



Instruction Manual for ADA Paratransit Forecast Tool

ADA Paratransit Demand Forecast

Los Angeles, CA
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1 Introduction

The tool presents the findings of a research study conducted for SCAG to assist transit practitioners in the areas of market analysis, demand forecasting, planning and budgeting. The study relies primarily on a comprehensive literature review, a detailed examination of available data and interviews with transit agencies and other stakeholders. The tool provides a general framework to estimate ADA paratransit demand, capacity needs and budget requirements. It is primarily intended for long-term forecasting and scenario analysis and is not meant to replace the more detailed short-term forecasts used by some transit agencies.

The purpose of this instruction manual is to inform users how to use the ADA paratransit forecast tool, and to provide an overview of the methodologies used for the calculations. The manual also instructs users how to update the underlying data in the tool. The rest of this manual is divided into four chapters:

- **Chapter 2, Tool Overview** provides a high-level summary of all the worksheets in the tool
- **Chapter 3, Step-by-Step Instructions** details how to use the tool and where the user needs to enter data or make selections
- **Chapter 4, Technical Documentation** describes the methodologies used for the tool calculations and projections
- **Chapter 5, Updating the Tool Data** provides instructions for updating the underlying tool data over time

This manual also includes one appendix, which replicates the full instructions tables provided in the tool on the Instructions sheet.

2 Tool Overview

The tool includes 11 user-enabled worksheets.¹ The worksheets are categorized into one of five groups, depending on their function:

- Introduction sheets (blue)
- Background information (green)
- Tool instructions, user inputs, and calculations (orange)
- Data (purple)
- Population projections (purple-pink)

Within the tool worksheets, cells containing text in blue font indicates values are linked to other worksheets in the tool. Cells that are highlighted light orange are meant for user inputs. To help avoid accidental edits to tool calculations, cells containing calculations on the orange sheets are protected, and only cells meant for only user inputs can be changed.

The Contents worksheet includes a list of all worksheets in the tool, organized by the five color-coded groups. A brief description of the sheet contents is also provided. Figure 1 includes a screenshot of the Contents sheet.

Figure 1. Contents Sheet

#	Sheet	Description
1	Cover	Cover page of the tool
2	Contents	Lists tool contents with hyperlinks to access each sheet
3	Overview	Provides a description of the tool and its purpose
4	Methodology	Graphical representation of methodologies for estimating 1) ADA paratransit demand, 2) capacity needs and service design considerations and 3) budget requirements
5	Instructions	Step-by-step approach for each methodology
6	Inputs&Calc	Requires user inputs and optional data overrides; calculates one year of results for: 1) ADA paratransit demand, 2) capacity needs and service design considerations and 3) budget requirements
7	Projections	Calculates projected results for: 1) ADA paratransit demand, 2) capacity needs and service design considerations and 3) budget requirements
8	DataAgency	Agency-specific data gathered from a combination of agency interviews and NTD
9	DataDemographics	Demographic data at the county-level
10	DataNTD	ADA paratransit data at the agency/county level (demand response [DR] data gathered from NTD)
11	DataProjections	Population projections from SCAG

Legend:

- Introduction sheets
- Background information
- Tool instructions, user inputs, and calculations
- Data
- Projections

¹ Note that one sheet ('ListsLookups') is hidden as it does not need to be edited or viewed.

The ADA Paratransit Demand Forecast Tool, outputs and associated data are provided “as is” without warranty of any kind, whether expressed, implied, statutory, or otherwise including but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

As shown in the figure, the 11 worksheets include the following:

- **Cover:** Cover page of the tool
- **Contents:** Lists tool contents with hyperlinks to access each sheet
- **Overview:** Provides a description of the tool and its purpose
- **Methodology:** Graphical representation of methodologies for estimating 1) ADA paratransit demand, 2) capacity needs and service design considerations and 3) budget requirements
- **Instructions:** Step-by-step approach for each methodology
- **Inputs&Calc:** Requires user inputs and optional data overrides; calculates one year of results for: 1) ADA paratransit demand, 2) capacity needs and service design considerations and 3) budget requirements
- **Projections:** Calculates projected results for: 1) ADA paratransit demand, 2) capacity needs and service design considerations and 3) budget requirements
- **DataAgency:** Agency-specific data gathered from a combination of agency interviews and NTD
- **DataDemographics:** Demographic data at the county-level
- **DataNTD:** Paratransit data at the county-level gathered from NTD
- **DataProjections:** Population projections from SCAG

3 Step-by-Step Instructions for How to Use Tool

To run the tool, the user will rely on the three orange sheets, namely:

- Instructions
- Inputs&Calc
- Projections

The rest of the worksheets in the tool provide information on the tool methodology and purpose, as well as data. These sheets can be reviewed by the user, and the user may choose to edit or update the data sheets in the future (discussed further in chapter 5). However, to operate the tool, only the three orange sheets are required. Step-by-step instructions for what to do on each worksheet are described further below.

3.1 Step 1: Read Instructions

The first step in using the ADA Paratransit Demand Forecast Tool is to read the Instructions worksheet. This sheet provides information on each ‘output’ variable calculated on the Inputs&Calc worksheet. Specifically, the sheet provides a definition for each ‘input’ used to calculate the output and suggests sources for collecting the required inputs. The sheet also describes key factors affecting the outputs, the process followed in the tool to calculate the output, and any additional useful comments.

The Instructions worksheet follows the same structure and logic as the Inputs&Calc sheet, mirroring the same order of outputs, and grouped into the same three categories:

- **Estimation of ADA Paratransit Demand:** describes all inputs and outputs used to calculate paratransit demand
- **Estimation of Capacity Needs:** describes all inputs and outputs used to calculate total vehicle fleet required
- **Estimation of Budget Requirements:** describes all outputs related to agency budget requirements, including fare revenues, annual operating and maintenance (O&M) costs, subsidy requirements, and initial capital investments required for vehicle fleet

A partial screenshot of the Instructions sheet is provided below in Figure 2, and the full set of instructions are replicated in Appendix A.

