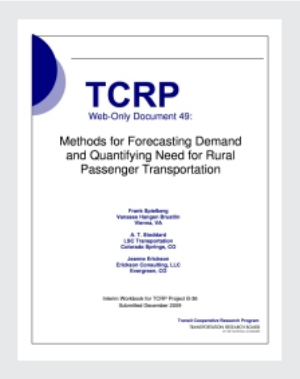


Methods for Forecasting Demand and Quantifying Need for Rural Passenger Transportation

DETAILS

0 pages | null | PAPERBACK

ISBN 978-0-309-43096-8 | DOI 10.17226/22942

AUTHORS

ACKNOWLEDGMENT

This work was sponsored by the Federal Transit Administration (FTA) in cooperation with the Transit Development Corporation. It was conducted through the Transit Cooperative Research Program (TCRP), which is administered by the Transportation Research Board (TRB) of the National Academies.

THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

The **National Academy of Sciences** is a private, nonprofit, self-perpetuating society of distinguished scholars engaged in scientific and engineering research, dedicated to the furtherance of science and technology and to their use for the general welfare. On the authority of the charter granted to it by the Congress in 1863, the Academy has a mandate that requires it to advise the federal government on scientific and technical matters. Dr. Ralph J. Cicerone is president of the National Academy of Sciences.

The **National Academy of Engineering** was established in 1964, under the charter of the National Academy of Sciences, as a parallel organization of outstanding engineers. It is autonomous in its administration and in the selection of its members, sharing with the National Academy of Sciences the responsibility for advising the federal government. The National Academy of Engineering also sponsors engineering programs aimed at meeting national needs, encourages education and research, and recognizes the superior achievements of engineers. Dr. Charles M. Vest is president of the National Academy of Engineering.

The **Institute of Medicine** was established in 1970 by the National Academy of Sciences to secure the services of eminent members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under the responsibility given to the National Academy of Sciences by its congressional charter to be an adviser to the federal government and, on its own initiative, to identify issues of medical care, research, and education. Dr. Harvey V. Fineberg is president of the Institute of Medicine.

The **National Research Council** was organized by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and advising the federal government. Functioning in accordance with general policies determined by the Academy, the Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in providing services to the government, the public, and the scientific and engineering communities. The Council is administered jointly by both the Academies and the Institute of Medicine. Dr. Ralph J. Cicerone and Dr. Charles M. Vest are chair and vice chair, respectively, of the National Research Council.

The **Transportation Research Board** is one of six major divisions of the National Research Council. The mission of the Transportation Research Board is to provide leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal. The Board's varied activities annually engage about 7,000 engineers, scientists, and other transportation researchers and practitioners from the public and private sectors and academia, all of whom contribute their expertise in the public interest. The program is supported by state transportation departments, federal agencies including the component administrations of the U.S. Department of Transportation, and other organizations and individuals interested in the development of transportation. **www.TRB.org**

www.national-academies.org

Quick Start Guide

This Workbook provides step-by-step instructions for developing forecasts of the need and demand for passenger transportation in rural communities. The data used in developing these forecasts come from many sources. The following table has space to enter data about public transportation service characteristics and community characteristics of your area. These data will be required for a number of the calculations that are included in this workbook. Note that not every calculation in this workbook requires all the data listed below.

This page is provided to give you a quick start by highlighting some key data that are used in estimating need and demand. These are not intended to be all the data required to complete the estimates included as part of this workbook. Please read the workbook thoroughly, and assemble all the data needed from published sources or the internet before applying the methods.

Service Characteristics		
Service Area Population		
Service Area (square miles)		
Annual Vehicle-Miles	_____per Month	_____per Year
Annual Vehicle-Hours	_____per Month	_____per Year
1-Way Trips Served	_____per Month	_____per Year

Community Characteristics		
Area of County		
College/University Enrollment	Base Year ( )	Forecast Year ( )
List of Social Service Agencies providing or requiring transportation		

Table of Contents

I. Introduction 1

Purpose of Workbook 1

Organization of Workbook 2

Definitions 3

II. Need 6

Population Segments 6

Mobility Gap 13

III. Demand 15

General Public Rural 15

Program (Sponsored) Trips 21

Small City Fixed Route 26

Commuters to Urban Centers 27

IV. Data Sources 28

Population (Total and by Segments) 28

Commuting Trips 28

Appendices 29

Appendix A: Chart for Estimating Non-program Trip Rates 30

Appendix B: Step-by-Step Instructions for the Rural Transit Need and Demand Spreadsheet 31

Appendix C: Suggested Guidelines for Data Collection 76

List of Figures

Figure 1. Census Main Page 7
Figure 2. ACS Home Page 8
Figure 3. Data Set Selection 9
Figure 4. Geographic Area Type Section Screen 10
Figure 5. Specific Geographic Area Section Screen 11
Figure 6. Results Screen 11

List of Tables

Table 1. Worksheet for Documenting Persons with Transportation Needs 7
Table 2. Example of Computation of Number of Persons Resident in Households Owning No Personal Vehicle 7
Table 3. Mobility Gap 13
Table 4. Worksheet for Application of Peer System Values 17
Table 5. Worksheet for Estimating General Public Demand 18
Table 6. Annual Non-program Trips per Person Using TCRP Report 3 Methodology 20
Table 7. Worksheet for Program Transportation Data 21
Table 8. Program Participants Estimation Methodologies 22
Table 9. Summing College and University Enrollment 26
Table 10. Expected Demand for Commuter Trips Using Passenger Transportation from Rural Counties 27

I. Introduction

Purpose of workbook

This Workbook is intended to provide planners with the ability to answer questions regarding the magnitude of the need for public transit services within a geographic area, as well as the annual ridership (i.e. "demand") that a transit service would be expected to carry.

Examples of questions that this Workbook can help answer include the following:

- "How many residents of my community need transit service?" (*page 6)*
- "How many trips per year are not being made due to the current lack of transit service?" (*page 13)*
- "We have enough annual funding to operate 5,000 vehicle-hours of service per year. How many passenger-trips per year will we serve?" *(page 15)*
- "How many transit trips will the average resident make on a transit service in our community?" (*page 20 and Appendix A)*
- "How many transit trips per year will be made by social service programs versus those made by the general public?" (*page 21)*
- "If we operate a fixed route transit service in our small city, how many passenger-trips per year will we serve?" (*page 26)*
- "If there were a commuter bus program from our community to the big city, how many daily passenger-trips would be served?" (*page 27)*

For each question there is a specific section/page of the Workbook that presents the method by which the question may be answered. The methodologies are in *italics*.

These methodologies are intended to evaluate area-wide need or demand, at a planning level of analysis. They are most useful in evaluating areas not currently served by transit. These methodologies are not intended to be used to assess specific routes or neighborhoods.

An Excel spreadsheet for applying the procedures described in this Workbook is available on line at www.trb.org by searching "TCRP Web-Only Document 49". Appendix B provides step-by-step instructions for use of the spreadsheet.

Organization of workbook

This Workbook is organized in four major chapters - Introduction, Need, Demand, and Data Sources. The remainder of this chapter provides definitions of terms used in the Workbook. The following sections provide methods for estimating need (Chapter II) and demand (Chapter III). Chapter IV list sources for the data required for application of the methods.

For Chapter II on need, two procedures are described. One documents a method for estimating the number of people having a need for passenger transportation. The other describes a method for estimating the number of trips that would have to be served to satisfy all unmet needs. The former method is likely to be most useful for presentations to policy-making groups and other non-technical audiences. The latter method is more suited for understanding the true magnitude of need and establishing long term goals for passenger transportation services. For both methods step-by-step instructions are provided for obtaining the needed data from the Census or the American Community Survey. Tables that can be used to record and/or summarize data are included.

For Chapter III on demand estimation, methods are provided for four markets:

1. Public (i.e. Section 5311 funded) services
2. Program or sponsored trips
3. Fixed route service in small urban towns in rural areas
4. Commuters from rural areas to central cities

For each market the basic functional relationships are described. Worksheets for carrying out computations and tables of values are provided.

The header at the top of each page identifies the market to which the method applies.

Definitions

Need

Need is defined in two ways:

1. The number of people in a given geographic area likely to require a passenger transportation service, and

2. The difference between the number of trips made by persons who reside in households owning no personal vehicle and the number of trips that would likely be made by those persons if they had access to a personal vehicle. This measure is referred to as the Mobility Gap.

Demand

Demand is defined as the number of trips likely to be made over a given period within a given geographic area at a given price and level of service. The procedures for preparing forecasts of demand have been stratified by market:

- Public (i.e. Section 5311 funded) services
- Program or sponsored trips
- Fixed route service in small urban towns in rural areas
- Commuters from rural areas to central cities

Trips

As used in this Workbook trips are defined as **one-way trips** made over a given time period – a day or a year.

Due to differences in data sources, trips are defined differently for different markets.

For public systems and fixed-route services in small urban towns in rural areas the Rural National Transit Database was used as the source of data. The definition of a trip is, therefore, the same as used in the NTD: "The number of passengers who board operational revenue vehicles. Passengers are counted each time they board a vehicle, no matter how many vehicles they use to travel from their origin to their destination." The time period for these estimates is one year.

For program or sponsored trips the data used for analysis were gathered from many social service agencies. For this market a trip is a "linked trip" from an original origin to an ultimate destination. Transfers or intermediate stops are not counted as additional trips. The forecast methodology produces estimates of annual trips.

Definitions

For commuter trips the methodology forecasts the number of transit trips based on a user provided measure of person trips. The definition of a trip will, therefore, depend on the source used. If the source for "person trips" is the American Community Survey or the Census Transportation Planning Package a trip is a daily one-way journey from home-to-work. The value must be multiplied by two to get daily transit trips and by 255 to get annual transit trips. If some other source is used for person trips (e.g. estimated by the urban area Metropolitan Planning Organization or by the State Transportation Agency), then the estimates will be in the units used for those projections.

Mobility gap

The difference between the number of trips per day made by persons living in households having one or more personal vehicles available and those living in households that own no personal vehicles.

American Community Survey

A survey administered by the U.S. Bureau of the Census that collects data each year from a sample of approximately 2.5% of the households in the nation. The information collected in the ACS will replace data previously collected every ten years in the Census long-form.

Rural

For the methodologies presented in this Workbook, a rural county is defined as one having a population density of less than 1,000 persons per square mile.

Urbanized area

An area consisting of a central place(s) and adjacent territory with a general population density of at least 1,000 people per square mile of land area that together have a minimum residential population of at least 50,000 people.[1]

1 http://factfinder.census.gov/home/en/epss/glossary_u.html, August 19, 2009.

Definitions

Urban cluster

An urban cluster consists of densely settled territory that contains at least 2,500 people, but fewer than 50,000 people.[2]

Urban center

A methodology is included in this Workbook for estimating the demand for passenger transportation from rural counties to urban centers. In this context an urban center is defined as the central place of an urbanized area.

2 I Federal Register / Vol. 67, No. 84 / Wednesday, May 1, 2002 / Notices page 21962 bid.

II. Need

Need is defined in two ways - as the number of people in a given geographic area likely to require a passenger transportation service, and as the number of trips that would be made by those persons if they had minimal limitations on their personal mobility. Because the incremental cost of a trip using a car is low for those who have ready access to and ability to use a car, the difference between the number of daily trips made by persons with ready availability of a personal vehicle and by those lacking such access is used as the indicator of the unmet need for additional person-trips. Not all of this unmet need will be provided by public transit services. Persons lacking a personal vehicle or the ability to drive, receive transportation from friends, relatives, volunteers and social service agencies, as well as from public transportation services.

Population segments

The population segment method for quantifying need is based on using demographic data from the American Community Survey (ACS). The ACS is an annual survey conducted by the U.S. Census Bureau (www.census.gov) of approximately 2.5% of households. The ACS replaces the long-form portion of the decennial census. Results are made available for each year and for a rolling three-year period. Beginning in 2010 results will also be made available for a rolling five-year period. Since the census must suppress some data to maintain confidentiality, data for areas with a population of 20,000 or less will be available only in the five-year rolling summaries.

The instructions given below for obtaining ACS data will yield data for the current three-year period as of late-2009. The specific steps required to retrieve ACS data may change in the future as the five-year summaries become available or the Census Bureau revises its website.

Recommendation – Estimates of need for passenger transportation services in rural areas should be presented as:

- *Number of persons residing in households with income below the poverty level, plus*
- *Number of persons residing in households owning no vehicle.*

To document the need for passenger transportation service in your area, complete the table below:

Estimation of Need (Population based)

Table 1. Worksheet for documenting persons with transportation needs

Persons residing in households with income below the poverty level	
Persons residing in households owning no automobile	

These data may be available from the local county or regional planning agencies that serve the areas under study. Alternatively, data on the number of persons residing in households owning no vehicle can be derived from the American Community Survey. Table 2 illustrates the computation of the number of persons residing in households owning no personal vehicle from data obtained from the ACS.

Table 2: Example of computation of number of persons resident in households owning no personal vehicle

	No Vehicle	Multiplier	Persons resident in households owning no vehicle
One person household	1350	1	1,350
Two person household	243	2	486
3 person household	28	3	84
4 or more person household	100	4	400
Total Persons			2,320

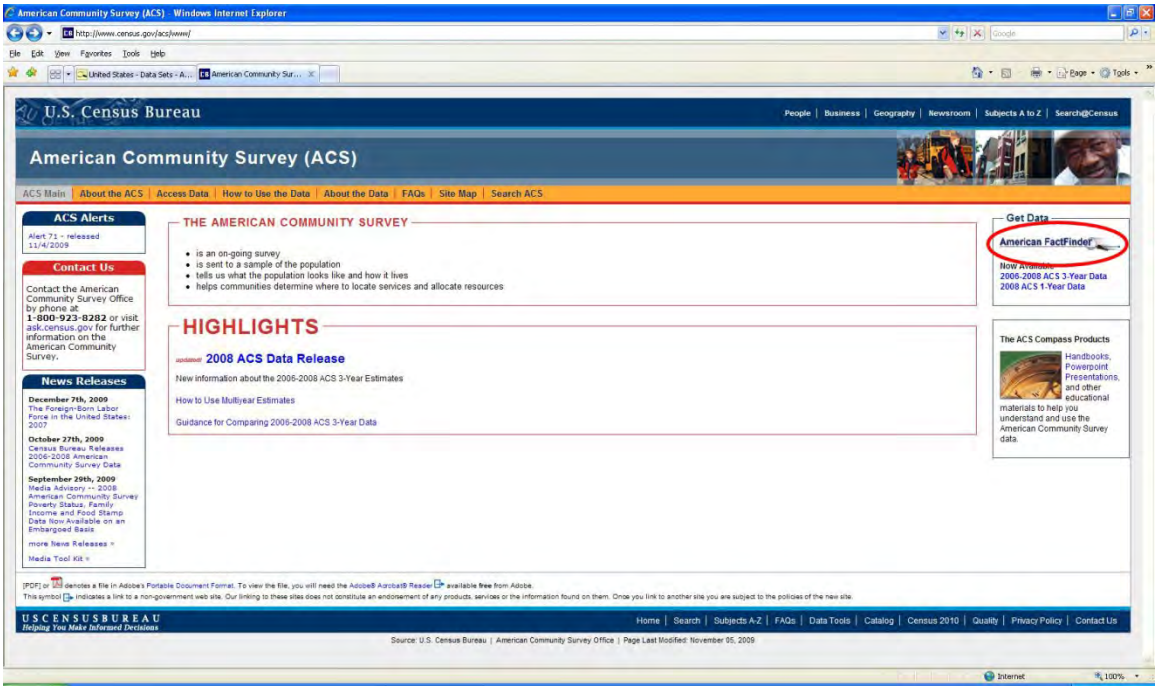
To obtain these data from the American Community Survey go to the main Census web site is at www.census.gov (Figure 1).

Figure 1: Census main page

Estimation of Need (Population based)

Clicking on the link to the American Community Survey brings the user to the ACS home page (Figure 2).

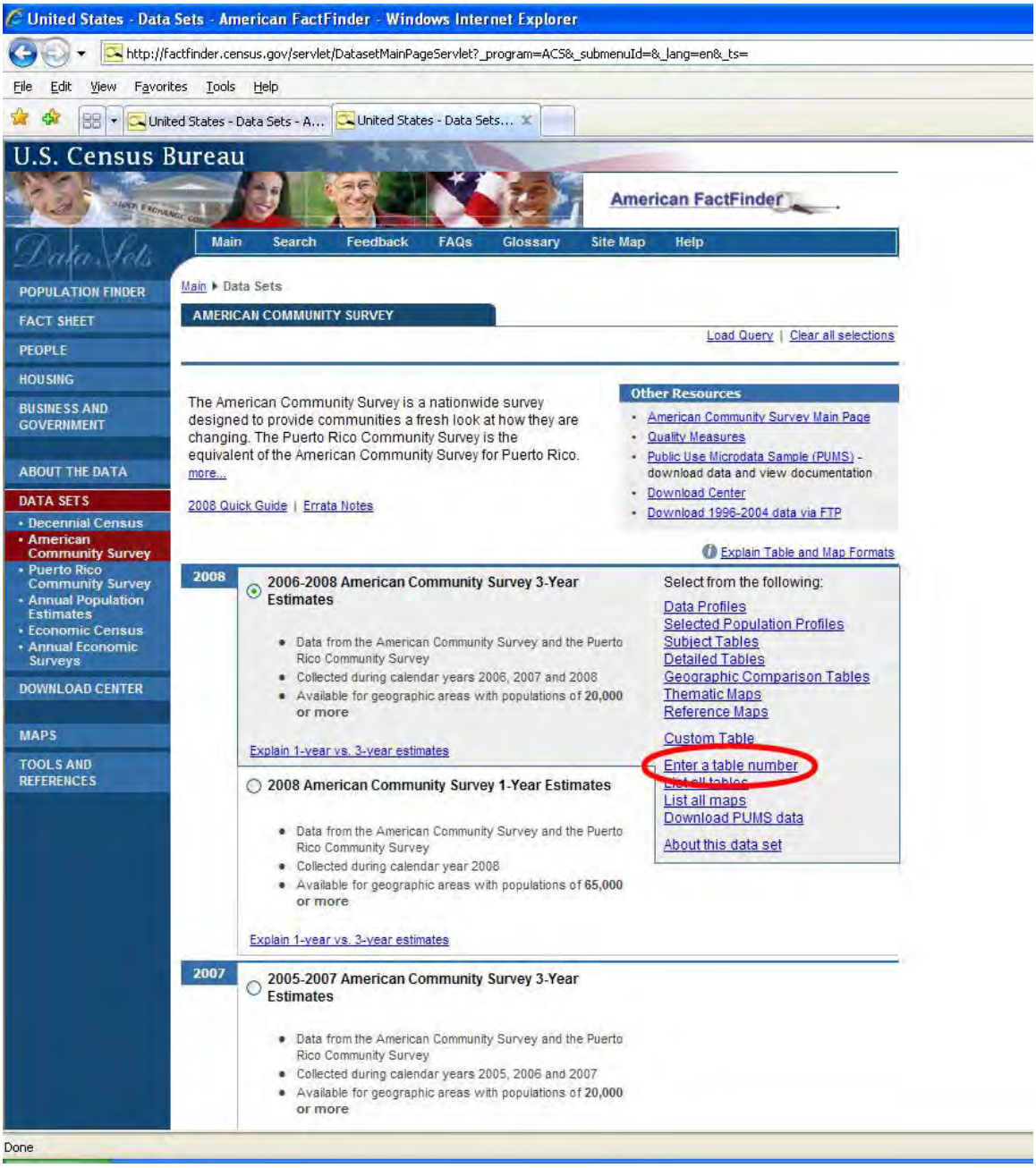
Figure 2: ACS home page



In the 'Get Data' area, click on the link to 'American Fact Finder'. The American Fact Finder page appears with "**2006-2008 American Community Survey 3-Year Estimates**" as the selected dataset. As of winter 2009 this is the most current and complete ACS data set. In future years, both five year ACS data and new three-year estimates will be available on this site. If the Census bureau maintains a similar web page design, the most current five-year estimates (e.g. "**2005-2009 American Community Survey 5-Year Estimates"**) is likely to be the first entry and the default selection. When five year ACS data are available, it is recommended that those data be used for demand analysis.

Estimation of Need (Population based)

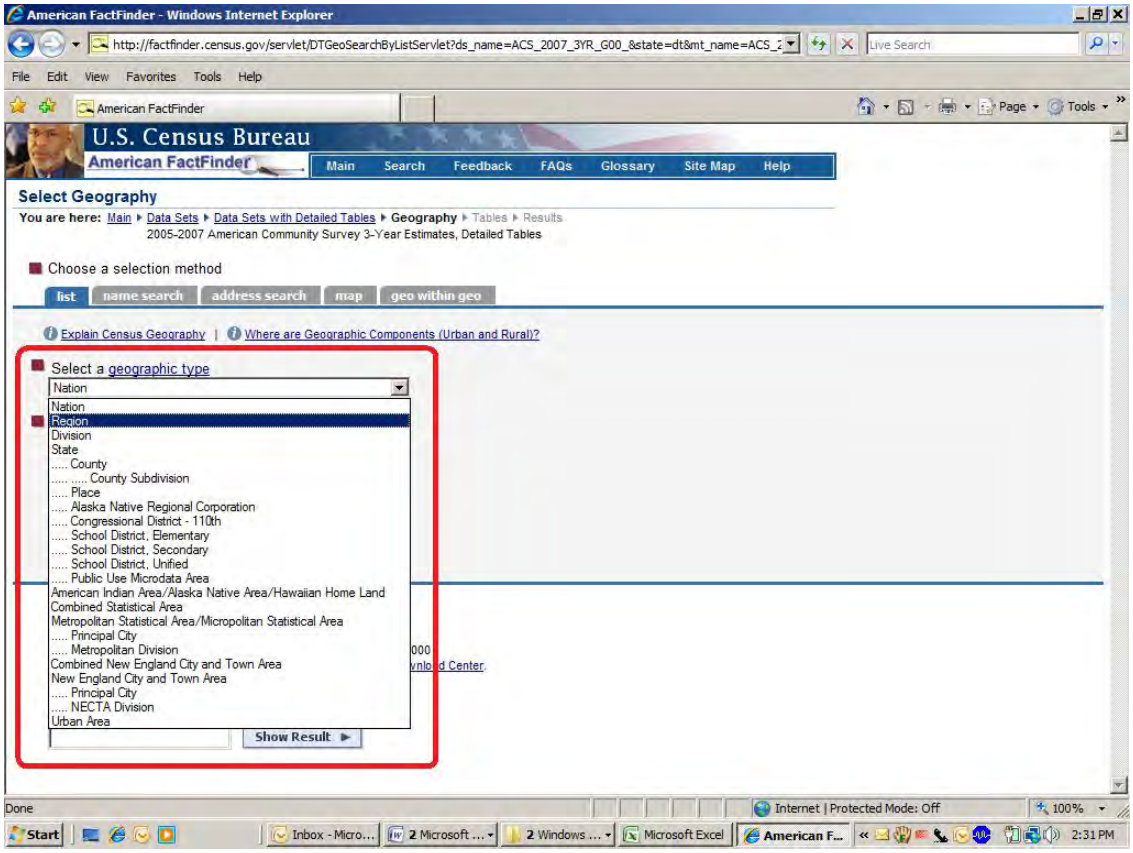
Figure 3: Data set selection



Select 'Enter a table number' (Figure 3) and in the table selection window enter **C08201.** Then select the geographic area for which the data required. This is done by selecting the geographic type (e.g. state, county, etc.) and the specific locations (Figure 4).

