-1). General Trips

tended to show the highest frequency, with 41% of these respondents making their reference trip four or more times per week, while reference trips in the Gilcrease Expressway corridor were made this frequently by only 20% of respondents. Trip frequency by corridor and for all respondents is shown in Figure 4-8.

FIGURE 4-8: TRIP FREQUENCY BY CORRIDOR



Respondents were asked whether they owned a PIKEPASS or any other type of transponder for electronic toll collection. Nearly all respondents indicated that they owned a PIKEPASS transponder (95%). Table 4-5 shows transponder ownership by corridor and for all respondents.

TABLE 4-5: TRANSPONDER OWNERSHIP BY CORRIDOR (SELECT ALL THAT APPLY)

Transponder Ownership	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
PIKEPASS	669	95%	349	94%	**1,018**	**95%**
Other transponder	2	0%	4	1%	**6**	**1%**
None	36	5%	20	5%	**56**	**5%**
Total	**707**	**--**	**373**	**--**	1,080	**--**

STATED PREFERENCE QUESTIONS

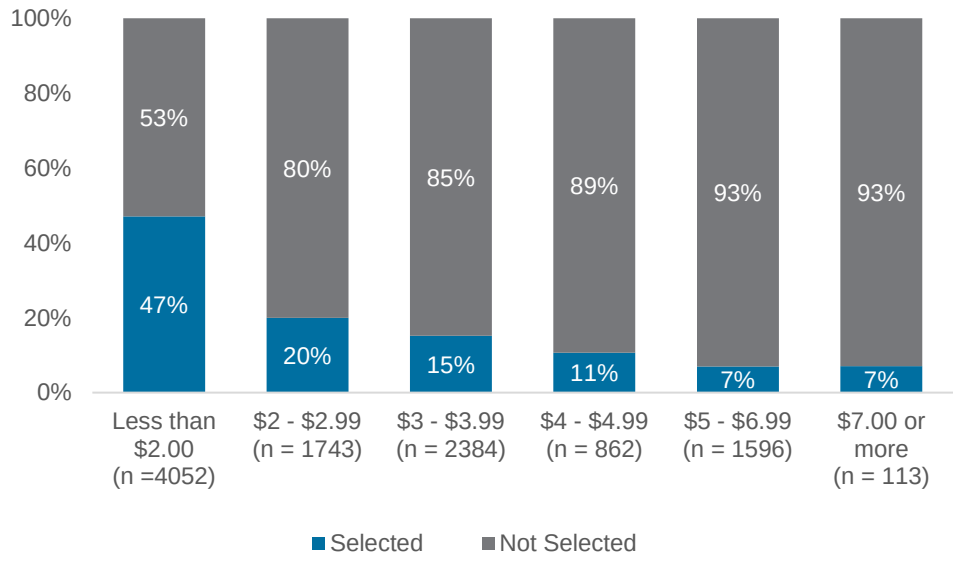
After completing the trip details portion of the survey, respondents answered a series of ten stated preference tradeoff exercises tailored to their reference trip. Survey respondents chose their current route in 74% of experiments and the alternative tolled option in 26% of experiments (Table 4-6).

TABLE 4-6: STATED PREFERENCE CHOICES

Alternative	Number of Experiments Shown	Number of Times Selected	Percent of All Choices
Use Current Route	10,750	7,921	74%
Use Alternate Tolled Route	10,750	2,829	26%

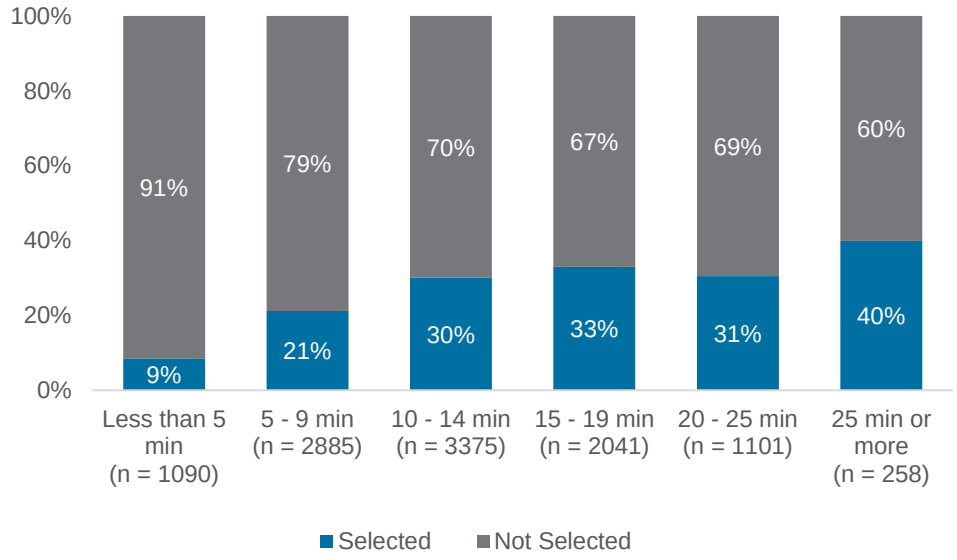
Respondents became less likely to choose the toll alternative tailored to their reference trip as the toll cost increased. Figure 4-9 shows the percentage of time the toll alternative was chosen in the stated preference experiments at different toll costs. The first bar on the left in Figure 4-9 shows that when the presented toll costs were less than $2.00, the toll option was selected 47% of the time, while the last bar on the right shows that when the presented toll costs were more than $7.00, the toll option was selected only 7% of the time. In general, Figure 4-9 shows that the likelihood of respondents choosing the toll option decreased considerably as the toll amount increased. Since each respondent was presented with ten questions, the total number of choice observations is 10,750.

FIGURE 4-9: SP TOLL OPTION SELECTION BY TOLL COST



Alternatively, respondents were generally more likely to choose the tolled option tailored to their reference trip as the travel time savings increased. Figure 4-10 shows the percentage of time the toll alternative was chosen in the stated preference experiments at different levels of travel time savings. The first bar on the left in Figure 4-10 shows that when the presented travel time savings was less than five minutes, the toll option was selected 9% of the time, while the last bar on the right shows that when the presented travel time savings was 25 minutes or more, the toll option was selected 40% of the time. In general, Figure 4-10 shows that the likelihood of respondents choosing the toll option increased considerably as the travel time savings increased.

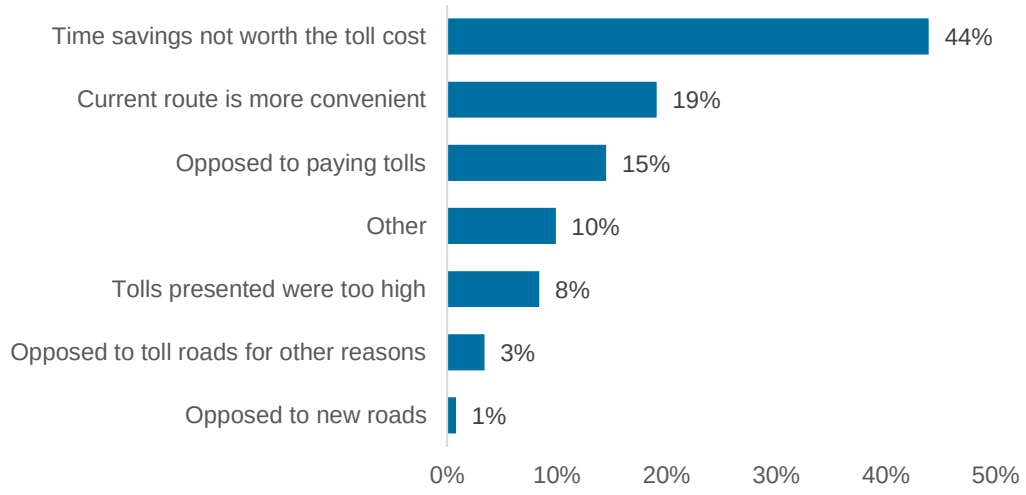
FIGURE 4-10: SP TOLL OPTION SELECTION BY TIME SAVINGS



DEBRIEF AND OPINION QUESTIONS

If a respondent never chose an option that had tolls during the stated preference section (24% of respondents), they were asked to indicate their primary reason for this. The reason most frequently cited (44% of all respondents who never selected the tolled alternative) was that the time savings presented in the experiments was not high enough to justify the toll cost (Figure 4-11).

FIGURE 4-11: PRIMARY REASON FOR NEVER SELECTING TOLLED OPTIONS



Approximately 37% of respondents were in favor of the project (11% strongly in favor and 26% somewhat in favor). Thirty-four percent of respondents were neutral in their project opinions, while approximately 28% were either strongly (11%) or somewhat (17%) opposed to the project. Table 4-7 shows project opinion by selected corridor and for all respondents.

It should be noted that General Trip respondents were asked for their opinion of toll facilities in the Tulsa region in general, not related to a specific corridor.

TABLE 4-7: PROJECT OPINION BY CORRIDOR

Project Opinion	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Strongly opposed	65	9%	55	15%	**120**	**11%**
Somewhat opposed	99	14%	87	24%	**186**	**17%**
Neutral	277	39%	91	25%	**368**	**34%**
Somewhat favor	176	25%	106	29%	**282**	**26%**
Strongly favor	88	12%	31	8%	**119**	**11%**
Total	**705**	**100%**	**370**	**100%**	**1,075**	**100%**

If a respondent reported a non-neutral opinion about the project, they were asked to indicate the main reason for that opinion. Table 4-8 and Table 4-9 show the main reasons for supporting or opposing the project by selected corridor. Of the 37% of respondents who supported the project, the most common reason was faster travel times, followed by a need for investment in infrastructure. Of the 28% of respondents who opposed the project, the most common reason was opposition to toll roads.

TABLE 4-8: PRIMARY REASON FOR PROJECT SUPPORT BY CORRIDOR

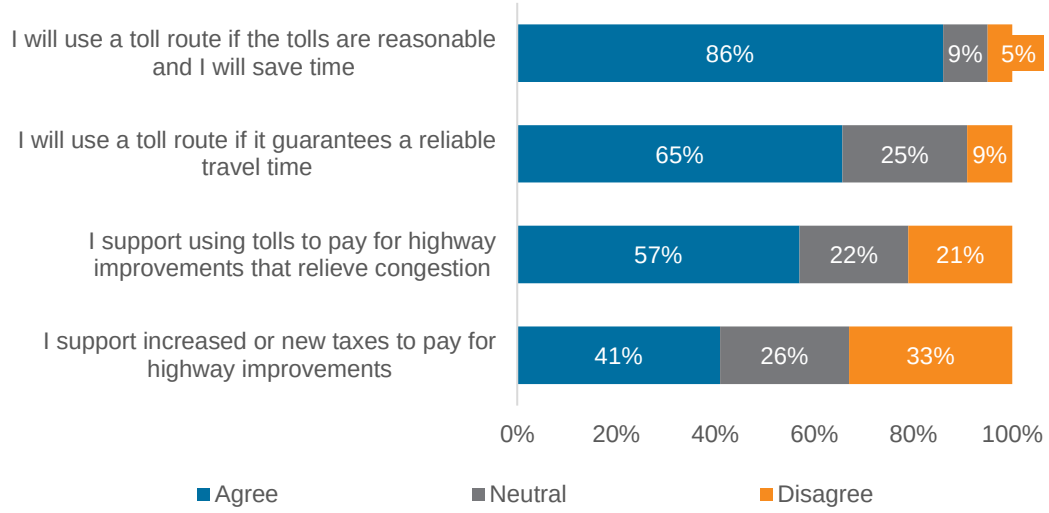
Reasons for Support	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Shorter travel times once completed	101	38%	77	56%	178	44%
Needed investment in infrastructure	86	33%	26	19%	112	28%
Safer road conditions	24	9%	26	19%	50	12%
More direct travel route	33	13%	0	0%	33	8%
Other reason	20	8%	8	6%	28	7%
Reduced emissions and improved air quality	0	0%	0	0%	0	0%
Total	**264**	**100%**	**137**	**100%**	**401**	**100%**

TABLE 4-9: PRIMARY REASON FOR PROJECT OPPOSITION BY CORRIDOR

Reasons for Opposition	Gilcrease Expressway		General Trips		Total	
	Count	Percent	Count	Percent	Count	Percent
Opposed to toll roads	71	43%	89	63%	160	52%
Other reason	41	25%	32	23%	73	24%
Rather see more investments in alternative transportation	24	15%	17	12%	41	13%
Opposed to where the highway would be built	20	12%	0	0%	20	7%
Opposed to spending money on road construction projects	7	4%	2	1%	9	3%
Opposed to new highways	1	1%	2	1%	3	1%
Total	**164**	**100%**	**142**	**100%**	**306**	**100%**

To gauge respondents' opinions about issues related to the proposed new road, levels of agreement were measured for a series of attitude statements (Figure 4-12). Of the statements presented, respondents were mostly likely to agree with the statement "I will use a toll route if the tolls are reasonable and I will save time" and least likely to agree with the statement "I support increased or new taxes to pay for highway improvements in the region."

FIGURE 4-12: TOLL ATTITUDE STATEMENTS



DEMOGRAPHIC QUESTIONS

To conclude the survey, respondents were asked a series of demographic questions. Fifty-six percent of respondents identified as male and 44% identified as female. The median age of the sample fell in the 45-54-year-old category. Forty-seven percent of respondents reported living in a two-person household and forty-eight percent of respondents reported living in a household with two vehicles. More than half (57%) of respondents indicated being employed full-time and 22% reported being retired.

When reporting income, respondents could select a 'Prefer not to answer' option, and approximately 20% of all respondents selected this option. The median annual household income of all respondents who chose to report their income was in the $75,000-$99,999 income category (Table 4-10).

TABLE 4-10: ANNUAL HOUSEHOLD INCOME BY CORRIDOR

Income Category	Gilcrease Expressway		General Trips		Total	
	Count	Percent	Count	Percent	Count	Percent
Less than $15,000	3	1%	5	2%	8	1%
$15,000-$24,999	21	4%	7	3%	28	3%
$25,000-$34,999	29	5%	8	3%	37	4%
$35,000-$49,999	68	12%	36	13%	104	12%
$50,000-$74,999	107	18%	63	22%	170	20%
$75,000-$99,999	111	19%	61	22%	172	20%
$100,000-$124,999	95	16%	42	15%	137	16%
$125,000-$149,999	55	9%	24	9%	79	9%
$150,000-$199,999	51	9%	20	7%	71	8%
$200,000 or more	43	7%	16	6%	59	7%
Total	**583**	**100%**	**282**	**100%**	**865**	**100%**

5.0 MODEL ESTIMATION

The primary purpose of the Tulsa Travel Study was to estimate the willingness to pay for travel time savings, or VOT, of passenger vehicle travelers who are candidates for using the Gilcrease Expressway or who make automobile trips on highways in the Tulsa area. These VOT estimates will support estimates of future traffic and revenue for the facility. The ten choice observations for each respondent were compiled into a dataset with 10,750 observations to support the estimations of VOT.

5.1 | METHODOLOGY

Statistical analysis and discrete choice model estimation were conducted using the stated preference survey data. The statistical estimation and specification testing were completed using a conventional maximum likelihood procedure that estimated coefficients for a set of MNL models. The MNL models were used to identify systematic differences in preference heterogeneity—for example, the difference in VOT by trip purpose, time of day, or income. The model coefficients provide information about the respondents' sensitivities to the attributes that were tested in the tradeoff scenarios and can be used to calculate VOT for travelers in the Gilcrease Expressway corridor and the larger Tulsa region. The model specification and results are discussed in more detail in the following sections.

5.2 | MULTINOMIAL LOGIT (MNL) MODEL SPECIFICATION

In each SP experiment, respondents were presented with two alternatives, with the label of the second alternative contingent on the corridor/trip type to which the respondent was assigned:

1. Make the trip using their current route
2. Make the trip using the Gilcrease Expressway/using a new toll highway

More information about the stated preference experimental design can be found in Section 2.3. The MNL model estimates a choice probability for each alternative presented in the stated preference tradeoff exercises. The alternatives are represented in the model by observed utility equations of the form described in Equation 1.

EQUATION 1: OBSERVED UTILITY EQUATION

$$\cup_1 = \boldsymbol{\beta_1 X_1} + \boldsymbol{\beta_2 X_2} \ldots + \boldsymbol{\beta_n X_n}$$

In Equation 1, each X represents a variable specified by the researcher and each β is a coefficient estimated by the model that represents the sensitivity of the respondents in the sample to the corresponding variable.

Several utility equation structures were tested using different variables from the collected data. In addition to the travel times and toll costs presented in the stated preference experiments, tested variables included trip characteristic and demographic variables. These variables were introduced, one at a time, to test potential interactions with the toll cost and

travel time coefficients and to determine whether respondents' trip or personal characteristics significantly influenced their choices in the stated preference scenarios. Interaction variables include:

- Corridor/trip type
- Time of day
- Trip purpose
- Income
- Transponder ownership
- Trip distance
- Travel time
- Travel delay
- Project opinion

After reviewing the significance of each variable, the final model specification was chosen based on model fit, the intuitiveness and reasonableness of the model coefficients, and the expected application of the model results. The final specification included variables for travel time and travel cost applied to both alternatives. In addition to time and cost, dummy variables, or constants, were included on the toll alternative for those respondents who own a transponder and for those respondents who indicated they were strongly opposed to the Gilcrease Expressway or a new highway. Along with the alternative specific constant, these dummy variables capture the additional utility (or disutility) for the toll alternative that cannot be attributed to time and cost alone. Several different transformations of the cost coefficient by household income were tested in order to capture any systematic relationship between cost sensitivity and income. To capture the relationship between cost sensitivity and household income, the toll cost coefficient was divided by the natural log of household income in the utility equation as described in Equation 2.

EQUATION 2: TOLL COST INTERACTION WITH INCOME LEVEL

$$V_i = \cdots + \boldsymbol{\beta Cost} * \boldsymbol{TC_i} * \frac{\mathbf{1}}{\boldsymbol{LN}(\frac{\boldsymbol{income}}{\mathbf{100}})}$$

5.3 | MNL MODEL: COEFFICIENT ESTIMATES

The result of the final model specification is presented below and includes coefficients segmented by corridor and trip purpose. The model segmentation details are shown in Table 5-1.

TABLE 5-1: MODEL SEGMENTS BY CORRIDOR/TRIP PURPOSE

Segment	Count	Percent
Gilcrease - Work Trips	258	24%
Gilcrease - Non Work Trips	447	42%
General - Work Trips	185	17%
General - Non Work Trips	185	17%
Total	**1,075**	**100%**

Table 5-2 presents the variables included in the final model specification and the alternatives to which each variable applies.

TABLE 5-2: FINAL MODEL SPECIFICATION

Coefficient	Units	Alt 1: Current Route	Alt 2: Alternate Toll Route
Travel Time			
Gilcrease - Work Trips	Minutes	X	X
Gilcrease - Non Work Trips	Minutes	X	X
General - Work Trips	Minutes	X	X
General - Non Work Trips	Minutes	X	X
Travel Cost			
Gilcrease - Work Trips	$	X	X
Gilcrease - Non Work Trips	$	X	X
General - Work Trips	$	X	X
General - Non Work Trips	$	X	X
Dummy Variables			
Strongly Opposed to Project/New Facility	1,0		X
Possess a transponder	1,0		X
Alternative Specific Constant			
Alternative 2 - Toll Route	1,0		X

Table 5-3 contains coefficient values, robust standard errors, robust t-statistics, and general model statistics. The coefficient values are the values estimated by the choice model that represent the relative importance of each of the variables. It should be noted that these values are unit-specific and the units must be accounted for when comparing coefficients. The sign of the coefficient indicates a positive or negative relationship between utility and the associated variable. For example, a negative travel time coefficient implies that utility for a given travel alternative will decrease as the travel time associated with that alternative increases.

The standard error is a measure of error around the mean coefficient estimate. The t-statistic is the coefficient estimate divided by the standard error, which can be used to evaluate

statistical significance. A t-statistic greater/less than ±1.96 indicates whether the coefficient is statistically significantly different from 0 (unless otherwise reported) at the 95% level.

The model fit statistics presented below include the number of observations, the number of estimated parameters, the initial log-likelihood, the log-likelihood at convergence, rho-squared, and adjusted rho-squared. The log-likelihood is a model fit measure that indicates how well the model predicts the choices observed in the data. The null log-likelihood is the measure of the model fit with coefficient values of zero. The final log-likelihood is the measure of model fit with the final coefficient values at model convergence. A value closer to zero indicates better model fit. The log-likelihood cannot be evaluated independently, as it is a function of the number of observations, the number of alternatives, and the number of parameters in the choice model. The rho-square model fit measure accounts for this to some degree by evaluating the difference between the null log-likelihood and the final log-likelihood at convergence. The adjusted rho-square value takes into account the number of parameters estimated in the model.

TABLE 5-3: FINAL MNL MODEL COEFFICIENTS AND STATISTICS

Coefficient	Units	Value	Rob. Std. Error	Rob. T-stat
Travel Time				
Gilcrease - Work Trips	Minutes	-0.13	0.0114	-11.42
Gilcrease - Non Work Trips	Minutes	-0.135	0.00894	-15.13
General - Work Trips	Minutes	-0.185	0.0136	-13.56
General - Non Work Trips	Minutes	-0.185	0.0125	-14.78
Travel Cost*				
Gilcrease - Work Trips	$	-4.96	0.404	-12.29
Gilcrease - Non Work Trips	$	-5.74	0.339	-16.95
General - Work Trips	$	-7.27	0.596	-12.2
General - Non Work Trips	$	-6.34	0.501	-12.66
Dummy Variables				
Strongly Opposed to Project/New Facility	1,0	-2	0.22	-9.08
Possess a transponder	1,0	0.708	0.242	2.92
Alternative Specific Constant				
Alternative 2 - Use New Highway	1,0	-1.3	0.248	-5.25
Model Statistics				
Number of parameters				11
Number of observations				10750
Number of individuals				1075
Initial log-likelihood				-7451.332
Final log-likelihood				-4640.236
Rho-square				0.377
Adjusted rho-square				0.376

5.4 | MNL MODEL: WILLINGNESS TO PAY FOR TRAVEL TIME SAVINGS

One way to evaluate the sensitivities that are estimated in the MNL models is to calculate the marginal rates of substitution for different attributes of interest. In economic theory, the marginal rate of substitution is the amount of one good (e.g., money) that a person would exchange for a second good (e.g., travel time), while maintaining the same level of utility or satisfaction. In this analysis, the marginal rate of substitution of the travel time and toll cost coefficients provides the implied toll value that travelers would be willing to pay for a given amount of travel time savings offered by using the proposed facility or a new highway in the Tulsa area.

The willingness to pay for travel time savings, or VOT, can be calculated by dividing the travel time coefficient by the toll cost coefficient after accounting for the income transformation that was applied in the model specification. The resulting VOT is in units of dollars per minute; multiplying by 60 will convert this into the more commonly cited units of dollars per hour (Equation 3).

EQUATION 3: WILLINGNESS TO PAY FOR TRAVEL TIME SAVINGS

$$VOT = 60 \times \frac{\beta Time}{\left[\frac{\beta Cost}{LN(income/100)}\right]}$$

In Equation 3, βTime is the value of the travel time coefficient (with units of 1/min), βCost is the value of the toll cost coefficient (with units of 1/$), and the log transformation controls for nonlinear income effects.

TABLE 5-4: VALUE OF TIME BY CORRIDOR/TRIP TYPE AND PURPOSE

Household Income	Gilcrease - Work Trips	Gilcrease - Non Work Trips	General - Work Trips	General - Non Work Trips
$10,000	$7.24	$6.50	$7.03	$8.06
$20,000	$8.33	$7.48	$8.09	$9.28
$30,000	$8.97	$8.05	$8.71	$9.99
$42,500	$9.52	$8.54	$9.24	$10.60
$62,500	$10.12	$9.08	$9.83	$11.27
$87,500	$10.65	$9.56	$10.34	$11.86
$112,500	$11.05	$9.91	$10.73	$12.30
$137,500	$11.36	$10.20	$11.03	$12.65
$175,000	$11.74	$10.54	$11.40	$13.07
$200,000	$11.95	$10.73	$11.61	$13.31

6.0 CONCLUSION

RSG successfully developed and implemented a stated preference survey that gathered information from 1,143 automobile travelers in the Tulsa area. The purpose of the survey was to measure the VOT of travelers who could potentially use the proposed Gilcrease Expressway, as well as drivers who make general highway trips in the region. The questionnaire collected data on current travel behaviors, presented respondents with information about the proposed facilities, and engaged the travelers in a series of stated preference questions to measure their propensity to use tolled routes in the Tulsa area.

Multinomial logit choice models were developed to provide estimates of VOT for potential travelers on both of the proposed facilities and for travelers in the general region, both for work-related and non-work-related trips. The magnitude and signs of the sensitivity estimates are reasonable and intuitively correct, and the VOT for work trips and non-work trips at each segment's median income category ranged from $9.56 to $11.86 per hour. These values are within the range of other similar studies across the country and in Oklahoma.

These estimates of VOT will serve as inputs into the travel demand model used to forecast traffic and revenue for future highway construction in the Tulsa area.