Figure 2. Instructions Sheet

Step #	Output	Input	Data Source(s)	Key Factors	Process
1	-	Total Population of Service Area	SCAG; California DoF	-	-
2	Target Population	<i>Target Population Rate</i> : percent of population who is the intended target of ADA paratransit service	SCAG	Age structure; household income distribution	Multiply Total Population of Service Area by Target Population Rate
3	Persons Applying for ADA Paratransit	<i>Market Penetration Rate</i> : percent of target population who actually applies for ADA paratransit service	Agency	Outreach activity; service area; availability and costs of accessible transportation alternatives; business cycle	Multiply Target Population by Market Penetration Rate
4	Registrants	<i>Eligibility Rate</i> : percent of applicants who are deemed eligible	Agency	Eligibility criteria and evaluation process; provincial and territorial regulations	Multiply Population Applying for ADA Paratransit by Eligibility Rate
5	Active Registrants	<i>Percent Active Registrants</i> : percent of registered customers who have taken at least one trip in the past year	Agency	Frequency of eligibility re-assessment; availability of subscription trips	Multiply Registrants by Percent of Active Registrants
6	Total Trip Requests	<i>Average Annual Trips Requested</i> : average number of passenger trips requested per active user and per month (or year)	Agency	Fare structure; service hours; quality of service; seasonality; attendant and companion policy	Multiply Active Users by Trip Request Rate
7	Booked Trips	<i>Denial Rate</i> : percent of denied/ unaccommodated trip requests	Agency	Zero denial policy; capacity	Multiply Total Trip Requests by Denial Rate and Subtract the Result from Total Trip Requests
8	Annual Passenger Trips	<i>Cancellation and No-show Rate</i> : percent of booked trips cancelled and no-shows	Agency	Cancellation and no-show policy; reservation window; pick-up window	Multiply Booked Trips by Cancellation and No-show Rate and Subtract the Result from Booked Trips

3.2 Step 2: Review Input Data and Calculations

The Inputs&Calc sheet requires data entry by the user. The user can also review data suggested by the tool and choose whether or not to override these values. After reading the Instructions sheet, the user will have a good understanding of the definitions of each output being calculated and input in use on the Inputs&Calc sheet. The structure of the Inputs&Calc sheet is the same as that on the Instructions sheet, with calculations organized into three categories:

- **Estimation of ADA Paratransit Demand:** calculates all intermediate outputs to estimate the annual passenger trips



- **Estimation of Capacity Needs:** calculates all intermediate outputs to estimate total vehicle fleet
- **Estimation of Budget Requirements:** calculates relevant measures of budget requirements, including fare revenues, annual O&M costs, subsidy requirements, and initial capital investments required for vehicle fleet

A partial screenshot of the sheet is shown below in Figure 3.

Figure 3. Inputs&Calc Sheet

USER SELECTIONS	
First year of analysis	2020
Last year of analysis	2030
Geography / Agency	Access

Step #	Output Name	Output Value	USER OUTPUTS OVERRIDE	Input Name	Alternate Input Source(s)	
ESTIMATION OF ADA PARATRANSIT DEMAND	1	-	n/a	Total Population of Service Area	SCAG; California DoF	
	2	Target Population	1,152,307	n/a	Target Population Rate	SCAG
	3	Persons Applying for ADA Paratransit	58,789	n/a	Market Penetration Rate	Agency
	4	Registrants	50,205	n/a	Eligibility Rate	Agency
	5	Active Registrants	42,258	n/a	Percent Active Registrants	Agency
	6	Total Trip Requests	4,559,589	n/a	Average Annual Trips Requested	Agency
	7	Booked Trips	4,559,589	n/a	Denial Rate	Agency
	8	Annual Passenger Trips	4,252,156		Cancellation and No-show Rate	Agency
OF CAPACITY NEEDS	1	-	n/a	Breakdown of Year into Days: - Weekdays - Saturdays - Sundays - Holidays	-	
	2	Weekday Equivalents	251.0	n/a	Service Hours and Weekday Equivalent Factor for: - Weekdays - Saturdays - Sundays - Holidays	Agency
			16.8			
			14.6			
0.5						

As part of Step 2, the user will follow three steps, as described below. All cells intended for user inputs or overrides are colored in light orange. The rest of the cells are locked for editing.

Step 2.1: Enter Analysis Parameters in ‘User Selections’ Table

During Step 2.1 the user will define the scope of the analysis. This information is required to develop the projections. Specifically, the user will enter values in Cells E3:E5, which correspond to the following variables:

- **First Year of Analysis:** enter the first year of calculations to be considered on the Projections sheet. This value must be greater than or equal to 2020, and less than the Last Year of Analysis.
- **Last Year of Analysis:** enter the last year of analysis to be considered on the Projections sheet. This value must be greater than the First Year of Analysis and less than or equal to 2045.
- **Geography/Agency:** select from a drop-down menu of SCAG counties or key paratransit agencies. This selection will be used to lookup the corresponding tool data for the inputs. All data suggested by the tool will populate inputs in the ‘Tool Suggested Inputs’ column (columns I:J).

Step 2.2: Review Input Data from Tool and Override Values as Needed

Based on the information entered during Step 2.1, the 'Tool Suggested Inputs' (columns I:J) will automatically populate with data from the tool. The user should review the input values suggested by the tool. For each input, the user has the option to override the value by entering a new value in the orange 'USER INPUTS OVERRIDE' column (columns K:L). To use the data provided by the tool, the corresponding cell should be left blank in the 'USER INPUTS OVERRIDE' column.

Step 2.3: Review Calculated Outputs and Override Values as Needed

In addition to overriding inputs, the user has the option to directly override two key outputs: annual passenger trips and total vehicle fleet. The user may choose to override these values if he or she has information on these values. First, the user can review the calculated annual passenger trips and total vehicle fleet in cells E16 and E30. To override these values, enter the desired number of annual passenger trips and total vehicle fleet in the cells F16 and F30.

3.3 Step 3: View Projections

After all required information is entered on the Inputs&Calc sheet, the user should navigate to the Projections sheet to view forecasted results. Similar to the Instructions and Inputs&Calc sheets, the results are organized into three groups:

- **Projections of ADA Paratransit Demand:** forecasts ADA paratransit demand based on the data entered on Inputs&Calc and population growth for the geography selected (or the geography associated with the agency selected).
- **Projections of Capacity Needs:** forecasts total vehicle fleet required to support projected demand.
- **Projections of Budget Requirements:** forecasts annual fare revenues, O&M costs, and operating deficit based on projected demand. Also forecasts periodic capital investments required to maintain projected vehicle fleet.

Projections are shown for the period of analysis defined on the Inputs&Calc sheet. Total results over that period are shown in column F in black or red font. Figure 4 shows a partial screenshot of the Projections sheet.