Estimation of Need (Population based)

Figure 4: Geographic area type section screen



Select the specific area (e.g. a county in specific state). Then Select "Show Result" (Figure 5).

Estimation of Need (Population based)

Figure 5: Specific geographic area section screen

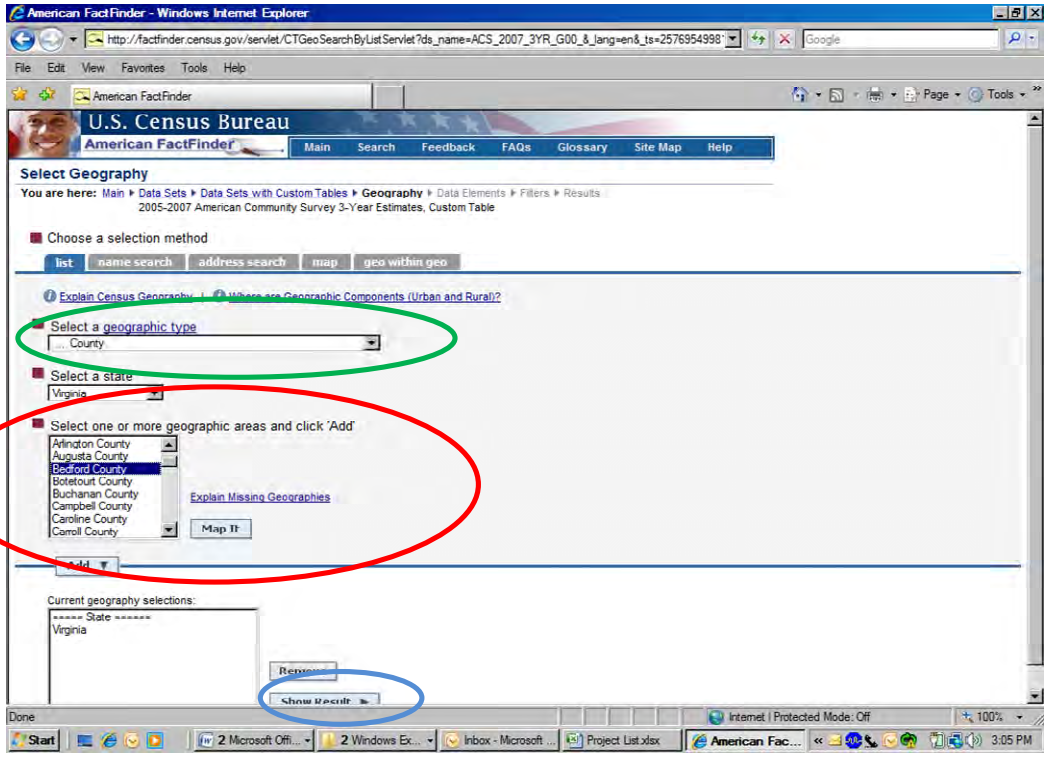
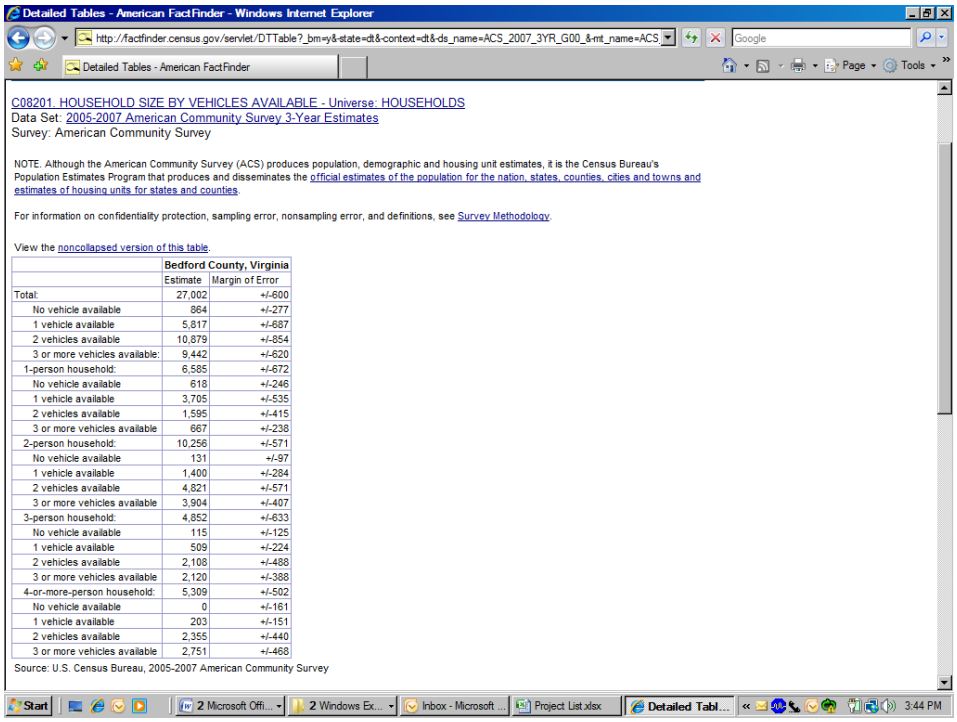


Figure 6: Results screen



	Bedford County, Virginia	
	Estimate	Margin of Error
Total:	27,002	+/-600
No vehicle available	864	+/-277
1 vehicle available	5,817	+/-687
2 vehicles available	10,879	+/-854
3 or more vehicles available:	9,442	+/-620
1-person household:	6,585	+/-672
No vehicle available	618	+/-246
1 vehicle available	3,705	+/-535
2 vehicles available	1,595	+/-415
3 or more vehicles available	667	+/-238
2-person household:	10,256	+/-571
No vehicle available	131	+/-97
1 vehicle available	1,400	+/-284
2 vehicles available	4,821	+/-571
3 or more vehicles available	3,904	+/-407
3-person household:	4,852	+/-633
No vehicle available	115	+/-125
1 vehicle available	509	+/-224
2 vehicles available	2,108	+/-488
3 or more vehicles available	2,120	+/-388
4-or-more-person household:	5,309	+/-502
No vehicle available	0	+/-161
1 vehicle available	203	+/-151
2 vehicles available	2,355	+/-440
3 or more vehicles available	2,751	+/-468

Create a table similar to Table 2 above and enter the corresponding data from the results screen (Figure 6). Sum the results and write that number into the 'Persons residing in households owning no automobile' row in Table 1 above.

Information on the number of persons residing in households below the poverty level can be obtained in the same way, except that table number **C17001** is entered on the "Data Sets" screen. Make note of the result in the appropriate row in Table 1 above.

Mobility gap

The "mobility gap" is the total number of trips *not* taken because members of zero vehicle households do not have the ease of mobility available to members of households with ready access to a car. The mobility gap for the nation as a whole and the nine census regions has been developed from data in the National Household Travel Survey (Table 3). A mobility gap estimate based on household vehicle availability, with the gap measured in trips per day, is computed as:

Estimation of Demand – General Public

Number of households having no car X Mobility Gap

Table 3: Mobility gap

Division	States	Trips per Rural Household Per Day		
		Vehicles Available		Gap
		0	1	
National		3.3	5.4	2.1
Division 1: New England	Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island	*	5.3	*
Division 2: Middle Atlantic	New Jersey, New York, Pennsylvania	3.1	5.9	2.7
Division 3: East North Central	Wisconsin, Michigan, Ohio, Indiana, Illinois	3.3	4.9	1.6
Division 4: West North Central	North Dakota, South Dakota, Nebraska, Kansas, Missouri, Iowa, Minnesota	2.3	5.1	2.8
Division 5: South Atlantic	Maryland, Delaware, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Florida	3.1	5.5	2.4
Division 6: East South Central	Kentucky, Tennessee, Alabama, Mississippi	3.1	4.9	1.8
Division 7: West South Central	Oklahoma, Arkansas, Texas, Louisiana	3.7	5.2	1.5
Division 8: Mountain	Idaho, Montana, Wyoming, Colorado, Utah, Nevada, Arizona, New Mexico	5.2	6.4	1.2
Division 9: Pacific	Washington, Oregon, California, Alaska, Hawaii	3.3	5.8	2.5

* Insufficient data; use national rate.

To compute the daily mobility gap use the data on the number of households owning no vehicle obtained from the American Community Survey data **C08201**. Multiply the gap number for your region from Table 3, by the number of households in your service area owning no personal vehicle to estimate the daily mobility gap for the households being studied. This method may also be used to estimate the mobility gap for subareas of your region.

The estimate produced by the mobility gap method is measured in one-way trips. Having an estimate of the number of trips that would have to be served over a given

service area provides a way to quantify the resources that would be needed to meet this unserved demand. *TCRP Report 98: Resource Requirements for Demand-Responsive Transportation Services* provides a methodology for estimating the number of vehicles that are required to serve a given level of demand over a given service area when the call-ahead time window and the required degree of assurance that a trip can be served are specified.

III. Demand

General public rural

Several methods are available to estimate demand for the general public living in rural areas. When preparing estimates of demand for this group, users may wish to apply each of the methods below and then consider which result seems most reasonable. The methods are listed below in order of suggested application:

Peer data from your system, other nearby systems or systems in same state
or
Rural Transit Trips = 0.2 trips per rural vehicle-mile
or
use of the non-program trip methodology documented in TCRP Report 3
or
Rural Transit Trips = 3.7 trips per rural vehicle-hour
or
$$Trips/person = 1.97 (Vehicle\text{-}hours/person)^{0.69}$$

Peer data

The preferred approach to estimating the demand for General Public Passenger Transportation services is to base the estimate on the experience of your system, if one is currently operating, or the experience of other systems operating in similar rural settings in your own state. If there are few other systems in similar communities or regions within your state, you may need to obtain data from systems in adjacent states. To do this you will want to obtain some information from the peer agencies so that their experience may be applied to your system. The information you will want is:

- Population of the area served
- Size in square miles of the area served
- Annual vehicle-miles and/or vehicle-hours of service provided
- Nature of the operation (e.g. fixed-route, route-deviation, demand-response)
- Number of one-way trips served (per month, per year)
- Degree of coordination with other carriers

From these data, compute such key ratios as:

- Passenger trips per capita
- Passenger trips per vehicle-mile (by service type)
- Passenger trips per vehicle-hour (by service type)

Compute these ratios for each peer system. Then determine the average value and the median value. (Note: The Excel function =AVERAGE and =MEDIAN can be used to do this once the data are entered in an Excel spreadsheet. Other spreadsheet software will have similar functions.) Also determine the maximum and minimum values.

Define your proposed operation in terms of:

- Population that will be served
- Vehicle-miles that will be operated (per month, per year)
- Vehicle-hours of service that will be operated (per month, per year)

Fill in the cells in Table 4. In the row named "My System" enter the values for the population of your proposed service area and the number of vehicle-miles and/or vehicle-hours of service you propose to operate.

In the column headed "Trip Rates" enter the values of trips per unit (population, miles, hours) determined from the identified peer systems. Then multiply the value for your system (column) by the peer rate (row) and enter the value in the appropriate column.

For each column determine the maximum, average and minimum values. This gives reasonable estimates of the range of trips that may be expected.

Do not forget that your best peer system is your own operation.

If you are currently operating service and wish to analyze the effects of adding new service or reducing existing service, simply compute the rates per capita, per hour, and per mile for your current operations and apply them to the proposed revised service plan. If you provide different levels of service to different parts of your community, then you can use your own data to estimate how other parts of your service area will respond to a different level of service. If you have changed service levels in past years, the experience gained from those changes can be used to estimate planned changes.

Estimation of Demand – General Public

Table 4: Worksheet for application of peer system values

My system	Population	Annual Vehicle-miles	Annual Vehicle-hours

Peer Values	Observed Trip Rates	Demand Estimate Based On: Population	Annual Vehicle-miles	Annual Vehicle-hours
Trips per Capita				
Maximum				
Average				
Median				
Minimum				
Trips per Vehicle-mile				
Maximum				
Average				
Median				
Minimum				
Trips per Vehicle-hour				
Maximum				
Average				
Median				
Minimum				
Values expected for my system				
Maximum				
Average				
Minimum				

Estimation of Demand – General Public

Trip rate functions

Based on analysis of data reported to the Rural National Transit Database for 2007 three functions were developed that should produce reasonable estimates of the demand for passenger transportation in rural areas. These are, in order of simplicity of application:

Annual Rural Transit Trips = 0.2 trips per annual rural vehicle-mile

Annual Rural Transit Trips = 3.7 trips per annual rural vehicle-hour

$$Annual\ Trips/Person = 1.97 \times (Annual\ Vehicle\text{-}hours/person)^{0.69}$$

To apply the first two functions for analysis or planning, simply determine how many miles or hours of service your agency plans to operate and multiply by the proper factor.

Table 5: Worksheet for estimating general public demand

	Column A (miles or hours)	**Column B** Factor	**A x B** Estimated Demand
Proposed Vehicle-miles of service		0.2	
Proposed Vehicle-hours of service		3.7	

Use of the third function requires either a spreadsheet such as Excel or a calculator with an y^x function key. To apply the function on a calculator first compute:

Annual vehicle hours/population of service area

Then press the y^x key on the calculator and enter 0.69. Press the "=" key.

Then multiply the values shown by 1.97.

As with the peer group estimates it is advisable to consider the range of estimates produced by each method before selecting a value to be used for planning purposes.

Also remember that the rates used in the vehicle-mile and vehicle-hour functions presented above are based on national data. If you are currently operating a service, and new services being planned or proposed will be similar to those you now operate, a preferred method to forecasting demand is to determine your system's current productivity – measured in trips or boardings per vehicle-mile, or in trips or boardings per vehicle-hour – and then apply those rates to the new services.

Estimation of Demand – General Public

Non-program trip methodology from TCRP Report 3

The procedures recommended for non-program trips in TCRP Report 3 remain a valid approach to forecasting the demand for general public passenger transportation. For reference, the reports may be downloaded from: **http://www.trb.org/TRBNet/ProjectDisplay.asp?ProjectID=1024**.

The function for estimating general public (non-program) demand presented in that study is:

$$D = R_e E\left(\frac{1}{1 + k_e e^{-U_e}}\right) + R_m M\left(\frac{1}{1 + k_m e^{-U_m}}\right) + R_p P\left(\frac{1}{1 + k_p e^{-U_p}}\right)$$

where:

D = annual demand for general public (non-program) trips

$R_e = R_m = R_p = 1{,}200$

E = number of persons age 60 or over

M = number of mobility limited persons age 16 to 64

P = number of persons, age 64 or less, in families with incomes below the poverty level

$k_e = e^{6.38}$; $k_m = e^{6.41}$; $k_p = e^{6.63}$

$$U_e = 0.000510 \times \frac{Annual\ Vehicle - Miles\ Available\ to\ the\ Elderly\ Market}{Area\ of\ the\ County}$$

$$U_m = 0.000400 \times \frac{Annual\ Vehicle - Miles\ Available\ to\ the\ Mobility\ Limited\ Market}{Area\ of\ the\ County}$$

$$U_p = 0.000490 \times \frac{Annual\ Vehicle - Miles\ Available\ to\ the\ Low - income\ Market}{Area\ of\ the\ County}$$

For convenience, Table 6 presents the rates of annual trips per person in various market segments that the methodology will estimate for various levels of service density. A chart for estimating the trip demand is presented in Appendix A.

Estimation of Demand – General Public

Table 6: Annual non-program trips per person using TCRP Report 3 methodology

Vehicle-Miles per Square-Mile	Annual Trips per Person Age 60 or Over	Annual Trips per Mobility Limited Person Age 16 to 64	Annual Trips per Person Age 64 or less in Household with Income Below the Poverty Level
200	2.248	2.135	1.745
400	2.489	2.312	1.924
600	2.756	2.504	2.122
800	3.051	2.712	2.340
1000	3.378	2.938	2.580
1200	3.740	3.182	2.845
1400	4.140	3.446	3.138
1600	4.583	3.732	3.460
1800	5.073	4.042	3.815
2000	5.615	4.377	4.206

Note that as with any forecasting methodology the results are likely to be more accurate when applied over a larger area. The relationships developed in TCRP Project B-3 were developed at the county level. The methods can be applied for smaller (e.g. sub-county) areas but the expected error will be greater.

Program (sponsored) trips

The rates reported in TCRP Project B-3 are retained. The following categories are eliminated as they are no longer relevant: Homeless Transportation, Head Start: Home Base, and Head Start: Other.

To develop an estimate of the demand for program trips begin by listing the known programs of the types shown in the table. Obtain from the agencies providing these services the number of clients currently receiving transportation service and the number of clients expected in the future.

Table 7: Worksheet for program transportation data

PROGRAM TRANSPORTATION DATA

Program Type	Program Name	Indicate Program by "X" Base	Indicate Program by "X" Forecast	# of Participants Base	# of Participants Forecast	Annual Days of Operation Base	Annual Days of Operation Forecast	Base Existing Ridership
Developmental Services								
Developmental Services: Case Mgmt								
Developmental Services: Pre-School								
Group Home								
Headstart								
Job Training								
Mental Health Services								
Mental Health Services: Case Mgmt								
Nursing Home								
Senior Nutrition								
Sheltered Workshop								
Other								

Should you not be able to obtain the requested information from the agencies, the methodologies developed in TCRP Report 3 may be applied.

Table 8: Program participants estimation methodologies

Program Participants Estimation Methodologies

NOTE: ALL POPULATION FIGURES SHOULD BE IN THOUSANDS (,000)

	Best Estimation Technique								If Best Data Unavailable, Use...							
Program Type	Criteria	Formula							Criteria	Formula						
Developmental Services: Adult	All	Age 16 & Above	x	2.15					All	Total Population	x	1.76				
Developmental Services: Case Mgmt	All	Mobility Limited 16 to 64	x	26.6					All	Total Population	x	0.50				
Developmental Services: Children	All	Total Population	x	1.08					All	--						
Developmental Services: Pre-School	All	Total Mobility Limited	x	10.8					All	Total Population	x	0.56				
Group Home	< 2,000 Mobility Limited	Total Mobility Limited	x	9.66					< 30,000 Tot Pop	Total Population	x	0.54				
	>= 2,000 Mobility Limited	Total Mobility Limited	x	5.57	+	7.33			>= 30,000 Tot Pop	Total Population	x	0.22	+	10.9		
Headstart	< 1,500 Families in Poverty	Families In Poverty	x	52.4					All	Total Population	x	3.30				
	>= 1,500 Families in Poverty	Families In Poverty	x	36.2	+	24.4										
Job Training	All	Age 16 to 59	x	5.60					All	Total Population	x	3.66				
Mental Health Services	< 2,000 Mobility Limited	Total Mobility Limited	x	27.6					All	Total Population	x	1.61				
	>= 2,000 Mobility Limited	Total Mobility Limited	x	45.9	-	36.4										
Mental Health Services: Case Mgmt	All	Age 16 to 64	x	8.40					All	Total Population	x	4.89				
Nursing Home	All	Age 75 & Above	x	28.7					All	Total Population	x	2.03				
Senior Nutrition	All	Age 65 & Above	x	30.1					All	Total Population	x	3.57				
Sheltered Workshop	< 15,000 Pop Age 16 to 59	Age 16 to 59	x	2.94					< 20,000 Tot Pop	Total Population	x	1.75				
	>= 15,000 Pop Age 16 to 59	Age 16 to 59	x	1.01	+	23.8			>= 20,000 Tot Pop	Total Population	x	0.69	+	22.3		
Substance Abuse	All	Total Population	x	0.87					All	--						

Estimation of Demand – Program or Sponsored Trips

ANNUAL PROGRAM TRIP ESTIMATION WORKSHEET – Page One

Developmental Services: Adult

If # of participants is less than 25, use:		# participants	x	358		=	
If at least 25, use:		# participants	x	430 - 1,686		=	

Developmental Services: Case Management

In all cases use:		# participants	x	39.2		=	

Developmental Services: Pre-School

In all cases use:		# participants	x	224		=	

Group Home

If you know the number of days per year transportation is provided, and the # of participants is less than 10, use:		# participants	x	2.05	X	# of days		=	
If you know the number of days and the # of participants is at least 10, use:	(	# participants	x	1.4 + 5.94	)	x	# of days	=	
If you do not know the number of days, and the # of participants is less than 10, use:		# participants	x	615				=	
If you do not know the number of days, and the # of participants is at least 10, use:		# participants	x	291 + 3,760				=	

Headstart

In all cases use:		# participants	x	263		=	

TOTAL FOR PAGE ONE:

Estimation of Demand – Program or Sponsored Trips

ANNUAL PROGRAM TRIP ESTIMATION WORKSHEET – Page Two

Job Training

In all cases use: [ ] # participants x 137 = [ ]

Mental Health Services

In all cases use: [ ] # participants x 347 = [ ]

Mental Health Services: Case Management

In all cases use: [ ] # participants x 6.35 = [ ]

Nursing Home

If the number of participants is less than 50, use: [ ] # participants x 9.10 = [ ]

If the number of participants is at least 50, use: [ ] # participants x 12.5 - 173 = [ ]

Senior Nutrition

In all cases use: [ ] # participants x 248 = [ ]

Sheltered Workshop

If you know the number of days per year the program operates, use: [ ] # participants x 1.58 x [ ] # of days = [ ]

If you do not, use: [ ] # participants x 384 = [ ]

TOTAL FOR PAGE TWO: [ ]

Estimation of Demand – Program or Sponsored Trips

ANNUAL PROGRAM TRIP ESTIMATION WORKSHEET – Page Three

ALL OTHER PROGRAM TYPES: *Develop estimate on case-by-case basis*

Program: _____	
Program: _____	
Program: _____	

TOTAL FOR PAGE THREE:	
	+
ENTER TOTAL FROM PAGE ONE HERE:	
	+
ENTER TOTAL FROM PAGE TWO HERE:	
	=
TOTAL ANNUAL PRGRAM TRIP ESTIMATION:	

Note: There are no trip rates provided to calculate estimates for Developmental Services – Children or Substance Abuse Programs. If your area currently has programs of this type, calculate trip rates based on existing conditions.

Small city fixed route

In many rural counties there exist one or more small cities in which a traditional fixed-route, fixed-schedule transit service is operated. Analysis of data from the Rural NTD led to the following function for estimating ridership. This relationship demonstrates the importance, in these small cities, of transit in supporting the local colleges and universities.

*Annual Ridership = 6.22 * College and University Enrollment*
*+ 10.68 * Annual Revenue-Hours*

Conditions of application: Revenue-hours > 0; Population of urban center < 50,000.
Does not include community college enrollment.