7.0 SURVEY SCREEN CAPTURES

7.1 | INTRODUCTION AND QUALIFICATION QUESTIONS

FIGURE 7-1: SURVEY INTRODUCTION AND INSTRUCTIONS

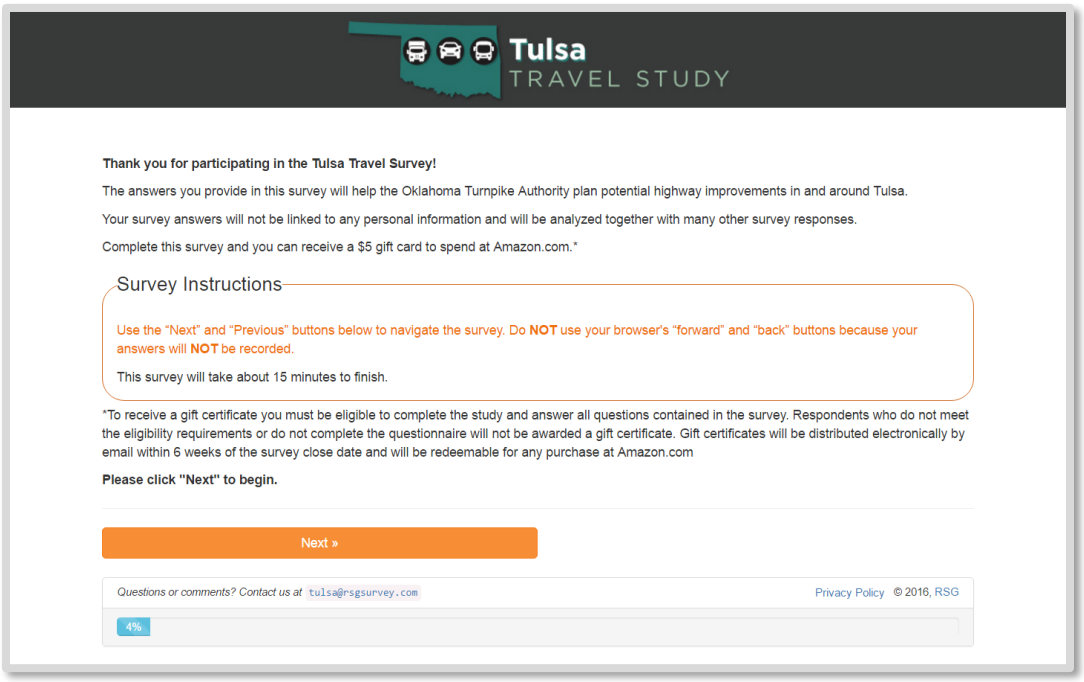


FIGURE 7-2: TRIP QUALIFICATION (GILCREASE EXPRESSWAY STUDY AREA)

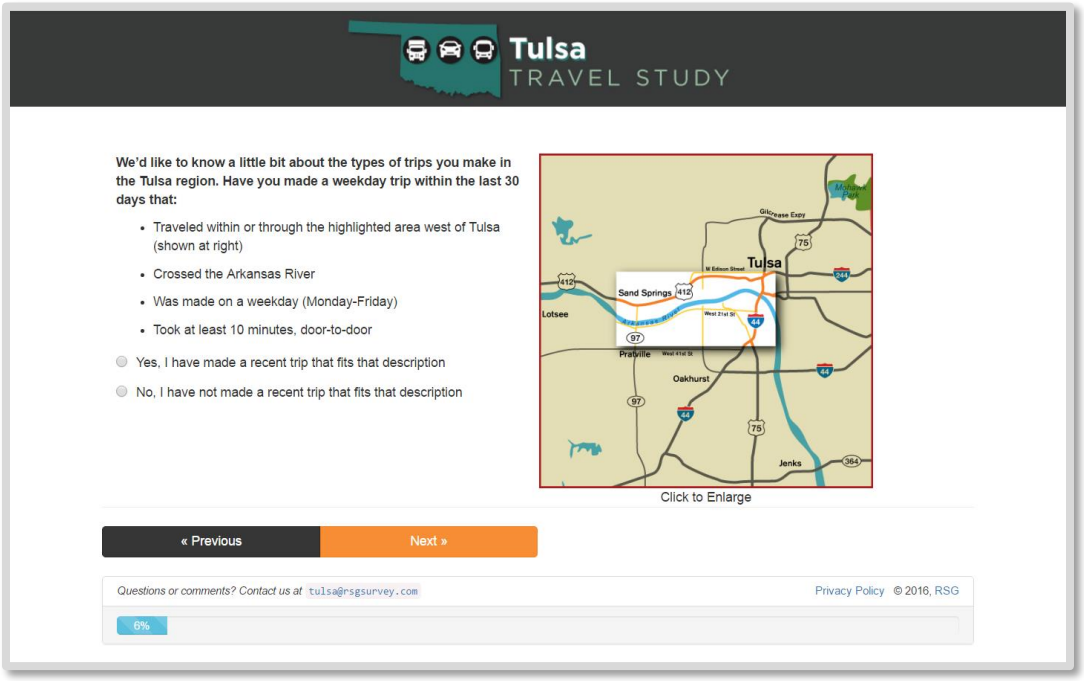


FIGURE 7-3: TRIP QUALIFICATION (GENERAL)

If respondent has not made a trip through the Gilcrease Expressway study area

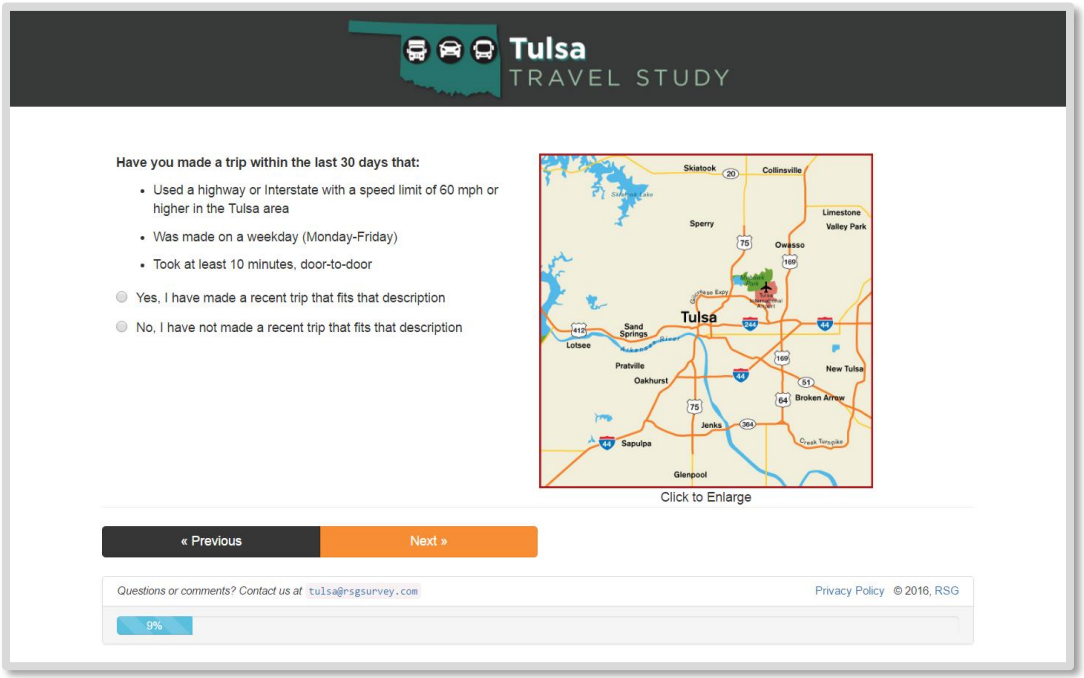
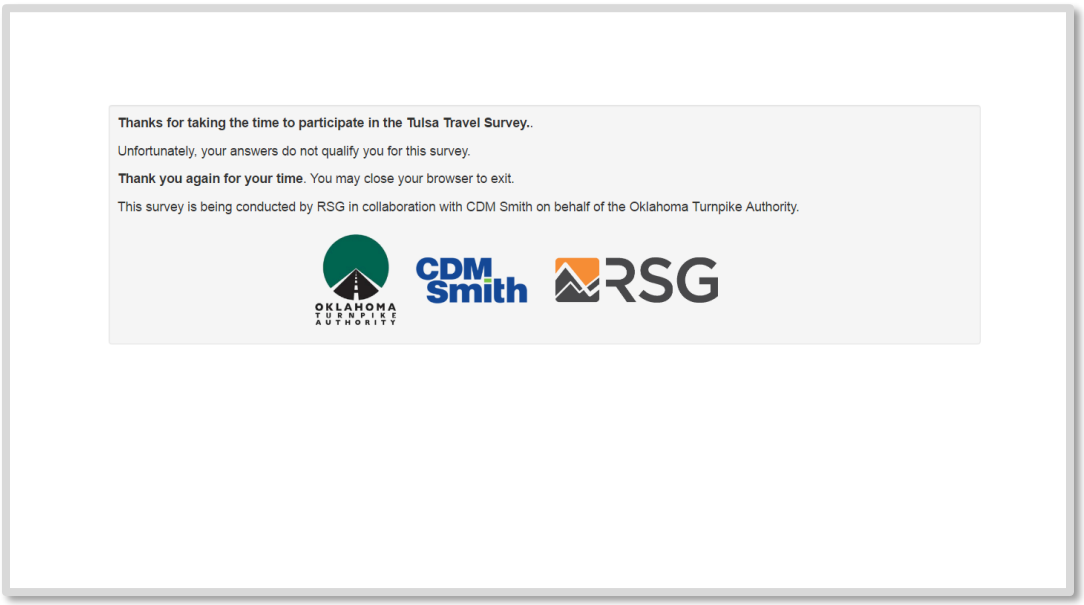