Figure 4. Projections Sheet

Projected Demand, Capacity, and Budget			2020	2021	2022	2023	2024	2025	2026
SCAG Region	output	input							
Projections of ADA Paratransit Demand									
	2017	2020							
Total Population of Service Area	18,974,658	20,257,560	20,257,560	20,907,186	21,577,646	22,269,605	22,983,755	23,720,807	24,313,952
Population Growth Rate		2.2%		3.21%	3.21%	3.21%	3.21%	3.21%	2.50%
Target Population		10.1%	2,045,088	2,110,671	2,178,356	2,248,213	2,320,309	2,394,718	2,454,598
Persons Applying for ADA Paratransit		6.9%	141,878	146,428	151,123	155,970	160,971	166,134	170,288
Registrants		87.8%	124,550	128,544	132,667	136,921	141,312	145,843	149,490
Active Registrants		84.1%	104,747	108,106	111,573	115,150	118,843	122,654	125,721
Total Trip Requests		123	12,844,040	13,255,928	13,681,024	14,119,752	14,572,549	15,039,867	15,415,943
Booked Trips		3.9%	12,341,838	12,737,621	13,146,096	13,567,669	14,002,762	14,451,808	14,813,180
Annual Passenger Trips	0	5.1%	0	11,710,257	12,085,786	12,473,357	12,873,357	13,286,185	13,712,251
				11,710,257	12,085,786	12,473,357	12,873,357	13,286,185	13,712,251
				11,710,257	12,085,786	12,473,357	12,873,357	13,286,185	13,712,251
Projections of Capacity Needs									
Passengers per Weekday		291	40,252	41,542	42,875	44,250	45,669	47,133	48,312
Passengers per Peak Hour		10.8%	4,347	4,487	4,630	4,779	4,932	5,090	5,218
Vehicle Requirement in Peak Hour		2.80	1,554	1,604	1,656	1,709	1,763	1,820	1,865
Total Vehicle Fleet	0	15.0%	0	1,787	1,845	1,904	1,965	2,028	2,093
				1,787	1,845	1,904	1,965	2,028	2,093
				1,787	1,845	1,904	1,965	2,028	2,093
Projections of Budget Requirements									
Annual Fare Revenue	\$3.21	\$1,329,067,977	\$37,644,723	\$38,851,928	\$40,097,846	\$41,383,718	\$42,710,827	\$44,080,493	\$45,182,739
Annual O&M Costs	\$23.66	\$9,780,084,179	\$277,012,591	\$285,895,932	\$295,064,147	\$304,526,372	\$314,292,034	\$324,370,866	\$332,481,856
Operating Deficit/ Subsidy Required		(\$8,451,016,202)	(\$239,367,868)	(\$247,044,004)	(\$254,966,301)	(\$263,142,653)	(\$271,581,208)	(\$280,290,373)	(\$287,299,117)
				(\$239,367,868)	(\$247,044,004)	(\$254,966,301)	(\$263,142,653)	(\$271,581,208)	(\$280,290,373)
				(\$239,367,868)	(\$247,044,004)	(\$254,966,301)	(\$263,142,653)	(\$271,581,208)	(\$280,290,373)
Capital Cost of Vehicles	\$7,609	\$480,173,092	\$13,600,496	\$14,036,641	\$14,486,773	\$14,951,341	\$15,430,806	\$15,925,646	\$16,323,872

4 Technical Documentation and Methodology

The ADA Paratransit Forecast Tool presents the findings of a research study conducted for SCAG to assist transit practitioners in the areas of market analysis, demand forecasting, planning and budgeting. The study relies primarily on a comprehensive literature review, a detailed examination of available data and interviews with transit agencies and other stakeholders. The tool provides a general framework to estimate the demand for ADA paratransit, capacity needs and service design considerations and budget requirements. More specifically, the tool develops estimates of and projections for the three following key pieces of planning information:

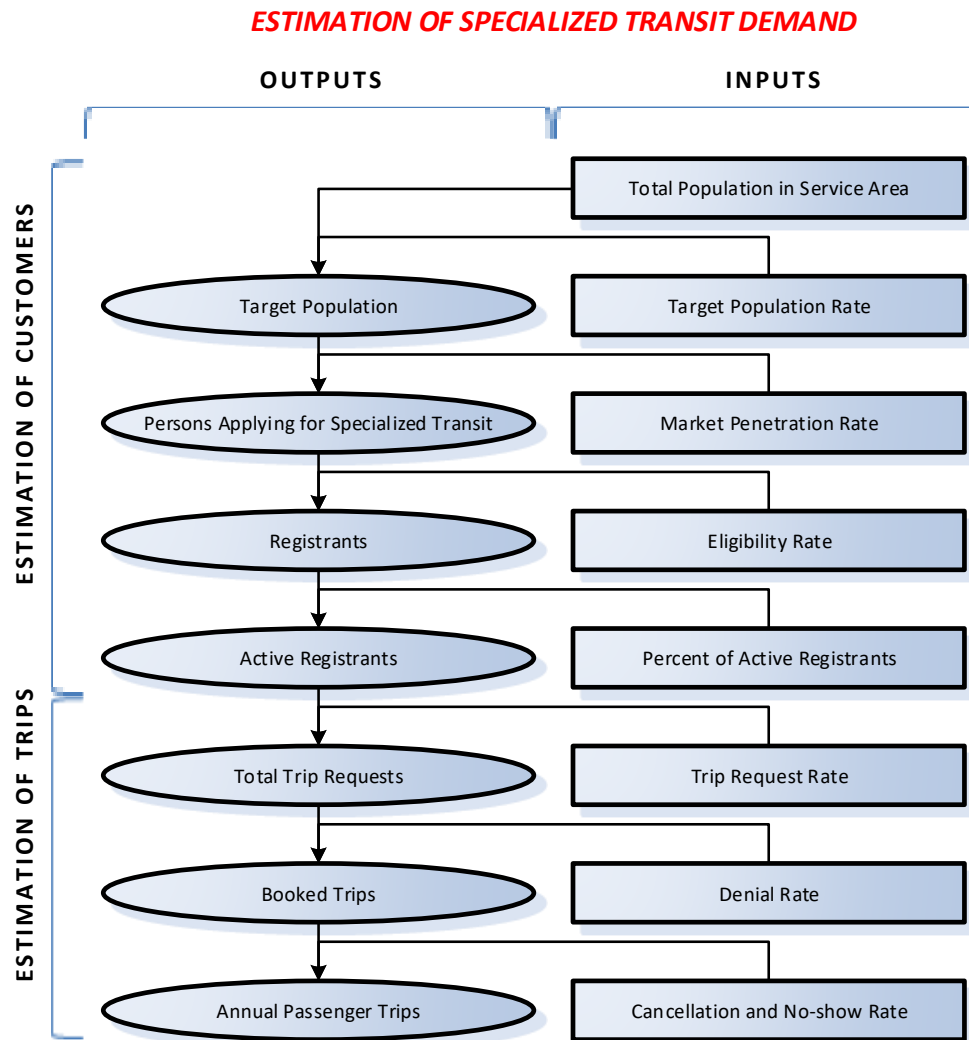
- **ADA paratransit demand** (specifically, annual passenger trips)
- **Capacity needs** (vehicle fleet size required to meet demand)
- **Budget requirements** (fare revenues, O&M costs, operating deficit/subsidy requirements, and capital investments required for vehicles)