To develop an estimate of demand, complete Table 9.

Table 9: Summing college and university enrollment

Name of Institution	Current Enrollment (FTEs)	Projected Planning Year Enrollment (FTEs)
Name of first university		
Name of second university		
Name of first college		
Etc.		
Totals		

Use the total enrollment, summed over all institutions, for either the current year or the planning year in the equation above to estimate the ridership that can be expected on a small fixed-route system in an area of less than 50,000 population.

Note that this methodology was developed using information from the Rural National Transit Database. The data used were restricted to the mode code MB (Motor bus) but both the "fixed route" and "deviated fixed route" data were included. The methodology may properly be applied to any small city operation that is either fixed-route or deviated fixed route.

Also, note that while colleges and universities are transit trip generators that are included in the recommended estimation methodology, other installations such as military bases or national laboratories that are located in rural settings may be of importance in other areas.

Commuters to urban centers

The function developed for estimating the demand for commuter passenger transportation from a rural county to another county is given by:

Commuter trips by transit from County to County per Day = 0.012 x Person work trips

Conditions of application: Commuter trips from home to work by all modes in the range of 2,000 to 30,000 per day. Note: If using person trips from home to work as reported in US Census or American Community Survey multiply by 2 to account for trips from work to home. Data obtained from a Metropolitan Planning Organization or a state transportation agency may reflect both trips to and from work. Be sure to check with the source.

Note that in this function the number of trips comprising the market for passenger transportation is directly related to the total commuting market. That value must be obtained from other sources.

Information on county-to-county commuter flows can be obtained through the US Census Bureau's "Longitudinal Employer-Household Dynamics" program. See: http://lehd.did.census.gov/led/. This interactive website allows the analyst to specifically define both the residential area and employment area, and to further define the data by job type, worker age, earnings level, and industry class. For more specific details on using these data see Appendix B, Page 30.

Information on current and projected county-to-county commuter flows may also be available from the Metropolitan Planning Organization serving the urban center or from your state transportation agency.

Table 10: Expected daily demand for commuter trips using passenger transportation from rural counties

	Person Work Trips (home to work)						
	2,000	5,000	10,000	15,000	20,000	25,000	30,000
Potential Transit Trips	24	60	120	180	240	300	360

The values in Table 10 are the number of passenger transportation trips expected for travel from home to work. Multiply by 2 to estimate daily trips or boardings.

IV. Data sources

Population (total and by segments)

- US Census
  www.census.gov
- American Community Survey http://www.census.gov/acs/www/index.html

Commuting trips

- US Census (2000)
  www.census.gov
- American Community Survey (after 2010)
  http://www.census.gov/acs/www/index.html
- State travel forecasts - from various state transportation agencies
- Metropolitan area travel forecasts - from Metropolitan Planning Organizations
- US Census Bureau's "Longitudinal Employer-Household Dynamics" program:
  http://lehd.did.census.gov/led/

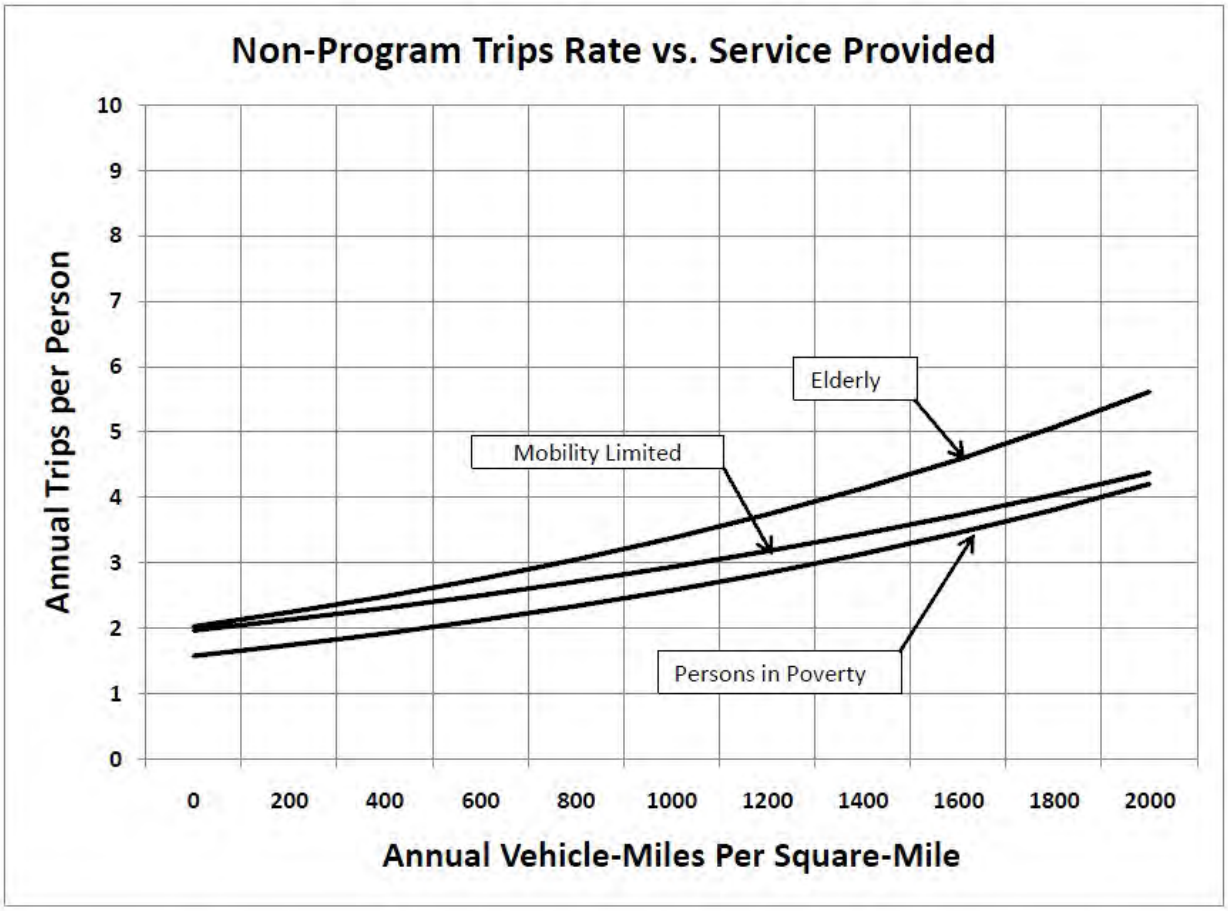
Appendices

Appendix A: Chart for Estimating Non-Program Trip Rates

Appendix B: Step by Step Instructions for the Rural Transit Need and Demand Spreadsheet

Appendix C: Suggested Guidelines for Data Collection

Appendix A: Chart for estimating non-program trip rates



Appendix B: Step-by-step instructions for the rural transit need and demand spreadsheet

The following are step by step instructions showing the user how to perform the different analyses available in the *Rural Transit Need and Demand Spreadsheet*. Each of the analyses is performed showing how to collect the appropriate data required and where to enter the information. In addition, at the end of each analysis is a manual computation of the desired result using the *TCRP Project B36 Methods for Forecasting Demand and Quantifying Need for Rural Passenger Transportation Workbook.* This not only acts as a check on the spreadsheet values produced, but also shows how the values can be computed manually. The Excel spreadsheet for applying the procedures described below is available on line at www.trb.org by searching "TCRP Web-Only Document 49".

1. Open the TCRP B-36 Need Demand Spreadsheet.

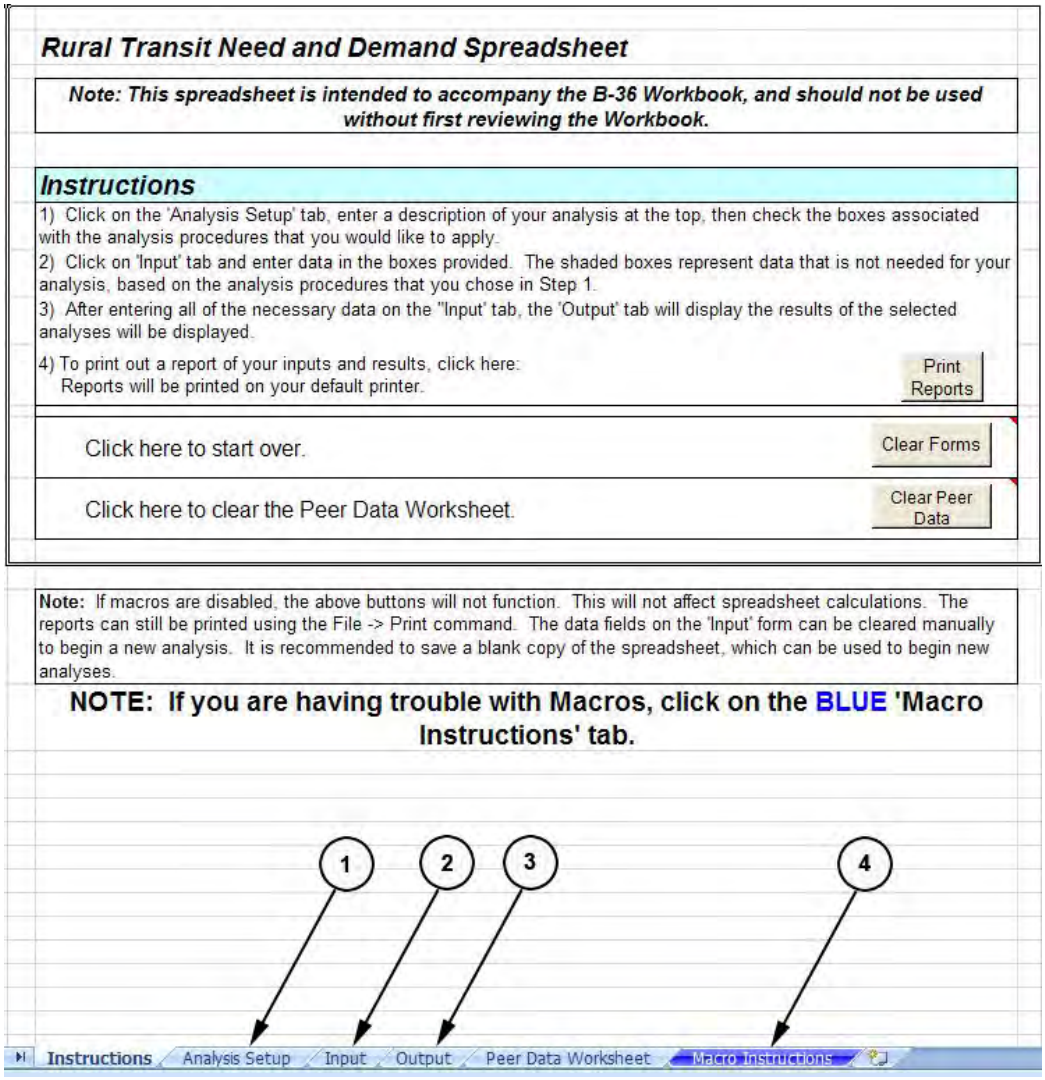
2. The "Instructions" tab provides basic instructions on how to use the spreadsheet (Figure 1). This tab is used to print the other tabs once an analysis has been completed. It is also used to clear the information from the form. **IN ORDER TO USE ALL THE FEATURES OF THIS SPREADSHEET AND THE ASSOCIATED BUTTONS, MACROS NEED TO BE ENABLED WITHIN MICROSOFT EXCEL. INSTRUCTIONS FOR ENABLING MACROS ARE PROVIDED IN STEP 4, BELOW.**

3. Future references to the "Analysis Setup" tab (1)[3], the "Input" tab (2), and the "Output" tab (3) refer to the tabs at the bottom of the spreadsheet that allow the user to toggle between each of the different worksheets (Figure 1).

[3] The numbers in parentheses (1) refer to the arrows on the referenced figure. These numbers are associated with key features of the figure.

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 1: Instructions tab of the TCRP B-36 spreadsheet



4. The following are instructions for enabling macros in the spreadsheet. The "Macros Instructions" tab (4) also contains these instructions (Figure 1).

    a. The TCRP B36 Spreadsheet contains a few simple macros that make the spreadsheet more user-friendly. Unfortunately, some macros can contain computer viruses, so Microsoft Office has a function that will disable ALL macros if the security level is set too high. This safety feature can protect users, but also can cause problems by disabling useful features in spreadsheets. The macros contained in the TCRP B36 Spreadsheet are SAFE. These instructions explain how to remove the security warnings and use the spreadsheet normally. Note, however, that the calculations in the spreadsheet will still function correctly without use of the macros.

    b. This version of the TCRP B36 Spreadsheet contains a security certification created by LSC Transportation Consultants, Inc. that will allow users to operate the macros in the spreadsheet with the macro security setting on 'High'. Since the locally created security certificate was not issued by a licensed certificate dealer, authorized by Microsoft, the user must complete the following steps to accept LSC's certificate. **Please note that these procedures are not necessary if macro security is set to low. If macro security is set to medium, the user can simply check the box to 'Enable Macros.'**

    c. When the spreadsheet is loaded, a 'Security Warning' dialog box will appear. Click on the box to 'Always trust macros from this source'. Click 'Enable macros'.

    d. If the 'Always trust macros from this source' checkbox is unable to be selected, complete the following procedure: Click 'Details' or 'Digital Signature Details'. Click on 'View Certificate', and then click 'Install Certificate'. This will open the 'Certificate Import Wizard'. Click 'Next' twice, and then click 'Finish'. Now, another security warning will appear, again notifying the user that the LSC certificate has not been validated by Microsoft. Click 'Yes' at the bottom of this dialog box. After this step, click 'OK' on all of the open dialog boxes. The 'Always trust macros (or content) from this source' checkbox should now be available. If not, save and close the spreadsheet. Then, re-open the spreadsheet. When the spreadsheet opens, the same Security Warning dialog box will appear. Click the button for 'Always trust content from this source'. Click 'Enable Macros'.

    e. The spreadsheet should now function with all of the features working properly. This process should only have to be completed the first time the spreadsheet is used on a new computer. The spreadsheet will open normally for future uses.

    f. **Office 2007 users must follow these additional steps:**

    Macros will likely be automatically disabled upon opening the spreadsheet.

    1. (Figure 2) Click on the Office graphical icon (1) in the upper-left corner of the display. Click 'Excel Options' (2).
    2. (Figure 3) Check the box for 'Show Developer Tab in Ribbon' (3).
    3. (Figure 4) Click on the 'Developer' tab (4). Click on 'Macro security' (5). Check the appropriate security option for the user's firm or agency. Click 'Disable all macros except digitally signed macros' (6).

4. When the 'Security Warning' dialog box appears (Figure 5), click 'Options' (7). Click 'Details' or 'Digital Signature Details' (8).
5. (Figure 6) Click on 'View Certificate' (9).
6. (Figure 7) Click 'Install Certificate' (10).
7. This will open the 'Certificate Import Wizard' (Figure 8). Click 'Next' (11) twice, and then click 'Finish'.
8. Now, another security warning will appear (Figure 9), again notifying the user that the LSC certificate has not been validated by Microsoft. Click 'Yes' (12) at the bottom of this dialog box. After this step, click 'OK' on all of the open dialog boxes. The 'Always trust macros (or content) from this source' checkbox should now be available. If not, save and close the spreadsheet. Then, re-open the spreadsheet. When the spreadsheet opens, the same Security Warning dialog box will appear. Click the button for 'Always trust content from this source'. Click 'Enable Macros'.

5. The "Analysis Setup" tab allows the user to choose the appropriate analysis or analyses they would like to perform (Figure 10). There are six different analyses that can be performed using the workbook:
    a. Need – Persons
    b. Need – Trips
    c. Demand – Program
    d. Demand – Non Program
    e. Demand – Small City Fixed Rural
    f. Demand – Commuters to Urban Centers

6. Selecting the "Demand – Program" box (1) will open a list of boxes below that allow the analysis to be tailored to a desired program (2). It is important to select "yes" or "no" based on whether the number of program participants is known (3) as this allows the spreadsheet to compute demand based on an estimate if the exact number is not known. If possible, information on the number of program participants should be obtained from social service agencies. Use of such data rather than estimates based on the function incorporated in the spreadsheet should yield more accurate results.

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 2: Office 2007 Excel main menu

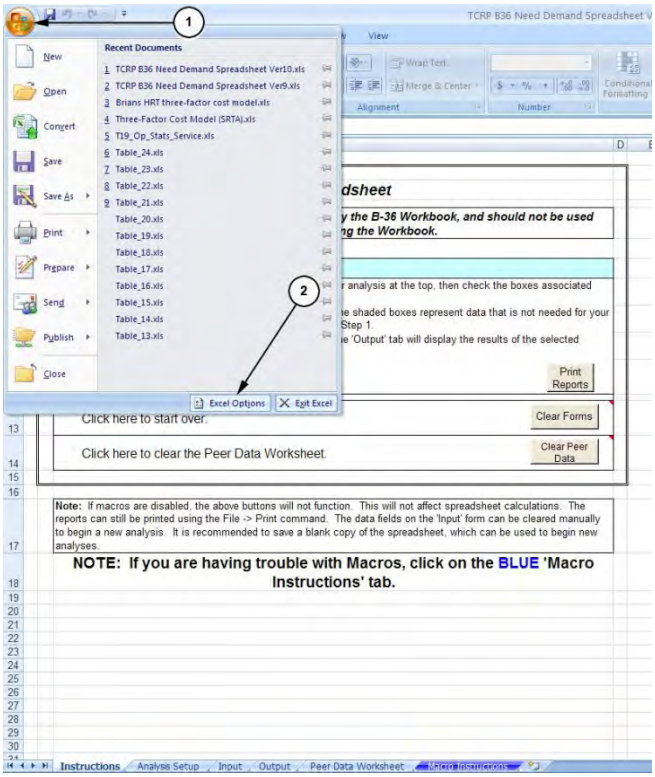
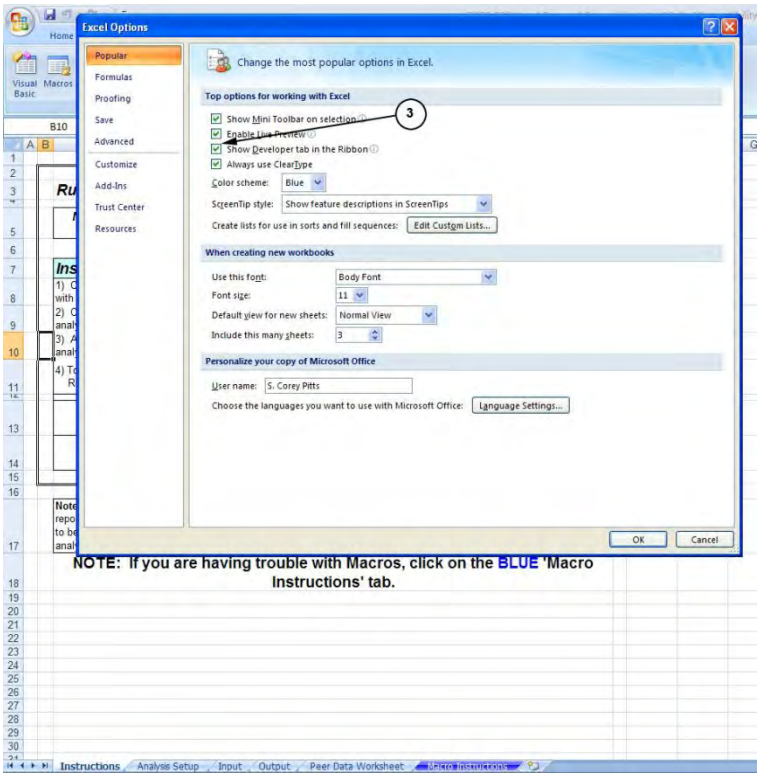


Figure 3: Excel option menu



Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 4: Excel developer tab

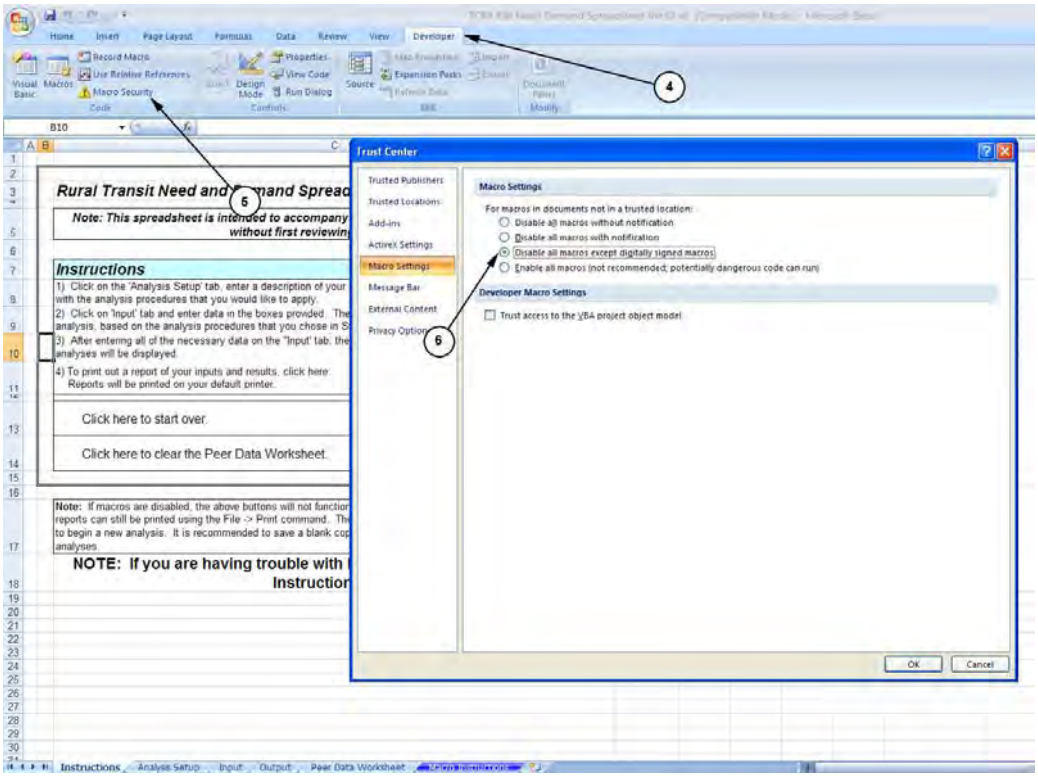
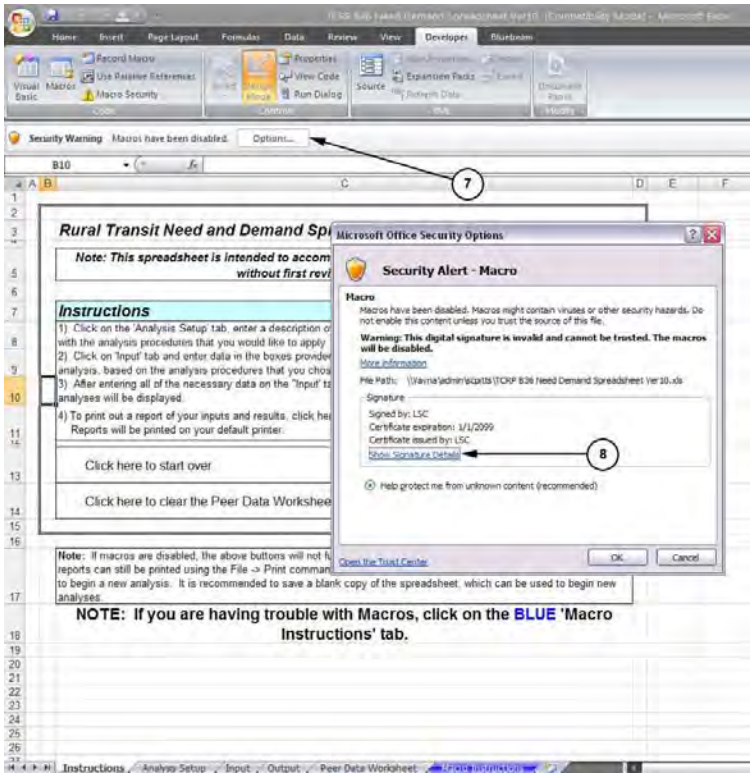