FIGURE 7-4: TERMINATION

If respondent has not made a qualifying trip



7.2 | TRIP DETAIL QUESTIONS

FIGURE 7-5: DEFINITION OF QUALIFYING ONE-WAY TRIP

Figures 5-7 show Gilcrease Expressway version

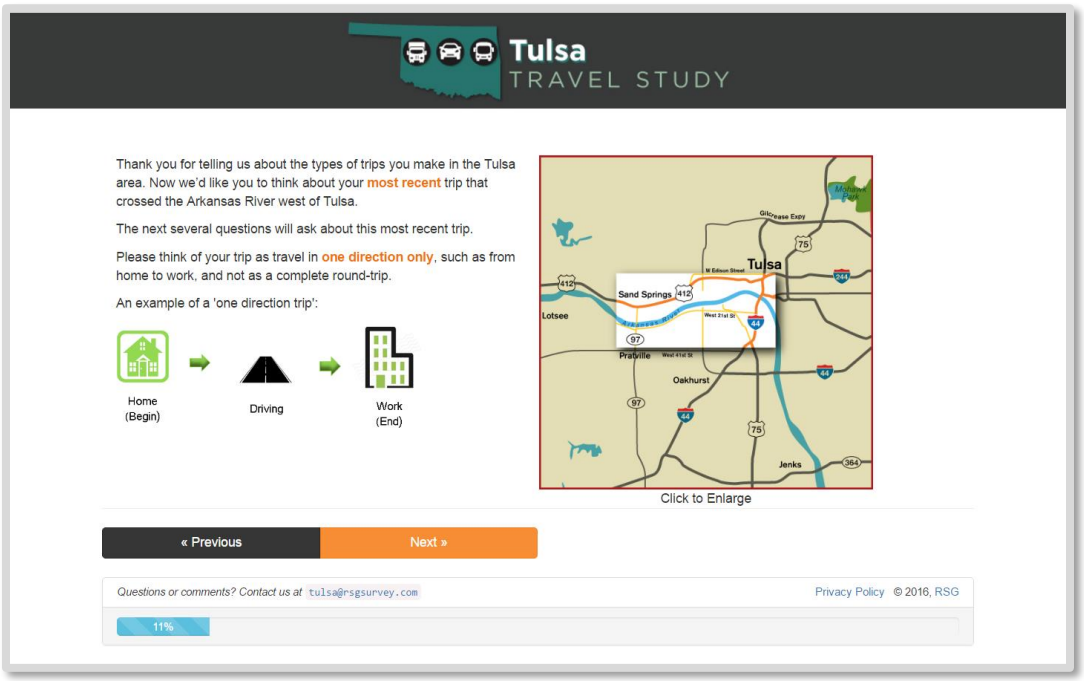


FIGURE 7-6: DAY OF WEEK

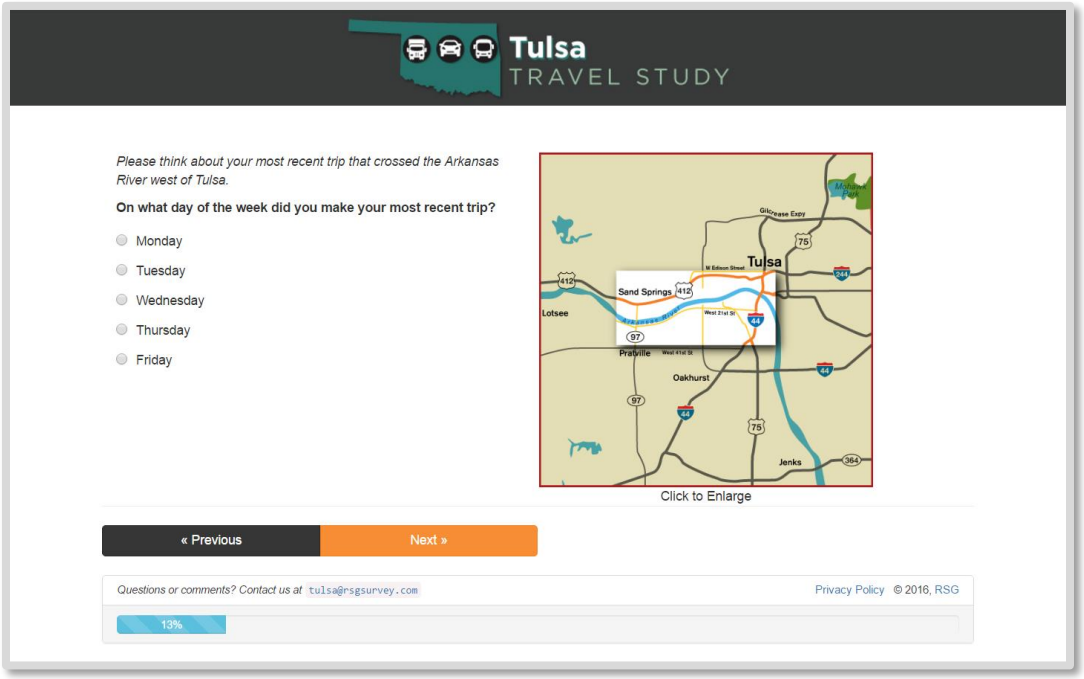


FIGURE 7-7: PURPOSE

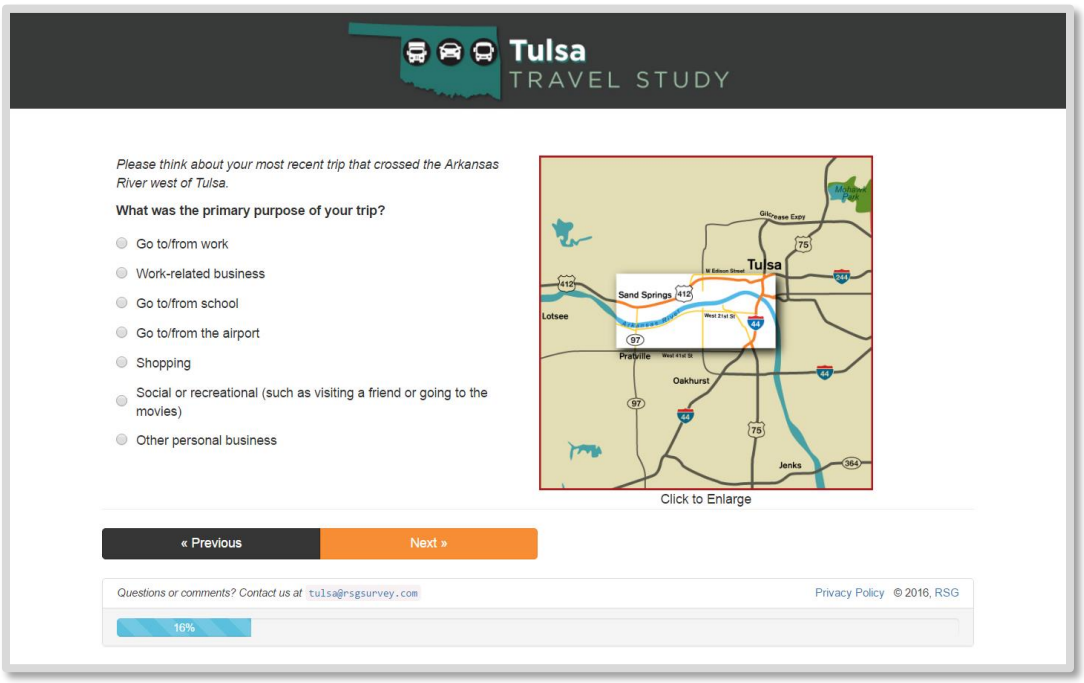


FIGURE 7-8: BEGINNING AND ENDING LOCATIONS

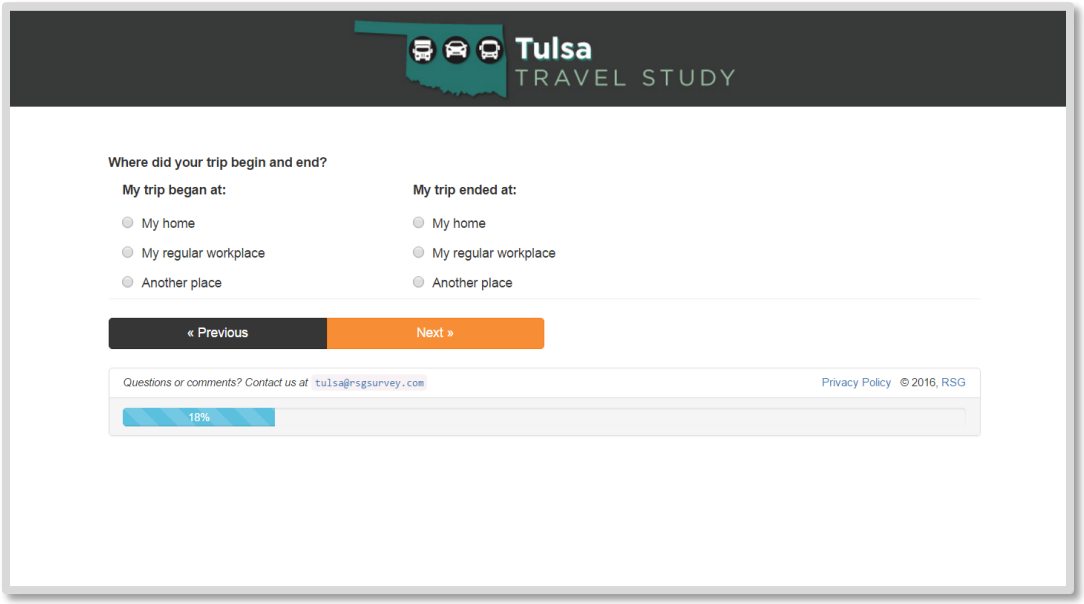


FIGURE 7-9: TRIP CONFIRMATION

If respondent's beginning and ending locations are both home or both work

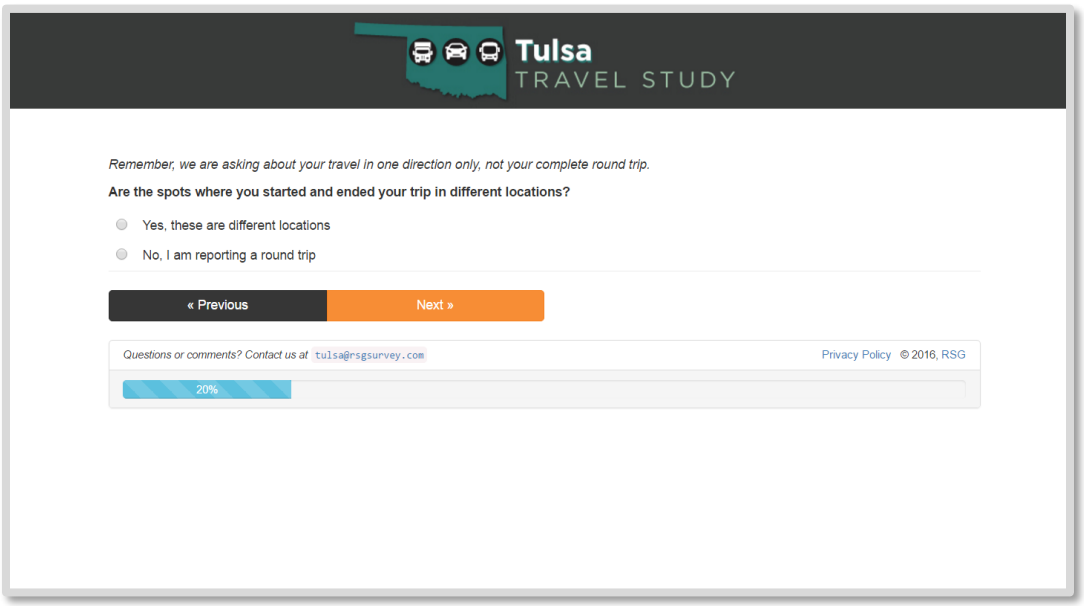


FIGURE 7-10: ORIGIN

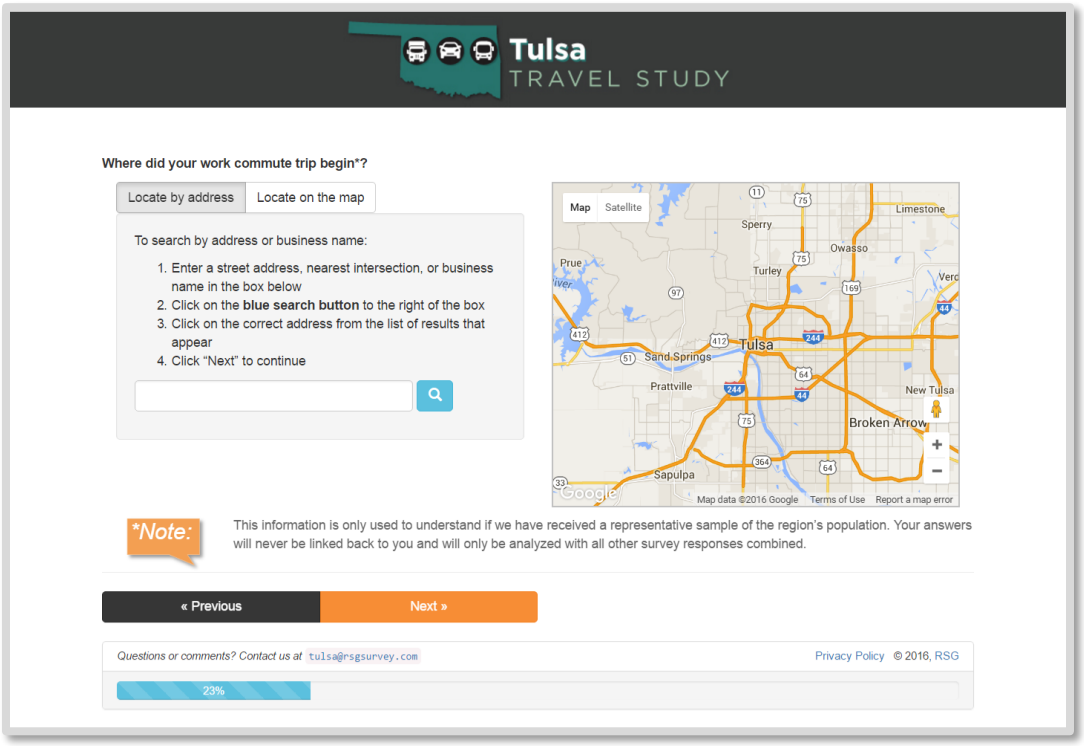


FIGURE 7-11: DESTINATION

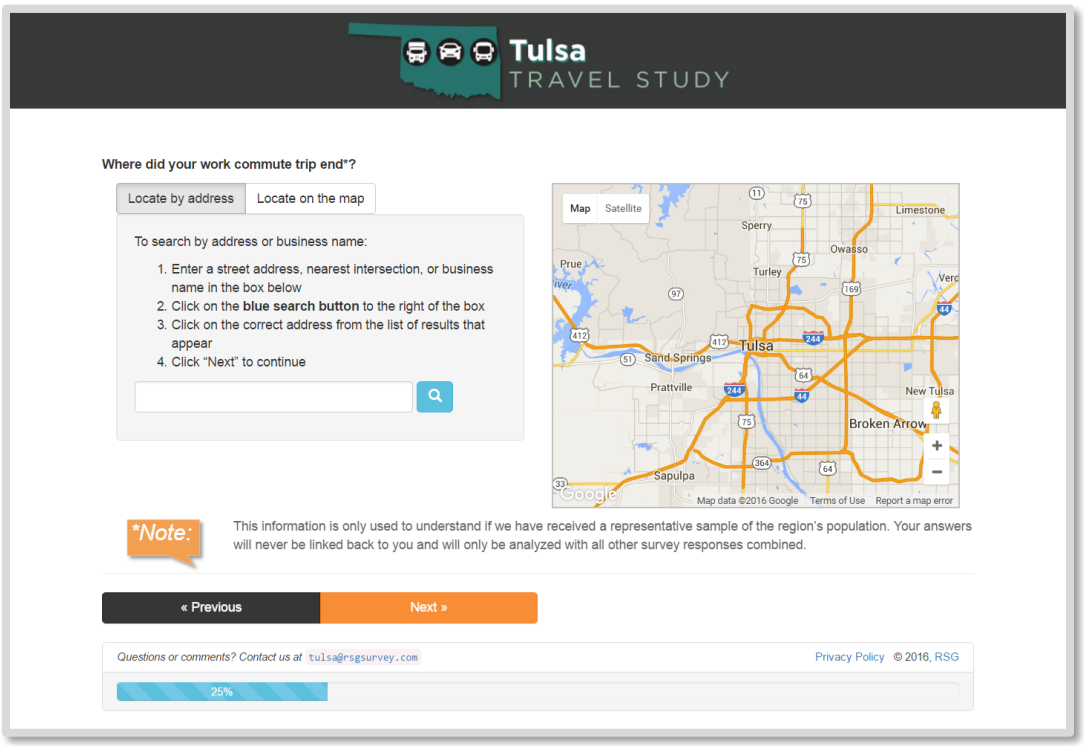


FIGURE 7-12: INVALID TRIP

If respondent's origin and destination indicate an invalid trip

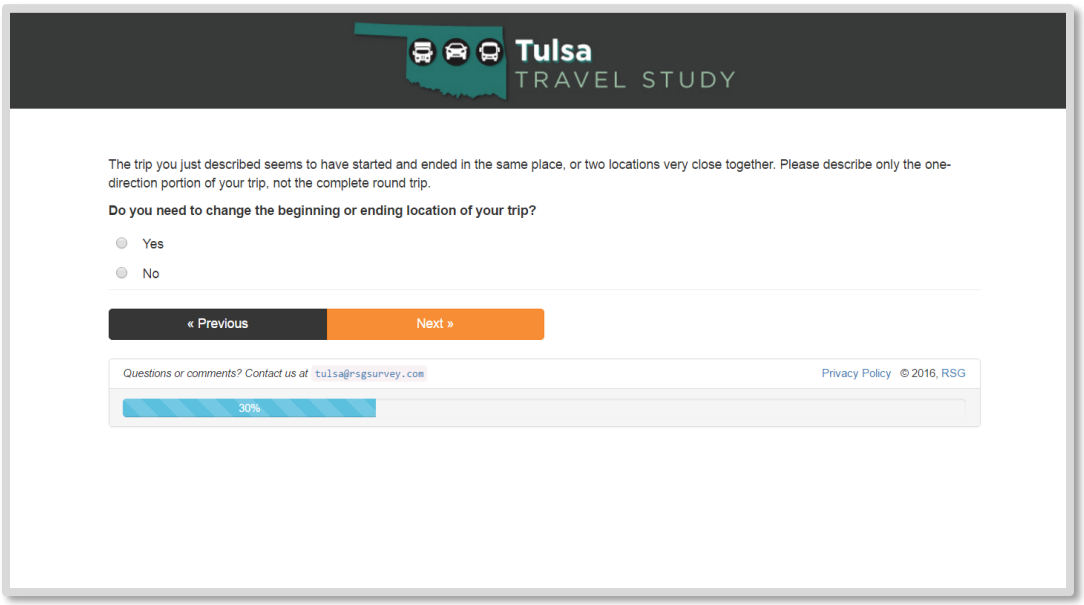


FIGURE 7-13: ORIGIN AND DESTINATION CONFIRMATION

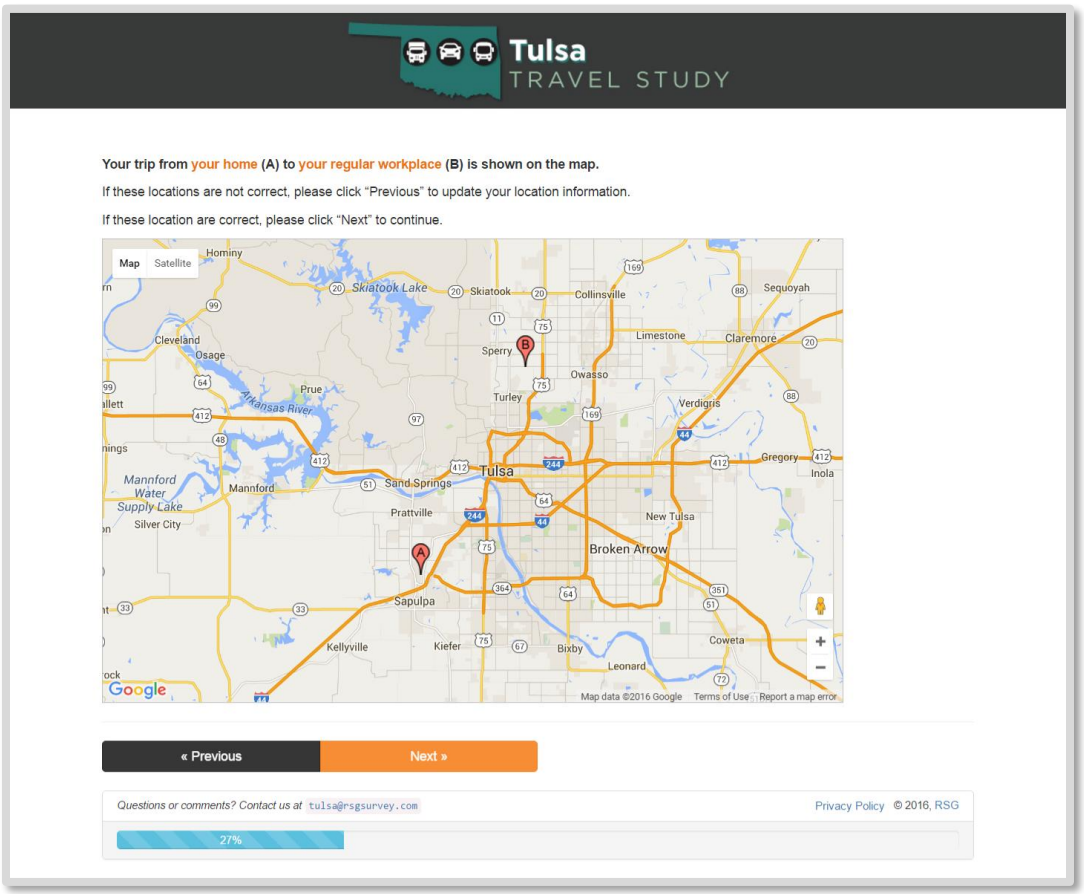


FIGURE 7-14: DEPARTURE TIME

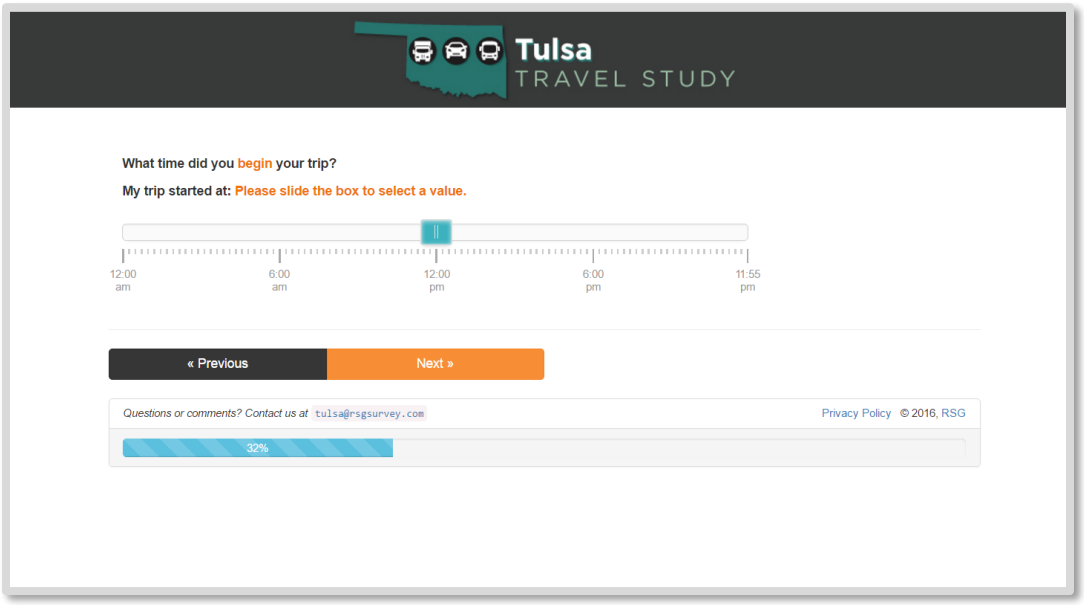


FIGURE 7-15: TRAVEL TIME

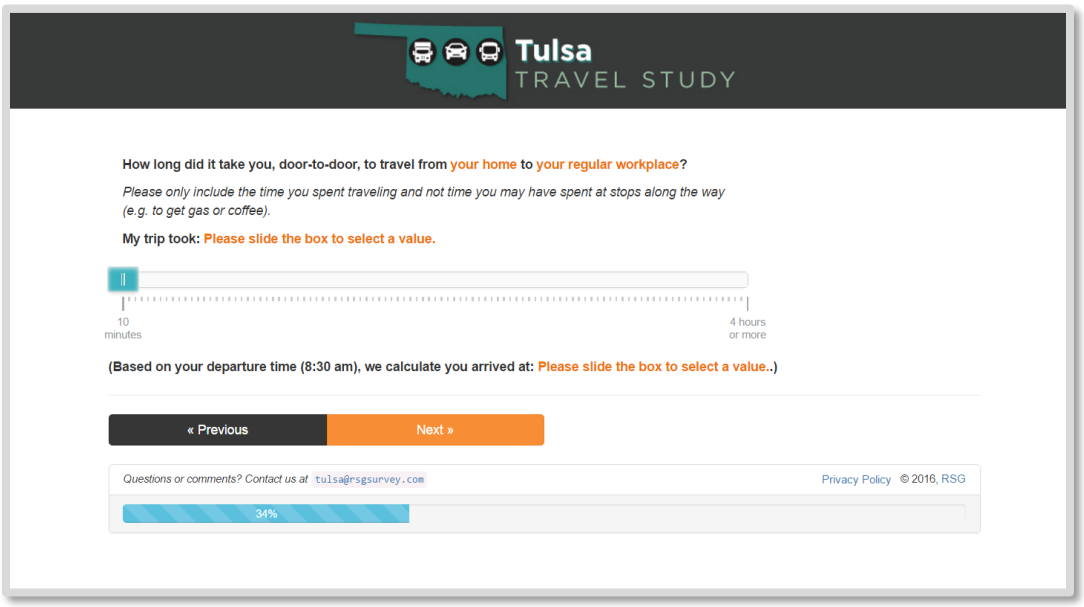


FIGURE 7-16: TRAVEL TIME CONFIRMATION

If stated travel time seems too short or too long

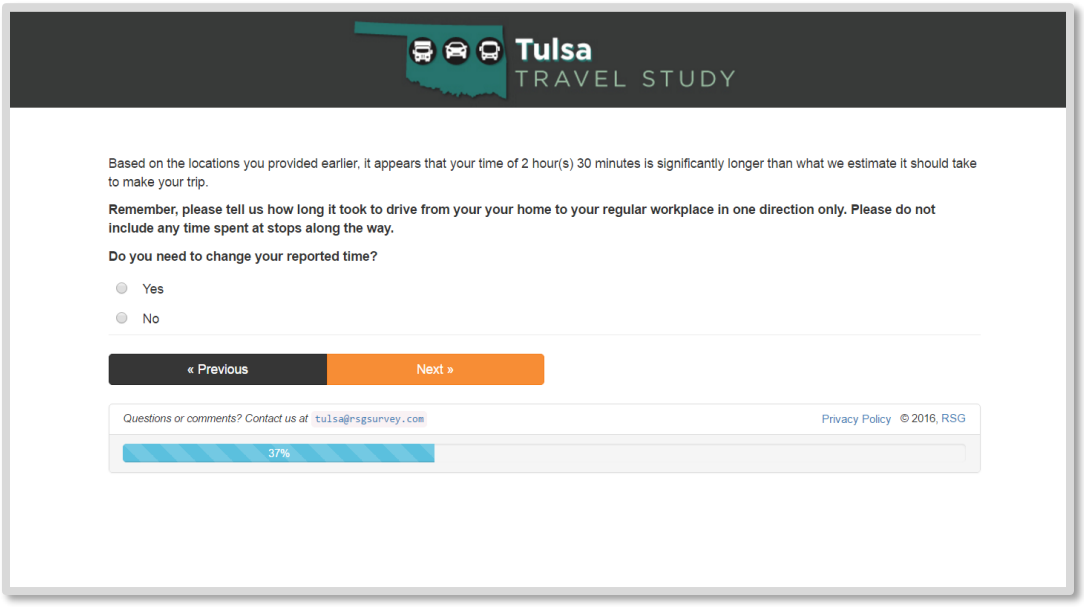


FIGURE 7-17: DELAY

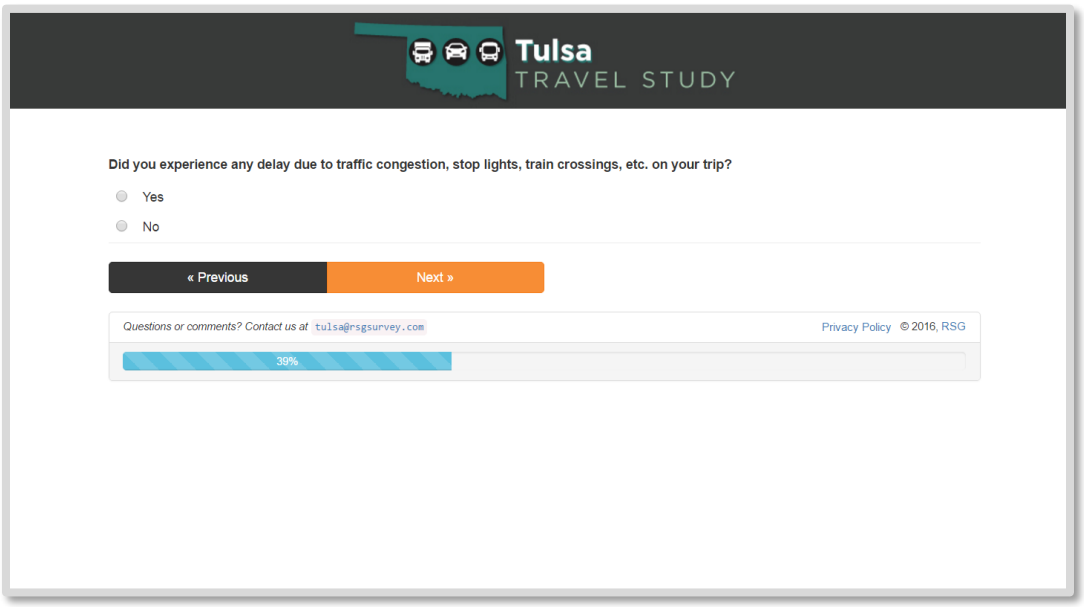


FIGURE 7-18: TRAVEL TIME WITHOUT DELAY

If respondent experienced delay due to traffic congestion

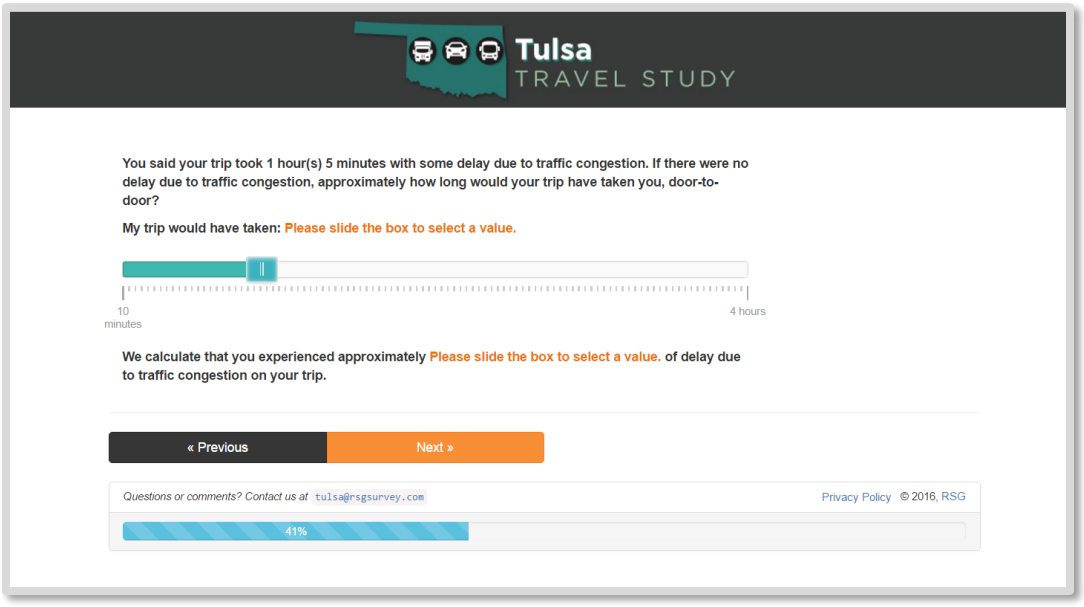


FIGURE 7-19: TOLL(S) PAID

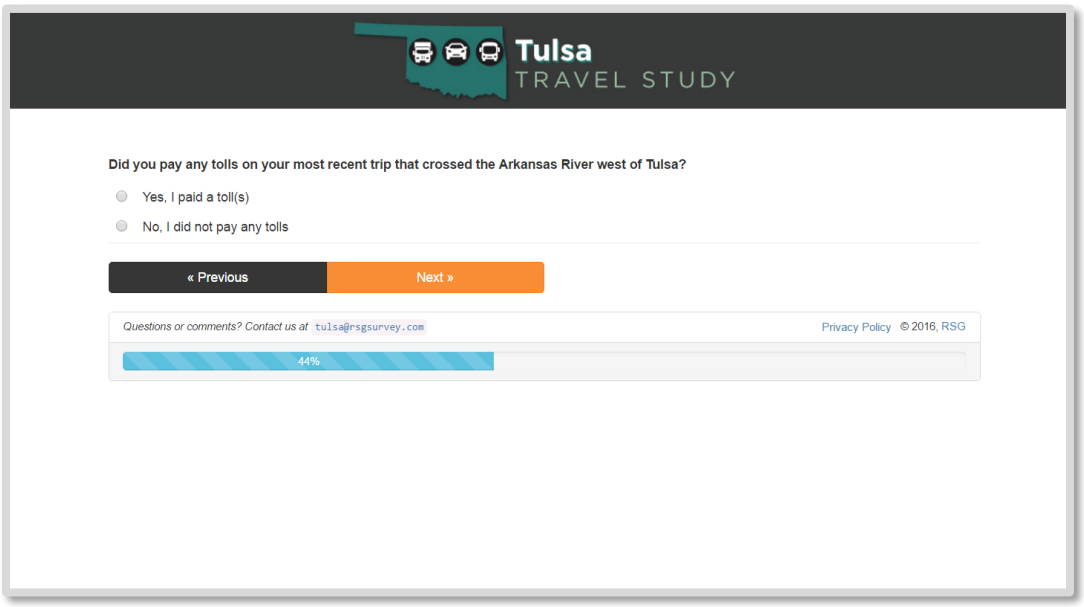


FIGURE 7-20: TOLL AMOUNT(S) PAID

If respondent paid toll(s)

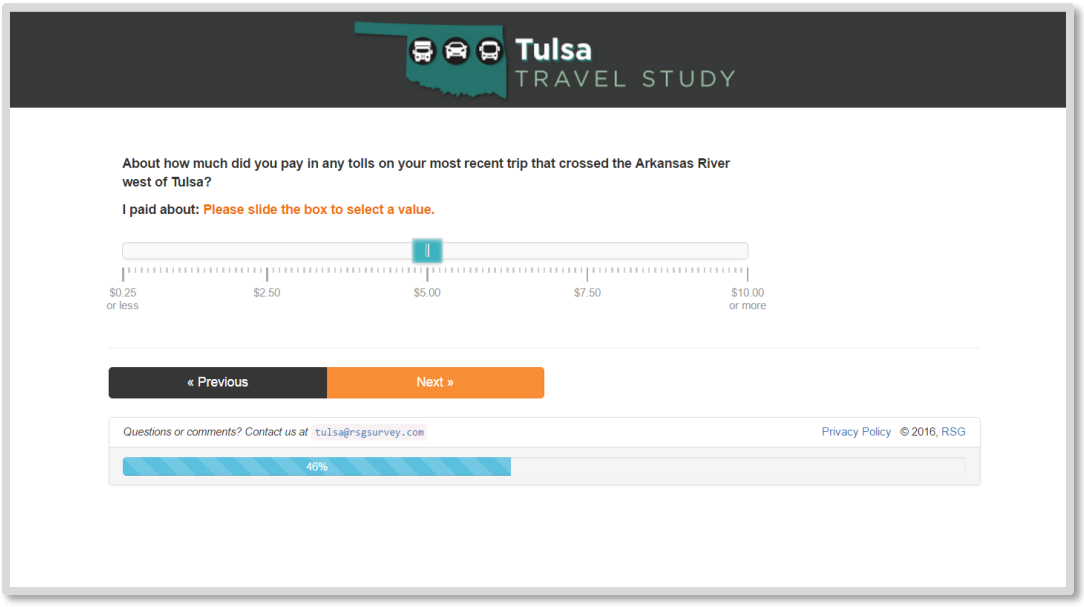


FIGURE 7-21: VEHICLE OCCUPANCY

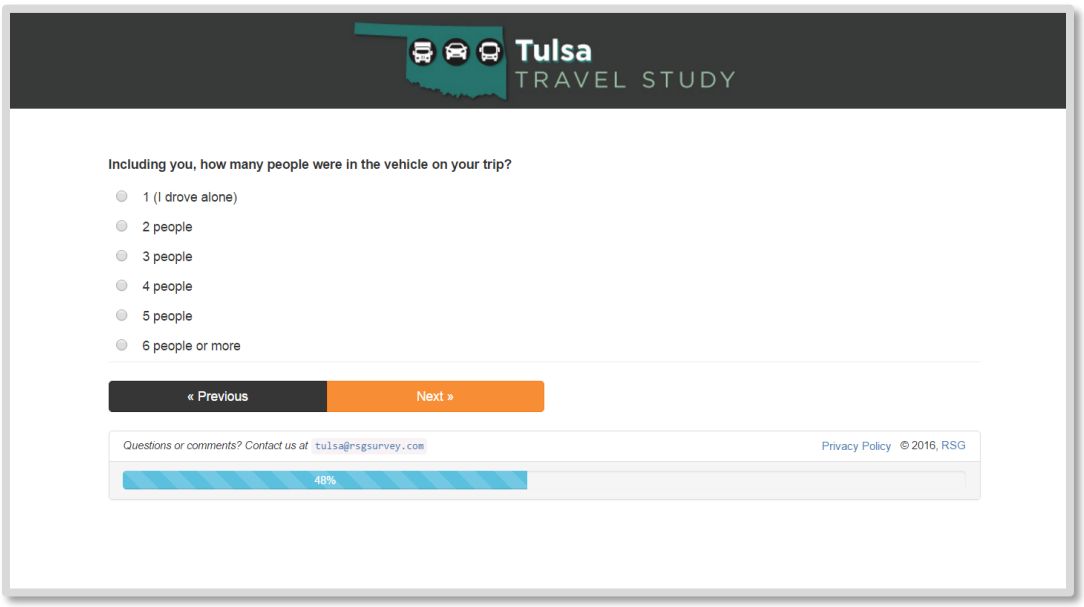


FIGURE 7-22: TRIP FREQUENCY

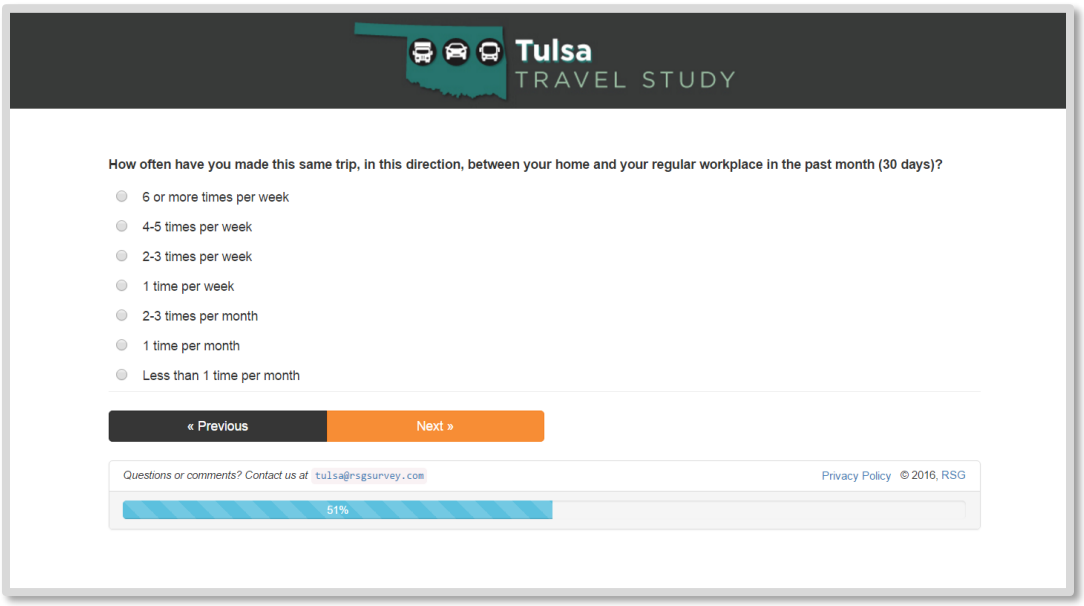


FIGURE 7-23: TRANSPONDER OWNERSHIP

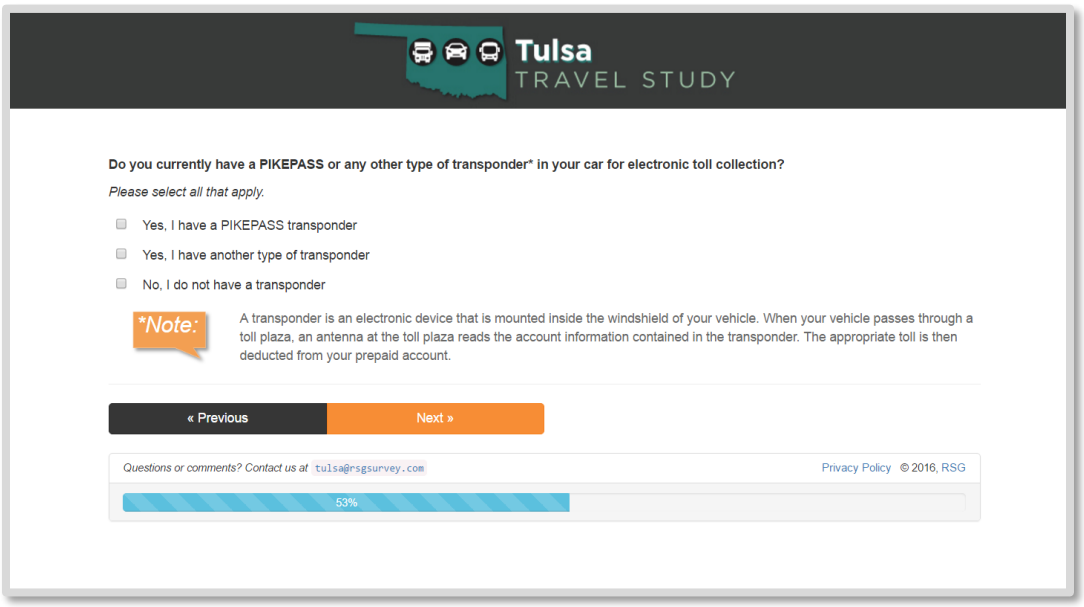
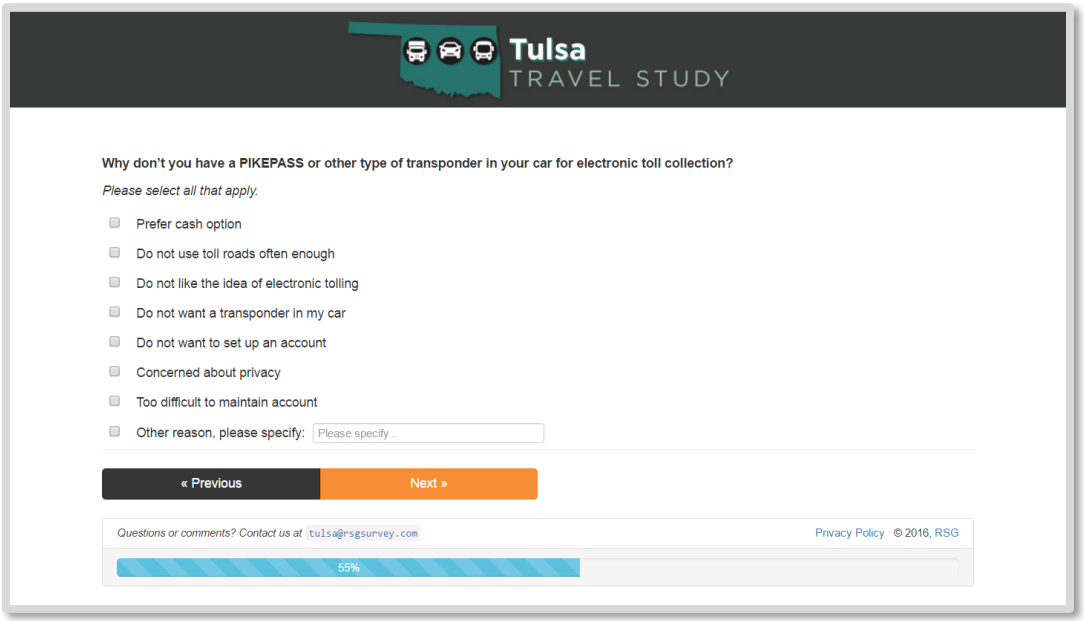


FIGURE 7-24: REASON(S) FOR NOT OWNING A TRANSPONDER

If respondent has no transponder



7.3 | STATED PREFERENCE QUESTIONS

FIGURE 7-25: PROJECT INTRODUCTION (GILCREASE EXPRESSWAY VERSION)

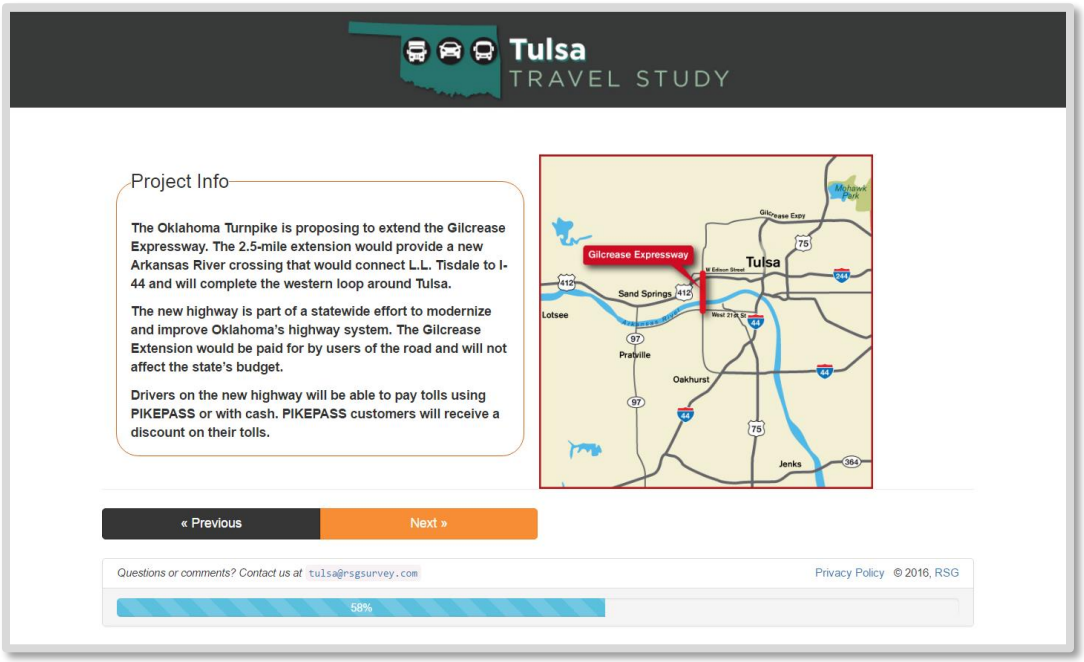


FIGURE 7-26: PROJECT INTRODUCTION (GENERAL VERSION)

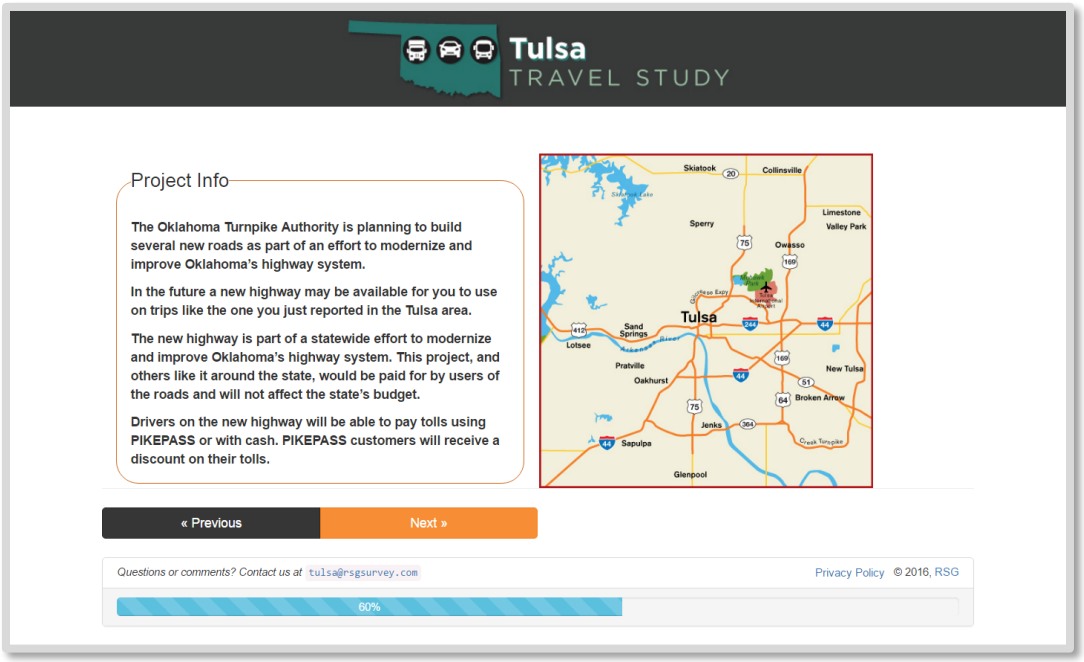


FIGURE 7-27: STATED PREFERENCE (SP) INSTRUCTIONS

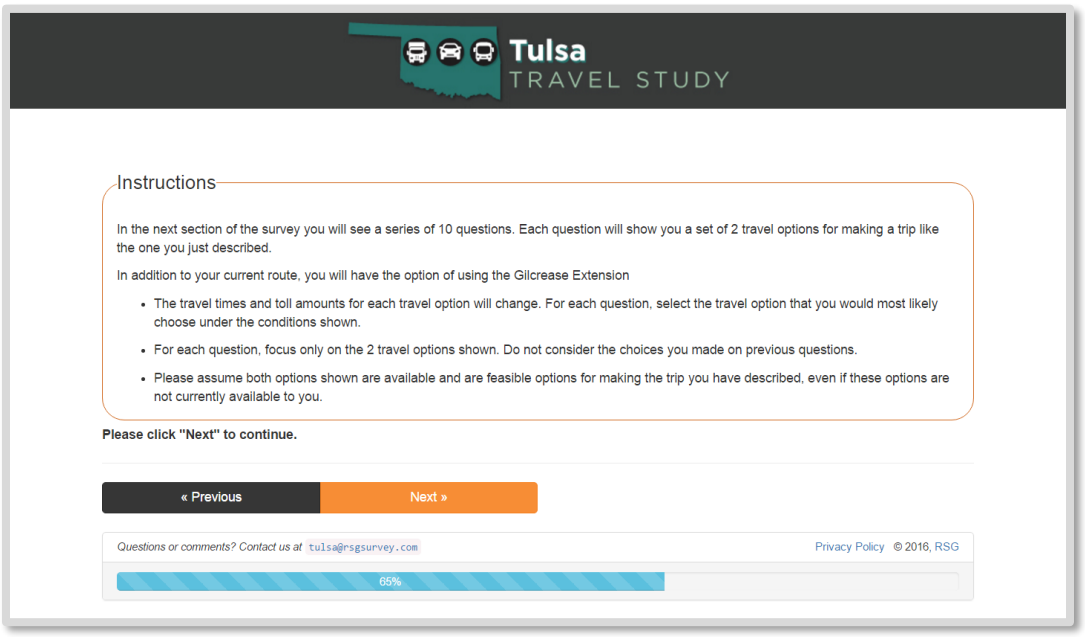


FIGURE 7-28: SP EXPERIMENT EXAMPLE #1 (GILCREASE EXPRESSWAY VERSION)