The flowcharts in the following three figures below illustrate the methodologies used to estimate these three categories of planning information. The diagrams show the different steps to arrive at the final output and identify the input(s) required at each step. This step-by-step process is described in detail on the Instructions sheet in the tool. On the Instructions sheet, each step in the calculation process is defined by a number. At each step, the intermediate output, the relevant input(s), potential data source(s) for those inputs and the process to be performed are identified and/or defined. Where appropriate, comments are also provided to help the user apply the methodology. In addition, key factors influencing the intermediate output to be estimated are listed. This is particularly useful to understand where in the estimation process specific internal factors (those over which transit managers exercise some control, such as the fare structure) and external factors (which are largely exogenous to the transit system, such as demographic trends) should be considered. For instance, an increase in outreach activity by the transit agency is expected to have a positive impact on the market penetration rate.

For all the methodologies described below, adjustments can be made based on the characteristics of the agency (e.g., type of customers served) or the availability of resources (e.g., data). In particular, some steps may be skipped or added. For instance, the number of Annual Passenger Trips can be determined simply based on an estimate of the number of Registrants and the average number of Trips per Registrant. On the other hand, the number of Annual Passenger Trips can be divided into as many customer categories (gender, age group, type of service, etc.) as desired.

Figure 5 illustrates the process for calculating ADA paratransit demand. For diagrams in the following three figures, boxes represent inputs (or calculated outputs from previous diagrams) and circles are calculated outputs.

Figure 5. Flowchart for Calculating Paratransit Demand

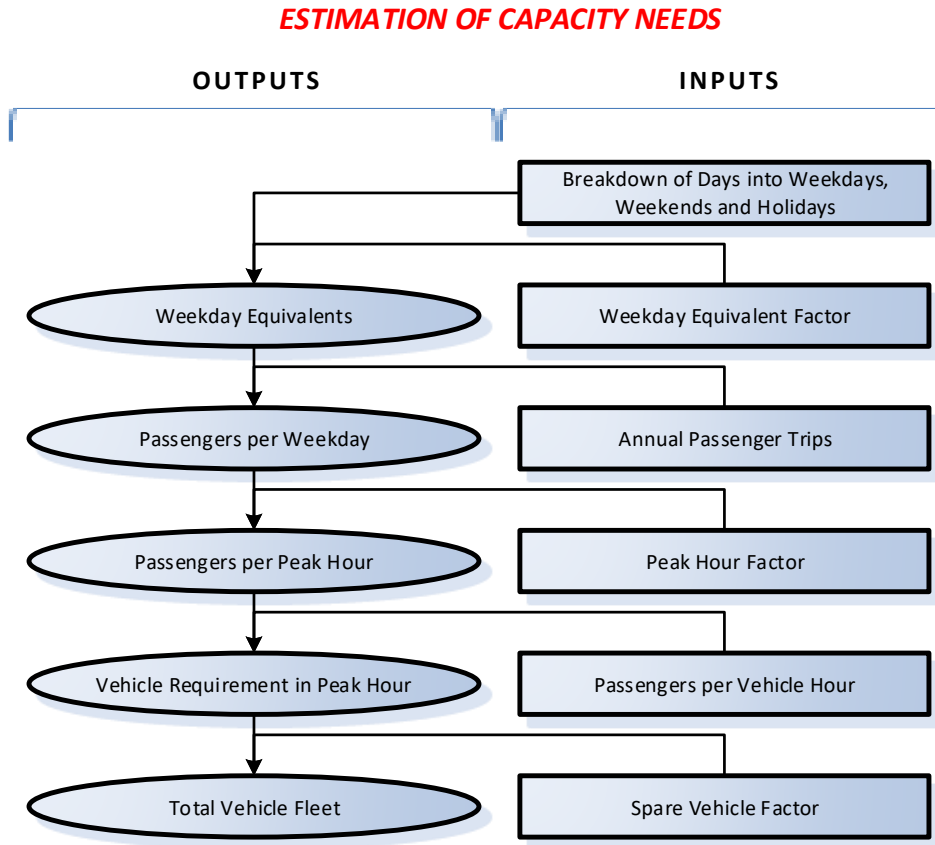


As illustrated by the figure, the outputs are calculated based on inputs and subsequent interim outputs. The list of outputs below explains the calculations. Definitions for all inputs are provided in the tool on the Instruction sheet:

- **Target Population:** Multiply Total Population of Service Area by Target Population Rate
- **Persons Applying for Specialized Transit:** Multiply Target Population by Market Penetration Rate
- **Registrants:** Multiply Population Applying for ADA Paratransit by Eligibility Rate
- **Active Registrants:** Multiply Registrants by Percent of Active Registrants
- **Total Trip Requests:** Multiply Active Users by Trip Request Rate
- **Booked Trips:** Multiply Total Trip Requests by Denial Rate and Subtract the Result from Total Trip Requests
- **Annual Passenger Trips:** Multiply Booked Trips by Cancellation and No-show Rate and Subtract the Result from Booked Trips

Figure 6 illustrates the process for calculating the number of vehicles required to transport the estimated paratransit demand.