Figure 5: Macros security dialog box



Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 6: Digital signature details menu

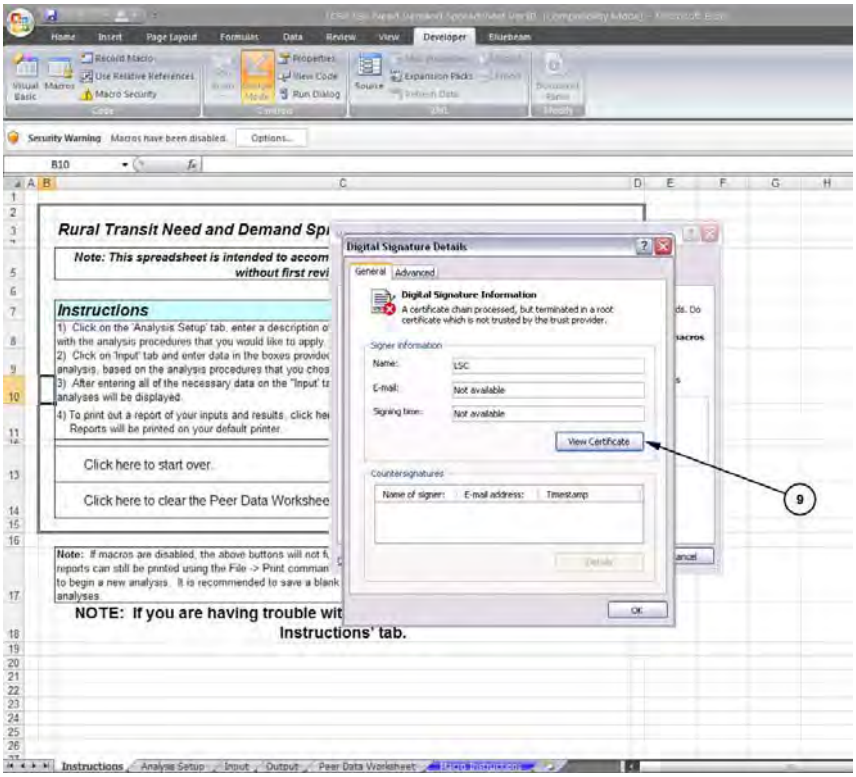
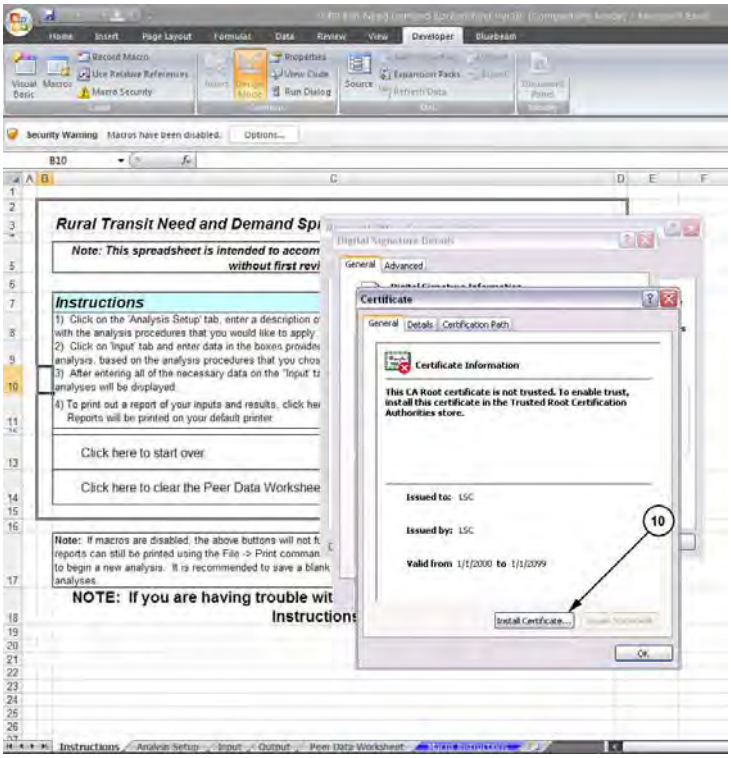


Figure 7: Certificate menu



Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 8: Certificate import wizard

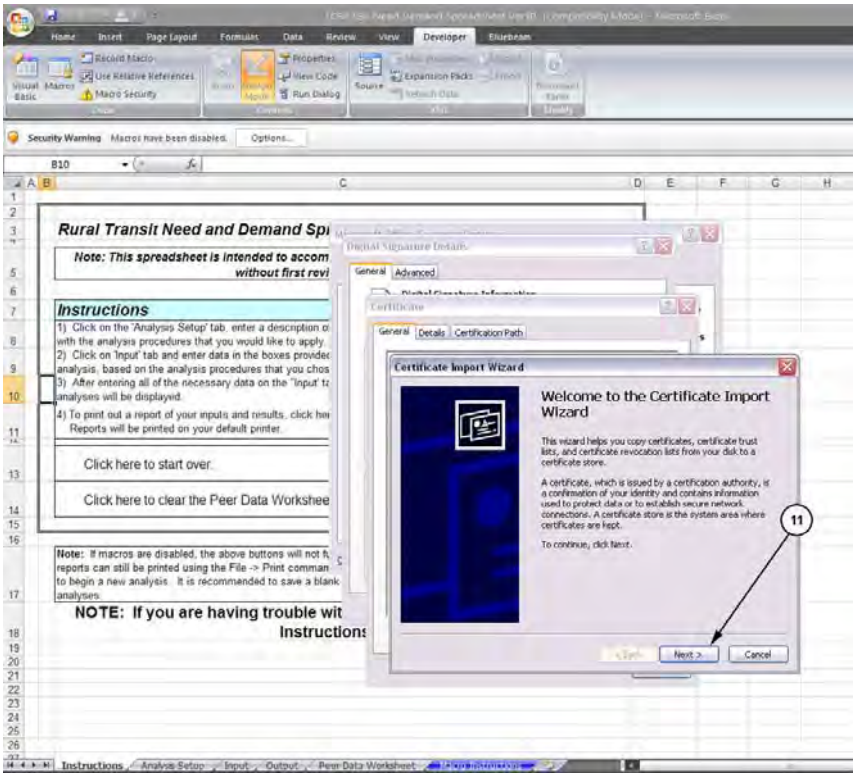
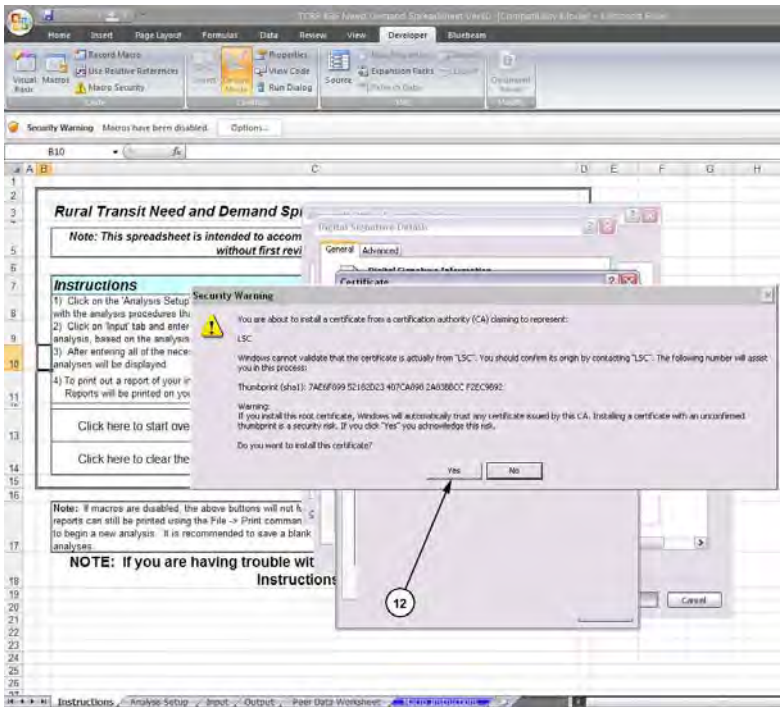
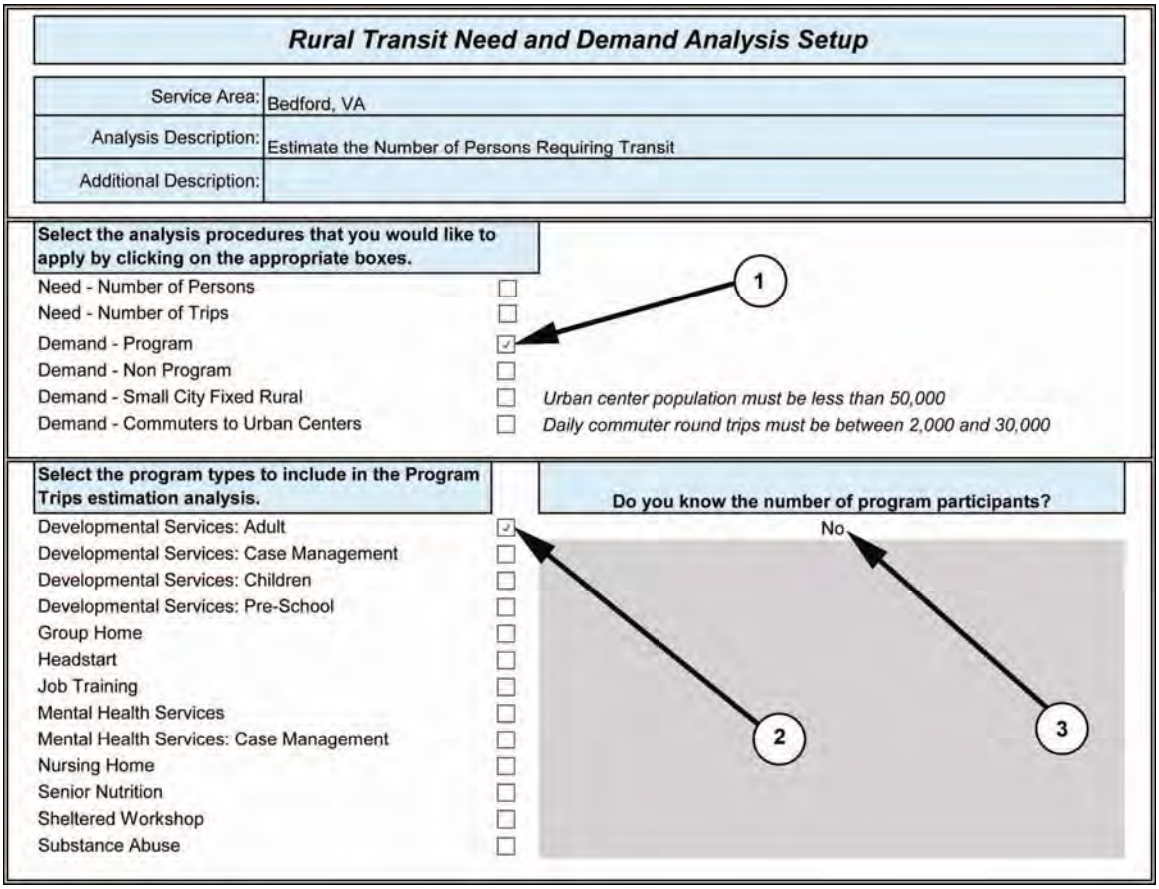


Figure 9: Security warning - Install certificate



Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 10: Analysis setup tab



NEED

Two measures are used to quantify the "need" for passenger transportation services:

- Number of persons having a need
- Number of trips that are not being served

Need – Number of persons (refer to Figures 11 and 12)

1. Select the "Need – Number of Persons" box on the Analysis tab. This will allow the user to estimate the number of individuals likely to require public transportation.

2. Click the "Input" tab at the bottom of the spreadsheet. This will bring up the input sheet with the required inputs needed for this analysis in white (Figure 11).

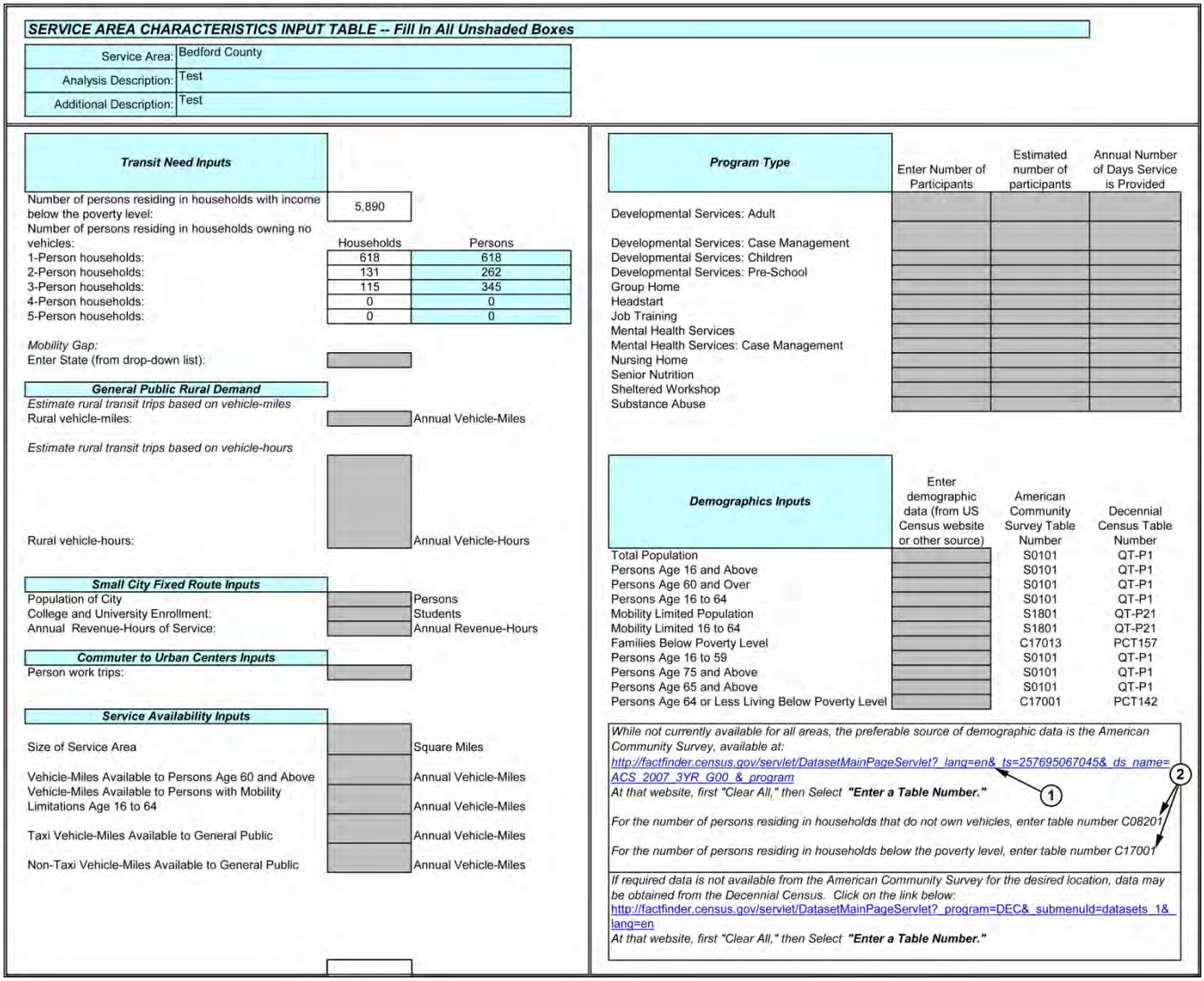
3. Access the American Community Survey[4] via the website link (1) on the spreadsheet and the corresponding table numbers (2) to collect the data (Tables 1 & 2). Table 1 shows figures for poverty status based on age classification. The figure required for the spreadsheet is the total number of individuals who fall below the poverty line (5,890). Table 2 shows the number of households based on vehicle ownership. The figures required for the spreadsheet are as follows: 618, 131, 115, 0. Enter these figures into the corresponding field shown in Figure 11.

Click the "Output" tab at the bottom of the spreadsheet. This will bring up the output sheet with the calculated result displayed 7,115 (3) based on the inputs entered (Figure 12).

[4] Instructions for using the American Community Survey to access U.S. Census data can be found on Page 7 of the Workbook. Once the user has arrived at the "Enter Table Number" link on the ACS website, they can enter the appropriate table number associated with the desired data (this can be found on the "Input" tab) and follow the remainder of the steps in the Workbook for selecting the appropriate geography and arriving at the results table.

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 11: Need - Number of persons (input tab)



SERVICE AREA CHARACTERISTICS INPUT TABLE -- Fill In All Unshaded Boxes

Service Area:	Bedford County
Analysis Description:	Test
Additional Description:	Test

Transit Need Inputs

Number of persons residing in households with income below the poverty level: 5,890

Number of persons residing in households owning no vehicles:

	Households	Persons
1-Person households:	618	618
2-Person households:	131	262
3-Person households:	115	345
4-Person households:	0	0
5-Person households:	0	0

Mobility Gap:
Enter State (from drop-down list):

General Public Rural Demand

Estimate rural transit trips based on vehicle-miles
Rural vehicle-miles: Annual Vehicle-Miles

Estimate rural transit trips based on vehicle-hours
Rural vehicle-hours: Annual Vehicle-Hours

Small City Fixed Route Inputs

Population of City: Persons
College and University Enrollment: Students
Annual Revenue-Hours of Service: Annual Revenue-Hours

Commuter to Urban Centers Inputs

Person work trips:

Service Availability Inputs

Size of Service Area: Square Miles
Vehicle-Miles Available to Persons Age 60 and Above: Annual Vehicle-Miles
Vehicle-Miles Available to Persons with Mobility Limitations Age 16 to 64: Annual Vehicle-Miles
Taxi Vehicle-Miles Available to General Public: Annual Vehicle-Miles
Non-Taxi Vehicle-Miles Available to General Public: Annual Vehicle-Miles

Program Type

Program Type	Enter Number of Participants	Estimated number of participants	Annual Number of Days Service is Provided
Developmental Services: Adult			
Developmental Services: Case Management			
Developmental Services: Children			
Developmental Services: Pre-School			
Group Home			
Headstart			
Job Training			
Mental Health Services			
Mental Health Services: Case Management			
Nursing Home			
Senior Nutrition			
Sheltered Workshop			
Substance Abuse			

Demographics Inputs

Demographics Inputs	Enter demographic data (from US Census website or other source)	American Community Survey Table Number	Decennial Census Table Number
Total Population		S0101	QT-P1
Persons Age 16 and Above		S0101	QT-P1
Persons Age 60 and Over		S0101	QT-P1
Persons Age 16 to 64		S0101	QT-P1
Mobility Limited Population		S1801	QT-P21
Mobility Limited 16 to 64		S1801	QT-P21
Families Below Poverty Level		C17013	PCT157
Persons Age 16 to 59		S0101	QT-P1
Persons Age 75 and Above		S0101	QT-P1
Persons Age 65 and Above		S0101	QT-P1
Persons Age 64 or Less Living Below Poverty Level		C17001	PCT142

While not currently available for all areas, the preferable source of demographic data is the American Community Survey, available at:
http://factfinder.census.gov/servlet/DatasetMainPageServlet?_lang=en&_ts=257695067045&_ds_name=ACS_2007_3YR_G00_&_program
At that website, first "Clear All," then Select ***"Enter a Table Number."***

(1)

For the number of persons residing in households that do not own vehicles, enter table number C08201

(2)

For the number of persons residing in households below the poverty level, enter table number C17001

If required data is not available from the American Community Survey for the desired location, data may be obtained from the Decennial Census. Click on the link below:
http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=DEC&_submenuId=datasets_1&_lang=en
At that website, first "Clear All," then Select ***"Enter a Table Number."***

Table 1: ACS Table C17001 - Poverty status by sex by age

	Bedford County, Virginia	
	Estimate	Margin of Error
Total:	64,984	+/-196
Income in the past 12 months below poverty level:	5,890	+/-1,241
Male:	2,993	+/-681
Under 18 years	1,041	+/-433
18 to 64 years	1,758	+/-402
65 years and over	194	+/-117
Female:	2,897	+/-670
Under 18 years	662	+/-294
18 to 64 years	1,782	+/-436
65 years and over	453	+/-161
Income in the past 12 months at or above poverty level:	59,094	+/-1,216
Male:	29,165	+/-677
Under 18 years	6,028	+/-446
18 to 64 years	19,385	+/-451
65 years and over	3,752	+/-179
Female:	29,929	+/-715
Under 18 years	6,365	+/-348
18 to 64 years	19,591	+/-432
65 years and over	3,973	+/-178

Source: U.S. Census Bureau, 2005-2007 American Community Survey

Table 2: ACS Table 08201 - Households by vehicles available

	Bedford County, Virginia	
	Estimate	Margin of Error
Total:	27,002	+/-600
No vehicle available	864	+/-277
1 vehicle available	5,817	+/-687
2 vehicles available	10,879	+/-854
3 or more vehicles available:	9,442	+/-620
1-person household:	6,585	+/-672
No vehicle available	618	+/-246
1 vehicle available	3,705	+/-535
2 vehicles available	1,595	+/-415
3 or more vehicles available	667	+/-238
2-person household:	10,256	+/-571
No vehicle available	131	+/-97
1 vehicle available	1,400	+/-284
2 vehicles available	4,821	+/-571
3 or more vehicles available	3,904	+/-407
3-person household:	4,852	+/-633
No vehicle available	115	+/-125
1 vehicle available	509	+/-224
2 vehicles available	2,108	+/-488
3 or more vehicles available	2,120	+/-388
4-or-more-person household:	5,309	+/-502
No vehicle available	0	+/-161
1 vehicle available	203	+/-151
2 vehicles available	2,355	+/-440
3 or more vehicles available	2,751	+/-468

Source: U.S. Census Bureau, 2005-2007 American Community Survey

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 12: Need - Number of persons (output tab)

RURAL TRANSIT NEED/DEMAND ESTIMATION - OUTPUT TABLE

Service Area:	Bedford County
Analysis Description:	Test
Additional Description:	Test

Estimation of Transit Need		
Total need for passenger transportation service:	7,115	Persons ← 3
Total households without access to a vehicle:		Households
State Mobility Gap:		Daily 1-Way Psgr.-Trips per Household
Total need based on mobility gap:		Daily 1-Way Passenger-Trips
		Annual 1-Way Passenger-Trips
General Public Rural Non-Program Demand		
Estimate of rural transit trips based on vehicle-miles		
Rural transit trips:		Annual 1-Way Passenger-Trips
Estimate of rural transit trips based on vehicle-hours.		
Rural transit trips:		Annual 1-Way Passenger-Trips
Trips per person based on vehicle-hours per person		
Trips per person:		Annual Trips per Person
Non-Program Demand based on TCRP B3 Methodology		
Demand for Persons Age 60 and Above		Annual 1-Way Passenger-Trips
Demand for Persons with Mobility Limitations Age 16 to 64		Annual 1-Way Passenger-Trips
Demand for General Public		Annual 1-Way Passenger-Trips
Total Rural Non-Program Demand		Annual 1-Way Passenger-Trips
Small City Fixed Route		
Annual Ridership:		Annual 1-Way Passenger-Trips
Commuters to Urban Centers		
Commuter trips by transit between counties:		Daily 1-Way Passenger Trips
		Annual 1-Way Passenger-Trips
Rural Program Demand		
Annual Program Trip Estimation		
Developmental Services: Adult		Annual 1-Way Passenger-Trips
Developmental Services: Case Management		Annual 1-Way Passenger-Trips
Developmental Services: Children		Annual 1-Way Passenger-Trips
Developmental Services: Pre-School		Annual 1-Way Passenger-Trips
Group Home		Annual 1-Way Passenger-Trips
Headstart		Annual 1-Way Passenger-Trips
Job Training		Annual 1-Way Passenger-Trips
Mental Health Services		Annual 1-Way Passenger-Trips
Mental Health Services: Case Management		Annual 1-Way Passenger-Trips
Nursing Home		Annual 1-Way Passenger-Trips
Senior Nutrition		Annual 1-Way Passenger-Trips
Sheltered Workshop		Annual 1-Way Passenger-Trips
Substance Abuse		Annual 1-Way Passenger-Trips
Total Rural Program Demand		Annual 1-Way Passenger-Trips

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

The following is the manual computation of the number of persons in need of public transportation for Bedford County using the *TCRP Project B36 Methods for Forecasting Demand and Quantifying Need for Rural Passenger Transportation Workbook* as a check to the spreadsheet values produced.