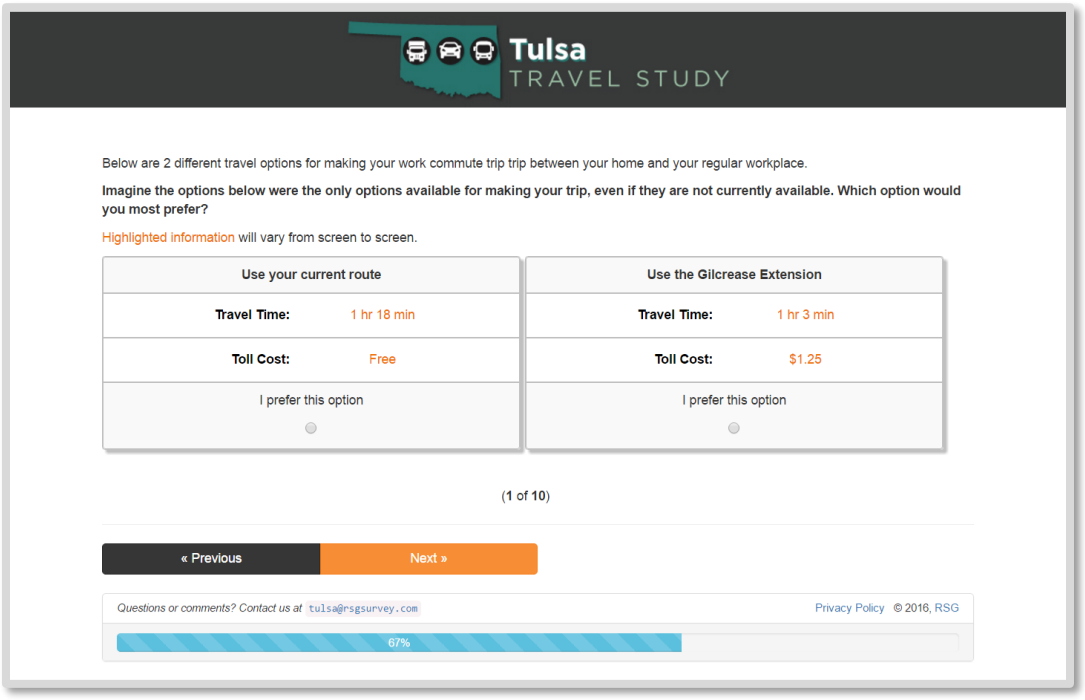


FIGURE 7-29: SP EXPERIMENT EXAMPLE #1 (GENERAL VERSION)

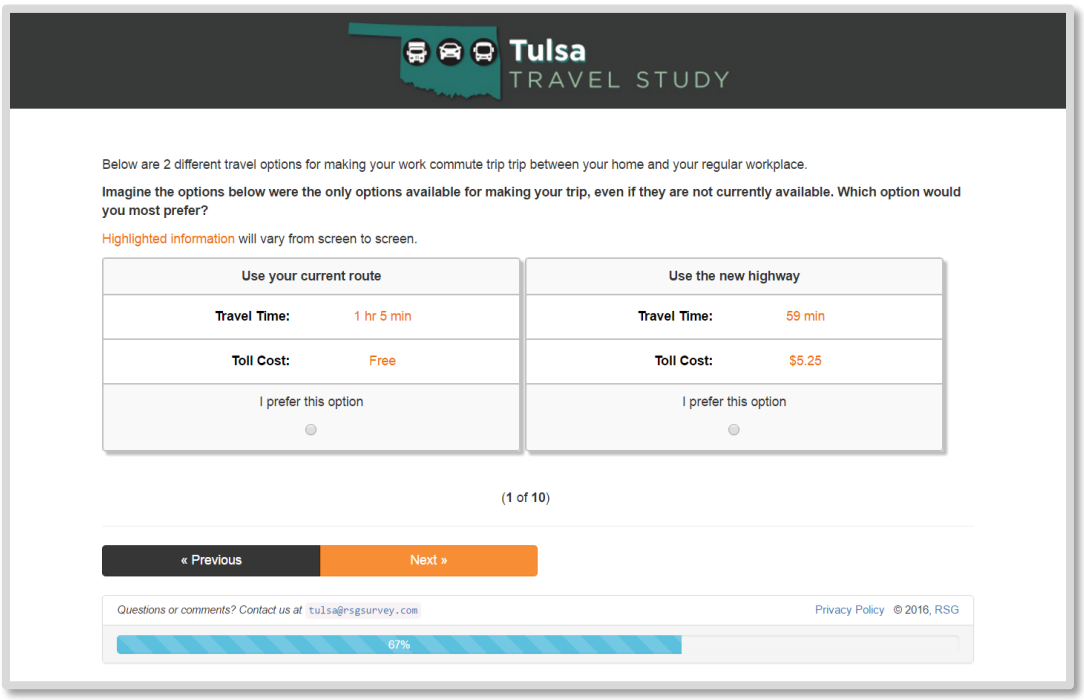


FIGURE 7-30: SP EXPERIMENT EXAMPLE #2

Examples #2-10 show the general version

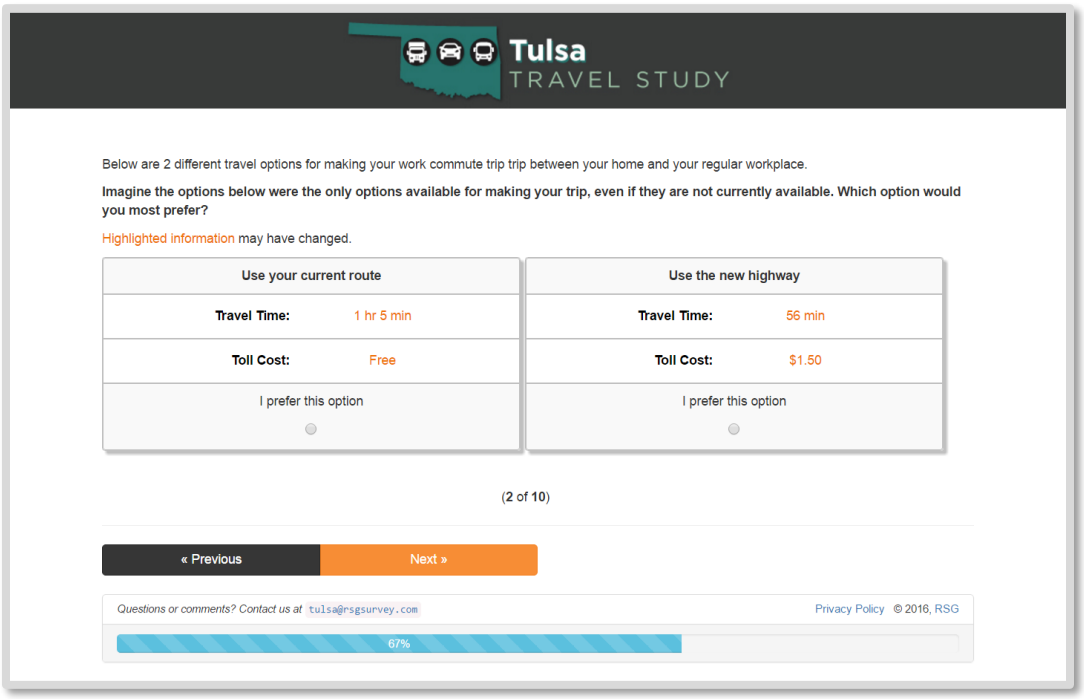


FIGURE 7-31: SP EXPERIMENT EXAMPLE #3

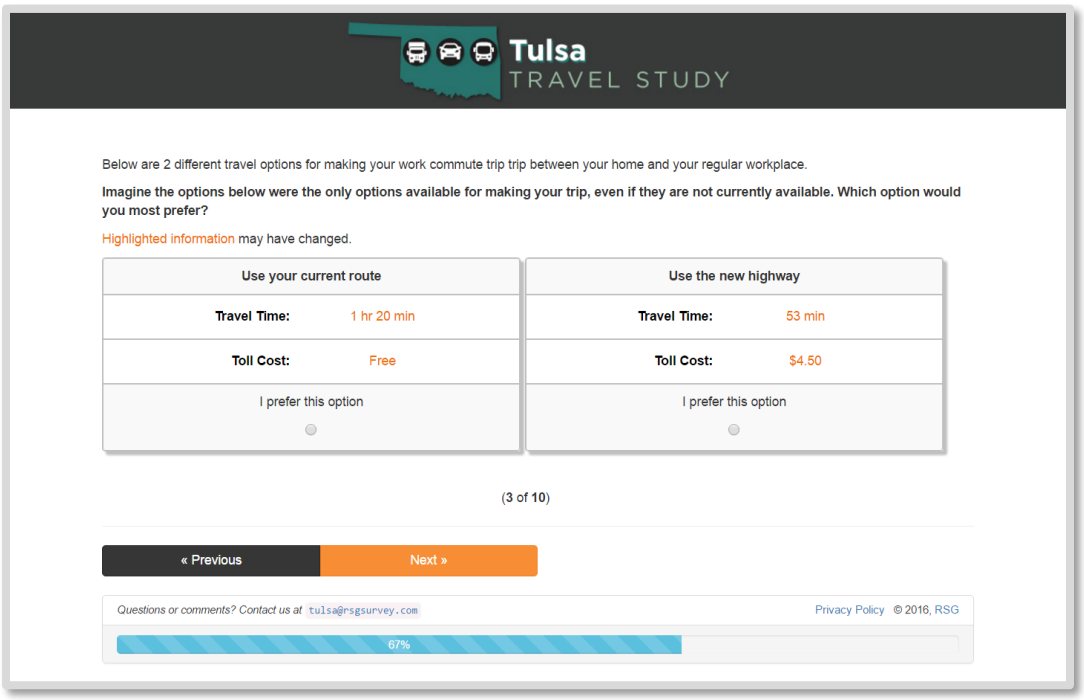


FIGURE 7-32: SP EXPERIMENT EXAMPLE #4

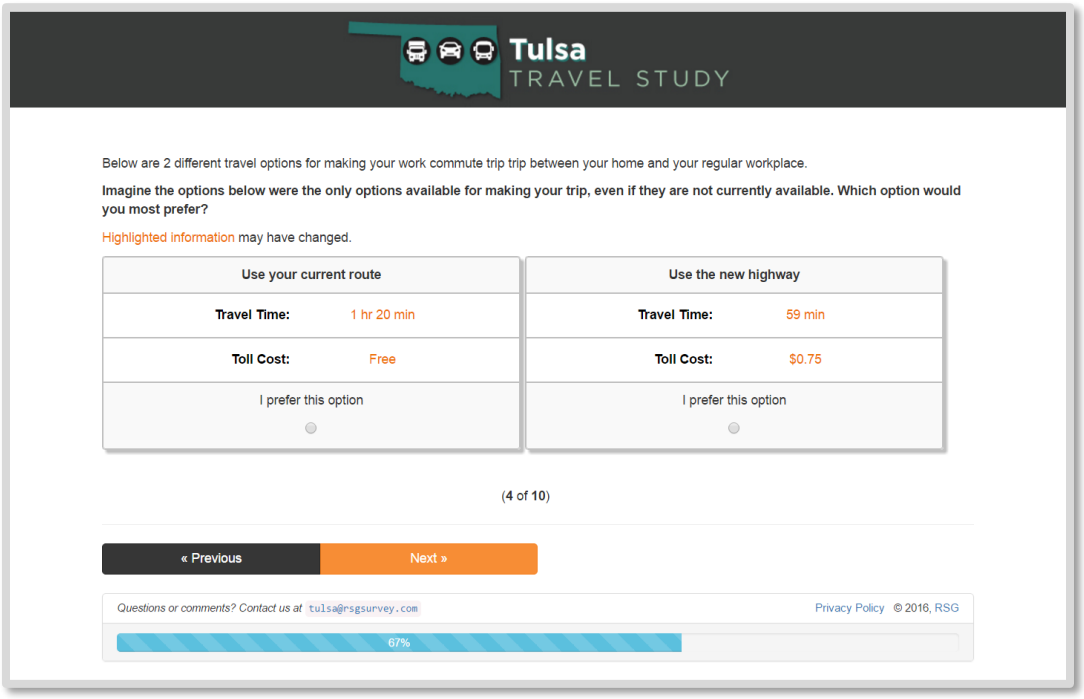


FIGURE 7-33: SP EXPERIMENT EXAMPLE #5

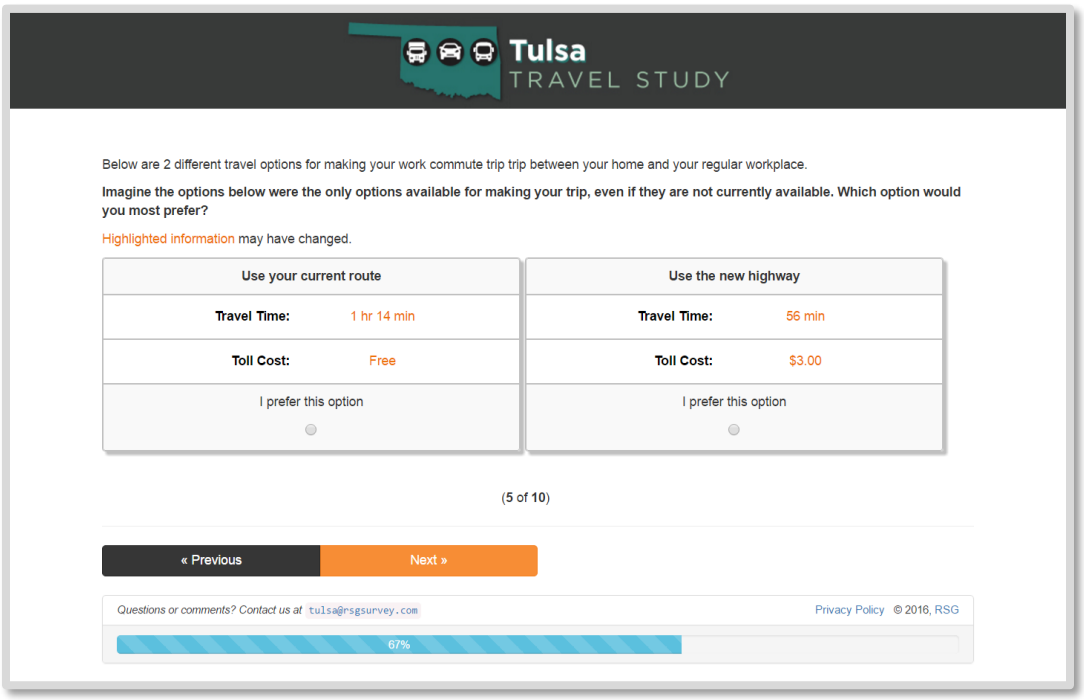


FIGURE 7-34: SP EXPERIMENT EXAMPLE #6

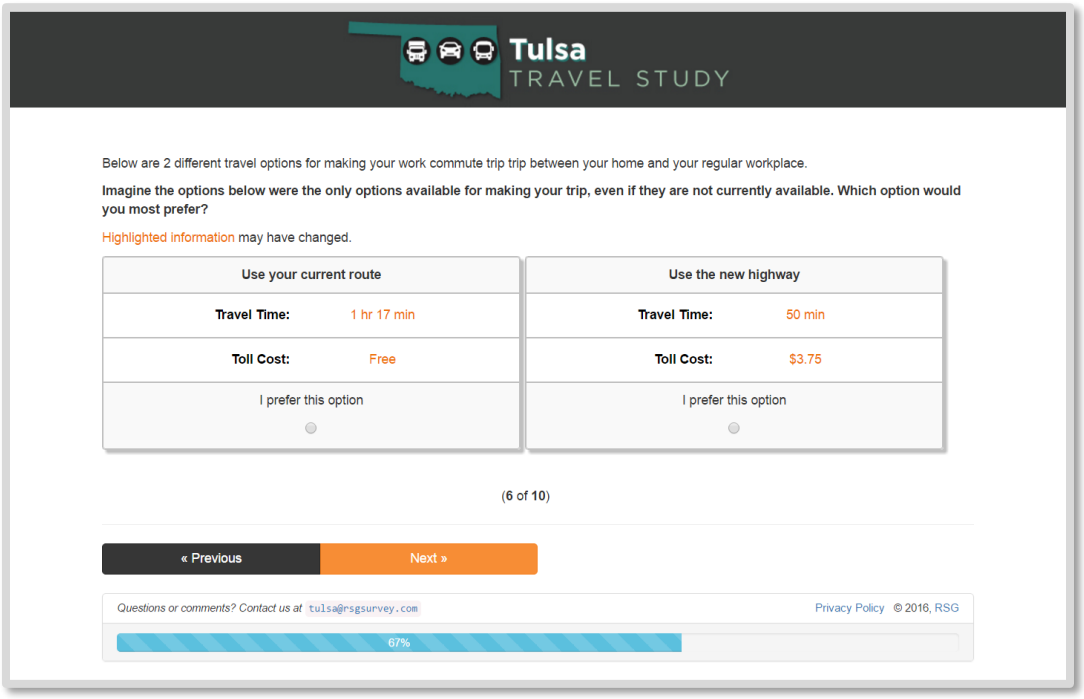


FIGURE 7-35: SP EXPERIMENT EXAMPLE #7

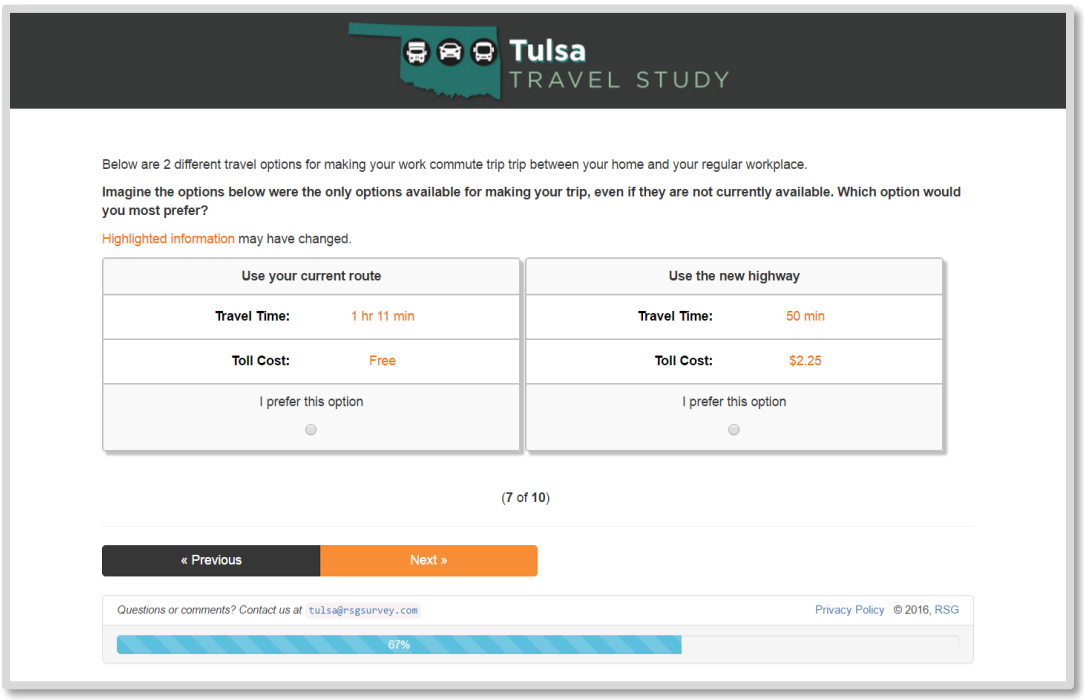


FIGURE 7-36: SP EXPERIMENT EXAMPLE #8

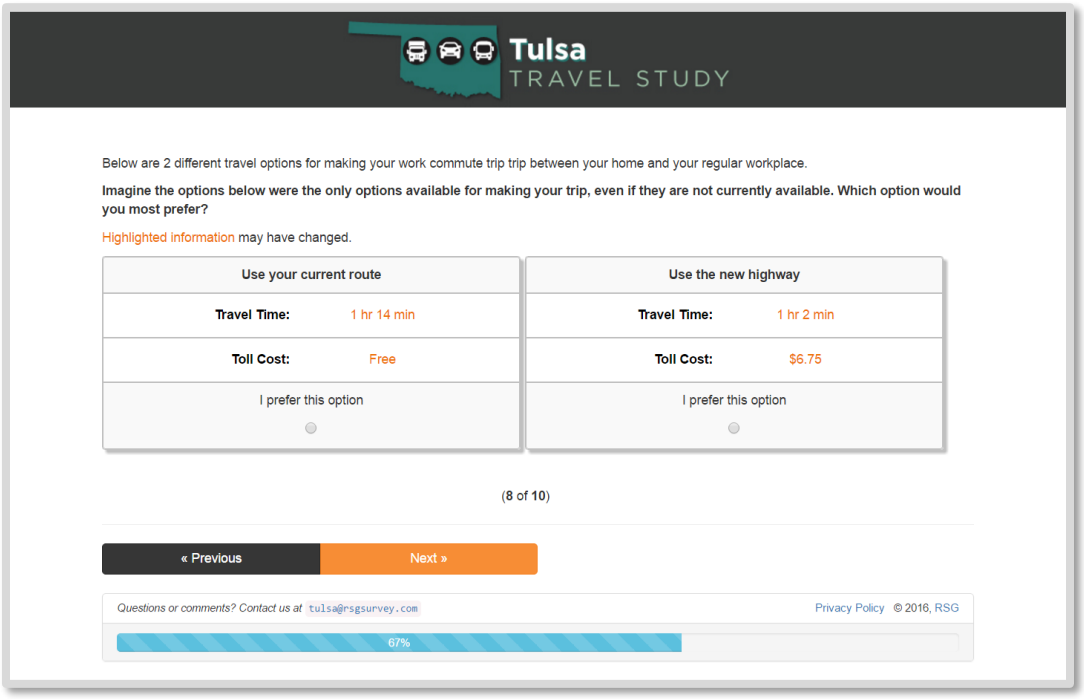


FIGURE 7-37: SP EXPERIMENT EXAMPLE #9

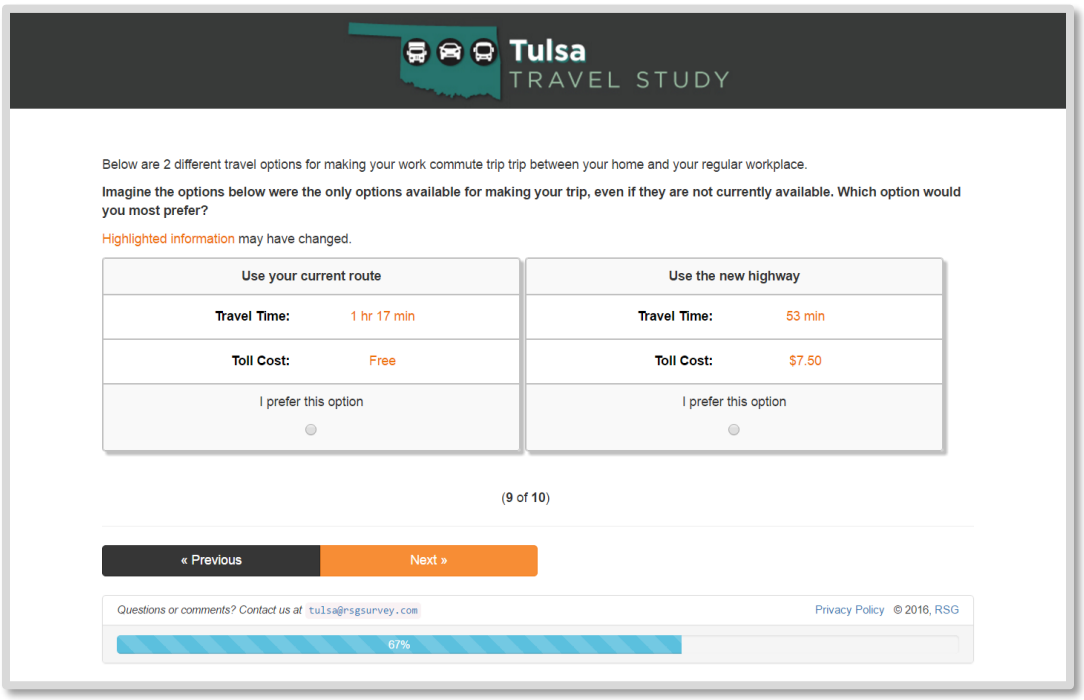
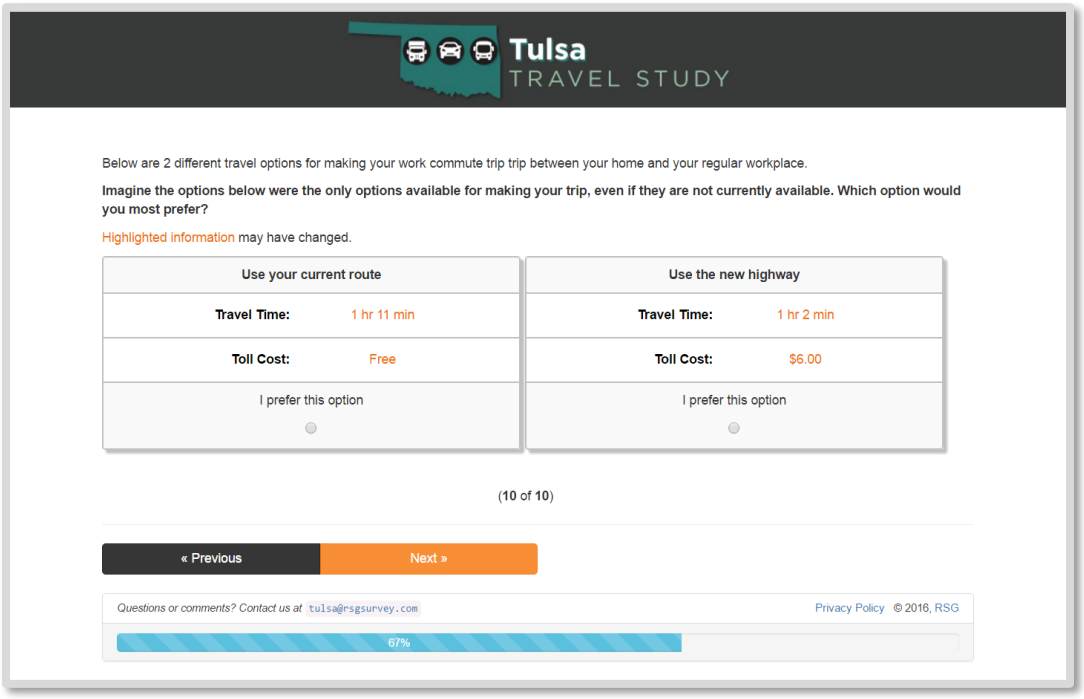