Figure 6. Flowchart for Calculating Capacity Needs



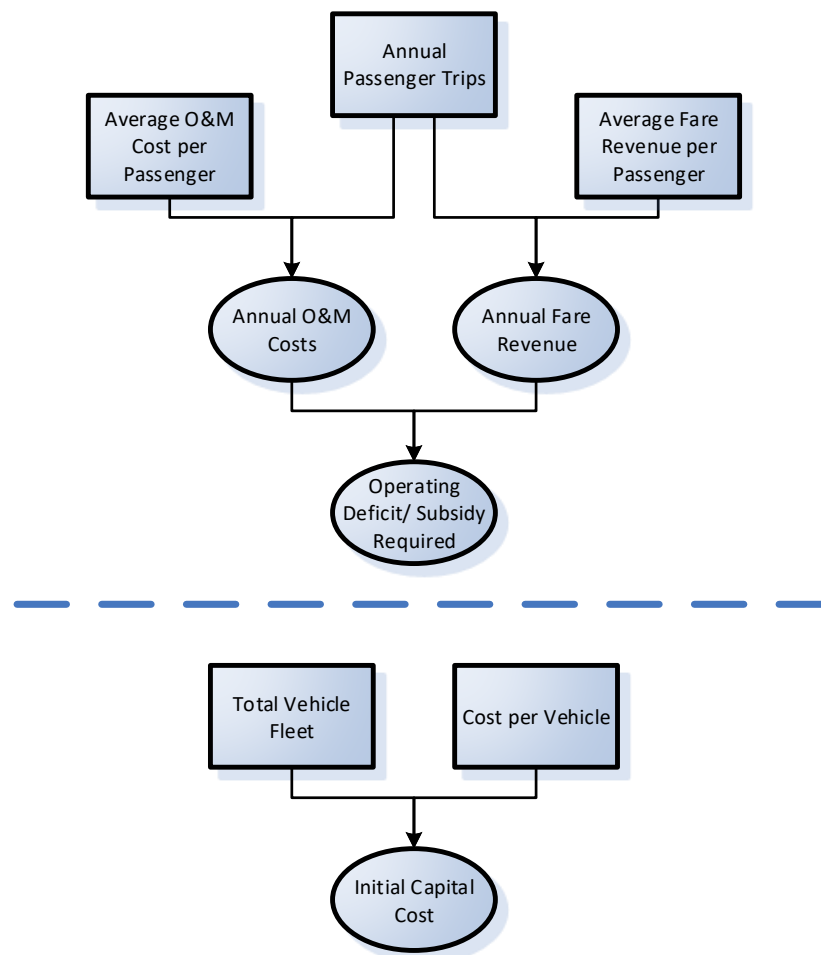
The list of outputs below explains the calculations. Definitions for all inputs are provided in the tool on the Instruction sheet:

- **Weekday Equivalents:** Multiply Breakdown of Days into Weekdays, Weekends and Holidays by Weekday Equivalent Factors
- **Passengers per Weekday:** Divide Annual Passenger Trips by Weekday Equivalents
- **Passengers per Peak Hour:** Multiply Passengers per Weekday by Peak Hour Factor
- **Vehicle Requirement in Peak Hour:** Divide Passengers per Peak Hour by Passengers per Vehicle Hour
- **Total Vehicle Fleet:** Multiply Vehicle Requirement in Peak Hour by (1 + Spare Vehicle Factor)

Figure 7 on the next page illustrates the process for calculating budget metrics given the estimated demand and vehicle fleet requirements.

Figure 7. Flowchart for Calculating Budget Requirements

ESTIMATION OF BUDGET REQUIREMENTS



The list of outputs below explains the calculations, first for the operating deficit/subsidy requirements, and then for the initial capital investment in vehicles. Definitions for all inputs are provided in the tool on the Instruction sheet.

Operating Deficit/Subsidy Required:

- **Annual Fare Revenue:** Multiply Annual Passenger Trips by Average Fare Revenue per Passenger
- **Annual O&M Costs:** Multiply Annual Passengers Trips by Average O&M Cost per Passenger
- **Operating Deficit/Subsidy Required:** Subtract Annual O&M Costs from Annual Fare Revenue

Initial Capital Cost of Vehicles:

- **Initial Capital Cost:** Multiply Total Vehicle Fleet by Cost per Vehicle

5 Updating the Tool Data

Over time, the user may wish to update the underlying data in the tool as it becomes available. There are five data sheets in the tool that the user can update:

- DataAgency
- DataDemographics
- DataNTD
- DataProjections

As described in section 3.2, to run the tool the user must select a specific geography or agency for the analysis. Some of the data in this tool is specific to a particular SCAG agency, while other data is based on one of the six SCAG counties. If the user selects an agency for the analysis, the tool will use agency-specific data where available, and otherwise pull data for the county corresponding to that agency's service area. Similarly, in the case where the user selects a SCAG county for the analysis and only agency data is available, the tool will pull data for the agency corresponding to that county.²

The **DataAgency** sheet includes agency data, which was collected through a combination of agency interviews and the National Transit Database (NTD). Specifically, the worksheet includes 2017 data for the following variables:

- Service area population
- Percent no shows and cancelations
- Passengers per revenue hour
- Fare revenue per passenger
- Number of new applicants
- Number of re-certifications
- Total new applicants and re-certifications
- Number of applicants not eligible
- Eligibility rate

To update the data on this sheet, the user should only replace values in cells with a light blue background. The rest of the cells are calculations and should not be changed. A screenshot of this worksheet is in Figure 8.

² In the case of Riverside County, there are two corresponding paratransit agencies: RTA and SunLine. When Riverside County is selected as the geography of analysis and only agency-specific data is available, the tool takes an average of the data for these two agencies.

Figure 8. DataAgency Sheet

Data by Major ADA Paratransit Agency
 Sources: Agencies and NTD
 see: SCAG_Analysis of System Performance.xlsx