PERSONS HAVING TRANSPORTATION NEED = Number of Persons Below the Poverty Level + Number of Persons with No Vehicle Available

NEED = 5,890 + [(1*618) + (2*131) + (3*115) + (4*0)]

NEED = 5,890 + [618 + 262 + 345 + 0]

NEED = 5,890 + 1,225

NEED = 7,115

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Need – Number of trips (refer to Figures 13 and 14)

1. Select the "Need – Number of Trips" box on the Analysis tab. This will allow the user to estimate the number of trips those individuals requiring transportation would make if there were minimal limitations on their ability to travel.

2. Click the "Input" tab at the bottom of the spreadsheet. This will bring up the input sheet with the required inputs needed for this analysis in white (Figure 13).

3. Access the American Community Survey via the website link (1) on the spreadsheet and the corresponding table number (2) to collect the data (Table 3). Table 3 shows the number of households based on vehicle ownership. The figures required for the spreadsheet are as follows: 618, 131, 115, 0. Enter these figures into the corresponding field shown in Figure 13.

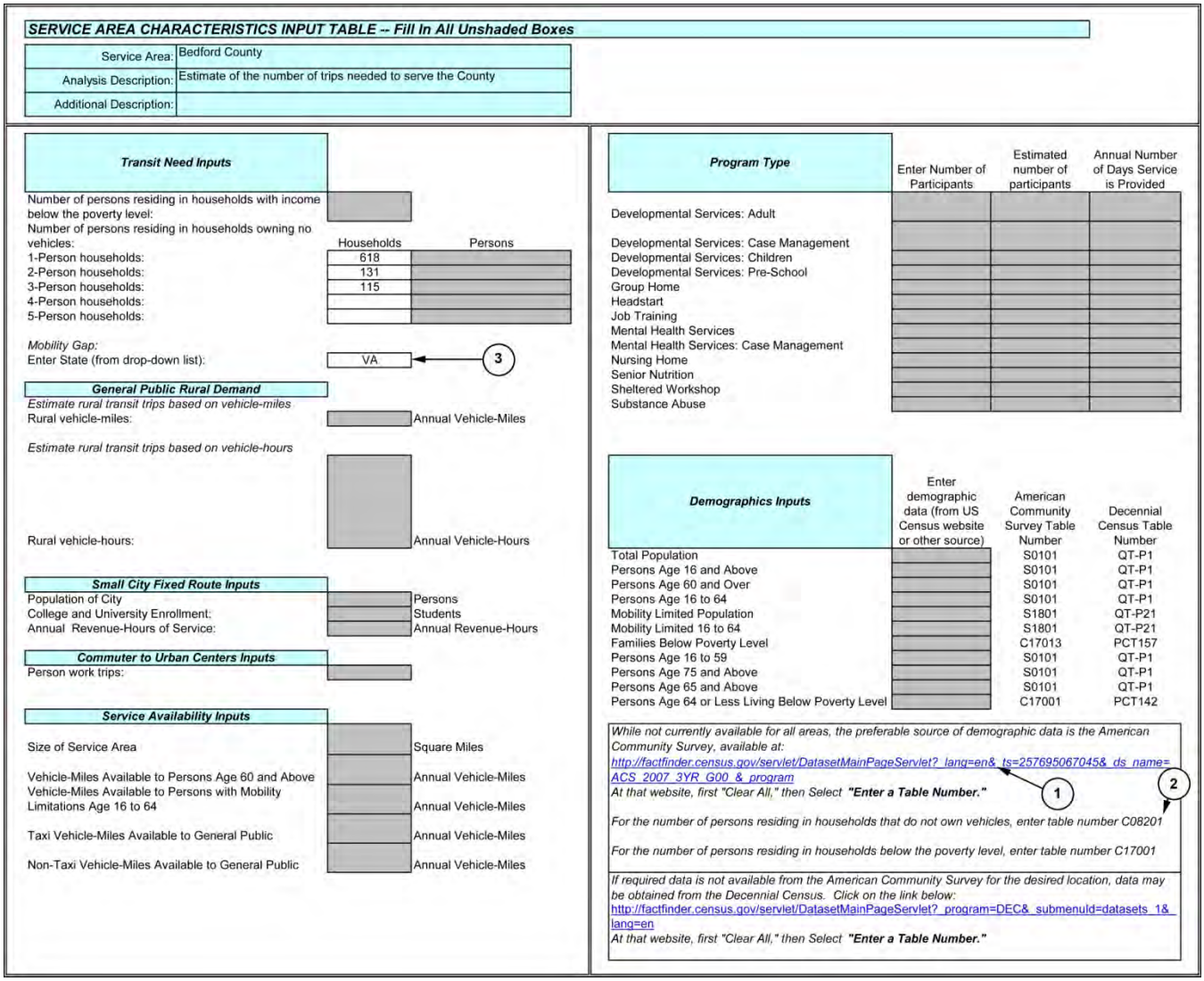
4. Click on the "Mobility Gap"[5] field (3) and select the appropriate state from the drop-down menu (Table 4).

5. Click the "Output" tab at the bottom of the spreadsheet. This will bring up the output sheet with the calculated result (4) based on the inputs entered (Figure 14). The daily value computed was 2,074 one-way trips. This results in 622,100 annual one-way passenger trips.

[5] There was insufficient data available to create a mobility gap value for New England. The national value is used instead.

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 13: Need - Number of trips (input tab)



SERVICE AREA CHARACTERISTICS INPUT TABLE -- Fill In All Unshaded Boxes

Service Area:	Bedford County
Analysis Description:	Estimate of the number of trips needed to serve the County
Additional Description:	

Transit Need Inputs

Number of persons residing in households with income below the poverty level:

Number of persons residing in households owning no vehicles:

	Households	Persons
1-Person households:	618	
2-Person households:	131	
3-Person households:	115	
4-Person households:		
5-Person households:		

Mobility Gap:
Enter State (from drop-down list): VA ← 3

General Public Rural Demand

Estimate rural transit trips based on vehicle-miles
Rural vehicle-miles: Annual Vehicle-Miles

Estimate rural transit trips based on vehicle-hours
Rural vehicle-hours: Annual Vehicle-Hours

Small City Fixed Route Inputs

Population of City: Persons
College and University Enrollment: Students
Annual Revenue-Hours of Service: Annual Revenue-Hours

Commuter to Urban Centers Inputs

Person work trips:

Service Availability Inputs

Size of Service Area: Square Miles
Vehicle-Miles Available to Persons Age 60 and Above: Annual Vehicle-Miles
Vehicle-Miles Available to Persons with Mobility Limitations Age 16 to 64: Annual Vehicle-Miles
Taxi Vehicle-Miles Available to General Public: Annual Vehicle-Miles
Non-Taxi Vehicle-Miles Available to General Public: Annual Vehicle-Miles

Program Type

	Enter Number of Participants	Estimated number of participants	Annual Number of Days Service is Provided
Developmental Services: Adult			
Developmental Services: Case Management			
Developmental Services: Children			
Developmental Services: Pre-School			
Group Home			
Headstart			
Job Training			
Mental Health Services			
Mental Health Services: Case Management			
Nursing Home			
Senior Nutrition			
Sheltered Workshop			
Substance Abuse			

Demographics Inputs

	Enter demographic data (from US Census website or other source)	American Community Survey Table Number	Decennial Census Table Number
Total Population		S0101	QT-P1
Persons Age 16 and Above		S0101	QT-P1
Persons Age 60 and Over		S0101	QT-P1
Persons Age 16 to 64		S0101	QT-P1
Mobility Limited Population		S1801	QT-P21
Mobility Limited 16 to 64		S1801	QT-P21
Families Below Poverty Level		C17013	PCT157
Persons Age 16 to 59		S0101	QT-P1
Persons Age 75 and Above		S0101	QT-P1
Persons Age 65 and Above		S0101	QT-P1
Persons Age 64 or Less Living Below Poverty Level		C17001	PCT142

While not currently available for all areas, the preferable source of demographic data is the American Community Survey, available at:
http://factfinder.census.gov/servlet/DatasetMainPageServlet?_lang=en&_ts=257695067045&_ds_name=ACS_2007_3YR_G00_&_program
At that website, first "Clear All," then Select ***"Enter a Table Number."*** ← 1

For the number of persons residing in households that do not own vehicles, enter table number C08201 ← 2

For the number of persons residing in households below the poverty level, enter table number C17001

If required data is not available from the American Community Survey for the desired location, data may be obtained from the Decennial Census. Click on the link below:
http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=DEC&_submenuId=datasets_1&_lang=en
At that website, first "Clear All," then Select ***"Enter a Table Number."***

Table 3: ACS Table 08201 - Household size by vehicles available

	Bedford County, Virginia	
	Estimate	Margin of Error
Total:	27,002	+/-600
No vehicle available	864	+/-277
1 vehicle available	5,817	+/-687
2 vehicles available	10,879	+/-854
3 or more vehicles available:	9,442	+/-620
1-person household:	6,585	+/-672
No vehicle available	618	+/-246
1 vehicle available	3,705	+/-535
2 vehicles available	1,595	+/-415
3 or more vehicles available	667	+/-238
2-person household:	10,256	+/-571
No vehicle available	131	+/-97
1 vehicle available	1,400	+/-284
2 vehicles available	4,821	+/-571
3 or more vehicles available	3,904	+/-407
3-person household:	4,852	+/-633
No vehicle available	115	+/-125
1 vehicle available	509	+/-224
2 vehicles available	2,108	+/-488
3 or more vehicles available	2,120	+/-388
4-or-more-person household:	5,309	+/-502
No vehicle available	0	+/-161
1 vehicle available	203	+/-151
2 vehicles available	2,355	+/-440
3 or more vehicles available	2,751	+/-468

Source: U.S. Census Bureau, 2005-2007 American Community Survey

Table 4: Mobility gap

Division	States	Trips per Rural Household Per Day		
		Vehicles Available		Gap
		0	1	
National		3.3	5.4	2.1
Division 1: New England	Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island	*	5.3	*
Division 2: Middle Atlantic	New Jersey, New York, Pennsylvania	3.1	5.9	2.7
Division 3: East North Central	Wisconsin, Michigan, Ohio, Indiana, Illinois	3.3	4.9	1.6
Division 4: West North Central	North Dakota, South Dakota, Nebraska, Kansas, Missouri, Iowa, Minnesota	2.3	5.1	2.8
Division 5: South Atlantic	Maryland, Delaware, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Florida	3.1	5.5	2.4
Division 6: East South Central	Kentucky, Tennessee, Alabama, Mississippi	3.1	4.9	1.8
Division 7: West South Central	Oklahoma, Arkansas, Texas, Louisiana	3.7	5.2	1.5
Division 8: Mountain	Idaho, Montana, Wyoming, Colorado, Utah, Nevada, Arizona, New Mexico	5.2	6.4	1.2
Division 9: Pacific	Washington, Oregon, California, Alaska, Hawaii	3.3	5.8	2.5

* Insufficient data, use national rate

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 14: Need - Number of trips (output tab)

RURAL TRANSIT NEED/DEMAND ESTIMATION - OUTPUT TABLE

Service Area:	Bedford County
Analysis Description:	Estimate of the number of trips needed to serve the County
Additional Description:	

Estimation of Transit Need			
Total need for passenger transportation service:			Persons
Total households without access to a vehicle:		864	Households
State Mobility Gap:		2.4	Daily 1-Way Psgr.-Trips per Household
Total need based on mobility gap:	4 →	2,074	Daily 1-Way Passenger-Trips
		622,100	Annual 1-Way Passenger-Trips
General Public Rural Non-Program Demand			
Estimate of rural transit trips based on vehicle-miles			
Rural transit trips:			Annual 1-Way Passenger-Trips
Estimate of rural transit trips based on vehicle-hours.			
Rural transit trips:			Annual 1-Way Passenger-Trips
Trips per person based on vehicle-hours per person			
Trips per person:			Annual Trips per Person
Non-Program Demand based on TCRP B3 Methodology			
Demand for Persons Age 60 and Above			Annual 1-Way Passenger-Trips
Demand for Persons with Mobility Limitations Age 16 to 64			Annual 1-Way Passenger-Trips
Demand for General Public			Annual 1-Way Passenger-Trips
Total Rural Non-Program Demand			Annual 1-Way Passenger-Trips
Small City Fixed Route			
Annual Ridership:			Annual 1-Way Passenger-Trips
Commuters to Urban Centers			
Commuter trips by transit between counties:			Daily 1-Way Passenger Trips
			Annual 1-Way Passenger-Trips
Rural Program Demand			
Annual Program Trip Estimation			
Developmental Services: Adult			Annual 1-Way Passenger-Trips
Developmental Services: Case Management			Annual 1-Way Passenger-Trips
Developmental Services: Children			Annual 1-Way Passenger-Trips
Developmental Services: Pre-School			Annual 1-Way Passenger-Trips
Group Home			Annual 1-Way Passenger-Trips
Headstart			Annual 1-Way Passenger-Trips
Job Training			Annual 1-Way Passenger-Trips
Mental Health Services			Annual 1-Way Passenger-Trips
Mental Health Services: Case Management			Annual 1-Way Passenger-Trips
Nursing Home			Annual 1-Way Passenger-Trips
Senior Nutrition			Annual 1-Way Passenger-Trips
Sheltered Workshop			Annual 1-Way Passenger-Trips
Substance Abuse			Annual 1-Way Passenger-Trips
Total Rural Program Demand			Annual 1-Way Passenger-Trips

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

The following is the manual computation of the number of trips those individuals in need of public transportation for Bedford County would require, using the *TCRP Project B36 Methods for Forecasting Demand and Quantifying Need for Rural Passenger Transportation Workbook* to check the spreadsheet values produced.

NEED (trips) = Number of Households with No Vehicle Available * Mobility Gap

NEED (trips) = (618 + 131 + 115 + 0) * 2.4

NEED (trips) = 864 * 2.4

NEED (trips) = 2073.6 (2074) Daily Trips

Annual trip need is based on a multiplier 300 days per year as the trip rates for Saturdays, Sundays and Holidays are typically lower than for weekdays.

Annual trip need = 2074 * 300 = 622,200

Note that in order to determine UNMET NEED it is necessary to know how many trips are currently being served by existing passenger transportation services. The number of trips currently being served can be determined from surveys or interviews with agencies or transportation service providers in the area of interest.

Unmet Need = Estimated need (trips) – trips currently being served

Demand – Program (refer to Figures 15 and 16)

1. Select the "Demand – Program" box on the Analysis tab. This will allow the user to estimate the demand for program trips.

2. After checking the Demand box, a new set of boxes will appear below related to different program types. Be sure to check the program type(s) for which you wish to estimate demand. **In addition, it is important to select "Yes" or "No" in the drop-down menu to the right of the program selected.** This will open up specific boxes in the input tab based on the available data.

3. Click the "Input" tab at the bottom of the spreadsheet. This will bring up the input sheet with the required inputs needed for this analysis in white (Figure 15).

4. Enter the total population 65,561 for the study area (1). This information can be obtained from the ACS using a variety of tables. To the right of the input field is the suggested ACS table number, S0101 (Table 5).

5. The population Age 16 and over (2) can be obtained from the same table used in Step 4. It does require calculating the percentage of the total population that is 16 and over (Table 5).

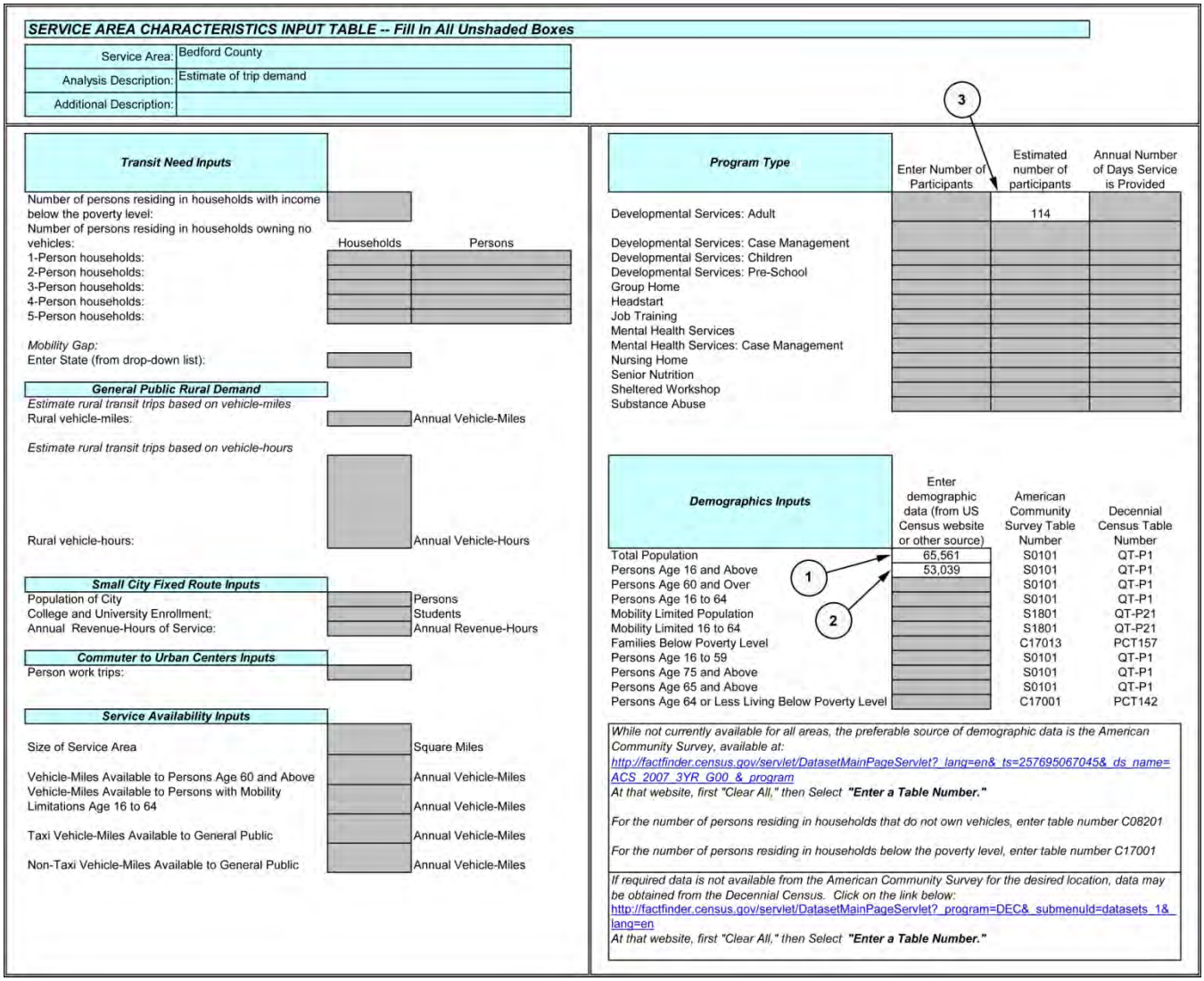
   Population Age 16 and Over = 65, 561 * 80.9%
   Population Age 16 and Over = 53,038.849, rounded to 53,039

6. This allows the spreadsheet to compute an estimated number of participants (3) for the selected program.

7. Click the "Output" tab at the bottom of the spreadsheet. This will bring up the output sheet with the calculated result (4) based on the inputs entered (Figure 16). The computed result is 47,300 one-way passenger trips.