FIGURE 7-38: SP EXPERIMENT EXAMPLE #10



7.4 | DEBRIEF AND OPINION QUESTIONS

FIGURE 7-39: REASON FOR NOT SELECTING TOLLED OPTION

If never selected a tolled option in the stated preference section

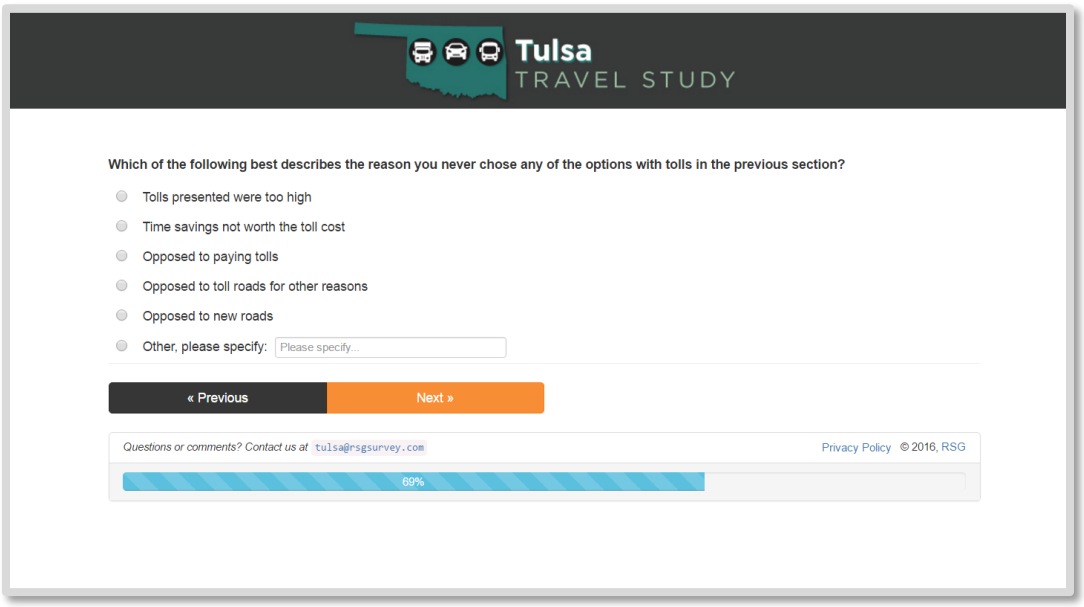


FIGURE 7-40: PROJECT OPINION

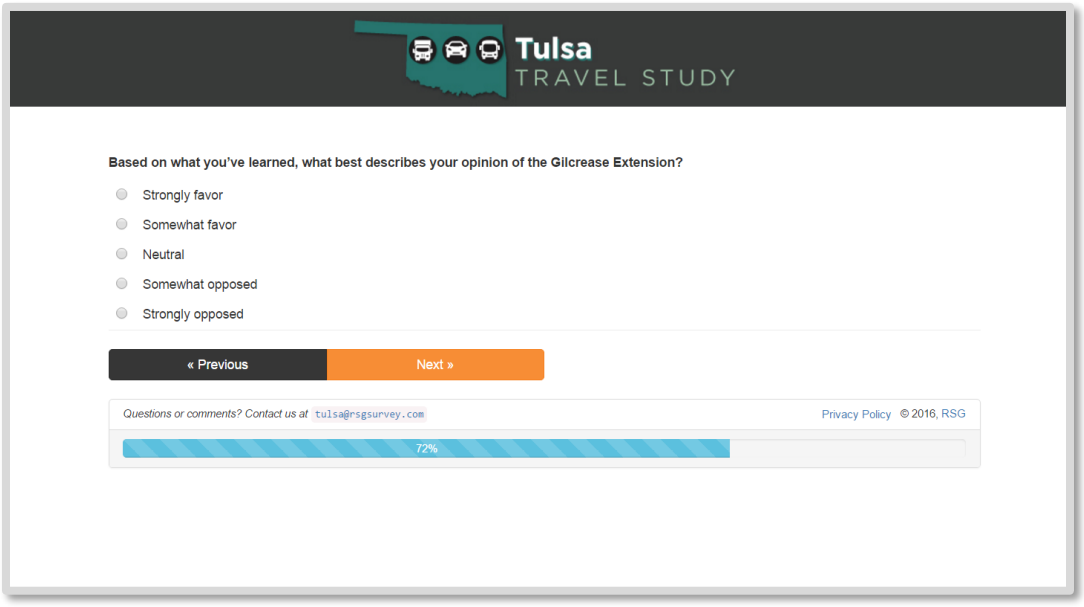


FIGURE 7-41: REASON FOR OPPOSING THE PROJECT
If somewhat or strongly opposes the project

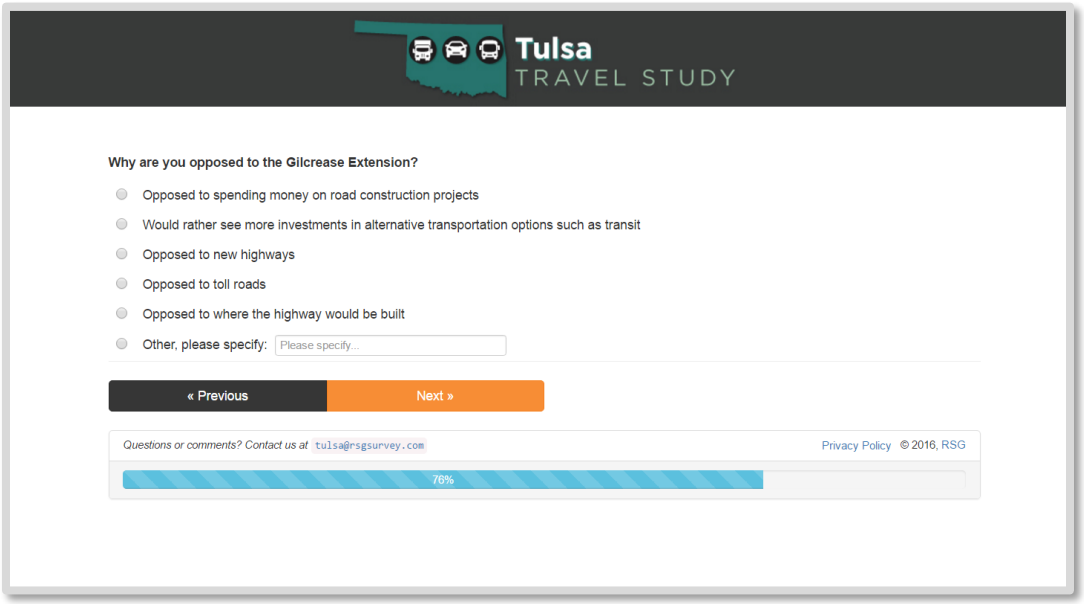


FIGURE 7-42: REASON FOR SUPPORTING THE PROJECT
If somewhat or strongly favors the project

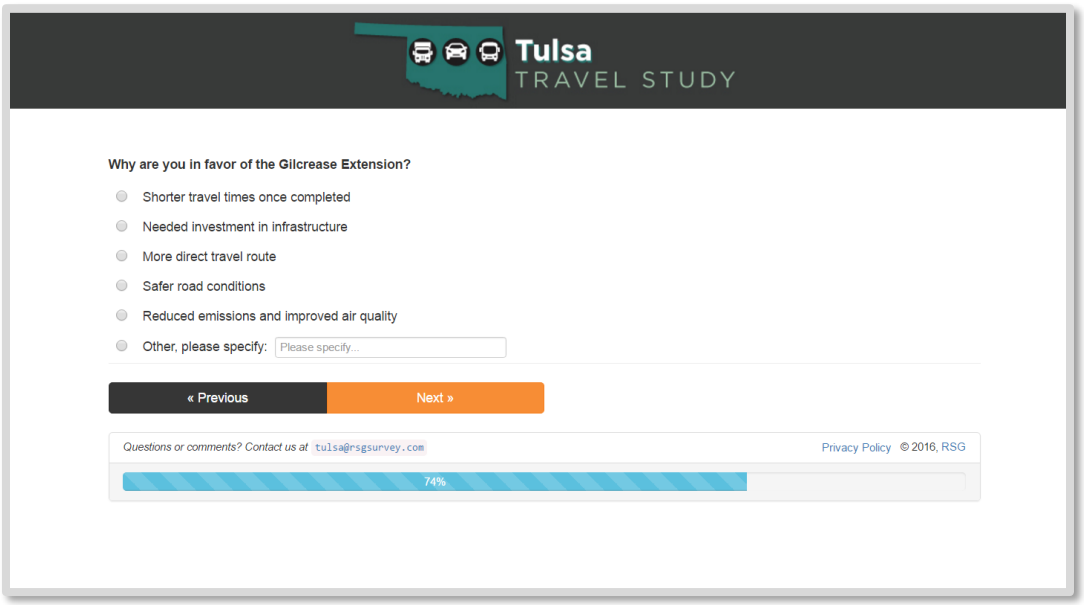
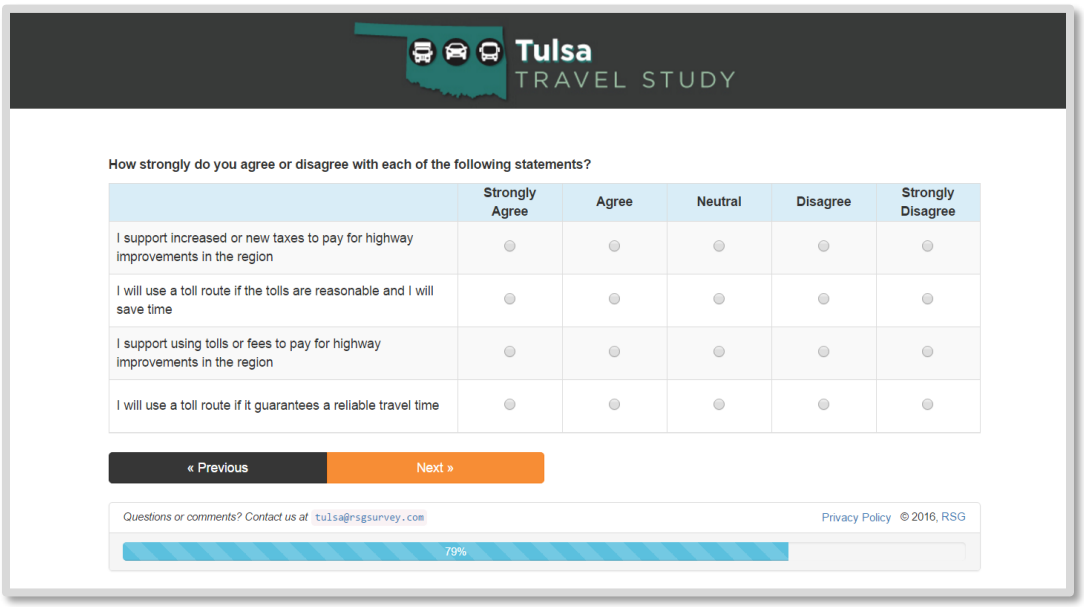


FIGURE 7-43: TOLL ATTITUDE STATEMENTS



7.5 | DEMOGRAPHIC QUESTIONS

FIGURE 7-44: ZIP CODE

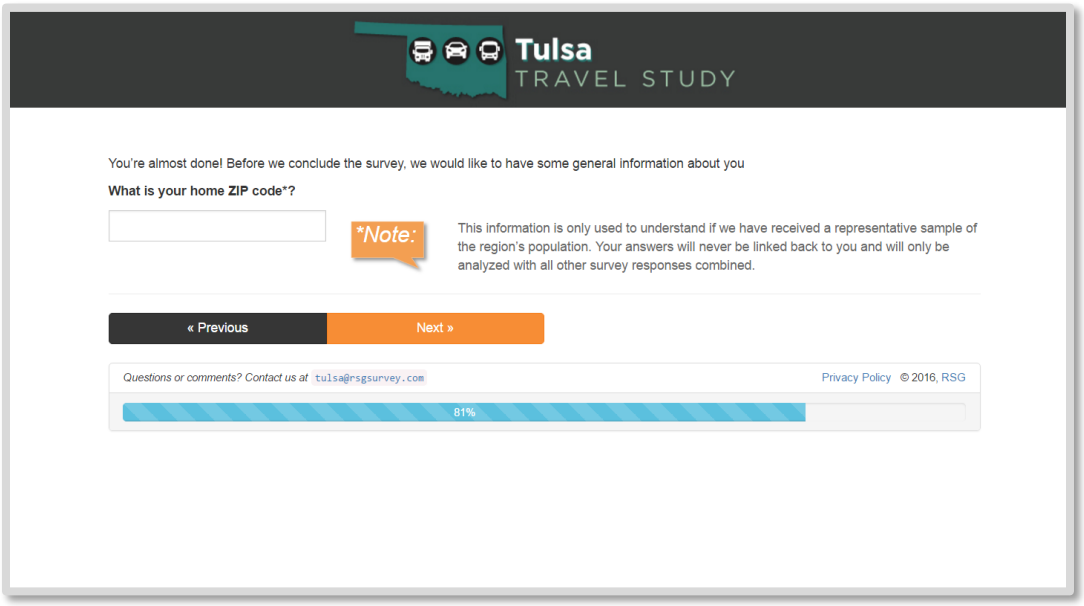


FIGURE 7-45: GENDER

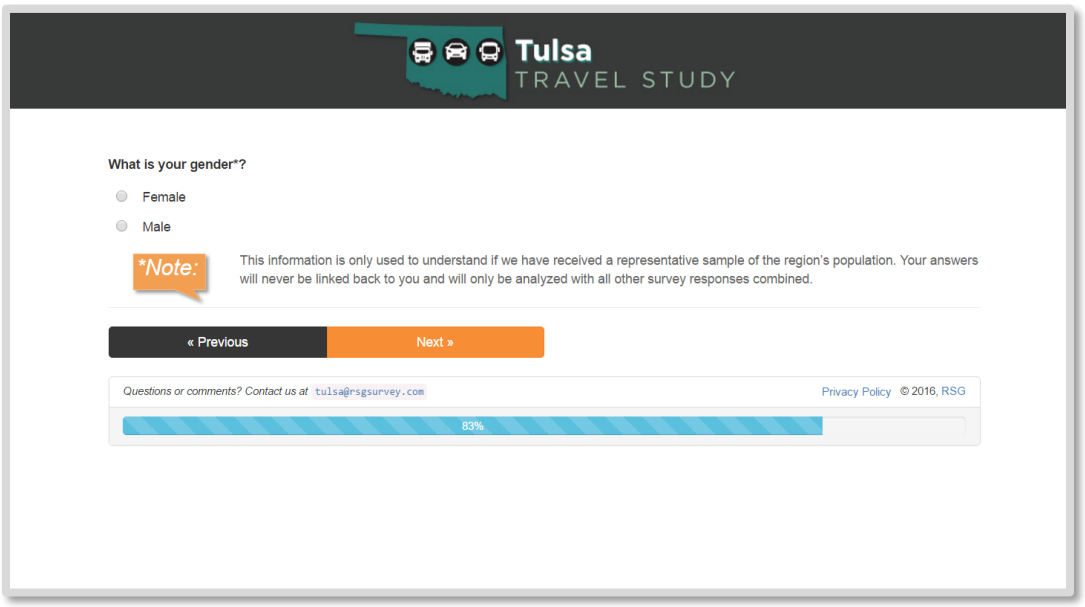


FIGURE 7-46: AGE

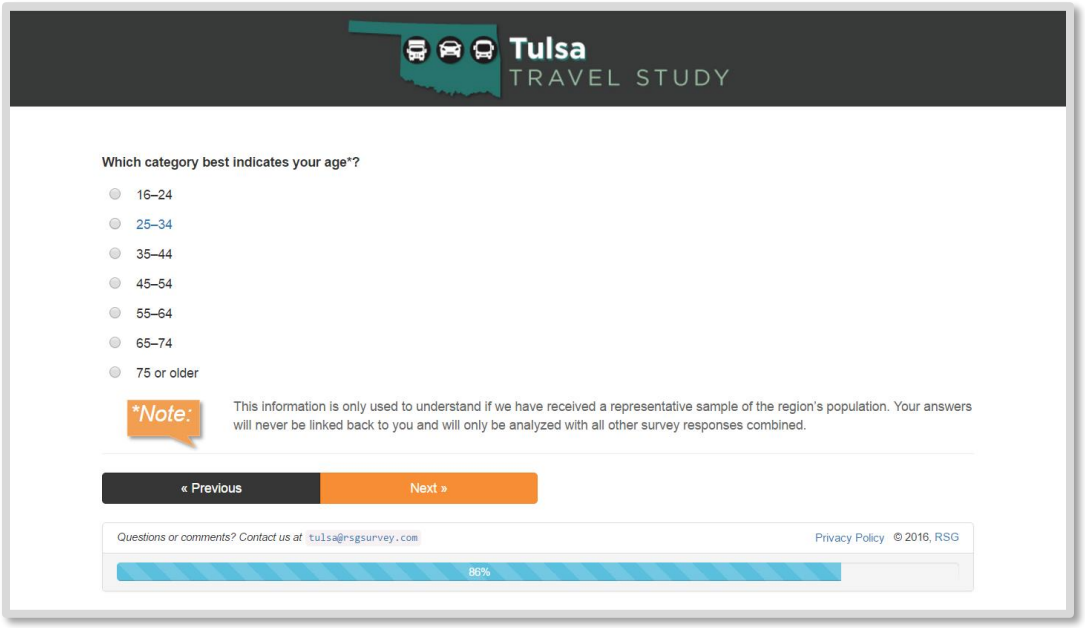


FIGURE 7-47: EMPLOYMENT STATUS

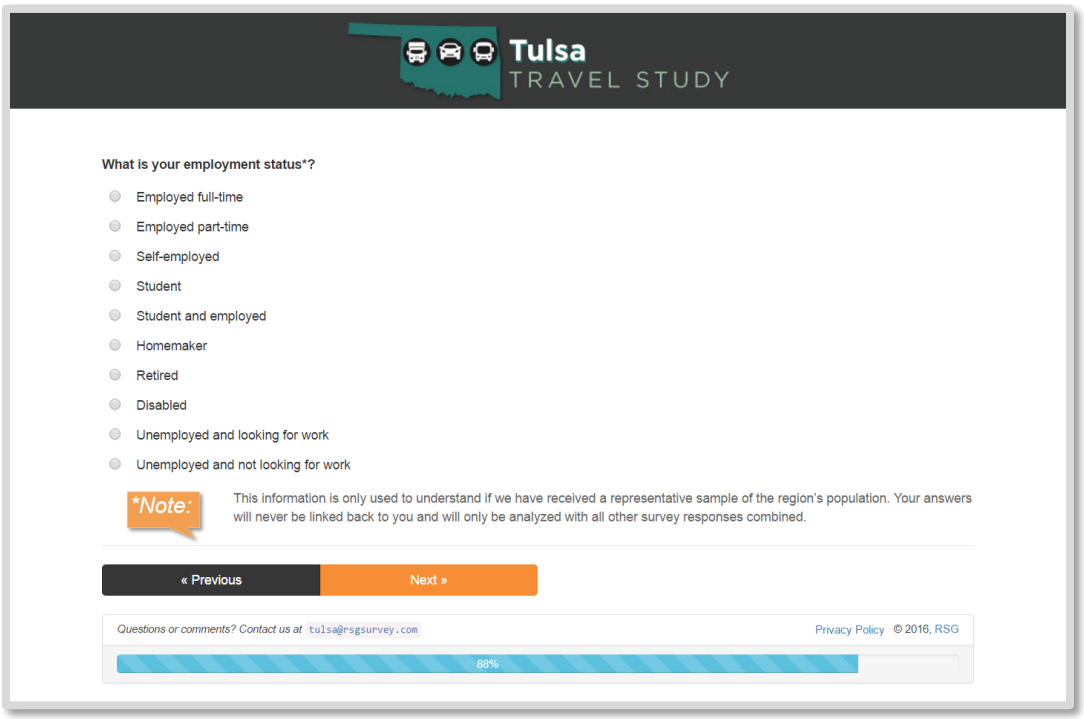


FIGURE 7-48: HOUSEHOLD SIZE

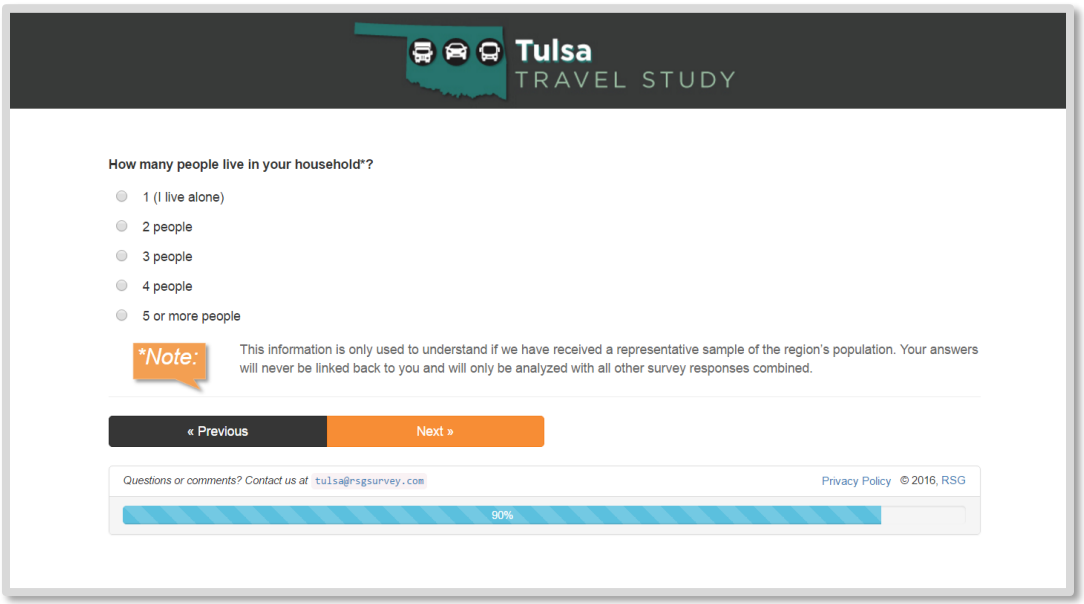


FIGURE 7-49: HOUSEHOLD VEHICLES

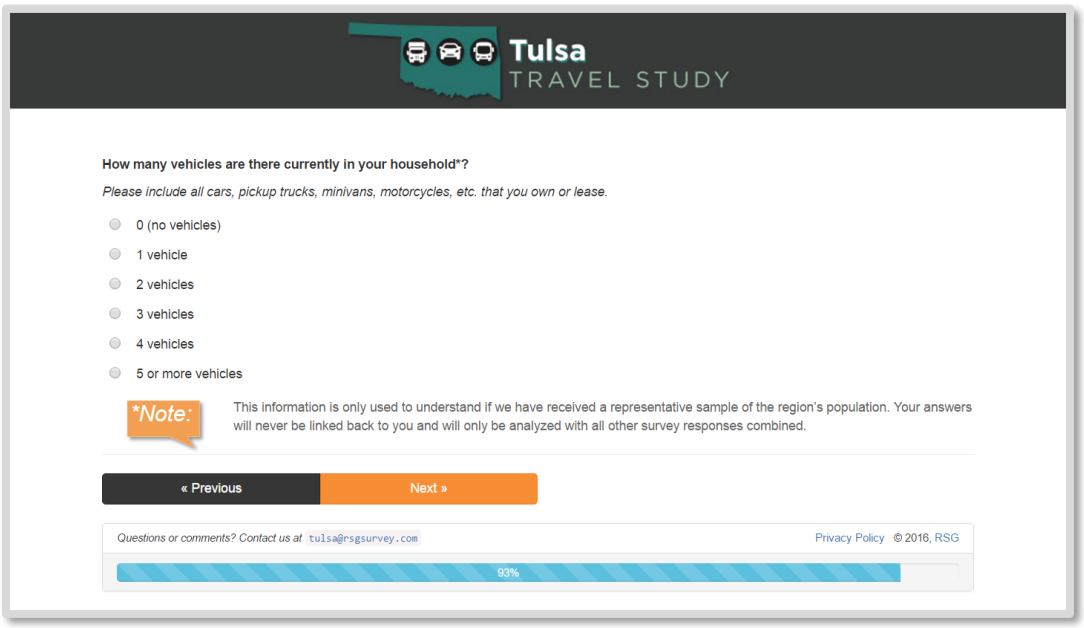


FIGURE 7-50: ANNUAL HOUSEHOLD INCOME

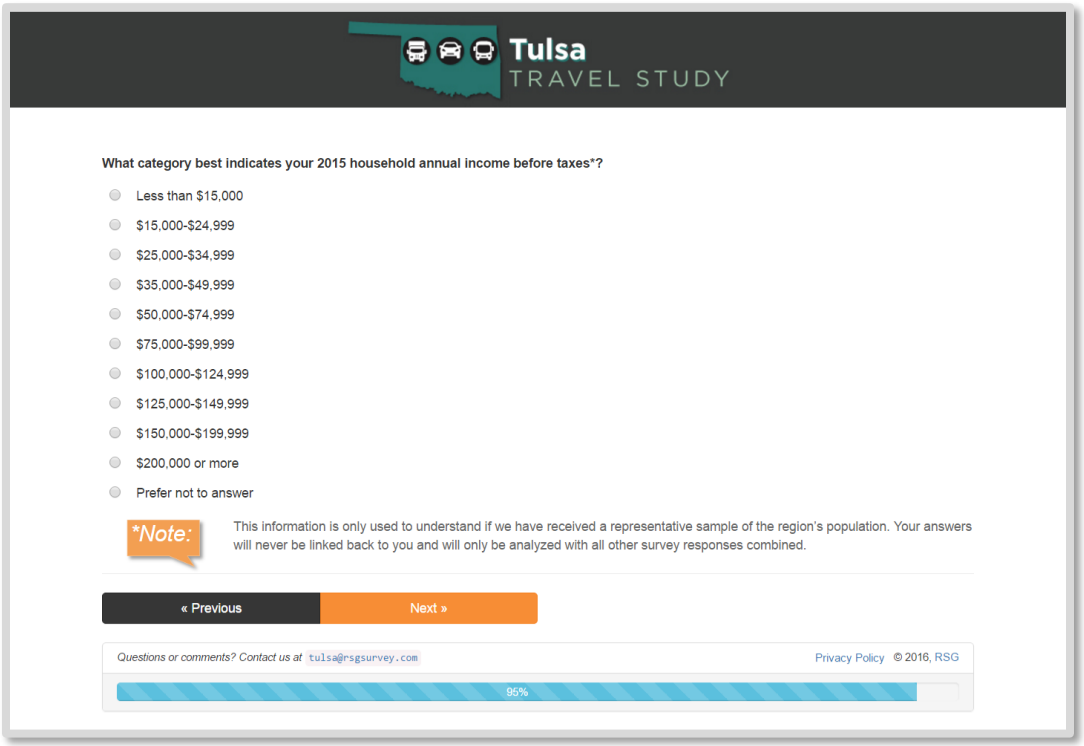


FIGURE 7-51: EMAIL ADDRESS AND SURVEY COMMENTS

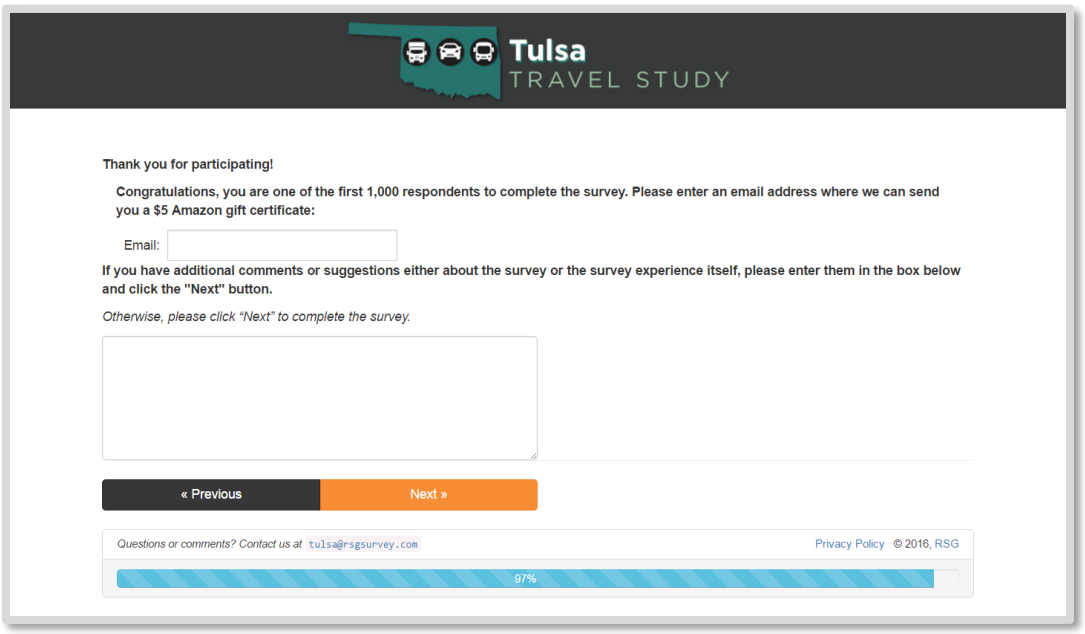
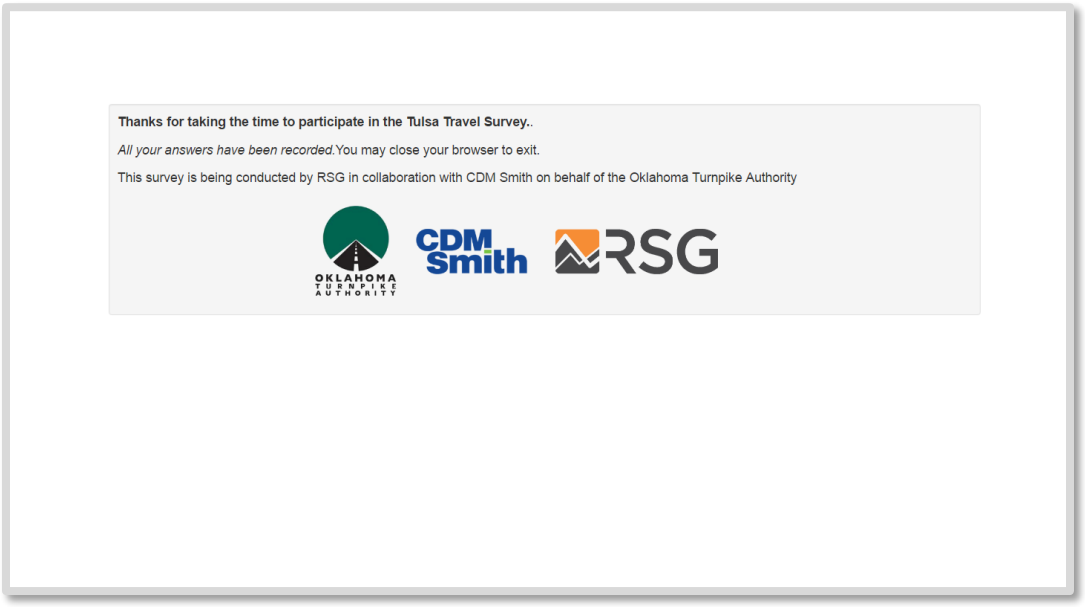