year: 2017

Agency	Service Area Population	% No-Shows + Cancellations (of Bookings) *	Passengers per Revenue Hour	Fare Revenues per Passenger	Number of New Applicants	Number of Re-Certifications	Total New Applicants and Re-Certifications	Number of Applicants not Eligible	Eligibility Rate
Access	11,638,106	6.7%	2.85	\$1.25	24,412	34,377	58,789	8,584	85.4%
GCTD	367,260	9.0%	2.08	\$2.62	822	479	1,301	1	99.9%
IVT	174,610	4.6%	2.09	\$2.11	129	N/A	129	N/A	87.8%
Omnitrans	1,487,235	6.0%	2.52	\$3.88	1,157	992	2,149	41	98.1%
OCTA	2,856,307	1.7%	2.05	\$2.00	3,896	1,746	5,642	32	99.4%
RTA	2,018,724	2.7%	2.80	\$0.80	1,731	173	1,904	71	96.3%
SunLine	432,416	5.0%	2.39	\$2.05	838	720	1,558	0	100.0%
All Agencies	18,974,658	5.6%	2.59	\$1.59	32,985	38,487	71,472	8,729	87.8%
IVT	Imperial County	4.6%	2.09	\$2.11	129	N/A	129	N/A	87.8%
Access	Los Angeles County	6.7%	2.85	\$1.25	24,412	34,377	58,789	8,584	85.4%
OCTA	Orange County	1.7%	2.05	\$2.00	3,896	1,746	5,642	32	99.4%
RTA	Riverside County	3.9%	2.60	\$1.43	2,569	893	3,462	71	97.9%
Omnitrans	San Bernardino County	6.0%	2.52	\$3.88	1,157	992	2,149	41	98.1%
GCTD	Ventura County	9.0%	2.08	\$2.62	822	479	1,301	1	99.9%
	SCAG Region	5.1%	2.40	\$2.10	32,985	38,487	71,472	8,729	87.8%

* Omnitrans counts cancellations as passenger no-shows, therefore cannot parse out cancellations from no-shows

Source: NTD Agency NTD & Agency NTD & Agency Agency Agency Agency

DataDemographics includes 2017 data by county from the U.S. Census Bureau’s American Community Survey (ACS) FactFinder. In particular, the sheet includes data for the following variables:

- Population Data:
 - Total population
 - Persons 60 to 64
 - Persons 65 to 74
 - Persons 75 to 84
 - Persons 85 and older
- Disability Data:
 - Total population used to calculate disability data
 - Total persons with a disability

This data is used to estimate the Target Population Rate (see Inputs&Calc Step 2 to estimate ADA paratransit demand). Two different Target Population Rates are calculated, one based on age, and the other based on disability status. Currently, the tool uses the Target Population Rate based on disability, but this can be changed by altering the formulas in the following location: Inputs&Calc cell I10.

Additionally, the Target Population Rate by age assumes persons 65 and older are part of the target population. This assumption can be changed by adjusting the formulas in cells N7:N21 of the DataDemographics sheet.

To update the data on this sheet, the user should only replace values in cells with a light blue background. A screenshot of the sheet is provided in Figure 9.



Figure 9. DataDemographics Sheet

Data by County from U.S. Census Bureau, American Community Survey (ACS) FactFinder

Year: 2017

Id	Id2	Geography	SCAG Counties from Lookup	Population					Disability		Target Population Estimate	
				Total Population (persons)	Persons 60 to 64 (persons)	Persons 65 to 74 (persons)	Persons 75 to 84 (persons)	Persons 85+ (persons)	Total Population for Disability Data	Total Persons with a Disability	by Age	by Disability
1	0500000US0602	6025 Imperial County, California	Imperial County	179,957	8,952	12,077	6,878	2,861	170,512	24,485	12.1%	14.4%
2	0500000US0603	6037 Los Angeles County, California	Los Angeles County	10,105,722	535,357	710,663	376,828	177,493	10,038,224	993,900	12.5%	9.9%
3	0500000US0605	6059 Orange County, California	Orange County	3,155,816	171,585	240,721	127,556	58,168	3,139,021	271,262	13.5%	8.6%
4	0500000US0606	6065 Riverside County, California	Riverside County	2,355,002	120,201	179,743	98,593	38,643	2,333,253	267,680	13.5%	11.5%
5	0500000US0607	6071 San Bernardino County, California	San Bernardino County	2,121,220	105,274	136,041	63,833	25,300	2,070,914	228,087	10.6%	11.0%
6	0500000US0611	6111 Ventura County, California	Ventura County	847,834	48,531	68,423	33,857	16,966	841,387	91,661	14.1%	10.9%
SCAG Region				18,765,551	989,900	1,347,668	707,545	319,431	18,593,311	1,877,075	12.7%	10.1%
Access											12.5%	9.9%
GCTD											14.1%	10.9%
IVT											12.1%	14.4%
Omnitrans											10.6%	11.0%
OCTA											13.5%	8.6%
RTA											13.5%	11.5%
SunLine											13.5%	11.5%
All Agencies											12.7%	10.1%

The **DataNTD** sheet provides capital and operating cost data collected from the NTD. The data is provided by county and by agency. Information was gathered for both 2017 and 2018, and currently the tool uses data from 2018. The variables included are as follows:

- Operating cost per passenger trip
- Fare revenue per passenger trip
- Rolling stock expenditures per vehicle (average of data for 2014 to 2018)
- Passengers per vehicle hour

The sheet also includes data on paratransit trips by weekday, Saturdays, Sundays, and holidays³ as retrieved from NTD. The data is for 2017 from the file '2017 Service.xlsx'.

To update the data on this sheet, the user should only replace values in cells with a light blue background. A partial screenshot is provided in Figure 10.

Figure 10. DataNTD Sheet

Data by County from National Transit Database (NTD)

HDR calculations based on the information from the following datasets:
 TS2.1TimeSeriesOpExpSvcModeTOS_2
 TS3.1TimeSeriesUsesofCap_2
 TS4.1TimeSeriesAssetModeTOS_2

SCAG County	Operating Cost per Passenger Trip		Fare Revenue per Passenger Trip		Rolling Stock Expenditures per Vehicle Avg. 2014-2018	Passengers per Vehicle Hour		
	2017	2018	2017	2018		2017	2018	
Imperial County	\$47.32	\$49.05	\$2.09	\$2.72	\$18,596	2.11	2.10	
Los Angeles County	\$20.98	\$21.93	\$2.64	\$2.77	\$6,090	2.76	2.74	
Orange County	\$27.31	\$27.63	\$4.16	\$4.53	\$10,740	3.02	2.96	
Riverside County	\$27.61	\$30.05	\$2.97	\$3.20	\$13,728	2.40	2.36	
San Bernardino County	\$17.92	\$19.36	\$3.83	\$3.90	\$13,931	3.58	3.50	
Ventura County	\$33.80	\$35.32	\$2.30	\$2.43	\$5,519	2.50	2.44	
SCAG Region	\$22.63	\$23.66	\$3.03	\$3.21	\$7,609	2.83	2.80	
Access Services	Access	\$34.02	\$34.06	\$2.30	\$2.26	\$8,173	1.92	1.99
Gold Coast Transit	GCTD	\$29.57	\$29.58	\$2.62	\$2.66	\$17,827	2.08	2.10
Imperial County Transporta	IVT	\$47.32	\$49.05	\$2.09	\$2.72	\$18,596	2.11	2.10
Omnitrans	Omnitrans	\$29.31	\$35.74	\$3.78	\$4.00	\$18,441	2.59	2.40
Orange County Transporta	OCTA	\$27.31	\$27.63	\$4.16	\$4.53	\$10,740	3.02	2.96
Riverside Transit Agency	RTA	\$27.77	\$32.22	\$3.69	\$3.62	\$14,050	2.03	1.97
SunLine Transit Agency	SunLine	\$35.39	\$36.19	\$2.05	\$2.55	\$27,251	2.39	2.45
All Agencies	All Agencies	\$31.16	\$31.86	\$3.09	\$3.21	\$9,369	2.25	2.28