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 15: Demand - Program (input tab)



SERVICE AREA CHARACTERISTICS INPUT TABLE -- Fill In All Unshaded Boxes

Service Area:	Bedford County
Analysis Description:	Estimate of trip demand
Additional Description:	

Transit Need Inputs

Number of persons residing in households with income below the poverty level:

Number of persons residing in households owning no vehicles:

	Households	Persons
1-Person households:		
2-Person households:		
3-Person households:		
4-Person households:		
5-Person households:		

Mobility Gap:
Enter State (from drop-down list):

General Public Rural Demand

Estimate rural transit trips based on vehicle-miles
Rural vehicle-miles: Annual Vehicle-Miles

Estimate rural transit trips based on vehicle-hours
Rural vehicle-hours: Annual Vehicle-Hours

Small City Fixed Route Inputs

Population of City: Persons
College and University Enrollment: Students
Annual Revenue-Hours of Service: Annual Revenue-Hours

Commuter to Urban Centers Inputs

Person work trips:

Service Availability Inputs

Size of Service Area: Square Miles
Vehicle-Miles Available to Persons Age 60 and Above: Annual Vehicle-Miles
Vehicle-Miles Available to Persons with Mobility Limitations Age 16 to 64: Annual Vehicle-Miles
Taxi Vehicle-Miles Available to General Public: Annual Vehicle-Miles
Non-Taxi Vehicle-Miles Available to General Public: Annual Vehicle-Miles

Program Type

	Enter Number of Participants	Estimated number of participants	Annual Number of Days Service is Provided
Developmental Services: Adult		114	
Developmental Services: Case Management			
Developmental Services: Children			
Developmental Services: Pre-School			
Group Home			
Headstart			
Job Training			
Mental Health Services			
Mental Health Services: Case Management			
Nursing Home			
Senior Nutrition			
Sheltered Workshop			
Substance Abuse			

Demographics Inputs

	Enter demographic data (from US Census website or other source)	American Community Survey Table Number	Decennial Census Table Number
Total Population	65,561	S0101	QT-P1
Persons Age 16 and Above	53,039	S0101	QT-P1
Persons Age 60 and Over		S0101	QT-P1
Persons Age 16 to 64		S0101	QT-P1
Mobility Limited Population		S1801	QT-P21
Mobility Limited 16 to 64		S1801	QT-P21
Families Below Poverty Level		C17013	PCT157
Persons Age 16 to 59		S0101	QT-P1
Persons Age 75 and Above		S0101	QT-P1
Persons Age 65 and Above		S0101	QT-P1
Persons Age 64 or Less Living Below Poverty Level		C17001	PCT142

While not currently available for all areas, the preferable source of demographic data is the American Community Survey, available at:
http://factfinder.census.gov/servlet/DatasetMainPageServlet?_lang=en&_ts=257695067045&_ds_name=ACS_2007_3YR_G00_&_program
At that website, first "Clear All," then Select ***"Enter a Table Number."***

For the number of persons residing in households that do not own vehicles, enter table number C08201

For the number of persons residing in households below the poverty level, enter table number C17001

If required data is not available from the American Community Survey for the desired location, data may be obtained from the Decennial Census. Click on the link below:
http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=DEC&_submenuId=datasets_1&_lang=en
At that website, first "Clear All," then Select ***"Enter a Table Number."***

Table 5: ACS Table S0101

Subject	Bedford County, Virginia Total
Total population	**65,561**
AGE	
Under 5 years	5.4%
5 to 9 years	5.1%
10 to 14 years	7.4%
15 to 19 years	6.4%
20 to 24 years	5.7%
25 to 29 years	5.8%
30 to 34 years	5.9%
35 to 39 years	5.8%
40 to 44 years	9.2%
45 to 49 years	8.5%
50 to 54 years	8.4%
55 to 59 years	7.3%
60 to 64 years	6.0%
65 to 69 years	4.6%
70 to 74 years	3.2%
75 to 79 years	2.6%
80 to 84 years	1.5%
85 years and over	1.2%
SELECTED AGE	
5 to 14 years	12.4%
15 to 17 years	4.1%
18 to 24 years	7.9%
15 to 44 years	38.8%
16 years and over	80.9%
18 years and over	78.1%
60 years and over	19.2%
62 years and over	16.6%
65 years and over	13.1%
75 years and over	5.3%

Source: U.S. Census Bureau, 2005-2007 American Community Survey

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 16: Demand - Program (output tab)

RURAL TRANSIT NEED/DEMAND ESTIMATION - OUTPUT TABLE

Service Area:	Bedford County
Analysis Description:	Estimate of trip demand
Additional Description:	

Estimation of Transit Need		
Total need for passenger transportation service:		Persons
Total households without access to a vehicle:		Households
State Mobility Gap:		Daily 1-Way Psgr.-Trips per Household
Total need based on mobility gap:		Daily 1-Way Passenger-Trips
		Annual 1-Way Passenger-Trips
General Public Rural Non-Program Demand		
Estimate of rural transit trips based on vehicle-miles		
Rural transit trips:		Annual 1-Way Passenger-Trips
Estimate of rural transit trips based on vehicle-hours.		
Rural transit trips:		Annual 1-Way Passenger-Trips
Trips per person based on vehicle-hours per person		
Trips per person:		Annual Trips per Person
Non-Program Demand based on TCRP B3 Methodology		
Demand for Persons Age 60 and Above		Annual 1-Way Passenger-Trips
Demand for Persons with Mobility Limitations Age 16 to 64		Annual 1-Way Passenger-Trips
Demand for General Public		Annual 1-Way Passenger-Trips
Total Rural Non-Program Demand		Annual 1-Way Passenger-Trips
Small City Fixed Route		
Annual Ridership:		Annual 1-Way Passenger-Trips
Commuters to Urban Centers		
Commuter trips by transit between counties:		Daily 1-Way Passenger Trips
		Annual 1-Way Passenger-Trips
Rural Program Demand		
Annual Program Trip Estimation		
Developmental Services: Adult	47,300	Annual 1-Way Passenger-Trips
Developmental Services: Case Management		Annual 1-Way Passenger-Trips
Developmental Services: Children		Annual 1-Way Passenger-Trips
Developmental Services: Pre-School		Annual 1-Way Passenger-Trips
Group Home		Annual 1-Way Passenger-Trips
Headstart		Annual 1-Way Passenger-Trips
Job Training		Annual 1-Way Passenger-Trips
Mental Health Services		Annual 1-Way Passenger-Trips
Mental Health Services: Case Management		Annual 1-Way Passenger-Trips
Nursing Home		Annual 1-Way Passenger-Trips
Senior Nutrition		Annual 1-Way Passenger-Trips
Sheltered Workshop		Annual 1-Way Passenger-Trips
Substance Abuse		Annual 1-Way Passenger-Trips
Total Rural Program Demand	47,300	Annual 1-Way Passenger-Trips

4

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

The following is the manual computation of the number of trips required to meet the demand for participants in a developmental services program for adults in Bedford County, using the *TCRP Project B-36 Methods for Forecasting Demand and Quantifying Need for Rural Passenger Transportation Workbook* (see Table 8 in Workbook) to check the spreadsheet values produced.

Estimated Number of Participants (developmental services) = Population 16 and Above (in Thousands) * 2.15

Estimated Number of Participants = (53039/1000) * 2.15

Estimated Number of Participants = 53.039 * 2.15

Estimated Number of Participants = 114.03 (rounded to 114)

Annual One-Way Passenger Trips = [Estimated Number of Participants * 358 (If < 25) or 430 (If ≥ 25)] – 1,686

Annual One-Way Passenger Trips = [114 * 430] – 1,686

Annual One-Way Passenger Trips = 49,020 – 1,686

Annual One-Way Passenger Trips = 47,334

Demand – Non-program

1. Select the "Demand – Non Program" box on the Analysis tab. This will allow the user to estimate the demand for non-program trips.

2. Click the "Input" tab at the bottom of the spreadsheet. This will bring up the input sheet with the required inputs needed for this analysis in white (Figure 17).

3. Enter the Annual Vehicle Miles (1), Vehicle Hours (2), Service Area Size (3), Vehicle Miles for individuals with a mobility limitation (4), and taxi vehicle miles (5). **This information can be gathered through an inventory of the agencies that currently provide transportation to individuals.**

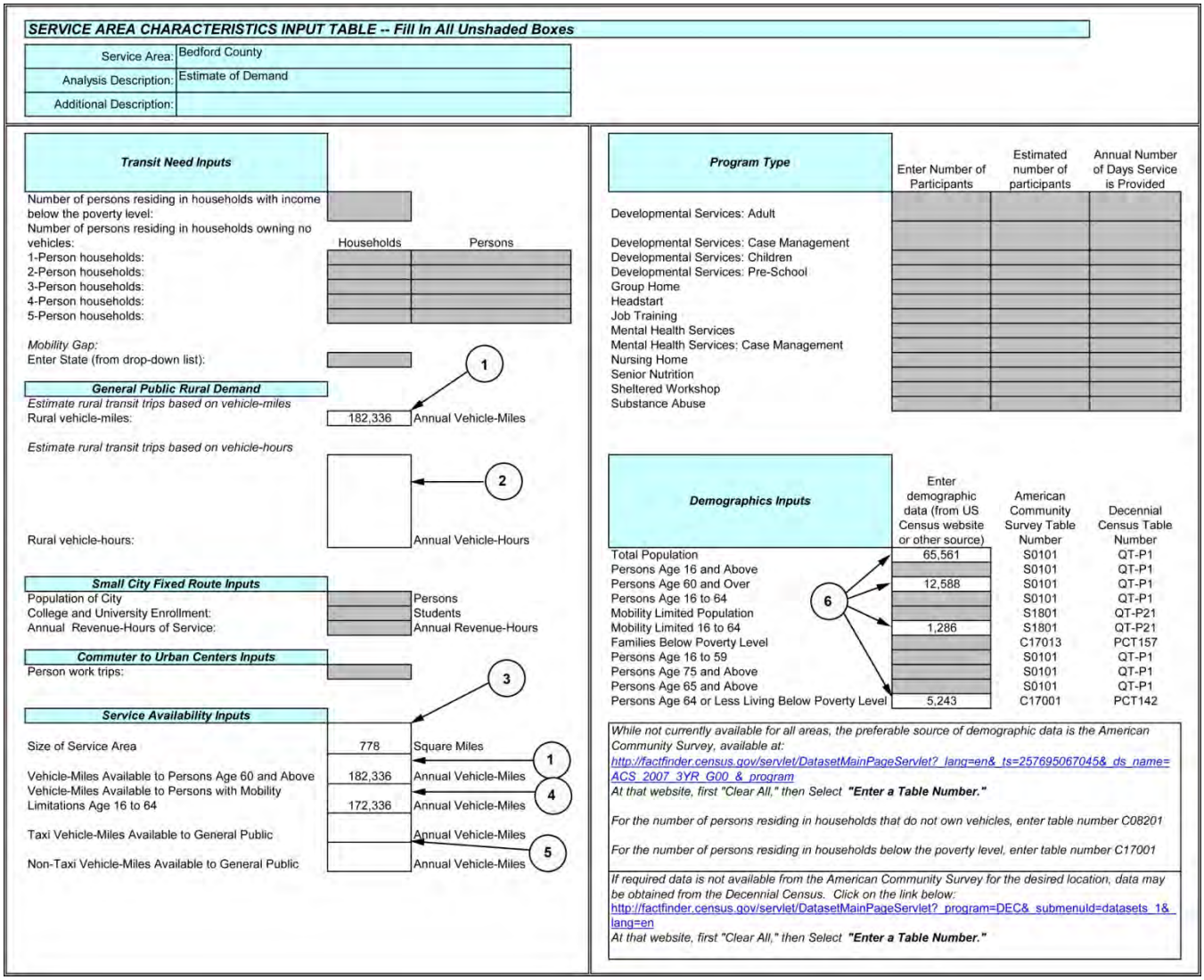
4. In addition, demographic information about the community should be entered (6). This information can be gathered from the ACS website. The recommended table numbers for each field are located to the right of that field. Total population and Persons Age 60 and Over use figures from ACS Table S0101 (Table 6). The total population is 65,561 for this example and the Persons Age 60 and Over can be calculated by multiplying the total population (65,561) by the percent of the population that is 60 and over (19.2%). This value is 12,587.712, which rounds to 12,588. The value for Persons who have a Mobility Limitation Age 16 to 64 can be calculated from figures in the ACS Table S1801 (Table 7). The figure 1,286 is calculated by using the Population 16 to 64 (44,357) and multiplying by the percent of that population who has a "go-outside-the-home disability" (2.9%). Lastly, the figure for Persons Age 64 or less living below the Poverty line requires data from ACS Table 17001 (Table 8). The way the table is organized requires the addition of figures for two different age groups of male (1,041 & 1,758) and female (662 & 1,782) individuals. The resulting figure used in the spreadsheet is 5,243.

5. Click the "Output" tab at the bottom of the spreadsheet. This will bring up the output sheet with a variety of results (Figure 10). This tab will show an estimate of the demand for trips based on vehicles miles (7) and hours (8). It will also show a demand for trips broken out into three different categories: Persons 60 and Above, Persons with a Mobility Limitation Age 16 to 64, and General Public[6] (9). An estimate of the total rural passenger transportation demand is found to be 31,600 (10).

[6] This estimate is comprised of the demand for those individuals that fall below the poverty line.

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 17: Demand – Non-program (input tab)



SERVICE AREA CHARACTERISTICS INPUT TABLE -- Fill In All Unshaded Boxes

Service Area:	Bedford County
Analysis Description:	Estimate of Demand
Additional Description:	

Transit Need Inputs

Number of persons residing in households with income below the poverty level:

Number of persons residing in households owning no vehicles:

	Households	Persons
1-Person households:		
2-Person households:		
3-Person households:		
4-Person households:		
5-Person households:		

Mobility Gap:
Enter State (from drop-down list):

General Public Rural Demand
Estimate rural transit trips based on vehicle-miles
Rural vehicle-miles: 182,336 Annual Vehicle-Miles

Estimate rural transit trips based on vehicle-hours
Rural vehicle-hours: Annual Vehicle-Hours

Small City Fixed Route Inputs
Population of City: Persons
College and University Enrollment: Students
Annual Revenue-Hours of Service: Annual Revenue-Hours

Commuter to Urban Centers Inputs
Person work trips:

Service Availability Inputs

Size of Service Area	778	Square Miles
Vehicle-Miles Available to Persons Age 60 and Above	182,336	Annual Vehicle-Miles
Vehicle-Miles Available to Persons with Mobility Limitations Age 16 to 64	172,336	Annual Vehicle-Miles
Taxi Vehicle-Miles Available to General Public		Annual Vehicle-Miles
Non-Taxi Vehicle-Miles Available to General Public		Annual Vehicle-Miles

Program Type

	Enter Number of Participants	Estimated number of participants	Annual Number of Days Service is Provided
Developmental Services: Adult			
Developmental Services: Case Management			
Developmental Services: Children			
Developmental Services: Pre-School			
Group Home			
Headstart			
Job Training			
Mental Health Services			
Mental Health Services: Case Management			
Nursing Home			
Senior Nutrition			
Sheltered Workshop			
Substance Abuse			

Demographics Inputs

	Enter demographic data (from US Census website or other source)	American Community Survey Table Number	Decennial Census Table Number
Total Population	65,561	S0101	QT-P1
Persons Age 16 and Above		S0101	QT-P1
Persons Age 60 and Over	12,588	S0101	QT-P1
Persons Age 16 to 64		S0101	QT-P1
Mobility Limited Population		S1801	QT-P21
Mobility Limited 16 to 64	1,286	S1801	QT-P21
Families Below Poverty Level		C17013	PCT157
Persons Age 16 to 59		S0101	QT-P1
Persons Age 75 and Above		S0101	QT-P1
Persons Age 65 and Above		S0101	QT-P1
Persons Age 64 or Less Living Below Poverty Level	5,243	C17001	PCT142

While not currently available for all areas, the preferable source of demographic data is the American Community Survey, available at:
http://factfinder.census.gov/servlet/DatasetMainPageServlet?_lang=en&_ts=257695067045&_ds_name=ACS_2007_3YR_G00_&_program
At that website, first "Clear All," then Select ***"Enter a Table Number."***

For the number of persons residing in households that do not own vehicles, enter table number C08201

For the number of persons residing in households below the poverty level, enter table number C17001

If required data is not available from the American Community Survey for the desired location, data may be obtained from the Decennial Census. Click on the link below:
http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=DEC&_submenuId=datasets_1&_lang=en
At that website, first "Clear All," then Select ***"Enter a Table Number."***

Table 6: ACS Table S0101

Subject	Bedford County, Virginia Total
Total population	**65,561**
AGE	
Under 5 years	5.4%
5 to 9 years	5.1%
10 to 14 years	7.4%
15 to 19 years	6.4%
20 to 24 years	5.7%
25 to 29 years	5.8%
30 to 34 years	5.9%
35 to 39 years	5.8%
40 to 44 years	9.2%
45 to 49 years	8.5%
50 to 54 years	8.4%
55 to 59 years	7.3%
60 to 64 years	6.0%
65 to 69 years	4.6%
70 to 74 years	3.2%
75 to 79 years	2.6%
80 to 84 years	1.5%
85 years and over	1.2%
SELECTED AGE	
5 to 14 years	12.4%
15 to 17 years	4.1%
18 to 24 years	7.9%
15 to 44 years	38.8%
16 years and over	80.9%
18 years and over	78.1%
60 years and over	19.2%
62 years and over	16.6%
65 years and over	13.1%
75 years and over	5.3%

Source: U.S. Census Bureau, 2005-2007 American Community Survey

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Table 7: ACS Table S1801

Subject	Total	Margin of Error
Population 5 years and over	**61,742**	**+/-199**
Without any disability	82.8%	+/-1.3
With one type of disability	8.5%	+/-1.1
With two or more types of disabilities	8.8%	+/-0.9
Population 5 to 15 years	**9,013**	**+/-322**
With any disability	9.6%	+/-3.0
With a sensory disability	1.0%	+/-1.0
With a physical disability	2.6%	+/-2.0
With a mental disability	6.3%	+/-2.5
With a self-care disability	1.4%	+/-1.4
Population 16 to 64 years	**44,357**	**+/-267**
With any disability	14.4%	+/-1.7
With a sensory disability	2.1%	+/-0.7
With a physical disability	9.9%	+/-1.4
With a mental disability	4.8%	+/-1.0
With a self-care disability	2.0%	+/-0.6
With a go-outside-home disability	2.9%	+/-0.7
With an employment disability	8.4%	+/-1.2
Population 65 years and over	**8,372**	**+/-142**
With any disability	40.2%	+/-4.3
With a sensory disability	17.5%	+/-3.7
With a physical disability	30.5%	+/-4.2
With a mental disability	11.3%	+/-3.0
With a self-care disability	8.8%	+/-2.7
With a go-outside-home disability	13.4%	+/-2.8

Source: U.S. Census Bureau, 2005-2007 American Community Survey

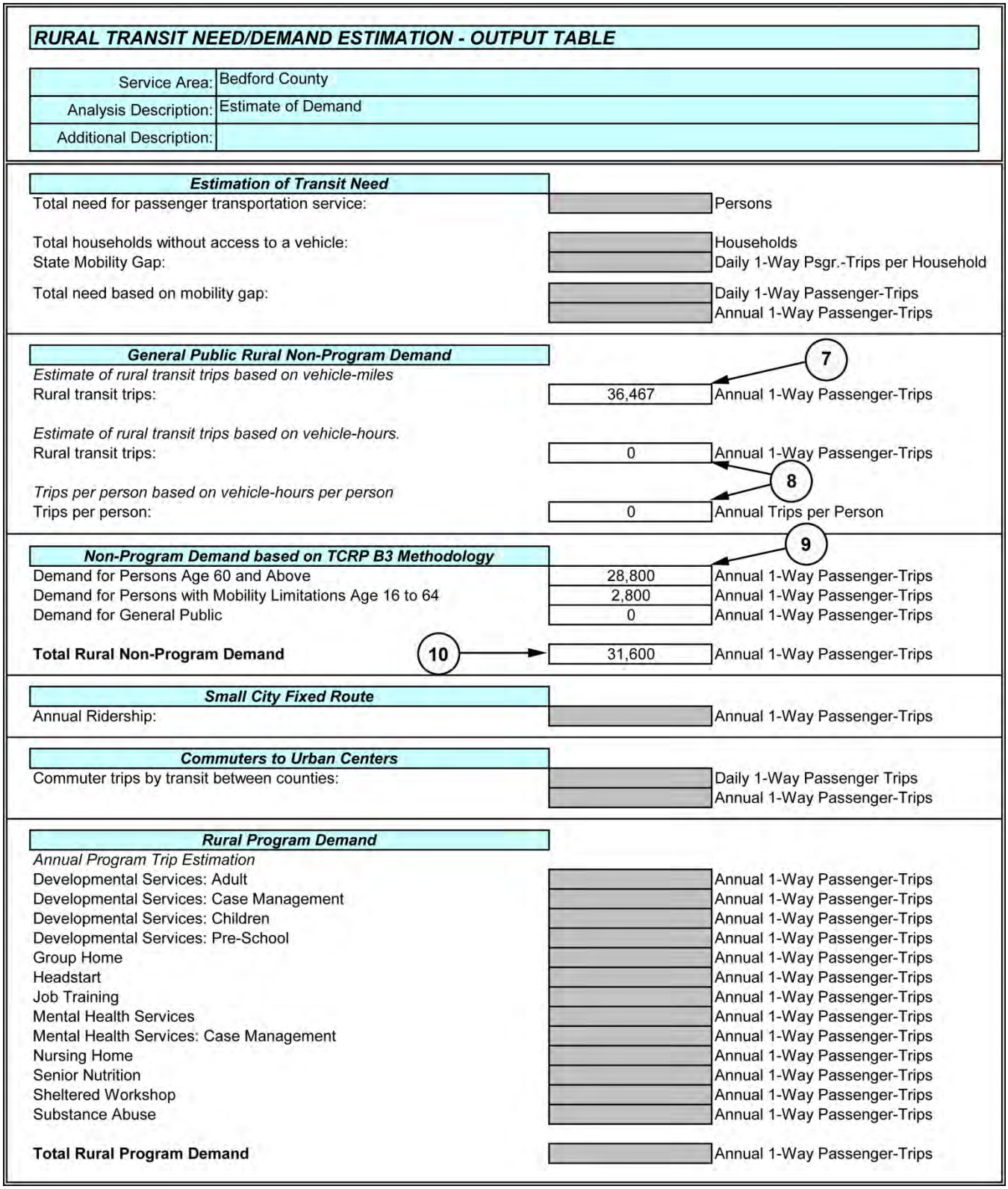
Table 8: ACS Table C17001

	Bedford County, Virginia
	Estimate
Total:	64,984
Income in the past 12 months below poverty level:	5,890
Male:	2,993
Under 18 years	1,041
18 to 64 years	1,758
65 years and over	194
Female:	2,897
Under 18 years	662
18 to 64 years	1,782
65 years and over	453
Income in the past 12 months at or above poverty level:	59,094
Male:	29,165
Under 18 years	6,028
18 to 64 years	19,385
65 years and over	3,752
Female:	29,929
Under 18 years	6,365
18 to 64 years	19,591
65 years and over	3,973

Source: U.S. Census Bureau, 2005-2007 American Community Survey

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 18: Demand – Non-program (output)



RURAL TRANSIT NEED/DEMAND ESTIMATION - OUTPUT TABLE

Service Area:	Bedford County
Analysis Description:	Estimate of Demand
Additional Description:	

Estimation of Transit Need

Total need for passenger transportation service:		Persons
Total households without access to a vehicle:		Households
State Mobility Gap:		Daily 1-Way Psgr.-Trips per Household
Total need based on mobility gap:		Daily 1-Way Passenger-Trips
		Annual 1-Way Passenger-Trips

General Public Rural Non-Program Demand

Estimate of rural transit trips based on vehicle-miles

Rural transit trips:	36,467	Annual 1-Way Passenger-Trips

Estimate of rural transit trips based on vehicle-hours.