FIGURE 7-52: SURVEY END



8.0 SURVEY TABULATIONS

8.1 | TRIP DETAIL QUESTIONS

TABLE 8-1: RECRUITMENT METHOD

Recruitment Method

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Postcard respondent	194	27.5%	85	23.0%	279	26.0%
Email respondent	511	72.5%	285	77.0%	796	74.0%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-2: GILCREASE EXPRESSWAY CORRIDOR

Selected Gilcrease Expressway

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Yes, I have made a recent trip that fits that description	705	100.0%	0	0.0%	705	65.6%
No, I have not made a recent trip that fits that description	0	0.0%	370	100.0%	370	34.4%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-3: GENERAL TRIP

Selected General Trip

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Yes, I have made a recent trip that fits that description	0	0.0%	370	100.0%	370	100.0%
No, I have not made a recent trip that fits that description	0	0.0%	0	0.0%	0	0.0%
Total	0	0.0%	370	100.0%	370	100.0%

If did not make a recent Gilcrease Expressway trip

TABLE 8-4: DAY OF WEEK

On what day of the week did you make your most recent trip?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Monday	123	17.4%	83	22.4%	206	19.2%
Tuesday	104	14.8%	63	17.0%	167	15.5%
Wednesday	119	16.9%	48	13.0%	167	15.5%
Thursday	161	22.8%	89	24.1%	250	23.3%
Friday	198	28.1%	87	23.5%	285	26.5%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-5: TRIP PURPOSE

What was the primary purpose of your trip?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Go to/from work	129	18.3%	157	42.4%	286	26.6%
Work-related business	129	18.3%	28	7.6%	157	14.6%
Go to/from school	13	1.8%	3	0.8%	16	1.5%
Go to/from the airport	13	1.8%	8	2.2%	21	2.0%
Shopping	78	11.1%	16	4.3%	94	8.7%
Social or recreational (such as visiting a friend or going to the movies)	191	27.1%	62	16.8%	253	23.5%
Other personal business	152	21.6%	96	25.9%	248	23.1%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-6: BEGIN LOCATION

Where did your trip begin?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
My home	551	78.2%	310	83.8%	861	80.1%
My regular workplace	95	13.5%	43	11.6%	138	12.8%
Another place	59	8.4%	17	4.6%	76	7.1%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-7: END LOCATION

Where did your trip end?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
My home	71	10.1%	39	10.5%	110	10.2%
My regular workplace	116	16.5%	131	35.4%	247	23.0%
Another place	518	73.5%	200	54.1%	718	66.8%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-8: TRIP START TIME

What time did you start your trip?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
12AM - 12:59AM	2	0.3%	0	0.0%	2	0.2%
1AM - 1:59AM	0	0.0%	1	0.3%	1	0.1%
2AM - 2:59AM	0	0.0%	0	0.0%	0	0.0%
3AM - 3:59AM	1	0.1%	0	0.0%	1	0.1%
4AM - 4:59AM	2	0.3%	4	1.1%	6	0.6%
5AM - 5:59AM	4	0.6%	10	2.7%	14	1.3%
6AM - 6:59AM	46	6.5%	40	10.8%	86	8.0%
7AM - 7:59AM	92	13.0%	66	17.8%	158	14.7%
8AM - 8:59AM	77	10.9%	48	13.0%	125	11.6%
9AM - 9:59AM	67	9.5%	29	7.8%	96	8.9%
10AM - 10:59AM	63	8.9%	24	6.5%	87	8.1%
11AM - 11:59AM	40	5.7%	23	6.2%	63	5.9%
12PM - 12:59PM	41	5.8%	14	3.8%	55	5.1%
1PM - 1:59PM	49	7.0%	22	5.9%	71	6.6%
2PM - 2:59PM	36	5.1%	17	4.6%	53	4.9%
3PM - 3:59PM	27	3.8%	16	4.3%	43	4.0%
4PM - 4:59PM	40	5.7%	14	3.8%	54	5.0%
5PM - 5:59PM	57	8.1%	22	5.9%	79	7.3%
6PM - 6:59PM	37	5.2%	9	2.4%	46	4.3%
7PM - 7:59PM	12	1.7%	6	1.6%	18	1.7%
8PM - 8:59PM	6	0.9%	1	0.3%	7	0.7%
9PM - 9:59PM	4	0.6%	1	0.3%	5	0.5%
10PM - 10:59PM	2	0.3%	3	0.8%	5	0.5%
11PM - 11:59PM	0	0.0%	0	0.0%	0	0.0%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-9: TRAVEL TIME

Approximately how long did it take you, door-to-door, to drive from where your trip started to where it ended?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Less than 30 minutes	281	39.9%	219	59.2%	500	46.5%
30 to 44 minutes	200	28.4%	108	29.2%	308	28.7%
45 to 59 minutes	62	8.8%	16	4.3%	78	7.3%
60 to 74 minutes	29	4.1%	5	1.4%	34	3.2%
75 to 89 minutes	23	3.3%	5	1.4%	28	2.6%
90 to 119 minutes	46	6.5%	8	2.2%	54	5.0%
Two hours or more	64	9.1%	9	2.4%	73	6.8%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-10: DELAY

Did you experience any delay due to traffic congestion, stop lights, train crossings, etc. on your trip?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Yes	277	39.3%	144	38.9%	421	39.2%
No	428	60.7%	226	61.1%	654	60.8%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-11: AMOUNT OF DELAY

Amount of delay experienced due to traffic congestion

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
No delay	428	60.7%	226	61.1%	654	60.8%
Less than 15 minutes	203	28.8%	120	32.4%	323	30.0%
15-29 minutes	60	8.5%	20	5.4%	80	7.4%
30 or more minutes	14	2.0%	4	1.1%	18	1.7%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-12: TOLLS

Did you pay any tolls on your most recent trip?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Yes	293	41.6%	135	36.5%	428	39.8%
No	412	58.4%	235	63.5%	647	60.2%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-13: TOLL AMOUNT

Toll Amount Categories

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
$0.25 - $1.00	101	34.5%	76	56.3%	177	41.4%
$1.01 - $2.00	71	24.2%	31	23.0%	102	23.8%
$2.01 - $3.00	46	15.7%	13	9.6%	59	13.8%
$3.01 - $4.00	25	8.5%	9	6.7%	34	7.9%
$4.01 - $5.00	29	9.9%	4	3.0%	33	7.7%
Greater than $5.00	21	7.2%	2	1.5%	23	5.4%
Total	293	100.0%	135	100.0%	428	100.0%

If respondent paid a toll on most recent trip

TABLE 8-14: OCCUPANCY

Including you, how many people were in the vehicle on your trip?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
1 (I drove alone)	420	59.6%	268	72.4%	688	64.0%
2 people	200	28.4%	69	18.6%	269	25.0%
3 people	48	6.8%	21	5.7%	69	6.4%
4 people	28	4.0%	5	1.4%	33	3.1%
5 people	3	0.4%	5	1.4%	8	0.7%
6 people or more	6	0.9%	2	0.5%	8	0.7%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-15: TRIP FREQUENCY

How often have you made this same trip, in this direction, in the past month (30 days)?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
6 or more times per week	30	4.3%	30	8.1%	60	5.6%
4-5 times per week	114	16.2%	121	32.7%	235	21.9%
2-3 times per week	84	11.9%	39	10.5%	123	11.4%
1 time per week	61	8.7%	26	7.0%	87	8.1%
2-3 times per month	143	20.3%	60	16.2%	203	18.9%
1 time per month	118	16.7%	28	7.6%	146	13.6%
Less than 1 time per month	155	22.0%	66	17.8%	221	20.6%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-16: TRANSPONDER OWNERSHIP

Do you currently have a transponder?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Yes, I have a PIKEPASS transponder	669	94.9%	349	94.3%	1018	94.7%
Yes, I have another type of transponder	2	0.3%	4	1.1%	6	0.6%
No, I do not have a transponder	36	5.1%	20	5.4%	56	5.2%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-17: REASON(S) FOR NOT OWNING A TRANSPONDER

Why don't you have a transponder?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Prefer cash option	8	22.2%	4	20.0%	12	21.4%
Do not use toll roads often enough	18	50.0%	15	75.0%	33	58.9%
Do not like the idea of electronic tolling	4	11.1%	1	5.0%	5	8.9%
Do not want a transponder in my car	4	11.1%	0	0.0%	4	7.1%
Do not want to set up an account	9	25.0%	2	10.0%	11	19.6%
Concerned about privacy	6	16.7%	1	5.0%	7	12.5%
Too difficult to maintain account	5	13.9%	3	15.0%	8	14.3%
Other reason, please specify:	10	27.8%	3	15.0%	13	23.2%
Total	36	100.0%	20	100.0%	56	100.0%

If respondent does not own a transponder

8.2 | DEBRIEF AND OPINION QUESTIONS

TABLE 8-18: REASON FOR NOT SELECTING TOLLED OPTION

Which of the following best describes the reason you never chose any of the options with tolls in the previous section?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Tolls presented were too high	16	8.0%	6	9.7%	22	8.4%
Time savings not worth the toll cost	76	38.0%	39	62.9%	115	43.9%
Opposed to paying tolls	28	14.0%	10	16.1%	38	14.5%
Opposed to toll roads for other reasons	6	3.0%	3	4.8%	9	3.4%
Current route is more convenient	50	25.0%	0	0.0%	50	19.1%
Opposed to new roads	2	1.0%	0	0.0%	2	0.8%
Other, please specify:	22	11.0%	4	6.5%	26	9.9%
Total	200	100.0%	62	100.0%	262	100.0%

If respondent never selected a toll alternative in stated preference experiments

TABLE 8-19: PROJECT OPINION

Based on what you've learned, what best describes your opinion of the toll road?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Strongly opposed	65	9.2%	55	14.9%	120	11.2%
Somewhat opposed	99	14.0%	87	23.5%	186	17.3%
Neutral	277	39.3%	91	24.6%	368	34.2%
Somewhat favor	176	25.0%	106	28.6%	282	26.2%
Strongly favor	88	12.5%	31	8.4%	119	11.1%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-20: REASON FOR SUPPORTING THE PROJECT

Why are you in favor of the new road?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Shorter travel times once completed	101	38.3%	77	56.2%	178	44.4%
Needed investment in infrastructure	86	32.6%	26	19.0%	112	27.9%
More direct travel route	33	12.5%	0	0.0%	33	8.2%
Safer road conditions	24	9.1%	26	19.0%	50	12.5%
Reduced emissions and improved air quality	0	0.0%	0	0.0%	0	0.0%
Other, please specify:	20	7.6%	8	5.8%	28	7.0%
Total	264	100.0%	137	100.0%	401	100.0%

If respondent "strongly" or "somewhat" favors project

TABLE 8-21: REASON FOR OPPOSING THE PROJECT

Why are you opposed to the new road?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Opposed to spending money on road construction projects	7	4.3%	2	1.4%	9	2.9%
Would rather see more investments in alternative transportation options such as transit	24	14.6%	17	12.0%	41	13.4%
Opposed to new highways	1	0.6%	2	1.4%	3	1.0%
Opposed to toll roads	71	43.3%	89	62.7%	160	52.3%
Opposed to where the highway would be built	20	12.2%	0	0.0%	20	6.5%
Other, please specify:	41	25.0%	32	22.5%	73	23.9%
Total	164	100.0%	142	100.0%	306	100.0%

If respondent "strongly" or "somewhat" opposes project

TABLE 8-22: TOLL ATTITUDE STATEMENT 1

I will use a toll route if the tolls are reasonable and I will save time

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Strongly Disagree	20	2.8%	5	1.4%	25	2.3%
Disagree	16	2.3%	12	3.2%	28	2.6%
Neutral	61	8.7%	34	9.2%	95	8.8%
Agree	302	42.8%	180	48.6%	482	44.8%
Strongly Agree	306	43.4%	139	37.6%	445	41.4%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-23: TOLL ATTITUDE STATEMENT 2

I will use a toll route if it guarantees a reliable travel time

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Strongly Disagree	28	4.0%	12	3.2%	40	3.7%
Disagree	37	5.2%	23	6.2%	60	5.6%
Neutral	162	23.0%	109	29.5%	271	25.2%
Agree	300	42.6%	159	43.0%	459	42.7%
Strongly Agree	178	25.2%	67	18.1%	245	22.8%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-24: TOLL ATTITUDE STATEMENT 3

I support using tolls or fees to pay for highway improvements in the region

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Strongly Disagree	52	7.4%	32	8.6%	84	7.8%
Disagree	92	13.0%	52	14.1%	144	13.4%
Neutral	149	21.1%	88	23.8%	237	22.0%
Agree	282	40.0%	143	38.6%	425	39.5%
Strongly Agree	130	18.4%	55	14.9%	185	17.2%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-25: TOLL ATTITUDE STATEMENT 4

I support increased or new taxes to pay for highway improvements in the region

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Strongly Disagree	101	14.3%	36	9.7%	137	12.7%
Disagree	154	21.8%	63	17.0%	217	20.2%
Neutral	170	24.1%	107	28.9%	277	25.8%
Agree	189	26.8%	118	31.9%	307	28.6%
Strongly Agree	91	12.9%	46	12.4%	137	12.7%
Total	705	100.0%	370	100.0%	1075	100.0%

8.3 | DEMOGRAPHIC QUESTIONS

TABLE 8-26: GENDER

What is your gender*?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Female	288	40.9%	180	48.6%	468	43.5%
Male	417	59.1%	190	51.4%	607	56.5%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-27: AGE

Which category best indicates your age*?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
16–24	8	1.1%	6	1.6%	14	1.3%
25–34	115	16.3%	38	10.3%	153	14.2%
35–44	90	12.8%	59	15.9%	149	13.9%
45–54	163	23.1%	77	20.8%	240	22.3%
55–64	172	24.4%	98	26.5%	270	25.1%
65–74	132	18.7%	72	19.5%	204	19.0%
75 or older	25	3.5%	20	5.4%	45	4.2%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-28: EMPLOYMENT STATUS

What is your employment status*?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Employed full-time	404	57.3%	210	56.8%	614	57.1%
Employed part-time	33	4.7%	16	4.3%	49	4.6%
Self-employed	68	9.6%	22	5.9%	90	8.4%
Student	1	0.1%	3	0.8%	4	0.4%
Student and employed	7	1.0%	4	1.1%	11	1.0%
Homemaker	25	3.5%	16	4.3%	41	3.8%
Retired	147	20.9%	90	24.3%	237	22.0%
Disabled	12	1.7%	4	1.1%	16	1.5%
Unemployed and looking for work	6	0.9%	5	1.4%	11	1.0%
Unemployed and not looking for work	2	0.3%	0	0.0%	2	0.2%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-29: HOUSEHOLD SIZE

How many people live in your household*?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
1 (I live alone)	105	14.9%	54	14.6%	159	14.8%
2 people	326	46.2%	181	48.9%	507	47.2%
3 people	134	19.0%	60	16.2%	194	18.0%
4 people	87	12.3%	50	13.5%	137	12.7%
5 or more people	53	7.5%	25	6.8%	78	7.3%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-30: NUMBER OF VEHICLES

How many vehicles are there currently in your household*?

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
0 (no vehicles)	0	0.0%	3	0.8%	3	0.3%
1 vehicle	117	16.6%	57	15.4%	174	16.2%
2 vehicles	331	47.0%	183	49.5%	514	47.8%
3 vehicles	155	22.0%	78	21.1%	233	21.7%
4 vehicles	61	8.7%	38	10.3%	99	9.2%
5 or more vehicles	41	5.8%	11	3.0%	52	4.8%
Total	705	100.0%	370	100.0%	1075	100.0%

TABLE 8-31: ANNUAL HOUSEHOLD INCOME

Annual household income before taxes

	Gilcrease Expressway		General Trip		Total	
	Count	Percent	Count	Percent	Count	Percent
Less than $15,000	3	0.5%	5	1.8%	8	0.9%
$15,000-$24,999	21	3.6%	7	2.5%	28	3.2%
$25,000-$34,999	29	5.0%	8	2.8%	37	4.3%
$35,000-$49,999	68	11.7%	36	12.8%	104	12.0%
$50,000-$74,999	107	18.4%	63	22.3%	170	19.7%
$75,000-$99,999	111	19.0%	61	21.6%	172	19.9%
$100,000-$124,999	95	16.3%	42	14.9%	137	15.8%
$125,000-$149,999	55	9.4%	24	8.5%	79	9.1%
$150,000-$199,999	51	8.7%	20	7.1%	71	8.2%
$200,000 or more	43	7.4%	16	5.7%	59	6.8%
Total	583	100.0%	282	100.0%	865	100.0%

Appendix C

Independent Demographic Review

This appendix contains the documentation of the Oklahoma City and Tulsa area demographic review and update as provided by the subconsultant, Research and Demographic Solutions Group. This report was provided to CDM Smith in February 2023.

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Oklahoma Turnpike Authority

Independent Socioeconomic Review

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February 2023

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INTRODUCTION

Research and Demographic Solutions Group (RDS) was commissioned by CDM Smith to perform an independent socioeconomic analysis for recent household, household population, and employment forecasts from the Association of Central Oklahoma Governments (ACOG) and the Indian Nations Council of Governments (INCOG) Study Areas. The ACOG Study Area contains 2,497 Traffic Analysis Zones (TAZ) within Oklahoma, Cleveland, Canadian, Logan, McClain, and Grady Counties. The INCOG Study Area contains 892 TAZ's within Tulsa, Wagoner, Creek, Rogers, and Osage Counties. This report provides RDS' independent socioeconomic analysis of the TAZ's in light of ACOG's Encompass 2045 and INCOG's Connected 2045 Metropolitan Transportation Plans.

RDS evaluated the latest ACOG and INCOG socioeconomic forecasts for accuracy and reasonableness, detailed to the level of TAZ zones. The RDS evaluation was completed for the years 2019 and 2045.

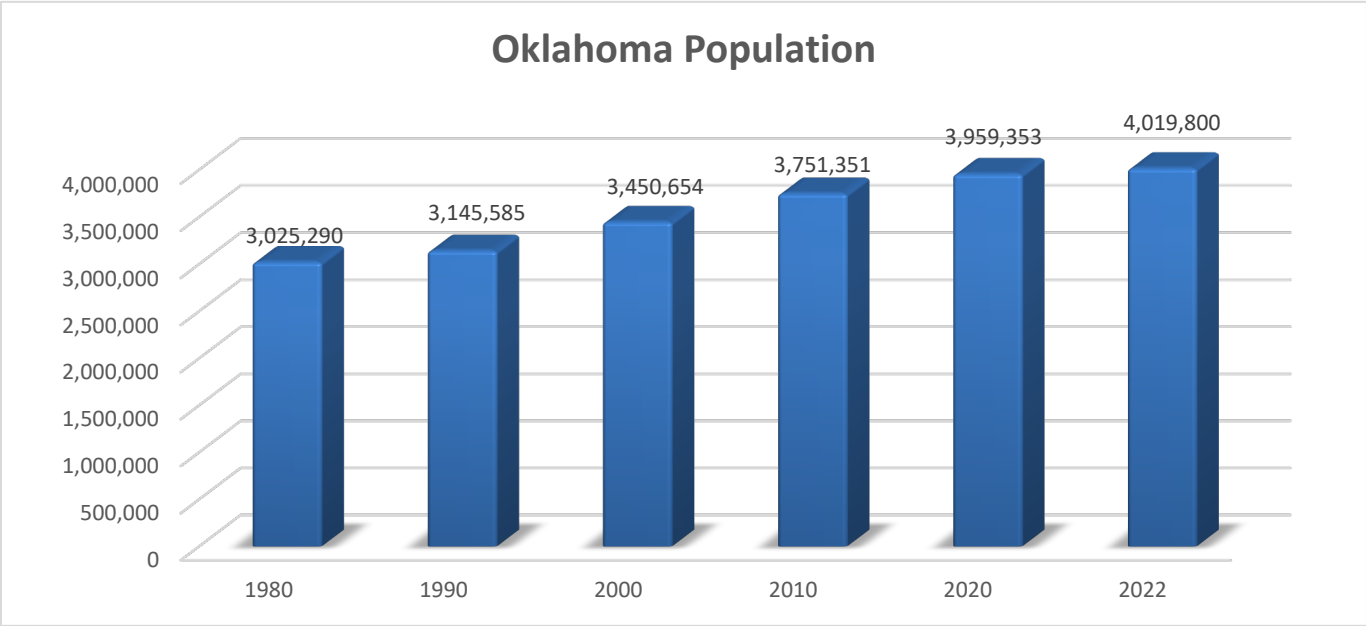
RDS identified major emerging economic trends which directly impact the level and distribution of future socioeconomic growth in the Oklahoma City and Tulsa Metropolitan Areas. Such trends include patterns in land use, transportation improvements, and major planned developments. RDS evaluated factors that might likely change economic growth potential or the overall distribution of economic growth.

Full citations are provided for methodologies, sources of development trends and projections, and narratives defining and detailing important issues affecting future socioeconomic growth in proximity to ACOG and INCOG roadways.

Population Trends and Projections

Oklahoma has seen modest population growth from 1980 to 2022 by adding almost one million persons. Overall, state growth has averaged just below 250,000 per decade during this time period but has varied widely. From 1990 to 2010, the state saw an increase of over 300,000 people per decade. Oklahoma only saw a 208,000 increase from 2010 to 2020 and has only added 60,000 persons since 2000. Figure 1 illustrates the trends in Oklahoma population from 1980 through 2022.

Figure 1: State of Oklahoma Total Population 1980 - 2022



Source: US Census Bureau.

Oklahoma's population growth will continue to remain modest going forward. The state economy's reliance on the oil and gas industry will cause migration uncertainties in the short-term, but likely will sort out over time. Depending on varying rates of migration as well as fertility and mortality rates, the Oklahoma Department of Commerce estimates that approximately 4.7 million people will live in the state by 2045, according to their most recent data, as shown in Table 1. Woods and Poole, a proprietary demographic projections firm, estimates Oklahoma's 2045 population to be about

240,000 lower than the Department of Commerce figures while the Demographics Research Group estimates are 190,000 persons lower. Overall, the absolute growth and compound annual growth rates (CAGR) are similar from the three sources.

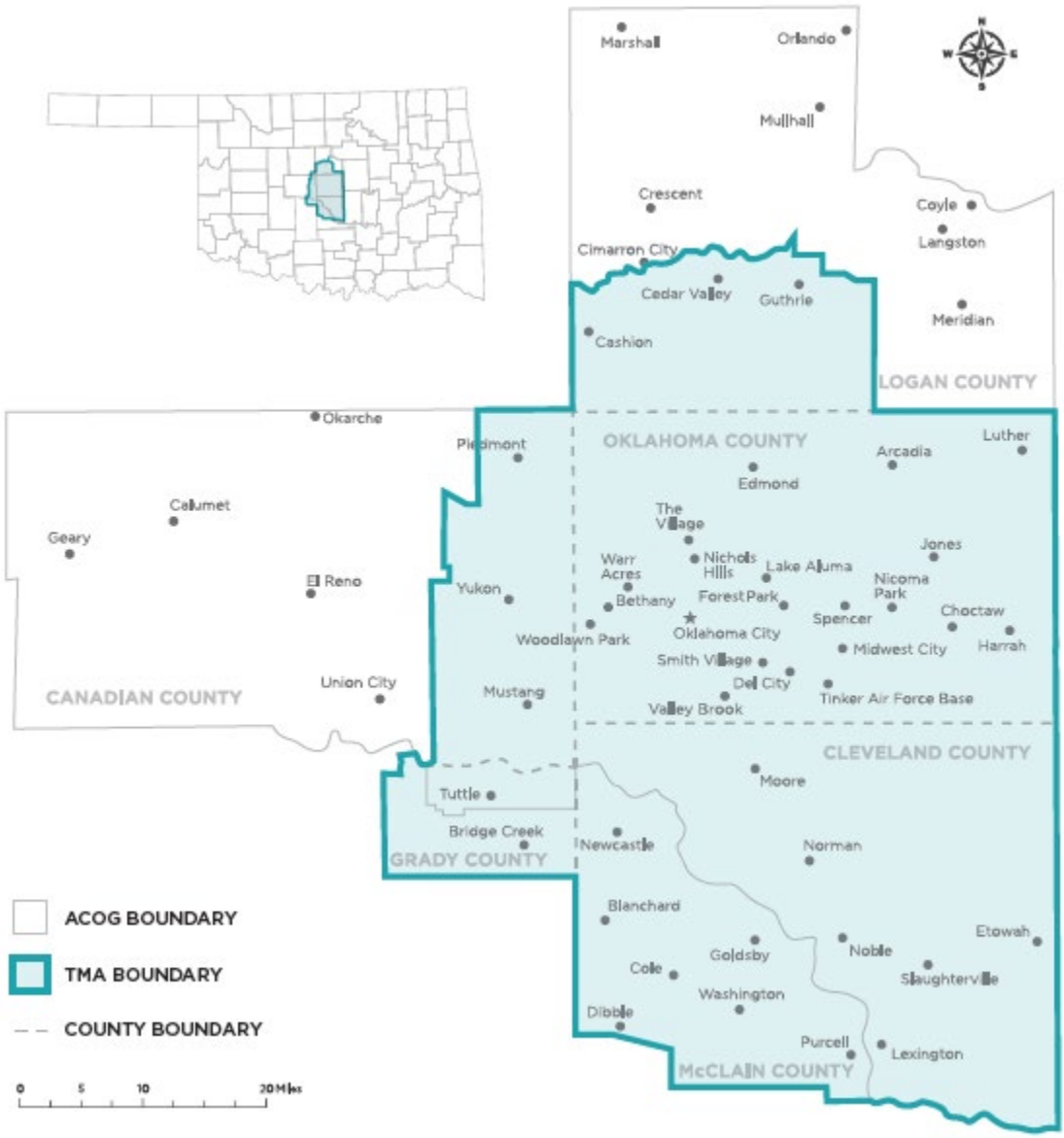
Table 1: State of Oklahoma Population Projections 2010 – 2045 (in Millions)

Scenarios	2010	2020	2030	2040	2045	2010-2045 Growth	Compound Annual Growth Rate 10-45
Oklahoma Dept. of Commerce	3.75	4.02	4.30	4.58	4.72	26%	0.66%
Woods & Poole	3.76	3.96	4.19	4.39	4.48	19%	0.50%
Demographics Research Group	3.75	4.00	4.25	4.44	4.53	21%	0.54%

Study Area

ACOG is responsible for transportation planning throughout the Transportation Management Area (TMA) in Central Oklahoma. This planning boundary includes 2,085 square miles and 47 cities and towns located within Oklahoma and Cleveland Counties, as well as portions of Canadian, Grady, Logan, and McClain Counties. Unincorporated land also comprises a sizable portion of the AOI.

Figure 2: ACOG Study Area Map



Population Trends and Projections

According to the most recent decennial Census Bureau population data, Oklahoma City has added approximately 277,000 people since 1980. The growth rate has risen to 1.50 percent since 2000. In comparison, Oklahoma County has added 227,000 persons from 1980 to 2020. From 1980 to 2000, the City's CAGR was about 38 percent higher than the County's and has risen to 56 percent since 2000. The Oklahoma City Metro Area, which is comprised of Canadian, Cleveland, Grady, Lincoln, Logan, McClain, and Oklahoma Counties, added almost 565,000 persons from 1980 to 2020. Overall, the OKC Metro growth rate has remained in-line with Oklahoma City's since 2000.

Table 2: Historical Population

	April 1, 1980	April 1, 1990	April 1, 2000	April 1, 2010	April 1, 2020	CAGR 1980-2000	CAGR 2000-2020
Oklahoma City	404,014	444,719	506,132	579,999	681,454	1.13%	1.50%
Canadian County	56,452	74,409	87,697	115,541	154,405	2.23%	2.87%
Cleveland County	133,173	174,253	208,016	255,755	295,528	2.25%	1.77%
Grady County	39,490	41,747	45,534	52,434	55,906	0.71%	1.03%
Lincoln County	26,601	29,216	32,155	34,355	35,045	0.95%	0.43%
Logan County	26,881	29,011	33,967	42,045	48,777	1.18%	1.83%
McClain County	20,291	22,795	27,863	34,737	41,348	1.60%	1.99%
Oklahoma County	568,933	599,611	660,448	718,633	796,292	0.75%	0.94%
OKC MA	860,969	958,839	1,083,346	1,252,987	1,425,695	1.16%	1.38%

Source: US Census Bureau.

While population growth has steadily increased in Oklahoma City and its Metro Area every decade since 1980, forecasting agencies including the Oklahoma Department of Commerce and Woods & Poole agree that looking forward to 2045, all counties will continue to see household and population growth continuing at paces similar to growth since 2000. There are many attributes that contribute to the overall strength of the county projections. These include recent history of steady growth, affordable and available land with no limiting geographic boundaries such as an ocean or foreign

border, the relatively low cost of doing business in the state and region, central geographic location in the U.S., favorable weather, and amenities, etc.

Table 3 includes a comparison of the projected population of the counties in the Oklahoma City Metro Area from 2015 to 2045. Overall, the two agencies forecast a very similar growth trend with Woods and Poole projecting a less than 2,000-person difference in total growth than the ODOC during the 30-year timeframe.