³ Note that NTD does not provide trip data for holidays. Instead an assumption is made based on average trips per day for Sundays, scaled up by the number of federal holidays per year.

DataProjections includes demographic forecasts by county, as provided by SCAG. In particular, SCAG provided projections for total population and persons 65 and older for six years: 2020, 2025, 2030, 2035, 2040, and 2045. The tool calculates the average annual growth rate between each set of years and applied this growth rate to the service area population as calculated (or provided by override) on the Inputs&Calc sheet.

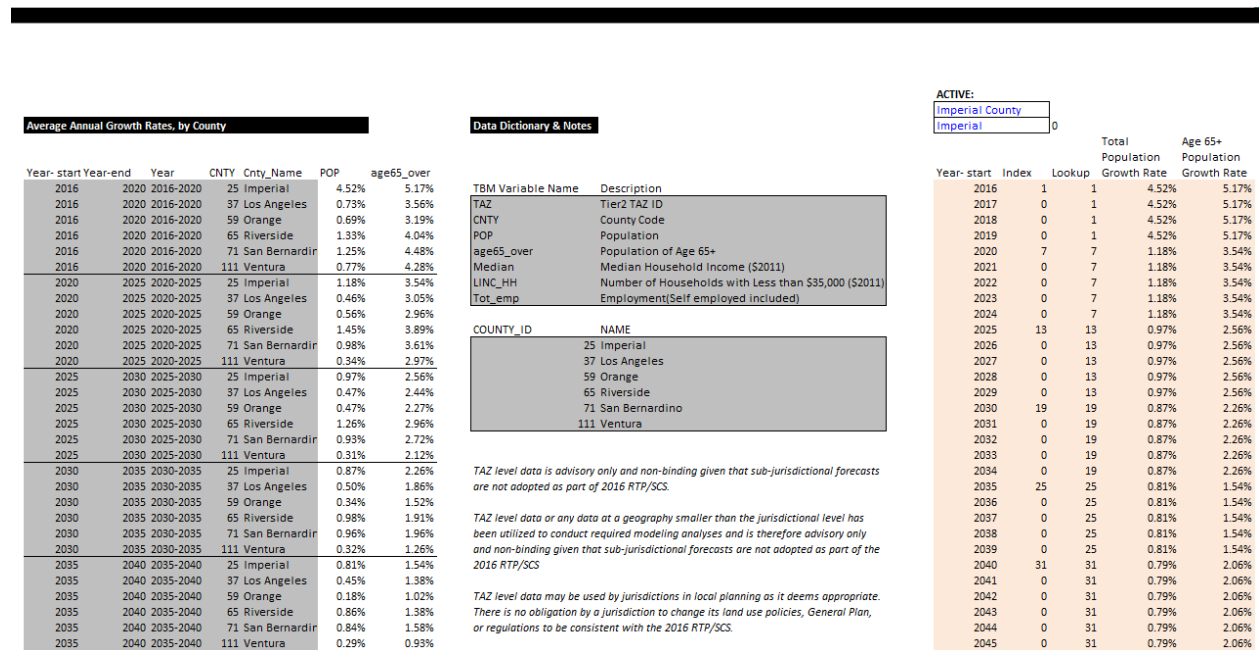
Currently, the tool uses the growth rate for populations 65 and older, but the user can change this to instead use total population growth rates. To make this change, the user should adjust formulas in the following locations:

- Projections sheet, cell D5
- Projections sheet, cells H5:AF5

Because the Projections sheet is protected, the user must first unprotect the sheet to edit the formulas in the above cells. To unprotect the sheet, select Format on the Home toolbar, and click 'Unprotect Sheet'. When finished with edits to the formulas, the user should re-protect the sheet by selecting Format, 'Protect Sheet', and clicking 'OK' in response to the pop-up window.

To update the data on this sheet, the user should only replace values in cells with a light blue background. A partial screenshot is provided in Figure 11.

Figure 11. DataProjections Sheet



Appendix A: Table from Instructions Sheet

Table 1. Estimation of ADA Paratransit Demand

Step	Output	Input	Data Source(s)	Key Factors	Process	Comments
1	-	Total Population of Service Area	SCAG; California DoF	-	-	By default, it is recommended using population estimates reported by SCAG or an official state agency.
2	Target Population	<i>Target Population Rate:</i> percent of population who is the intended target of ADA paratransit service	SCAG	Age structure; household income distribution	Multiply Total Population of Service Area by Target Population Rate	In most cases, the target population will be the population with a mobility disability. By default, it is recommended using data reported by SCAG or an official state agency. Some systems may use a more precise or restrictive definition of the target population (persons with a mobility disability).
3	Persons Applying for ADA Paratransit	<i>Market Penetration Rate:</i> percent of target population who actually applies for ADA paratransit service	Agency	Outreach activity; service area; availability and costs of accessible transportation alternatives; business cycle	Multiply Target Population by Market Penetration Rate	There is no specific data source to obtain/derive the Market Penetration Rate. It is primarily a function of how mature the market is (i.e., how long paratransit service has been provided and the level of community outreach to advertise the service). The more mature the market for ADA paratransit in the service area, the higher the Market Penetration Rate. Evidence from ADA paratransit services in the US suggest that the maximum Market Penetration Rate for a mature market lies between 70% and 80%.
4	Registrants	<i>Eligibility Rate:</i> percent of applicants who are deemed eligible	Agency	Eligibility criteria and evaluation process; provincial and territorial regulations	Multiply Population Applying for ADA Paratransit by Eligibility Rate	Eligibility criteria vary greatly across systems. The more stringent the criteria, the lower the eligibility rate.
5	Active Registrants	<i>Percent Active Registrants:</i> percent of registered customers who have taken at least one trip in the past year	Agency	Frequency of eligibility re-assessment; availability of subscription trips	Multiply Registrants by Percent of Active Registrants	-
6	Total Trip Requests	<i>Average Annual Trips Requested:</i> average number	Agency	Fare structure; service hours; quality of	Multiply Active Users by Trip Request Rate	For each step, the inputs/output can be subdivided into as many groups as needed (dedicated vs. non-dedicated