Rural transit trips:	0	Annual 1-Way Passenger-Trips

Trips per person based on vehicle-hours per person

Trips per person:	0	Annual Trips per Person

Non-Program Demand based on TCRP B3 Methodology

Demand for Persons Age 60 and Above	28,800	Annual 1-Way Passenger-Trips
Demand for Persons with Mobility Limitations Age 16 to 64	2,800	Annual 1-Way Passenger-Trips
Demand for General Public	0	Annual 1-Way Passenger-Trips
Total Rural Non-Program Demand	31,600	Annual 1-Way Passenger-Trips

Small City Fixed Route

Annual Ridership:		Annual 1-Way Passenger-Trips

Commuters to Urban Centers

Commuter trips by transit between counties:		Daily 1-Way Passenger Trips
		Annual 1-Way Passenger-Trips

Rural Program Demand

Annual Program Trip Estimation

Developmental Services: Adult		Annual 1-Way Passenger-Trips
Developmental Services: Case Management		Annual 1-Way Passenger-Trips
Developmental Services: Children		Annual 1-Way Passenger-Trips
Developmental Services: Pre-School		Annual 1-Way Passenger-Trips
Group Home		Annual 1-Way Passenger-Trips
Headstart		Annual 1-Way Passenger-Trips
Job Training		Annual 1-Way Passenger-Trips
Mental Health Services		Annual 1-Way Passenger-Trips
Mental Health Services: Case Management		Annual 1-Way Passenger-Trips
Nursing Home		Annual 1-Way Passenger-Trips
Senior Nutrition		Annual 1-Way Passenger-Trips
Sheltered Workshop		Annual 1-Way Passenger-Trips
Substance Abuse		Annual 1-Way Passenger-Trips
Total Rural Program Demand		Annual 1-Way Passenger-Trips

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

The following is the manual computation of the number of trips required to meet the general demand for public transportation in Bedford, using the *TCRP Project B-36 Methods for Forecasting Demand and Quantifying Need for Rural Passenger Transportation Workbook* to check the spreadsheet values produced.

$$D = R_e E\left(\frac{1}{1 + k_e e^{-U_e}}\right) + R_m M\left(\frac{1}{1 + k_m e^{-U_m}}\right) + R_p P\left(\frac{1}{1 + k_p e^{-U_p}}\right)$$

where:

D = annual demand for general public (non-program) trips

$R_e = R_m = R_p = 1{,}200$

E = number of persons age 60 or over

M = number of mobility limited persons age 16 to 64

P = number of persons, age 64 or less, in families with incomes below the poverty level

e = the base of the natural logarithm (**e^x is the EXP function in Excel**)

$k_e = e^{6.38}$; $k_m = e^{6.41}$; $k_p = e^{6.63}$

$$U_e = 0.000510 \times \frac{Annual\ Vehicle - Miles\ Available\ to\ the\ Elderly\ Market}{Area\ of\ the\ County}$$

$$U_m = 0.000400 \times \frac{Annual\ Vehicle - Miles\ Available\ to\ the\ Mobility\ Limited\ Market}{Area\ of\ the\ County}$$

$$U_p = 0.000490 \times \frac{Annual\ Vehicle - Miles\ Available\ to\ the\ Low - income\ Market}{Area\ of\ the\ County}$$

$$D = 1{,}200 * 12{,}588\left(\frac{1}{1+e6.38*e^{-.120}}\right) + 1{,}200 * 1{,}286\left(\frac{1}{1+e6.41*e^{-.089}}\right) + 1{,}200 * 5{,}243\left(\frac{1}{1+e6.63*e^{0}}\right)\ See\ Footnote^{7}$$

$$U_e = 0.000510 \times \frac{182{,}336}{778}$$

$$U_e = 0.000510 \times 234.36503856$$

$$U_e = .119526169666$$

$$U_m = 0.000400 \times \frac{172{,}336}{778}$$

$$U_m = 0.000400 \times 221.511568123$$

$$U_m = .088604627249$$

[7] It is important to note that when you have an exponent value of zero, based on no available service, the formula will still produce a result because of the function used. The value, in this case for Persons below the Poverty Line, cannot be considered a true demand and is therefore not added in the final result of 31,585.

$$U_p = 0.000490 \times \frac{0}{778}$$

$$U_p = 0.000490 \times 0$$

$$U_p = 0$$

$$D = 1{,}200 \text{ x } 12{,}588 \text{ x } 0.0019 + 1{,}200 \text{ x } 1{,}286 \text{ x } 0.0018 + 1{,}200 \text{ x } 5{,}243 \text{ x } 0.0013$$

$$D = 28{,}815 + 2{,}770 + \mathbf{8{,}295}$$

$$D = 31{,}585^{5}$$

Round estimate of demand to 31,600 or 32,000

Demand – Small city[8] (refer to Figures 19 and 20)

1. Select the "Demand – Small City Fixed Rural" box on the Analysis tab. This will allow the user to estimate the demand for small city fixed rural trips.

2. Click the "Input" tab at the bottom of the spreadsheet. This will bring up the input sheet with the required inputs needed for this analysis in white (Figure 19).

3. Enter values for:

   a. Population of City – 39,065 (1),
   b. University enrollment – 18,368 (2),
   c. Annual revenue hours or service – 36,042 (3).

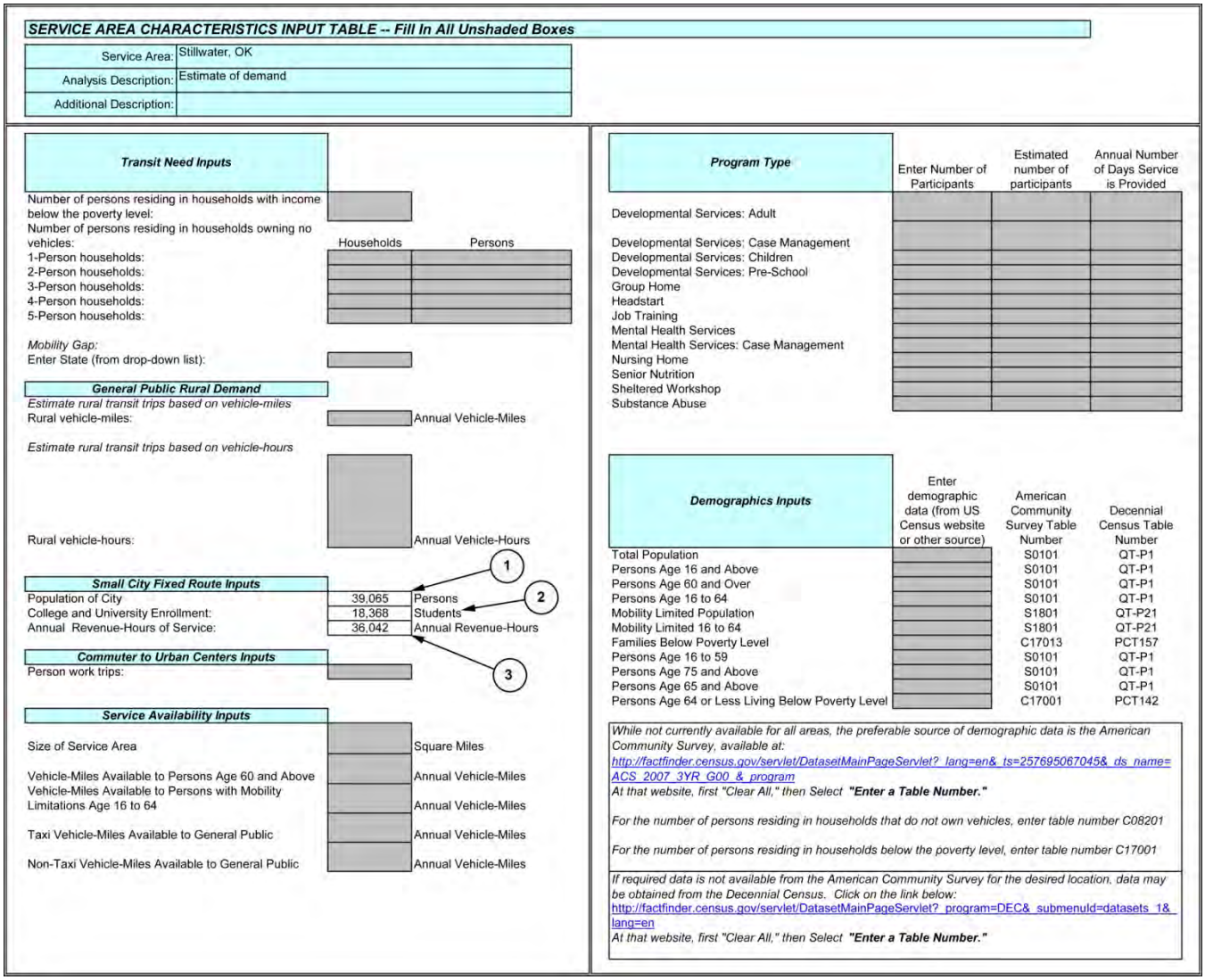
      - City population can be accessed using the ACS website.
      - University enrollment can be found at the College Board website: http://www.collegeboard.com/student/csearch/.
      - Revenue hours of service can be gathered directly from the agency(s) in question or by going to the National Transit Database website: www.ntdprogram.gov.

4. Click the "Output" tab at the bottom of the spreadsheet. This will bring up the output sheet with the result (4) (Figure 20). The resulting number of one-way passenger trip demand is 499,200.

[8] For this analysis, Stillwater, OK was used because data were available about the transit system, its population is below the 50,000 threshold, and there is a university located in the city.

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 19: Demand - Small city (input tab)



SERVICE AREA CHARACTERISTICS INPUT TABLE -- Fill In All Unshaded Boxes

Service Area:	Stillwater, OK
Analysis Description:	Estimate of demand
Additional Description:	

Transit Need Inputs

	Households	Persons
Number of persons residing in households with income below the poverty level:		
Number of persons residing in households owning no vehicles:		
1-Person households:		
2-Person households:		
3-Person households:		
4-Person households:		
5-Person households:		

Mobility Gap:
Enter State (from drop-down list):

General Public Rural Demand

Estimate rural transit trips based on vehicle-miles
Rural vehicle-miles: Annual Vehicle-Miles

Estimate rural transit trips based on vehicle-hours
Rural vehicle-hours: Annual Vehicle-Hours

Small City Fixed Route Inputs

Population of City	39,065	Persons
College and University Enrollment:	18,368	Students
Annual Revenue-Hours of Service:	36,042	Annual Revenue-Hours

Commuter to Urban Centers Inputs
Person work trips:

Service Availability Inputs

Size of Service Area	Square Miles
Vehicle-Miles Available to Persons Age 60 and Above	Annual Vehicle-Miles
Vehicle-Miles Available to Persons with Mobility Limitations Age 16 to 64	Annual Vehicle-Miles
Taxi Vehicle-Miles Available to General Public	Annual Vehicle-Miles
Non-Taxi Vehicle-Miles Available to General Public	Annual Vehicle-Miles

Program Type

	Enter Number of Participants	Estimated number of participants	Annual Number of Days Service is Provided
Developmental Services: Adult			
Developmental Services: Case Management			
Developmental Services: Children			
Developmental Services: Pre-School			
Group Home			
Headstart			
Job Training			
Mental Health Services			
Mental Health Services: Case Management			
Nursing Home			
Senior Nutrition			
Sheltered Workshop			
Substance Abuse			

Demographics Inputs

	Enter demographic data (from US Census website or other source)	American Community Survey Table Number	Decennial Census Table Number
Total Population		S0101	QT-P1
Persons Age 16 and Above		S0101	QT-P1
Persons Age 60 and Over		S0101	QT-P1
Persons Age 16 to 64		S0101	QT-P1
Mobility Limited Population		S1801	QT-P21
Mobility Limited 16 to 64		S1801	QT-P21
Families Below Poverty Level		C17013	PCT157
Persons Age 16 to 59		S0101	QT-P1
Persons Age 75 and Above		S0101	QT-P1
Persons Age 65 and Above		S0101	QT-P1
Persons Age 64 or Less Living Below Poverty Level		C17001	PCT142

While not currently available for all areas, the preferable source of demographic data is the American Community Survey, available at:
http://factfinder.census.gov/servlet/DatasetMainPageServlet?_lang=en&_ts=257695067045&_ds_name=ACS_2007_3YR_G00_&_program
At that website, first "Clear All," then Select ***"Enter a Table Number."***

For the number of persons residing in households that do not own vehicles, enter table number C08201

For the number of persons residing in households below the poverty level, enter table number C17001

If required data is not available from the American Community Survey for the desired location, data may be obtained from the Decennial Census. Click on the link below:
http://factfinder.census.gov/servlet/DatasetMainPageServlet?_program=DEC&_submenuId=datasets_1&_lang=en
At that website, first "Clear All," then Select ***"Enter a Table Number."***

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 20: Demand - Small city (output)

RURAL TRANSIT NEED/DEMAND ESTIMATION - OUTPUT TABLE

Service Area:	Stillwater, OK
Analysis Description:	Estimate of demand
Additional Description:	

Estimation of Transit Need

Total need for passenger transportation service:		Persons
Total households without access to a vehicle:		Households
State Mobility Gap:		Daily 1-Way Psgr.-Trips per Household
Total need based on mobility gap:		Daily 1-Way Passenger-Trips
		Annual 1-Way Passenger-Trips

General Public Rural Non-Program Demand

Estimate of rural transit trips based on vehicle-miles		
Rural transit trips:		Annual 1-Way Passenger-Trips
Estimate of rural transit trips based on vehicle-hours.		
Rural transit trips:		Annual 1-Way Passenger-Trips
Trips per person based on vehicle-hours per person		
Trips per person:		Annual Trips per Person

Non-Program Demand based on TCRP B3 Methodology

Demand for Persons Age 60 and Above		Annual 1-Way Passenger-Trips
Demand for Persons with Mobility Limitations Age 16 to 64		Annual 1-Way Passenger-Trips
Demand for General Public		Annual 1-Way Passenger-Trips
Total Rural Non-Program Demand		Annual 1-Way Passenger-Trips

Small City Fixed Route

Annual Ridership:	499,200	Annual 1-Way Passenger-Trips

4

Commuters to Urban Centers

Commuter trips by transit between counties:		Daily 1-Way Passenger Trips
		Annual 1-Way Passenger-Trips

Rural Program Demand

Annual Program Trip Estimation		
Developmental Services: Adult		Annual 1-Way Passenger-Trips
Developmental Services: Case Management		Annual 1-Way Passenger-Trips
Developmental Services: Children		Annual 1-Way Passenger-Trips
Developmental Services: Pre-School		Annual 1-Way Passenger-Trips
Group Home		Annual 1-Way Passenger-Trips
Headstart		Annual 1-Way Passenger-Trips
Job Training		Annual 1-Way Passenger-Trips
Mental Health Services		Annual 1-Way Passenger-Trips
Mental Health Services: Case Management		Annual 1-Way Passenger-Trips
Nursing Home		Annual 1-Way Passenger-Trips
Senior Nutrition		Annual 1-Way Passenger-Trips
Sheltered Workshop		Annual 1-Way Passenger-Trips
Substance Abuse		Annual 1-Way Passenger-Trips
Total Rural Program Demand		Annual 1-Way Passenger-Trips

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

The following is the manual computation of ridership associated with operating fixed route service in Stillwater, using the *TCRP Project B-36 Methods for Forecasting Demand and Quantifying Need for Rural Passenger Transportation Workbook* to check the spreadsheet values produced.

Annual Ridership = 6.22 x University Enrollment + 10.68 x Annual Revenue Hours

Annual Ridership = 6.22 x 18,368 + 10.68 x 36,042

Annual Ridership = 114,249 + 384,929

Annual Ridership = 499,178

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Demand – Commuters to urban centers (refer to Figures 21 through 29)

1. Select the "Demand – Commuters to Urban Centers" box on the Analysis tab. This will allow the user to estimate the demand for commuter passenger transportation from a rural area to a neighboring urban center.

2. Click the "Input" tab at the bottom of the spreadsheet. This will bring up the input sheet with the required inputs needed for this analysis in white (Figure 21).

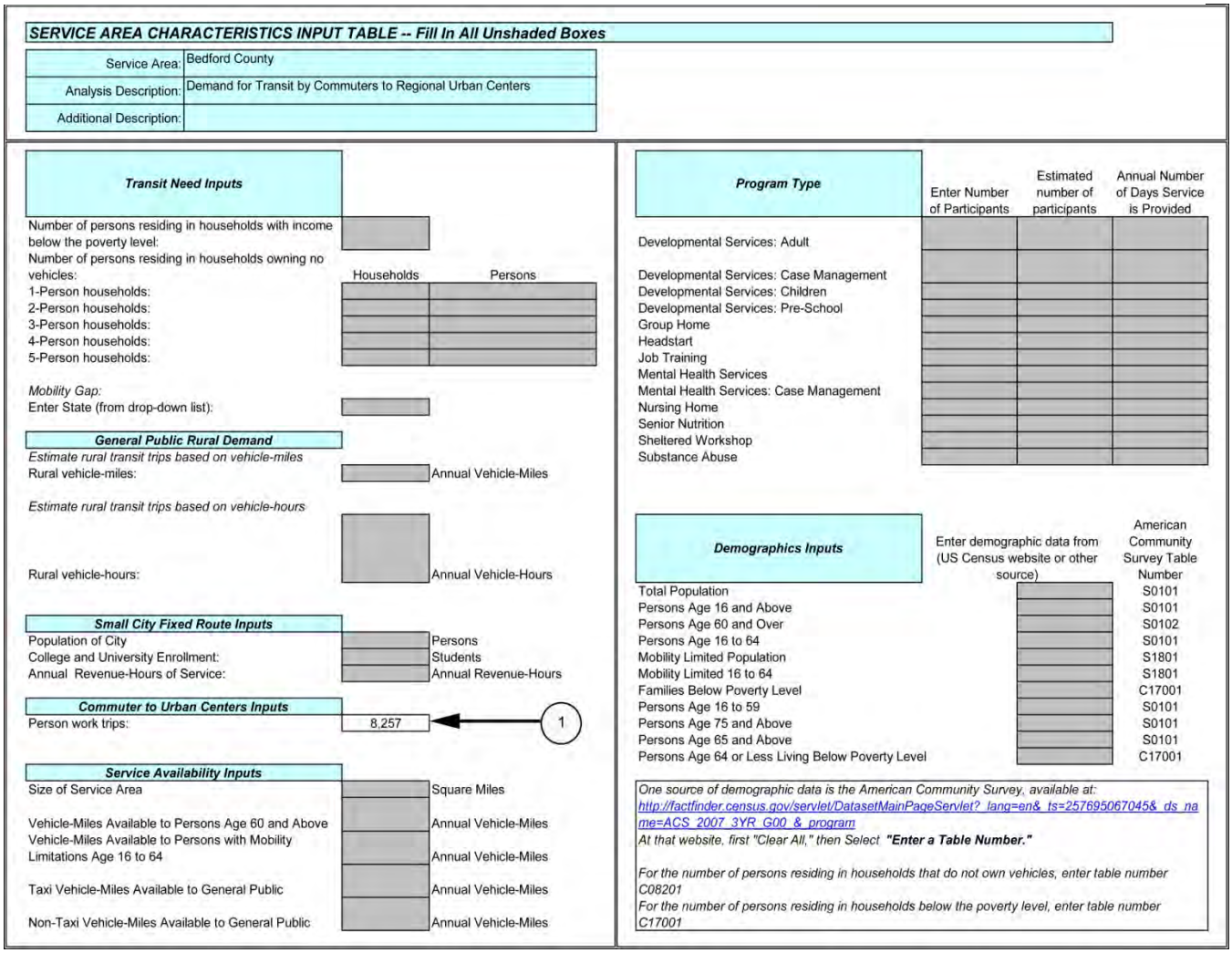
3. Enter in the number of person work trips between the rural area to the urban center (1). This information can be found at the following website: http://lehd.did.census.gov/led/.

    a. From the front page of the Census' LED page, select OnTheMap Version 3 (2) (Figure 22).
    b. The OnTheMap program will then appear (Figure 23). Enter the county/city you wish to perform the analysis on in the "Place Name" field (3).
    c. Once the correct location has been selected, the "Data Settings" page will appear (Figure 24). Select "Home/Residential Area" (4) to ensure that the analysis views the location as the starting point for commute trips. Also make sure "All Jobs" (5) and "All Workers" (6) are selected unless an analysis is desired on only a portion of the workforce.
    d. Click 'Next' and the "Study Area Selection" page will appear (Figure 25). Select the appropriate layer for the study area in the drop-down menu (7), in this case – "County". Check 'line' (8) and drag the mouse over the area you wish to select on the map (9).
    e. Step 3 for OnTheMap can be skipped. Step 4 is the "Map Overlay/Report" page (Figure 26). Select "Commute Shed Analysis" (10), and then click 'Go' (11).
    f. The OnTheMap results map (Figure 27) will appear showing where workers are commuting. Clicking 'View Report Only PDF' (12) will allow the user to view the results in a table (Figure 28).
    g. The desired result (13) can be pulled from the table and entered into the input field (1). For this analysis the value used is 8,257.

4. Clicking the "Output Tab" at the bottom of the spreadsheet will bring up the results from the analysis (14) (Figure 29). According to the spreadsheet there is a demand of 99 commuter trips daily, 25,200 annually.