Table 3: County Population Projections 2015-2045

Canadian County

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	124,481	142,454	160,426	178,399	53,918	1.21%
Woods & Poole	134,399	172,768	201,703	232,190	97,791	1.84%

Cleveland County

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	274,277	315,459	356,641	397,823	123,546	1.25%
Woods & Poole	278,518	310,956	343,551	374,253	95,735	0.99%

Grady County

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	54,198	58,923	63,649	68,374	14,176	0.78%
Woods & Poole	54,013	57,074	60,573	63,386	9,373	0.53%

Lincoln County

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	35,611	38,909	42,207	45,506	9,895	0.82%
Woods & Poole	34,149	34,422	35,591	36,285	2,136	0.20%

Logan County

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	44,046	48,324	52,601	56,878	12,832	0.86%
Woods & Poole	45,830	53,564	60,283	66,894	21,064	1.27%

McClain County

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	36,578	40,765	44,951	49,138	12,560	0.99%
Woods & Poole	38,251	46,097	52,702	59,411	21,160	1.48%

Oklahoma County

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	747,465	796,642	845,818	894,995	147,530	0.60%
Woods & Poole	774,034	819,253	864,550	899,588	125,554	0.50%

OKC MSA

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	1,316,656	1,441,476	1,566,293	1,691,113	374,457	0.84%
Woods & Poole	1,359,194	1,494,134	1,618,953	1,732,007	372,813	0.81%

Source: Oklahoma Department of Commerce Population Projections. Woods and Poole 2022.

State and Regional Employment Trends and Projections

Table 4 illustrates recent employment growth in Oklahoma, the Oklahoma City Metropolitan Area, and its counties. With the rebound in the economy beginning after the national recession of 2008-2009, all geographies saw steady employment gains through 2019. 2020 brought the COVID-19 pandemic and much of the employment gains over the past five years were lost in the short-term but rebounded strongly in the first years of the new decade. The Oklahoma City Metro Area added 103,000 jobs and accounted for 62 percent of all job growth in the state between 2010 to 2022. Job growth has been especially strong for Oklahoma and Cleveland Counties, with each gaining 58,000 and 15,000 jobs, respectively.

Table 4: Employment Trends

	2010 Emp	2015 Emp	2020 Emp	2022 Emp	Emp Growth 2010-22	Percent Change 2010-22	CAGR 2010-22
State of Oklahoma	1,650,388	1,750,532	1,721,142	1,817,183	166,795	10.1%	0.81%
OKC Metro Area	587,788	638,319	644,304	690,767	102,979	17.5%	1.35%
Canadian County	26,036	31,609	32,402	35,371	9,335	35.9%	2.59%
Cleveland County	71,487	80,915	82,947	86,474	14,987	21.0%	1.60%
Grady County	12,066	12,656	12,103	12,008	(58)	-0.5%	-0.04%
Lincoln County	6,591	6,579	6,682	6,865	274	4.2%	0.34%
Logan County	6,722	7,276	7,611	8,012	1,290	19.2%	1.47%
McClain County	7,555	8,825	9,617	10,313	2,758	36.5%	2.63%
Oklahoma County	409,747	450,460	445,014	468,177	58,430	14.3%	1.12%

Source: US Bureau of Labor Statistics, Local Area Unemployment Statistics

Looking into the future, the Oklahoma Employment Security Commission (OESC) is expecting both Oklahoma and the Oklahoma City Metro Area to continue to grow at a slower rate than 2010 to 2022. Below, the OESC is expecting a 0.41 to 0.52 percent per year growth rate for the state and the Oklahoma City metro area.

Table 5: Projected Employment

State of Oklahoma	
2018 Total Employment	1,802,040
2028 Total Employment	1,876,530
Absolute Difference	74,490
Percentage Change 2018-2028	4.1%
Compound Annual Growth Rate	0.41%

Oklahoma City MA	
2018 Total Employment	646,390
2028 Total Employment	680,470
Absolute Difference	34,080
Percentage Change 2018-2028	5.3%
Compound Annual Growth Rate	0.52%

Source: Oklahoma Employment Security Commission Projections. https://oklahoma.gov/oesc/labor-market/employment-projections.html

RDS Forecast Review Methodology

RDS was retained to review the latest socioeconomic forecasts for the ACOG Study Area for accuracy and reasonableness. For this study, CDM Smith provided RDS with household, population, and employment data at the TAZ level from ACOG. This data was originally provided to RDS in two intervals, 2015 and 2045, for 2,497 TAZs. RDS was asked to establish a 2019 baseline as well as review the 2045 demographic totals by zone.

ACOG's 2045 Demographics Introduction

Approved in November 2021, Encompass 2045 is the comprehensive, long-range transportation plan for Central Oklahoma. It guides how the region will manage, operate, and invest nearly $10 billion in its multi-modal transportation system over the next 30 years. The Plan uses a base year of 2015 and a forecast year of 2045 to analyze land use, population, employment, and other socioeconomic factors that will influence the region's development and travel in the coming years. Base year population, employment, dwelling unit, school enrollment, household income, and land use data were gathered to establish conditions as they existed in the Oklahoma City Area Regional Transportation Study (OCARTS) area in 2015. This data was then used to forecast 2045 socioeconomic and demographic conditions, allowing transportation improvements and maintenance to be targeted to the areas of greatest need.

ACOG 2045 Projection Methodologies

One of the primary undertakings to develop Encompass 2045 was the calibration and application of the Growth Allocation Model (GAM), a regional land use distribution model. The GAM requires substantial data inputs, including base year and forecast year land use, and projections of forecast year population, employment, dwelling units, and school enrollment within the transportation study area. Using historical trends and locally defined growth assumptions, as described later in this section, the GAM distributed the regional population and employment growth forecasts to each of the traffic analysis zones within the OCARTS area. The type and amount of future development within each zone was dependent upon the availability of developable land, its planned land use(s), and its attractiveness for new development. These zone-level figures, in combination with feedback from city and county

planners, were used by the transportation model to predict the quantity and type of trips that each subarea would generate and attract in the future.

Land Use

The MPO worked closely with local planners on the collection of base year land use within each OCARTS area entity. Each local government also provided information on future, planned land uses based on their adopted comprehensive plans, zoning ordinances and other sources reflective of local development trends. Base year land use information was grouped into eight "present" land use categories, and all undeveloped land was assigned a "planned" land use category. These standardized categories provided regional consistency for modeling purposes. Land use information from the previous OCARTS transportation plan and digital aerial photography served as guides for updating the region's land use, using GIS software.

Population

Before running the residential portion of the model, the MPO established population control totals for 2045. Base year population for the OCARTS area and its counties, cities, and TAZs were developed from the Census and supplemented with local information on residential building permits and group quarters from 2010 to 2014. Units lost due to fire, demolition, or natural disasters were also considered. The Intermodal Transportation Policy Committee approved a 2015 base year population of 1,219,036 for the OCARTS area. The Committee also approved base year totals for each TAZ, by entity, at that time. The 2045 population projections for the OCARTS area were developed using two development scenarios and included a trend scenario, which continued the current development patterns, and a nodal scenario, which encouraged infill, nodal, and downtown development within each community in the region. The scenarios were developed with generous input from planners, local leaders, and other stakeholders.

Population Growth Allocation

Residential growth assumptions describe the type of population growth to be allocated once the GAM has determined the share of population increase for each zone where future developable residential land exists. Using assumptions about future residential densities, dwelling unit mix, occupancy rates, household size, units lost, and group quarters, the GAM distributes the growth between single and multi-family populations and group quarters populations. The estimated growth in dwelling units is then distributed between single and multi-family units. The residential factors used by the GAM included perceived school district quality, median household income, historical residential trends, and existing residential densities. The influence of these factors on potential growth was determined by calibrating the OCARTS Plan GAM results to reproduce the actual population growth. Using a series of mathematical equations, each traffic analysis zone was assigned a percent attraction for 2045, which when summed equaled 100 percent of the study area's projected population growth. Based on the shares of population, results of the growth assumptions, and available land, the GAM determined if each zone would have the capacity to accept the population and dwelling units allocated by its relative attractiveness. If the growth capacity was exceeded, the GAM reallocated the excess population to other zones within the same community, and in the case of Oklahoma City, within the same county.

Employment

The 2015 employment data was developed from Oklahoma Employment Security Commission (OESC) wage and salary employment records and Census Transportation Planning Package self-employment counts. This information was supplemented with data from various phone directories, local newspapers and input from member entities to ensure employment was distributed throughout the region accurately. Employment records were sorted by Standard Industrial Classification (SIC) codes and categorized as either retail or non-retail for the modeling process. Employment in the OCARTS area is expected to reach 971,839 in the year 2045, which represents a 49 percent increase from the 2015 employment total of 651,556.

Employment Growth Allocation

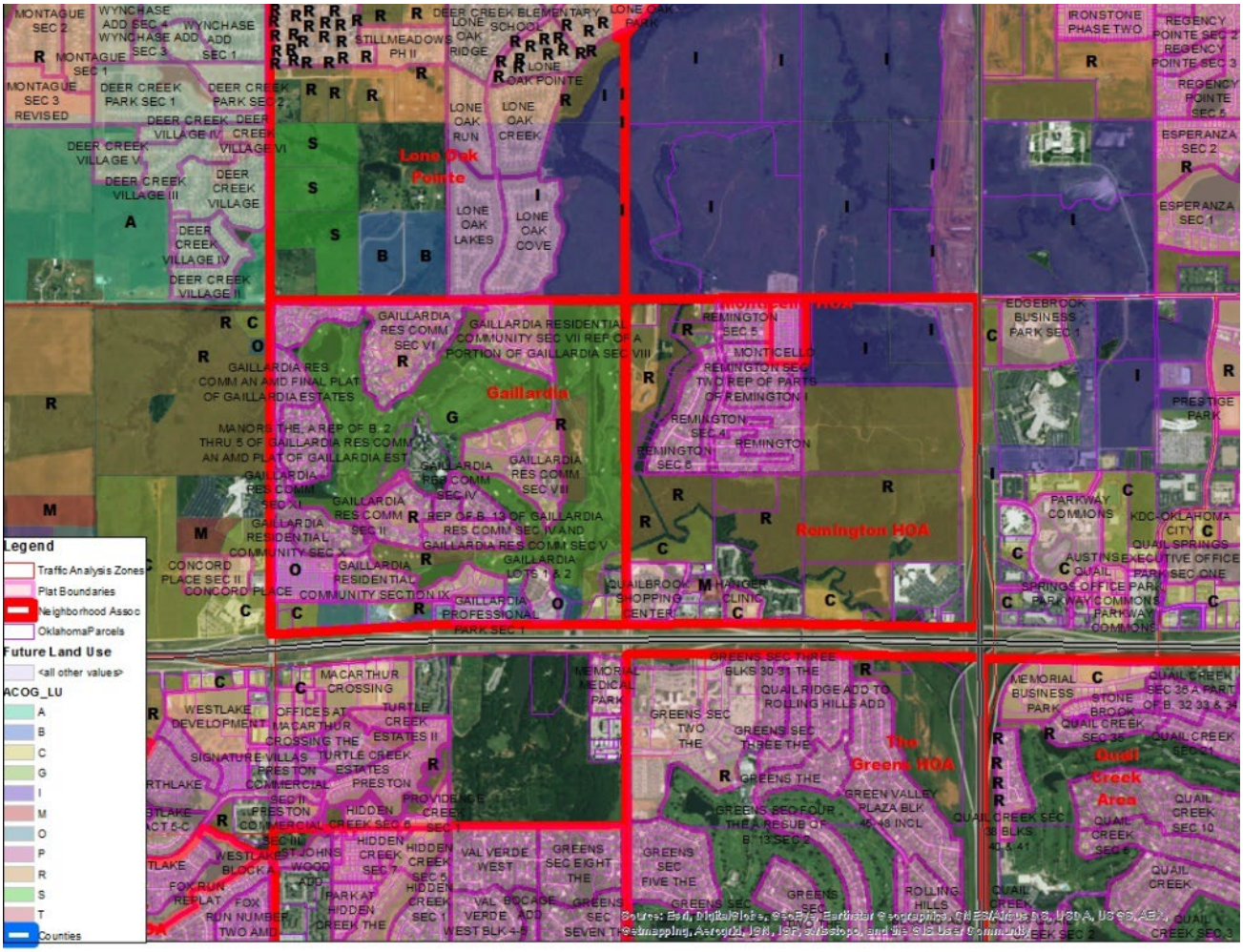
Using the approved 2045 regional, county, and city employment control totals, the model was run to redistribute the forecasted employment to the TAZs. The 2045 TAZ figures were compared against the 2040 TAZ employment numbers, and the availability of appropriate planned land uses was verified (commercial, office, industrial, and public). Recent and impending employment developments since the 2015 base year were tracked and factored into the TAZ employment figures to ensure that enough forecasted employment was assigned to the appropriate entities and TAZs. Local planners were consulted to identify specific changes in their communities. As with previous models, the preliminary TAZ forecasts were analyzed and adjusted as needed. The employment portion of the model used employment density, proximity to population, existing employment centers (2015), transportation corridors, and available land to develop 2045 attractiveness scores for each traffic analysis zone. Base year employment densities were calculated by TAZ for each employment land use type—commercial, office, industrial, and public. The model distributed future employment to the TAZs with the highest attractiveness scores if there was land available. An iterative process was used to distribute employment to the next highest scoring zones until all forecasted employment growth was distributed throughout the region.

RDS GIS Review

As ACOG did during their allocation process, RDS took advantage of geographic information system (GIS) technology during the comprehensive review process. RDS gathered multiple years of aerial photography, zoning and future land use maps, parcel boundaries and Census block data summed to the TAZ-level for GIS analysis. (See Figure 3) Using GIS, RDS determined TAZs where new household and employment development would or will likely occur post-2015. Using GIS, multiple datasets were displayed side- by-side. This allowed staff to review both model years of the project simultaneously.

Households/Population: After receiving the dataset, RDS reviewed the base year for accuracy. All 2,497 TAZs were reviewed by RDS, and a 2019 baseline was established for review. Household population was derived by using the household sizes that were established in the original ACOG data for each TAZ. During this review, specific attention was given to areas that have seen recent significant household growth. RDS staff conducted thorough research through examination of local development announcements including news-related websites. RDS used a bottom-up approach using this local knowledge, development research and professional judgment to attempt to accurately account for new housing within the study area.

Figure 3: Sample GIS Review



Employment: As with households, RDS first examined 2015 for accuracy and established a 2019 baseline for review. Specific attention was paid to special generator and major employer TAZs, as well as TAZs in proximity to OTA roadway facilities. RDS used current and future land use and zoning GIS layers to determine if commercial development was feasible. If a commercial development's project use was known, consistent employees per square footage ratios were used to estimate a project's employment potential.

RDS 2019-2045 Study Area Review: RDS began the review process by examining each TAZ's 2019 household and employment totals for accuracy. Based on RDS' staff review, the resultant 2019

demographics added 4,977 households, 19,145 population and reduced 1,870 jobs compared to the original ACOG data. RDS' 2045 demographics added 42,235 households and 106,102 population, and reduced employment by 61,674 compared to ACOG's 2045 totals. Table 6 illustrates these comparisons for the 2019 and 2045 demographic factors post-RDS review.

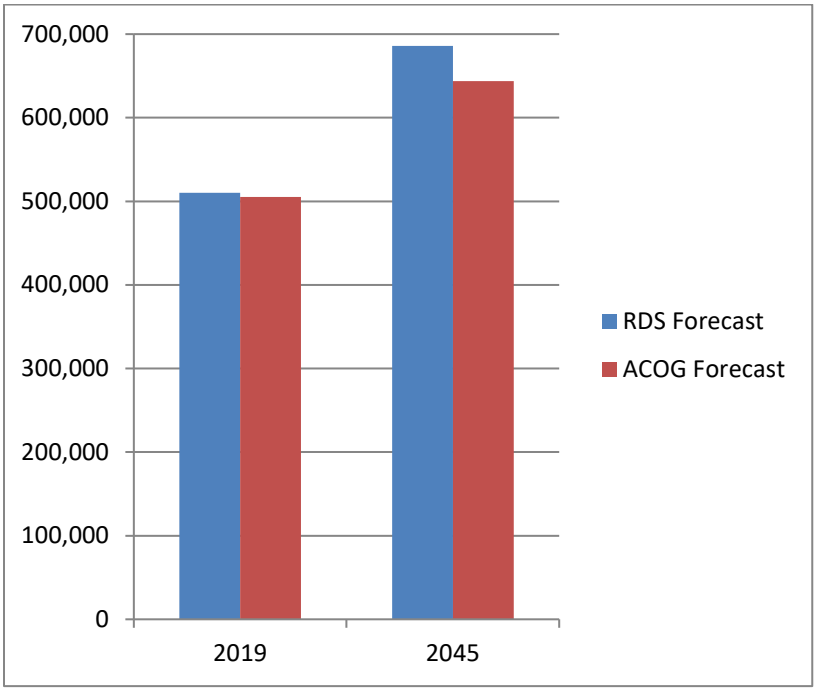
Table 6: Post-review ACOG Study Area Totals

	2019		
	ACOG Forecast	RDS Forecast	Difference from INCOG
Households	505,115	510,092	4,977
Population	1,278,187	1,297,332	19,145
Employment	683,908	682,038	-1,870

	2045		
	ACOG Forecast	RDS Forecast	Difference from INCOG
Households	643,762	685,997	42,235
Population	1,652,682	1,758,784	106,102
Employment	971,838	910,164	-61,674

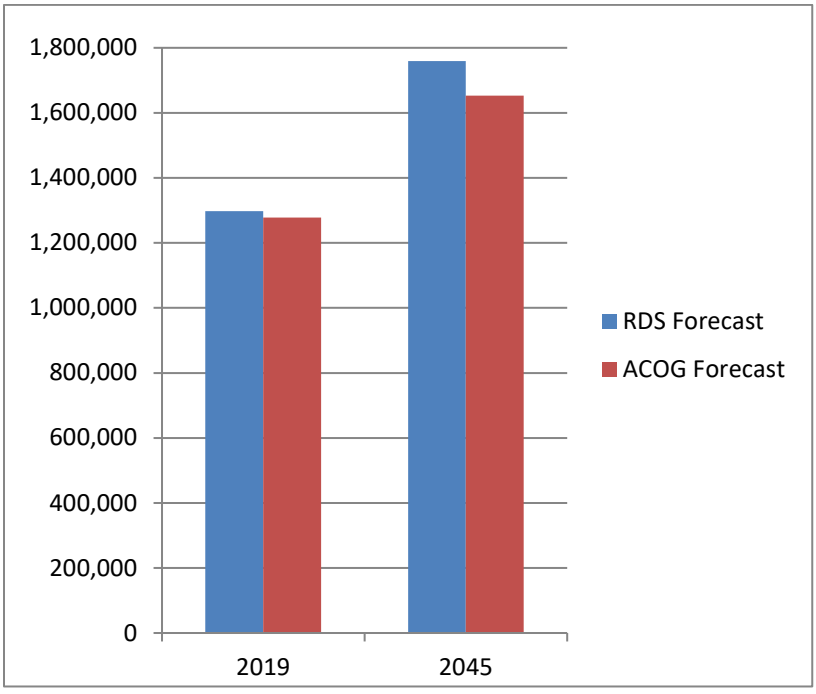
RDS 2019-2045 Review: After establishing new RDS 2019 demographics using staff review, new home reports, commercial development datasets and current year Appraisal District data for each individual TAZ, the 2045 future iteration was reviewed for growth and reasonableness. RDS staff established totals for each, noting the reason for each adjustment. Figures 4, 5, and 6 illustrate growth from 2019-2045 as well as compare them by the Compound Annual Growth Rate (CAGR) seen in RDS' and ACOG's forecasts.

Figure 4: RDS vs. ACOG AOI Forecast Households



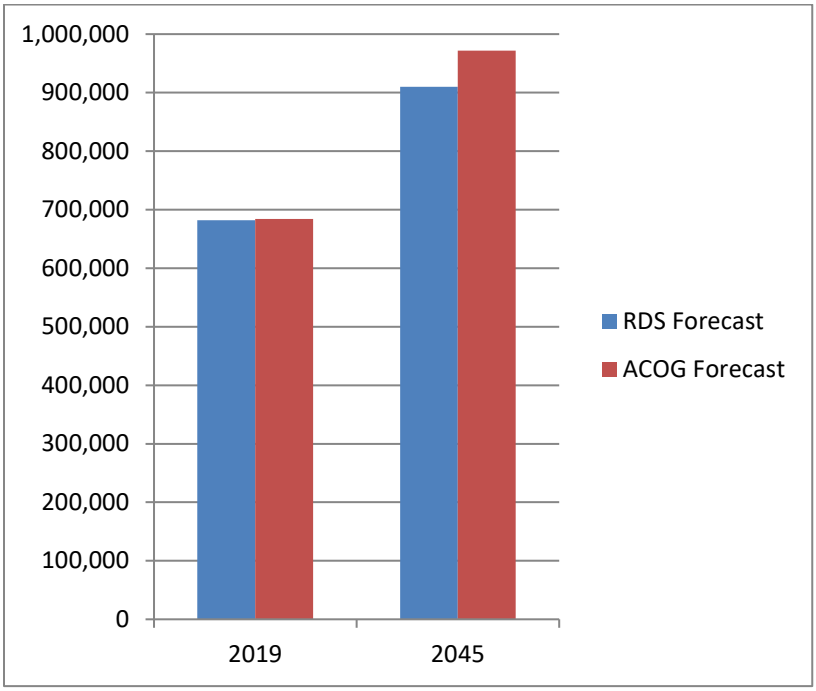
	2019-45 Absolute Change	2019-45 Compound Annual Growth Rate
RDS	175,905	1.15%
ACOG	138,647	0.94%

Figure 5: RDS vs. ACOG AOI Forecast Household Population



	2019-45 Absolute Change	2019-45 Compound Annual Growth Rate
RDS	461,452	1.18%
ACOG	374,495	0.99%

Figure 6: RDS vs. ACOG AOI Forecast Employment



	2019-45 Absolute Change	2019-45 Compound Annual Growth Rate
RDS	228,126	1.11%
ACOG	287,930	0.83%

Household and Employment Comparison Maps

The following maps have been included to display RDS' future TAZ growth patterns for the 2019 to 2045 span of the project.

Figure 7: RDS Household TAZ Growth Map 2019 - 2045

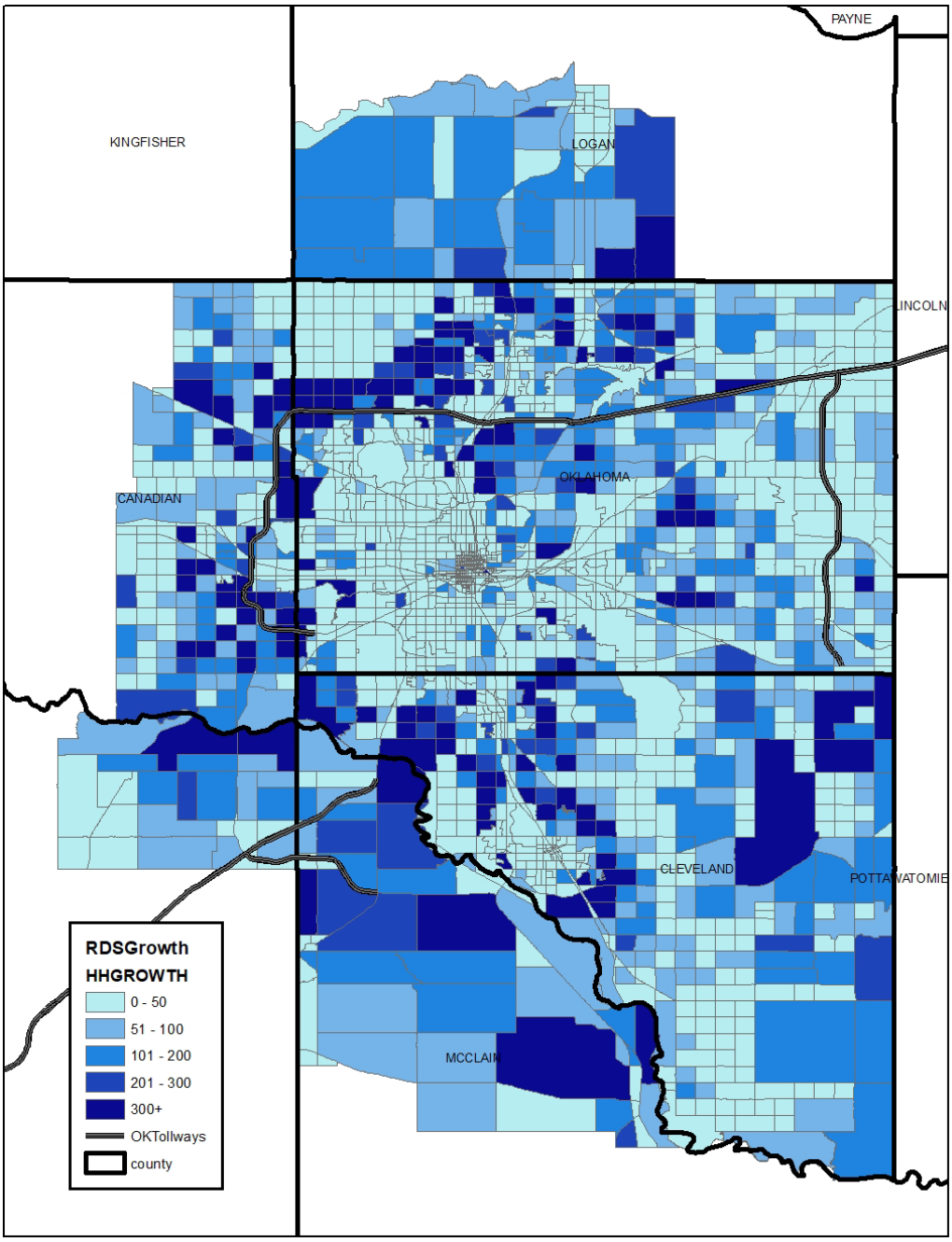
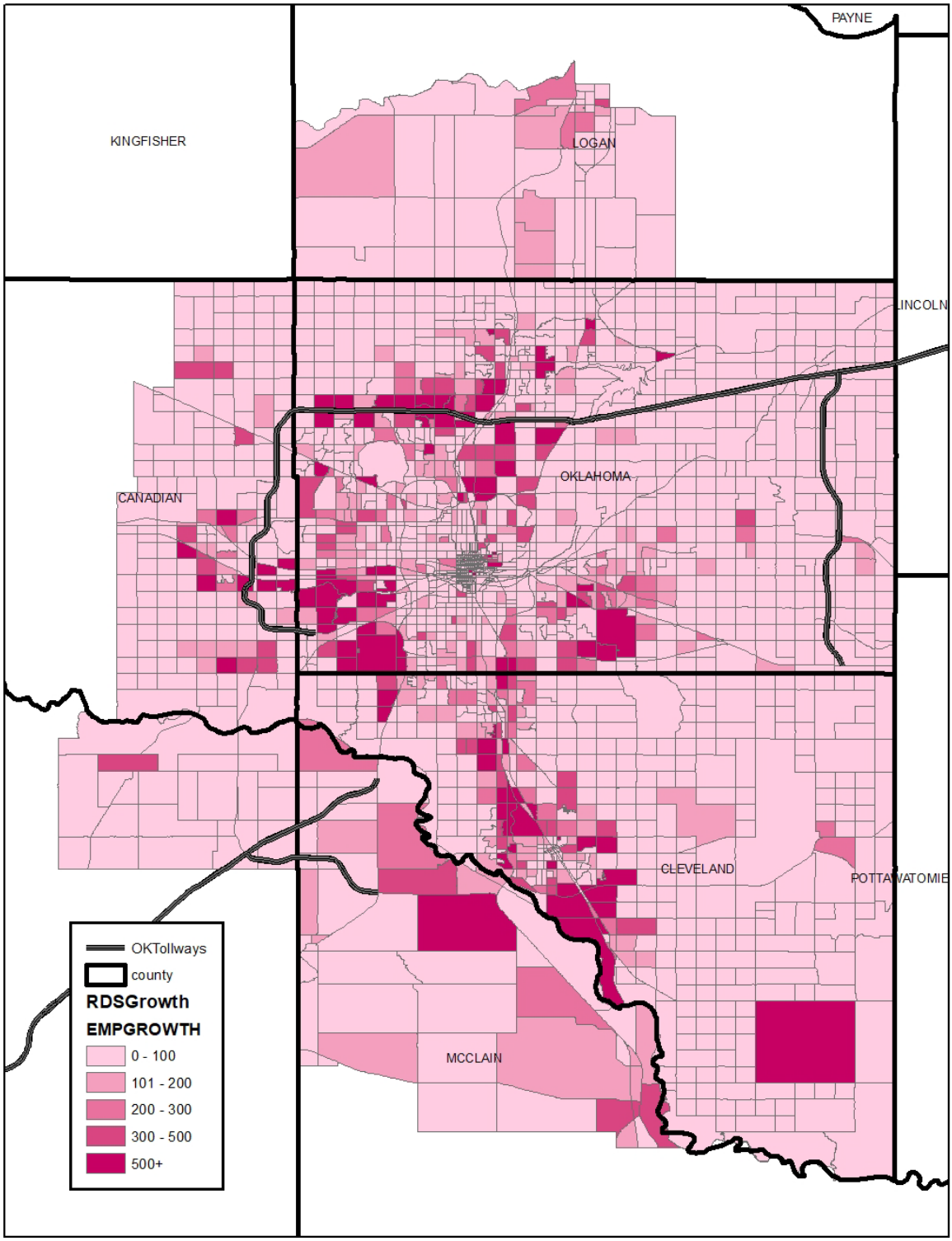


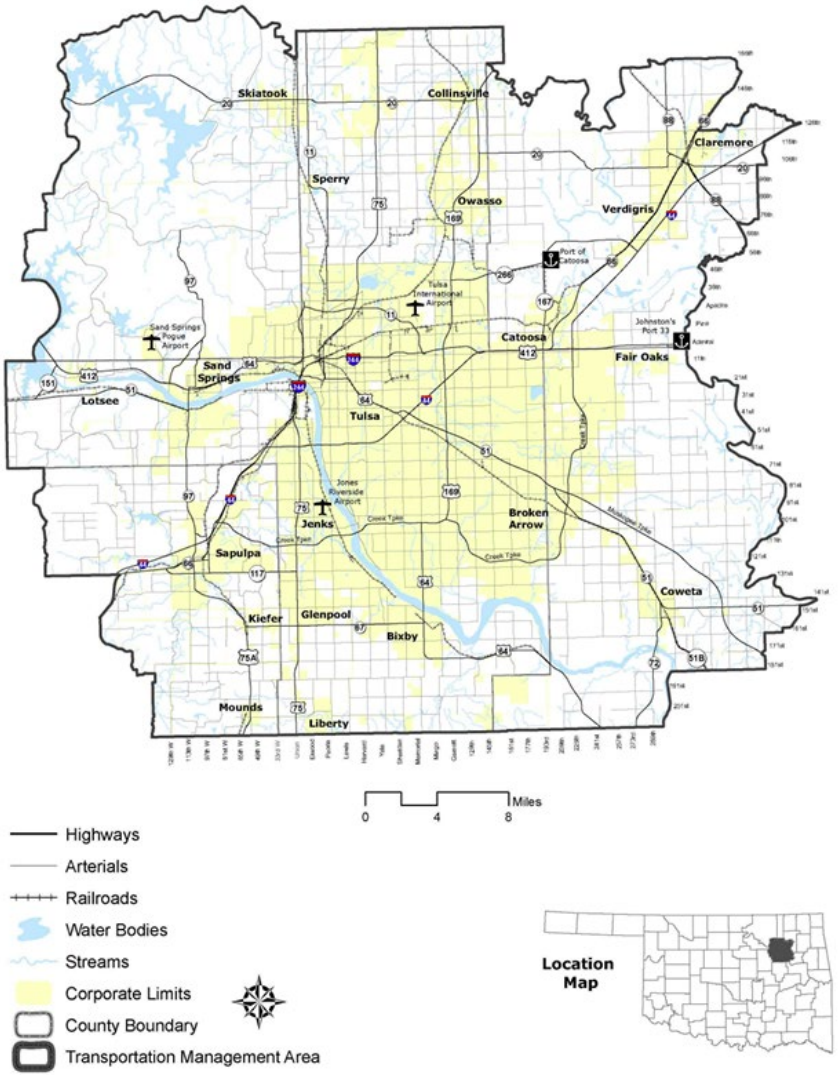
Figure 8: RDS Employment TAZ Growth Map 2019 – 2045



Study Area

The 1,400 square-mile Tulsa Transportation Management Area (TMA) is comprised of Tulsa County and portions of the adjacent counties of Creek, Osage, Rogers, and Wagoner. It is a part of the seven-county Tulsa Metropolitan Statistical Area (MSA), which also includes Okmulgee and Pawnee Counties. The TMA is predominately urban, with nearly 85% of its population being within the incorporated cities of Bixby, Broken Arrow, Catoosa, Claremore, Collinsville, Coweta, Fair Oaks, Glenpool, Jenks, Kiefer, Mounds, Owasso, Sand Springs, Sapulpa, Skiatook, Sperry, Verdigris, and the core city, Tulsa.