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 21: Demand – Commuters (input tab)



SERVICE AREA CHARACTERISTICS INPUT TABLE -- Fill In All Unshaded Boxes

Service Area:	Bedford County
Analysis Description:	Demand for Transit by Commuters to Regional Urban Centers
Additional Description:	

Transit Need Inputs

Number of persons residing in households with income below the poverty level:

Number of persons residing in households owning no vehicles:

	Households	Persons
1-Person households:		
2-Person households:		
3-Person households:		
4-Person households:		
5-Person households:		

Mobility Gap:
Enter State (from drop-down list):

General Public Rural Demand

Estimate rural transit trips based on vehicle-miles
Rural vehicle-miles: Annual Vehicle-Miles

Estimate rural transit trips based on vehicle-hours
Rural vehicle-hours: Annual Vehicle-Hours

Small City Fixed Route Inputs

Population of City: Persons
College and University Enrollment: Students
Annual Revenue-Hours of Service: Annual Revenue-Hours

Commuter to Urban Centers Inputs

Person work trips: 8,257 (1)

Service Availability Inputs

Size of Service Area: Square Miles
Vehicle-Miles Available to Persons Age 60 and Above: Annual Vehicle-Miles
Vehicle-Miles Available to Persons with Mobility Limitations Age 16 to 64: Annual Vehicle-Miles
Taxi Vehicle-Miles Available to General Public: Annual Vehicle-Miles
Non-Taxi Vehicle-Miles Available to General Public: Annual Vehicle-Miles

Program Type

	Enter Number of Participants	Estimated number of participants	Annual Number of Days Service is Provided
Developmental Services: Adult			
Developmental Services: Case Management			
Developmental Services: Children			
Developmental Services: Pre-School			
Group Home			
Headstart			
Job Training			
Mental Health Services			
Mental Health Services: Case Management			
Nursing Home			
Senior Nutrition			
Sheltered Workshop			
Substance Abuse			

Demographics Inputs

	Enter demographic data from (US Census website or other source)	American Community Survey Table Number
Total Population		S0101
Persons Age 16 and Above		S0101
Persons Age 60 and Over		S0102
Persons Age 16 to 64		S0101
Mobility Limited Population		S1801
Mobility Limited 16 to 64		S1801
Families Below Poverty Level		C17001
Persons Age 16 to 59		S0101
Persons Age 75 and Above		S0101
Persons Age 65 and Above		S0101
Persons Age 64 or Less Living Below Poverty Level		C17001

One source of demographic data is the American Community Survey, available at:
http://factfinder.census.gov/servlet/DatasetMainPageServlet?_lang=en&_ts=257695067045&_ds_name=ACS_2007_3YR_G00_&_program
At that website, first "Clear All," then Select ***"Enter a Table Number."***

For the number of persons residing in households that do not own vehicles, enter table number C08201
For the number of persons residing in households below the poverty level, enter table number C17001

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 22: U.S. Census longitudinal employer household dynamics front page

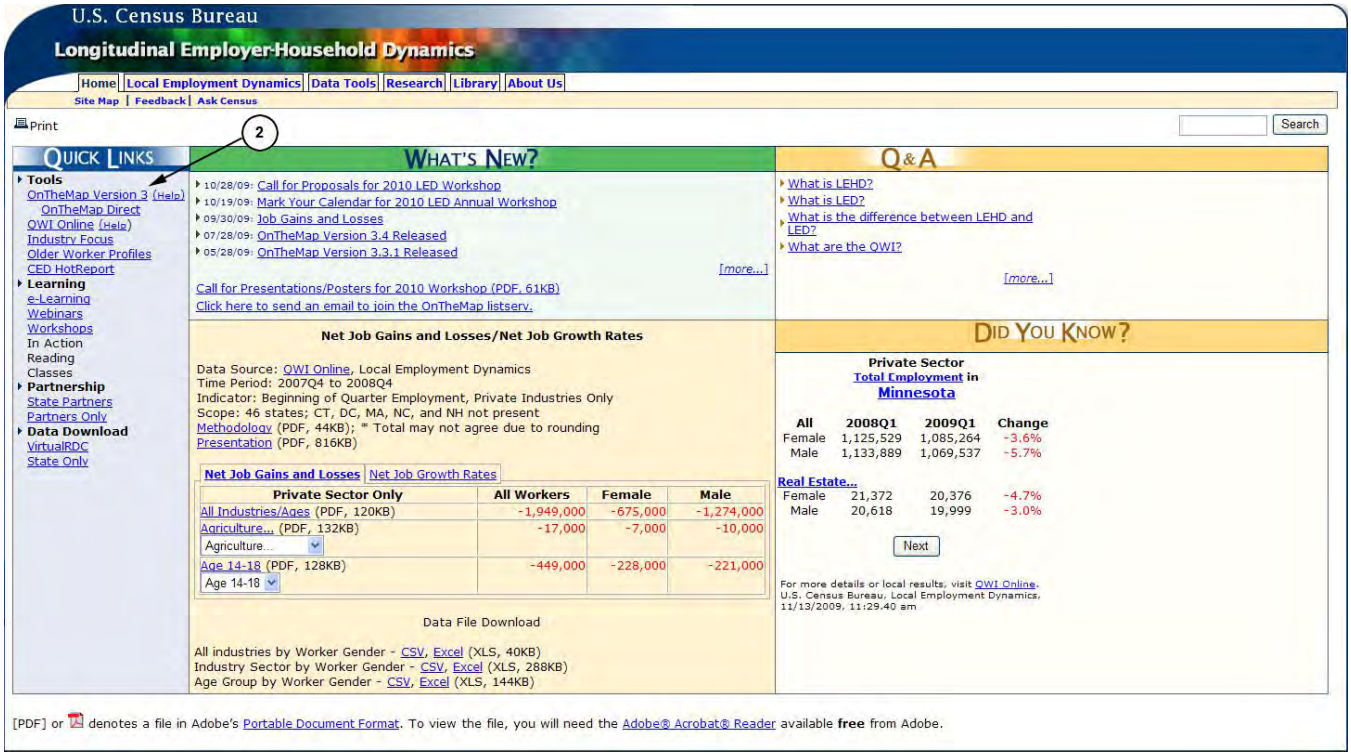


Figure 23: LED OnTheMap program

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 24: OnTheMap data settings page

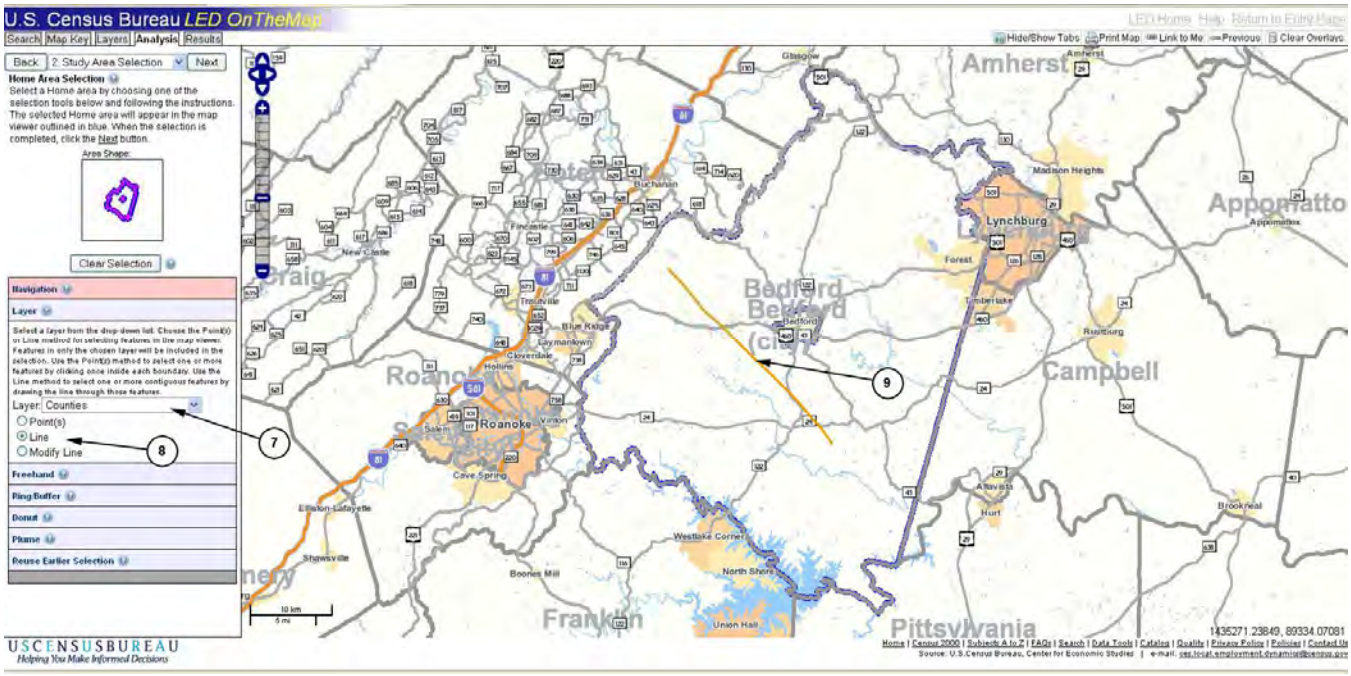
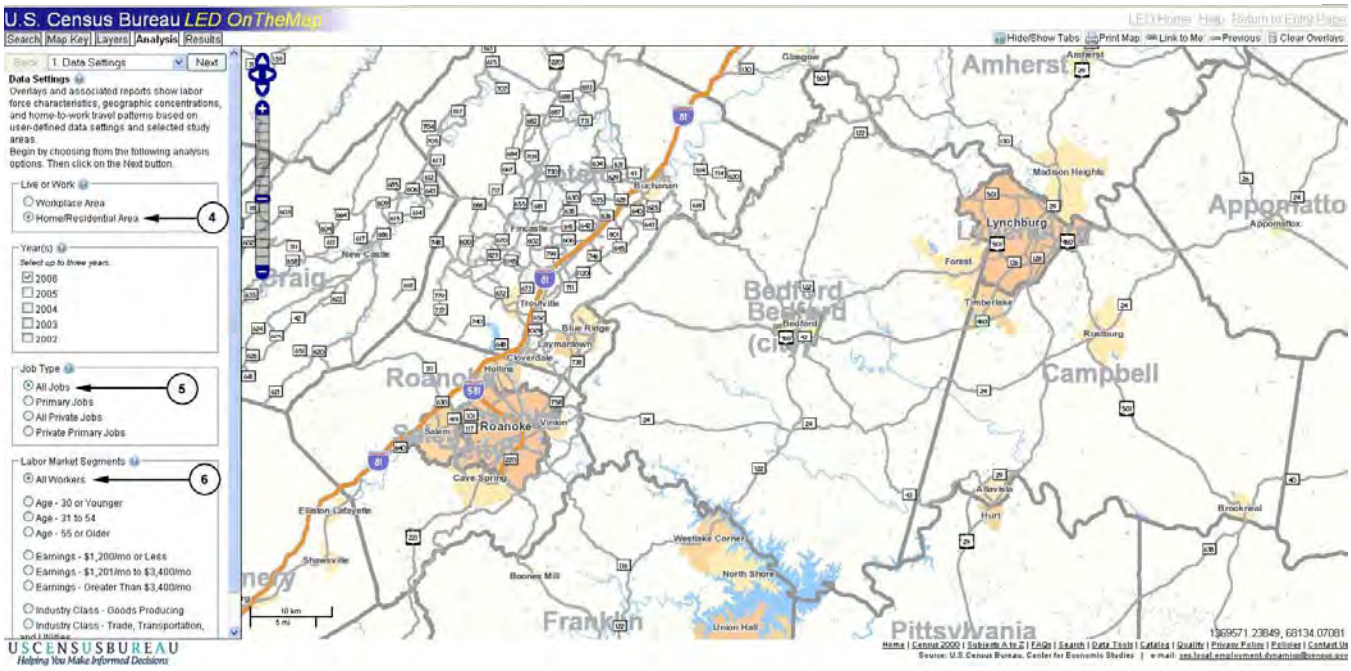


Figure 25: OnTheMap study area selection page



Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

Figure 26: OnTheMap map overlay/report page

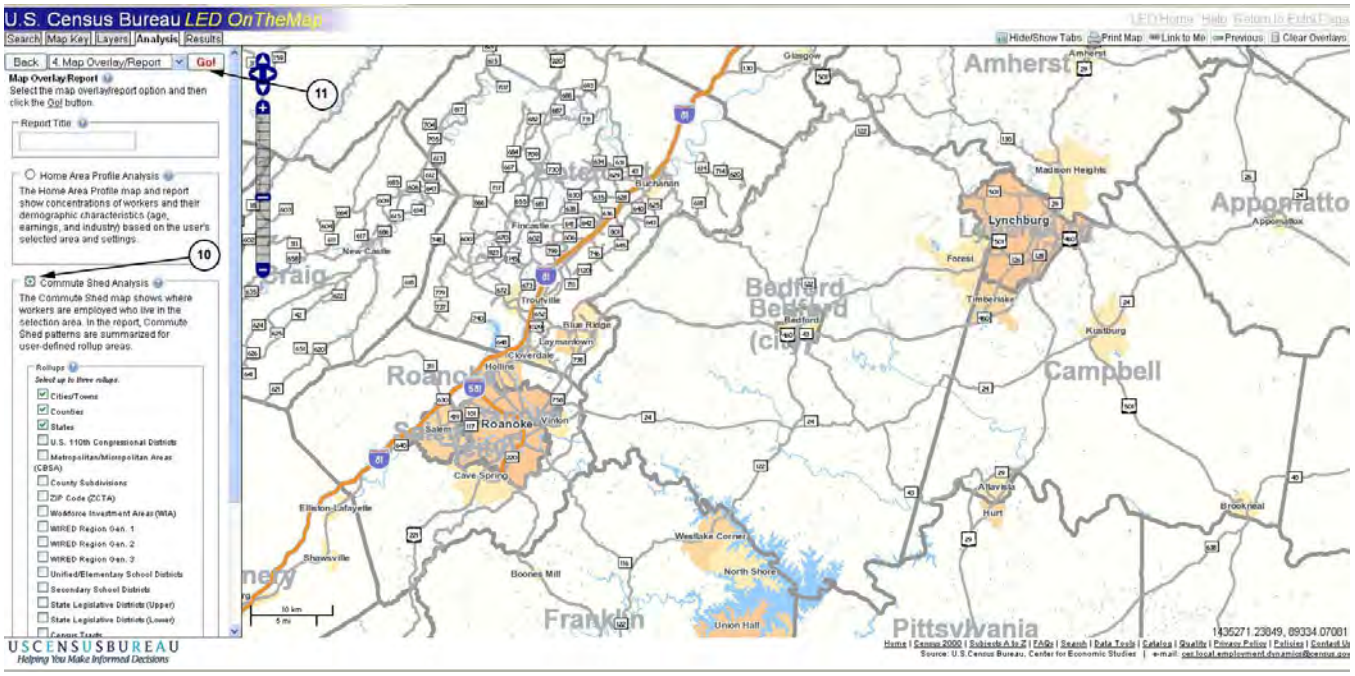


Figure 27: OnTheMap results page

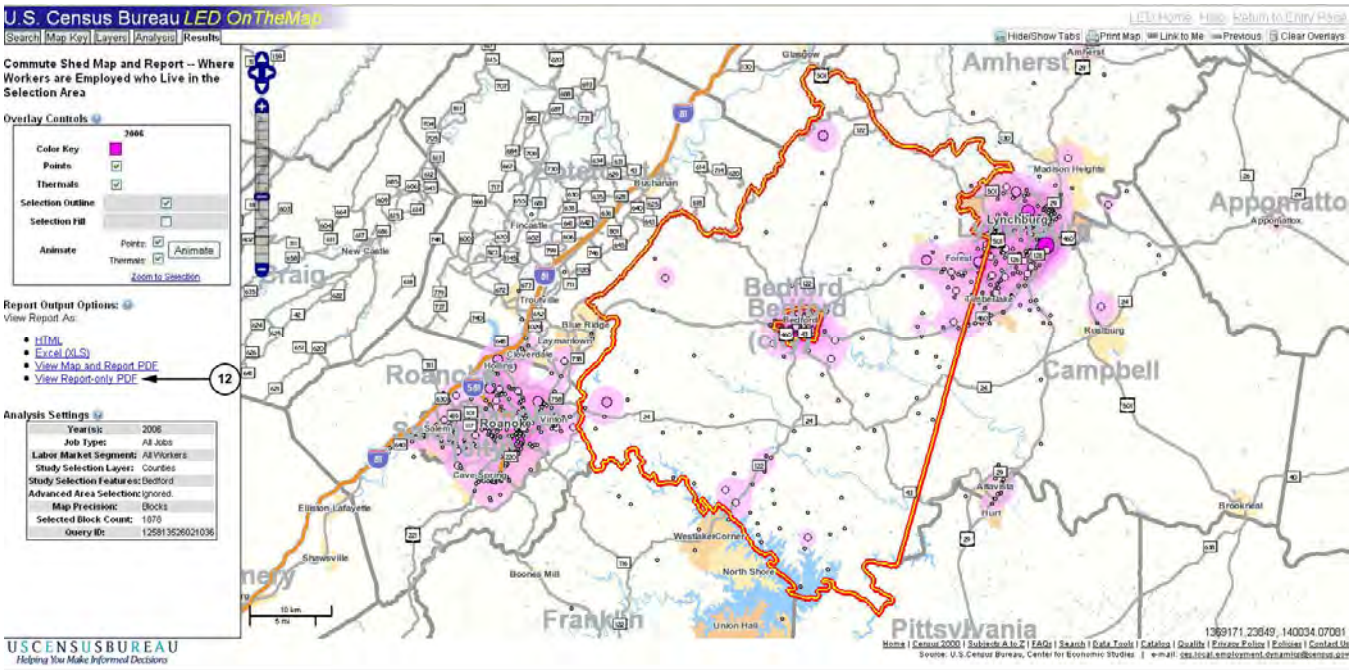


Figure 28: OnTheMap results table

Commute Shed Report -- Where Workers are Employed who Live in the Selection Area

Total All Jobs	2006 Count	2006 Share
Total All Jobs	33,776	100.0%

Job counts in Cities/Towns Where Workers are Employed	2006 Count	2006 Share
Lynchburg, Virginia (13)	8,257	24.4%
Roanoke, Virginia	5,059	15.0%
Bedford, Virginia	4,274	12.7%
Forest, Virginia	1,211	3.6%
Salem, Virginia	863	2.6%
Hollins, Virginia	836	2.5%
Cave Spring, Virginia	645	1.9%
Timberlake, Virginia	481	1.4%
Vinton, Virginia	336	1.0%
Madison Heights, Virginia	301	0.9%
All Other Locations	11,513	34.1%

Job counts in Counties Where Workers are Employed	2006 Count	2006 Share
Lynchburg Co., Virginia	8,257	24.4%
Bedford Co., Virginia	5,120	15.2%
Roanoke (city) Co., Virginia	5,059	15.0%
Bedford (city) Co., Virginia	4,274	12.7%
Roanoke Co., Virginia	2,309	6.8%
Campbell Co., Virginia	1,479	4.4%
Salem Co., Virginia	863	2.6%
Botetourt Co., Virginia	684	2.0%
Franklin Co., Virginia	660	2.0%
Amherst Co., Virginia	623	1.8%
All Other Locations	4,448	13.2%

Job counts in States Where Workers are Employed	2006 Count	2006 Share
Virginia	33,470	99.1%
North Carolina	184	0.5%
Maryland	27	0.1%
West Virginia	23	0.1%
Texas	12	0.0%
All Other Locations	60	0.2%

Figure 29: Demand - Commuters (output tab)

RURAL TRANSIT NEED/DEMAND ESTIMATION - OUTPUT TABLE

Service Area:	Bedford County
Analysis Description:	Demand for Transit by Commuters to Regional Urban Centers
Additional Description:	

Estimation of Transit Need		
Total need for passenger transportation service:		Persons
Total households without access to a vehicle:		Households
State Mobility Gap:		Daily 1-Way Psgr.-Trips per Household
Total need based on mobility gap:		Daily 1-Way Passenger-Trips
		Annual 1-Way Passenger-Trips
General Public Rural Non-Program Demand		
Estimate of rural transit trips based on vehicle-miles		
Rural transit trips:		Annual 1-Way Passenger-Trips
Estimate of rural transit trips based on vehicle-hours.		
Rural transit trips:		Annual 1-Way Passenger-Trips
Trips per person based on vehicle-hours per person		
Trips per person:		Annual Trips per Person
Non-Program Demand based on TCRP B3 Methodology		
Demand for Persons Age 60 and Above		Annual 1-Way Passenger-Trips
Demand for Persons with Mobility Limitations Age 16 to 64		Annual 1-Way Passenger-Trips
Demand for General Public		Annual 1-Way Passenger-Trips
Total Rural Non-Program Demand		Annual 1-Way Passenger-Trips
Small City Fixed Route		
Annual Ridership:		Annual 1-Way Passenger-Trips
Commuters to Urban Centers		
Commuter trips by transit between counties: (14)	99	Daily 1-Way Passenger Trips
	25,200	Annual 1-Way Passenger-Trips
Rural Program Demand		
Annual Program Trip Estimation		
Developmental Services: Adult		Annual 1-Way Passenger-Trips
Developmental Services: Case Management		Annual 1-Way Passenger-Trips
Developmental Services: Children		Annual 1-Way Passenger-Trips
Developmental Services: Pre-School		Annual 1-Way Passenger-Trips
Group Home		Annual 1-Way Passenger-Trips
Headstart		Annual 1-Way Passenger-Trips
Job Training		Annual 1-Way Passenger-Trips
Mental Health Services		Annual 1-Way Passenger-Trips
Mental Health Services: Case Management		Annual 1-Way Passenger-Trips
Nursing Home		Annual 1-Way Passenger-Trips
Senior Nutrition		Annual 1-Way Passenger-Trips
Sheltered Workshop		Annual 1-Way Passenger-Trips
Substance Abuse		Annual 1-Way Passenger-Trips
Total Rural Program Demand		Annual 1-Way Passenger-Trips

Appendix B – Instructions for the Rural Transit Need and Demand Spreadsheet

The following is the computation of ridership associated with commuters traveling to a major urban center, using the *TCRP Project B36 Methods for Forecasting Demand and Quantifying Need for Rural Passenger Transportation Workbook* to check the spreadsheet values produced.

Commuter Trips by Transit per Day = 0.012 x Person Work Trips

Commuter Trips by Transit per Day = 0.012 x 8,257

Commuter Trips by Transit per Day = 99

Commuter Trips by Transit per Year = 99 x 255

Commuter Trips by Transit per Year = 25,245

Appendix C: Suggested guidelines for data collection

The Rural National Transit Database specifies data that are to be reported each year by rural systems. These data are those that are necessary for FTA to properly determine the apportionment of funds made available under specific federal programs. However, those data do not provide a complete picture of the operations and use of rural passenger transportation services. Individual states, coordinating councils, or planning agencies may wish to implement more comprehensive data collection programs in order to develop a better understanding of the met and unmet needs in rural communities and the characteristics of the demand for rural passenger transportation services. These data could be used to identify those areas having the greatest unmet need and to guide the allocation of state or local funds.

In most rural communities passenger transportation services are provided by both public transit agencies and human service organizations. It was in recognition of this that the requirement for Coordinated Public Transportation-Human Service Transportation Plans was developed. Preparation of these plans offers states and agencies the opportunity to assemble data that can help to identify met and unmet needs while systematically building a database that will support analysis of likely demand functions.

Most public transit agencies collect the needed data:

- Service provided – measured in vehicle-miles and/or vehicle-hours
- Size of service area
- Population served – by market segment
- Trips (boardings) by trip purpose

Human service agencies will often have some of these data but may not regularly report them. The following information from each human service agency would provide a more complete picture of transpiration services:

- Trips (boardings) served per time period
- Unduplicated riders per time period
- Size of the agency's service area
- Population, by market, of the agency's service area
- For programs offered by the agency:
- Approximate number of program participants
    - Number of program events per week
    - The proportion of total program participants who attend the program on an average day

- The proportion of program participants that are transit dependent and do not typically get a ride from family members – therefore requiring public transportation
- Number of weeks per year that the program is offered

State agencies charged with the preparation of coordinated plans may also find it useful to request all agencies – public transportation or human service - that receive state or federal assistance for the purchase or operations of vehicles to provide information about the sources of revenues, the amounts received from each route, and all expenditures on transportation.