Figure 9: INCOG Study Area Map



Population Trends and Projections

According to the most recent 2020 Census Bureau population data, the City of Tulsa has added over 52,000 people since 1980. In comparison, Tulsa County has added almost 199,000 persons from 1980 to 2020. From 1980 to 2000, the County's CAGR was about twice the City's, but since 2000, the County CAGR has been more than three times the City's rate. The Tulsa Metro Area, which is comprised of Creek, Okmulgee, Osage, Pawnee, Rogers, Tulsa and Wagoner Counties, added 303,000 persons from 1990 to 2020. Overall, the Tulsa Metro growth rate has been in-line with Tulsa County since 1980.

Table 7: Historical Population

	April 1, 1980	April 1, 1990	April 1, 2000	April 1, 2010	April 1, 2020	CAGR 1980-2000	CAGR 2000-2020
City of Tulsa	360,919	367,302	393,049	391,906	413,066	0.43%	0.25%
Creek County	59,016	60,915	67,317	69,967	71,754	0.66%	0.32%
Okmulgee County	39,169	36,490	39,685	40,069	36,706	0.07%	-0.39%
Osage County	39,327	41,645	44,437	47,472	45,818	0.61%	0.15%
Pawnee County	15,310	15,575	16,612	16,577	15,553	0.41%	-0.33%
Rogers County	46,436	55,170	70,641	86,905	95,240	2.12%	1.51%
Tulsa County	470,593	503,341	563,299	603,403	669,279	0.90%	0.87%
Wagoner County	41,801	47,883	57,491	73,085	80,981	1.61%	1.73%
Tulsa MSA	711,652	761,019	859,532	937,478	1,015,331	0.95%	0.84%

Source: US Census Bureau.

Residential growth had slowed down in the city, county, and Metro Area of Tulsa between 2000 and 2010 but has picked back up from 2010 to 2020. Forecasting agencies including the Oklahoma Department of Commerce and Woods & Poole, agree that looking forward to 2045, Tulsa County will continue to see household and population growth continuing at a pace much like it has experienced since 2000, as shown in Table 3. There are many attributes that contribute to the overall county projections. These include a recent history of steady growth, affordable and available land with no limiting geographic boundaries such as an ocean or foreign border, the relatively low cost of doing business in the state and region, central geographic location in the U.S., favorable weather and amenities, etc. Table 8 compares the projected population of the Oklahoma Metro Area from 2015 to

2045. Overall, the two agencies forecast a similar growth trend with the Department of Commerce projecting a slightly higher rate of growth during the 30-year timeframe, ultimately resulting in a prediction of over 90,000 more residents than the Woods and Poole totals.

Table 8: County Population Projections 2015-2045

Creek County

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	72,739	78,908	85,076	91,245	18,506	0.76%
Woods & Poole	70,944	73,219	75,599	77,074	6,130	0.28%

Okmulgee County

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	40,159	40,867	41,575	42,283	2,124	0.17%
Woods & Poole	38,295	36,741	36,489	36,238	-2,057	-0.18%

Osage County

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	49,911	53,579	57,246	60,914	11,003	0.67%
Woods & Poole	46,883	46,209	47,317	48,452	1,569	0.11%

Pawnee County

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	17,132	18,431	19,731	21,030	3,898	0.69%
Woods & Poole	16,018	15,758	15,802	15,844	-174	-0.04%

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Rogers County

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	91,903	105,440	118,976	132,513	40,610	1.23%
Woods & Poole	91,193	101,004	111,627	121,815	30,622	0.97%

Tulsa County

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	626,543	677,822	729,100	780,379	153,836	0.73%
Woods & Poole	647,135	688,861	724,003	751,370	104,235	0.50%

Wagoner County

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	77,516	88,762	100,008	111,253	33,737	1.21%
Woods & Poole	75,979	88,171	98,489	108,630	32,651	1.20%

Tulsa MSA

	2015	2025	2035	2045	Absolute Growth 2015-2045	CAGR 2015-2045
Oklahoma Dept of Commerce	975,903	1,063,809	1,151,712	1,239,617	263,714	0.80%
Woods & Poole	986,447	1,049,963	1,109,326	1,159,423	172,976	0.54%

State and Regional Employment Trends and Projections

Table 9 illustrates recent employment growth in Tulsa, the Tulsa Metropolitan Area, and its counties. With the rebound in the economy beginning after the national recession of 2008-2009, all geographies, other than Okmulgee and Pawnee Counties, saw steady employment gains through 2019. 2020 brought the COVID-19 pandemic and much of the employment gains over the past five years were lost in the short-term but rebounded strongly in the first years of the new decade. The Tulsa Metro Area added 45,000 jobs and accounted for 27 percent of all job growth in the state between 2010 to 2022. Tulsa County's employment growth has been particularly strong, adding 29,000 jobs.

Table 9: County Employment Trends

	2010 Emp	2015 Emp	2020 Emp	2022 Emp	Emp Growth 2010-22	Percent Change 2010-22	CAGR 2010-22
State of Oklahoma	1,650,388	1,750,532	1,721,142	1,817,183	166,795	10.1%	0.81%
Tulsa Metro Area	429,900	454,306	447,686	474,848	44,948	10.5%	0.83%
Creek County	16,442	18,710	18,428	19,405	2,963	18.0%	1.39%
Okmulgee County	9,850	9,777	9,417	9,279	(571)	-5.8%	-0.50%
Osage County	6,070	6,754	6,285	6,769	699	11.5%	0.91%
Pawnee County	3,441	3,461	3,289	3,165	(276)	-8.0%	-0.69%
Rogers County	24,030	27,927	25,694	26,118	2,088	8.7%	0.70%
Tulsa County	327,799	349,408	343,829	356,552	28,753	8.8%	0.70%
Wagoner County	6,850	9,014	9,373	9,318	2,468	36.0%	2.60%

Source: US Bureau of Labor Statistics, Local Area Unemployment Statistics

Looking into the future, the Oklahoma Employment Security Commission (OESC) is expecting both Oklahoma and the Tulsa Metro Area to continue to grow at a slower rate than 2010 to 2022. Below, the OESC is expecting a 0.41 to 0.38 percent per year growth rate for the state and the Tulsa Metro Area.

Table 10: Projected Employment

State of Oklahoma	
2018 Total Employment	1,802,040
2028 Total Employment	1,876,530
Absolute Difference	74,490
Percentage Change 2018-2028	4.1%
Compound Annual Growth Rate	0.41%

Tulsa MSA	
2018 Total Employment	455,760
2028 Total Employment	473,320
Absolute Difference	17,560
Percentage Change 2018-2028	3.9%
Compound Annual Growth Rate	0.38%

Source: Oklahoma Employment Security Commission Projections. https://oklahoma.gov/oesc/labor-market/employment-projections.html

RDS Forecast Review Methodology

RDS was retained to review the latest socioeconomic forecasts for the INCOG Study Area for accuracy and reasonableness. For this study, CDM Smith provided RDS with household, population, and employment data at the TAZ level from INCOG. This data was originally provided to RDS in two intervals, 2015 and 2045, for 892 TAZs. RDS was asked to establish a 2019 baseline, as well as review the 2045 demographic totals by zone.

INCOG's 2045 Demographics Introduction

INCOG's Long Range Transportation Plan (LRTP) anticipates transportation needs for the TMA predicated on demographic and economic assumptions and forecasts for the entire region. The most recent Regional Transportation Plan, adopted in November 2017, was prepared using 2005 base year data, pending the outcome of 2010 Census. In the spirit of maintaining a continuous planning process, Connected 2045 was developed using the available 2015 Census data from the American Community Survey. [2]

INCOG 2045 Projection Methodologies

INCOG's first step in the process to determine and allocate population growth was to develop population projections for each of the geographies that encompass the Transportation Management Area (TMA), namely Tulsa County and portions of Creek, Osage, Rogers, and Wagoner Counties. Different population projections were developed before arriving at the recommended population projection. Methods included linear trends, other non-linear projection models, and outside sources, such as the Oklahoma Department of Commerce projections, and Woods and Poole projections.

[2] INCOG, *Connections: 2045 Regional Transportation Plan*.

For employment, different projections were initially developed, which included private source data from Woods and Poole, publicly available data from the Bureau of Labor Statistics, as well as a ratio forecast that compared the employment per capita in 2015 and carried that forward to 2045. The actual projected employment that was allocated was a hybrid of the Bureau of Labor Statistics and Woods and Poole.

From this point, both recommended 2045 population and employment totals were allocated to the TAZ-level by using GIS to analyze the effect of various weighting measures on potential future development. These attractiveness weights were based on several developmental factors and their influence on future residential or commercial TAZ growth. Some examples include previous development, future zoning, vacant developable land availability, highway and rail accessibility, proximity to public services, as well as geographic impedances to development such as water, floodplain, slope, and improper soils.

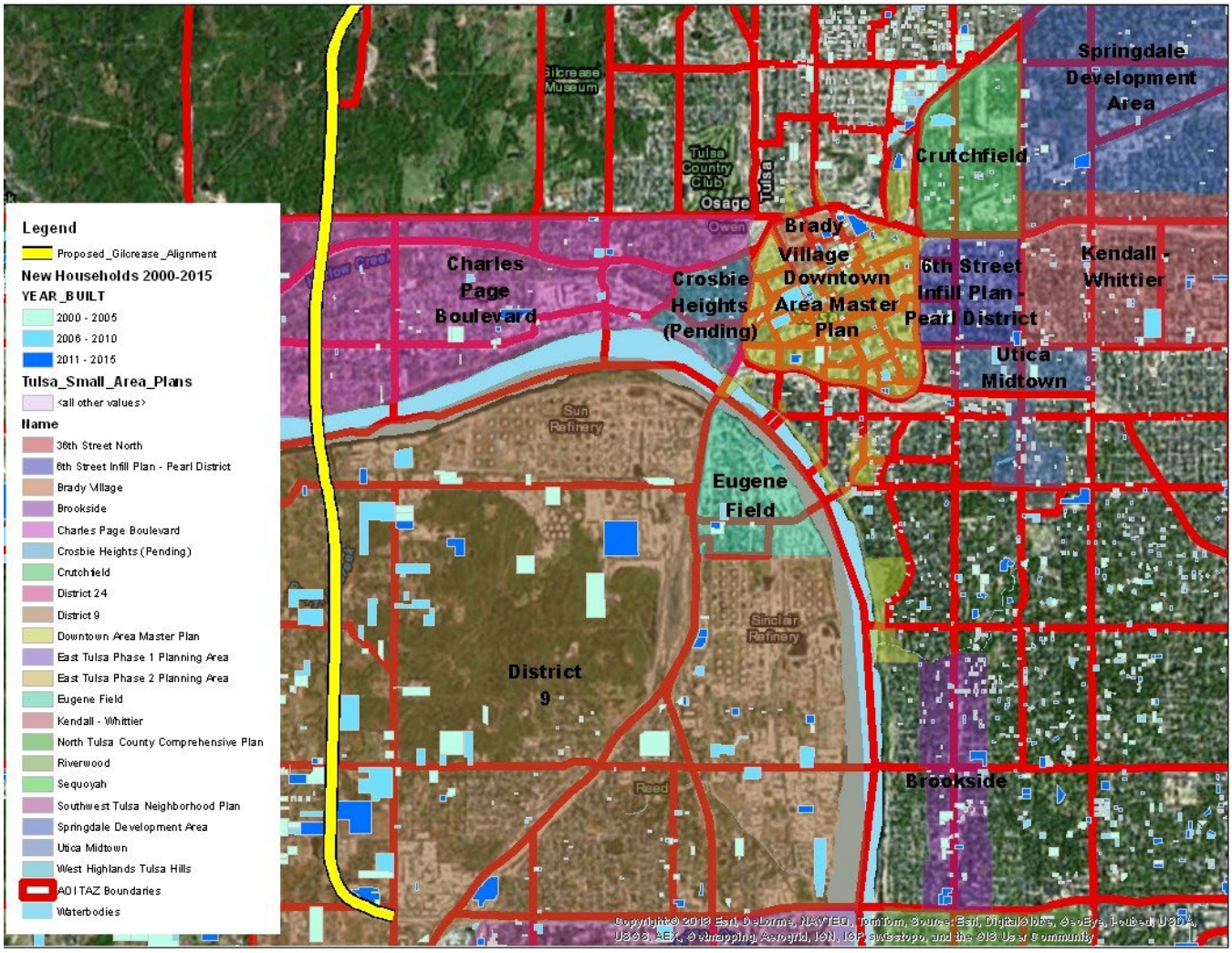
After allocation was complete, INCOG presented its findings to two review bodies, the Transportation Technical and the Transportation Policy Committees. Findings were also shared with development professionals, whose knowledge of future projects assisted in identifying needed reallocations to other TAZ's within the county.

RDS GIS Review

RDS GIS Review: As INCOG did during their allocation process, RDS took advantage of geographic information system (GIS) technology during the comprehensive review process. RDS gathered multiple years of aerial photography, zoning and future land use maps, parcel boundaries and Census block data summed to the TAZ-level for GIS analysis (see Figure 10). Using GIS, RDS determined TAZs where new household and employment development would or will likely occur post-2015. Through the use of GIS, multiple datasets were displayed side- by-side. This allowed staff to review both model years of the project simultaneously.

Households/Population: After receiving the dataset, RDS reviewed the base year for accuracy. All 892 TAZs were reviewed by RDS. Household population was derived by using the household sizes that were established in the original INCOG data for each TAZ and a 2019 baseline was established for review. During this review, specific attention was given to areas that have seen recent significant household growth. RDS staff conducted thorough research through examination of local development announcements including news-related websites. RDS used a bottom-up approach using this local knowledge, development research and professional judgment to attempt to accurately account for new housing within the AOI.

Figure 10: Sample GIS Review



Employment: As with households, RDS first examined 2015 for accuracy and established a 2019 baseline for review. Specific attention was paid to special generator and major employer TAZs, as well as TAZs in proximity to OTA roadway facilities. RDS used current and future land use and zoning GIS layers to determine if commercial development was feasible. If a commercial development's project use was known, consistent employees per square footage ratios were used to estimate a project's employment potential.

RDS 2019-2045 Study Area Review: RDS began the review process by examining each TAZ's 2019 household and employment totals for accuracy. Based on RDS' staff review, the resultant 2019 demographics added 15,609 households, 36,980 population and 1,741 jobs compared to INCOG data. RDS' 2045 demographics added 24,667 households and 60,575 population, and 23,222 employment compared to INCOG's 2045 totals. Table 12 illustrates these comparisons for the 2019 and 2045 demographic factors post-RDS review.

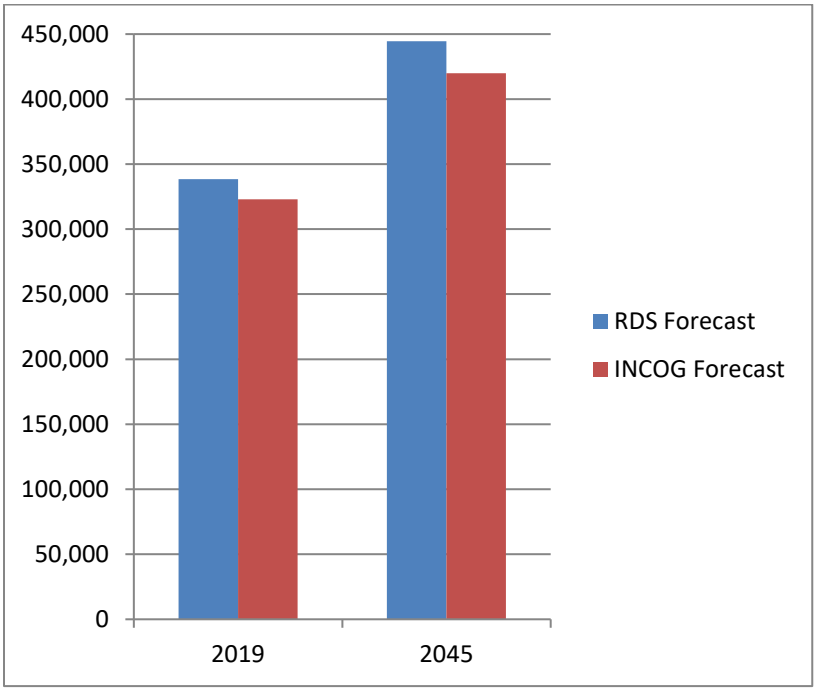
Table 11: Post-review INCOG Study Area Totals

	2019		
	INCOG Forecast	RDS Forecast	Difference from INCOG
Households	322,880	338,489	15,609
Population	834,807	871,787	36,980
Employment	448,577	450,318	1,741

	2045		
	INCOG Forecast	RDS Forecast	Difference from INCOG
Households	419,835	444,502	24,667
Population	1,079,652	1,140,227	60,575
Employment	539,361	562,583	23,222

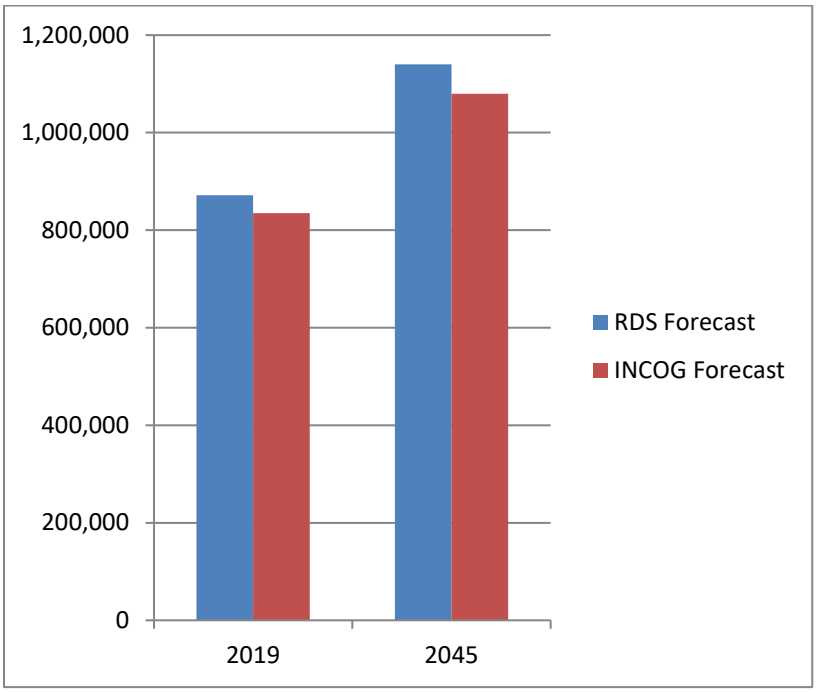
RDS 2019-2045 Review: After establishing new RDS 2019 demographics using staff review, new home reports, commercial development datasets and current year Appraisal District data for each individual TAZ, the 2045 future iteration was reviewed for growth and reasonableness. RDS staff established totals for each, noting the reason for each adjustment. Figures 11, 12, and 13 illustrate growth from 2019-2045 as well as compare them by the Compound Annual Growth Rate (CAGR) seen in RDS' and INCOG's forecasts.

Figure 11: RDS vs. INCOG AOI Forecast Households



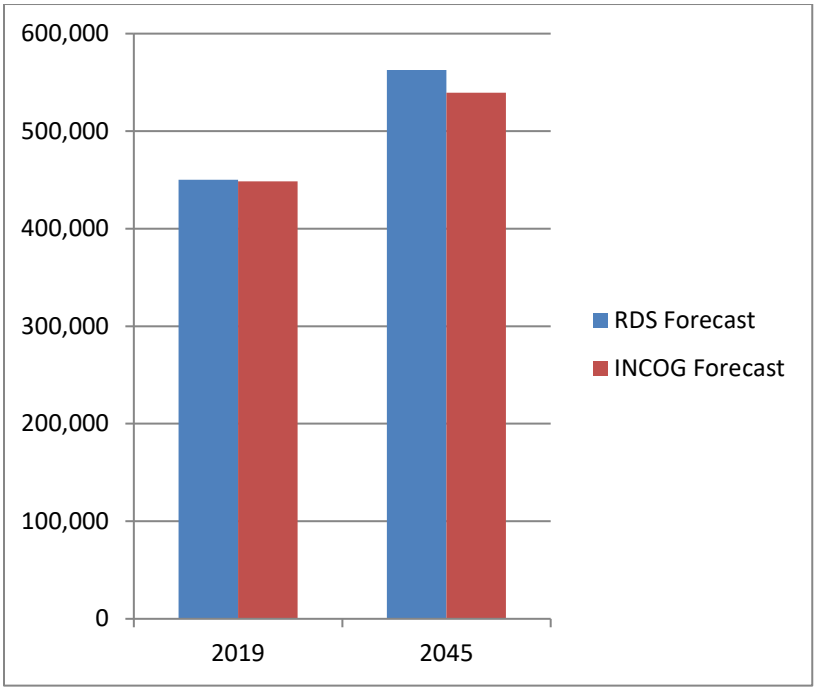
	2019-45 Absolute Change	2019-45 Compound Annual Growth Rate
RDS	106,013	1.05%
INCOG	96,955	1.02%

Figure 12: RDS vs. INCOG AOI Forecast Household Population



	2019-45 Absolute Change	2019-45 Compound Annual Growth Rate
RDS	268,440	1.04%
INCOG	244,845	0.99%

Figure 13: RDS vs. INCOG AOI Forecast Employment



	2019-45 Absolute Change	2019-45 Compound Annual Growth Rate
RDS	112,265	0.86%
INCOG	90,784	0.71%

Household and Employment Comparison Maps

The following maps have been included to display RDS' future TAZ growth patterns for the 2019 to 2045 span of the project.

Figure 14: RDS Household TAZ Growth Map 2019 - 2045

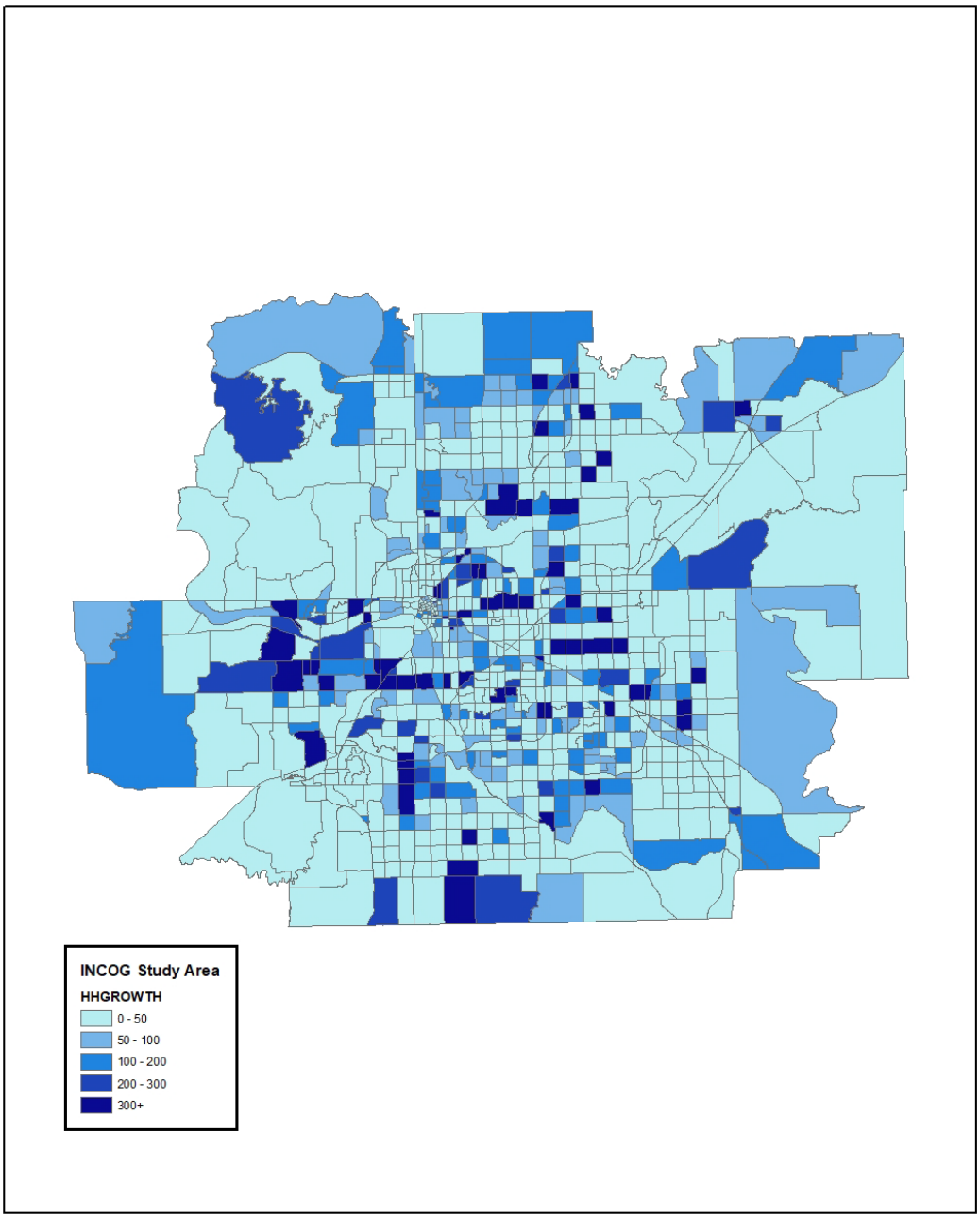


Figure 15: RDS Employment TAZ Growth Map 2019 – 2045