Step	Output	Input	Data Source(s)	Key Factors	Process	Comments
		of passenger trips requested per active user and per month (or year)		service; seasonality; attendant and companion policy		service, ambulatory vs. wheelchair passengers, subscription vs. regular trips, etc.). Trips refer to passenger trips (as opposed to vehicle trips) and include companions and attendants. For existing services, the inputs should be based on service-specific data. For new services, it is recommended using peer service data.
7	Booked Trips	<i>Denial Rate</i> : percent of denied/ unaccommodated trip requests	Agency	Zero denial policy; capacity	Multiply Total Trip Requests by Denial Rate and Subtract the Result from Total Trip Requests	
8	Annual Passenger Trips	<i>Cancellation and No-show Rate</i> : percent of booked trips cancelled and no-shows	Agency	Cancellation and no-show policy; reservation window; pick-up window	Multiply Booked Trips by Cancellation and No-show Rate and Subtract the Result from Booked Trips	

Table 2. Estimation of Capacity Needs

Step	Output	Input	Data Source(s)	Key Factors	Process	Comments
1	-	Breakdown of Days into Weekdays, Saturdays, Sundays and Holidays	-	-	-	-
2	Weekday Equivalent	<i>Weekday Equivalent Factor</i> : number of weekday equivalents per year	Agency	Service hours; trip purpose	Multiply Breakdown of Days into Weekdays, Weekends and Holidays by Weekday Equivalent Factors	The Weekday Equivalent Factors reflect the relative weighting of ridership by day of the week. ⁽¹⁾
3	Passengers per Weekday	<i>Annual Passenger Trips</i> : includes eligible riders who used dedicated and/or non-dedicated (taxi) ADA paratransit service, as well as attendants, companions, and other non-paying riders; a passenger trip is defined as a one-way trip from origin to destination.	Tool output; Agency	See 'ESTIMATION OF ADA PARATRANSIT DEMAND' above	Divide Annual Passenger Trips by Weekday Equivalent	-



Step	Output	Input	Data Source(s)	Key Factors	Process	Comments
4	Passengers per Peak Hour	<i>Peak Hour Factor</i> : percent of passengers during the maximum volume hour of the day	Agency	Service hours; urban vs. rural area; trip purpose	Multiply Passengers per Weekday by Peak Hour Factor	The Peak Hour Factor accounts for fluctuations in providing trips over the course of the day. Weekday ridership usually exhibits two peaks, morning and afternoon, which coincide with travel to work and school.
5	Vehicle Requirement in Peak Hour	<i>Passengers per Vehicle Hour</i> : regular service passenger trips divided by revenue vehicle hours	Agency	Dedicated vs. non-dedicated service; service area; attendant and companion policy	Divide Passengers per Peak Hour by Passengers per Vehicle Hour	-
6	Total Vehicle Fleet	<i>Spare Vehicle Factor</i> : spare vehicles as a percentage of vehicle fleet	Agency	Average fleet age; average kilometers per vehicle and per year	Multiply Vehicle Requirement in Peak Hour by (1 + Spare Vehicle Factor)	As a rule of thumb, the number of spare vehicles should be at least one vehicle or 15% of the number of peak vehicles, whichever is greater.
7	<p>The split between ambulatory and non-ambulatory passengers (see 'ESTIMATION OF ADA PARATRANSIT DEMAND') along with the vehicle occupancy rate for each type of vehicle (sedan, minivan and small bus) will help determine the number of vehicles needed.</p> <p>Ideally, the vehicle fleet composition should mirror the requirements of non-ambulatory and ambulatory passengers. However, as ambulatory passengers may be transported on both accessible vehicles and non-accessible vehicles, transit planners tend to use a higher percentage of accessible vehicles to ensure fleet flexibility, especially in small systems.</p>					

(1) Example - A transit system operates 365 days a year, broken down into 251 weekdays, 52 Saturdays, 52 Sundays and 10 holidays. Ridership weekday equivalent factors are determined using the number of service hours:

	Days		Service Hours	Weekday Equivalent Factor		Weekday Equivalents
Weekdays	251	x	206	1.00	=	251.00
Saturdays	52	x	84	0.41	=	21.20
Sundays	52	x	66	0.32	=	16.66
Holidays	10	x	55	0.27	=	2.67
Total	365					291.53

Table 3. Estimation of Budget Requirements

Step	Output	Input	Data Source(s)	Key Factors	Process	Comments
1-1	-	Annual Passenger Trips	Tool output; Agency	-	-	-
1-2	Annual Fare Revenue	Average Fare Revenue per Passenger	Agency	Fare structure; farebox recovery ratio	Multiply Annual Passenger Trips by Average Fare Revenue per Passenger	The average fare revenue per passenger was \$2.12 and the average farebox recovery ratio was 7.2% in 2018. There may be opportunities to generate other non-fare revenues from advertising, charter services or other activities; however, the funds generated are typically very small.
1-3	Annual O&M Costs	Average O&M Cost per Passenger	Agency	Average passenger trip distance; passengers per vehicle hour	Multiply Annual Passengers Trips by Average O&M Cost per Passenger	The average operating cost per passenger was \$26.58 in 2018.
1-4	Operating Deficit/ Subsidy Required	-	-	-	Subtract Annual O&M Costs from Annual Fare Revenue	-
2-1	-	Total Vehicle Fleet	Tool output; Agency	-	-	-
2-2	Initial Capital Cost of Vehicles ⁽²⁾	Cost per Vehicle	Agency	Type of vehicle (sedan, minivan or small bus)	Multiply Total Vehicle Fleet by Cost per Vehicle	Vehicles for ADA paratransit service may be funded or acquired in multiple ways: direct purchase from a municipal capital account, capital financing from a senior level of government, charity donation, vehicle leasing or a contract for service that includes both operating and capital charges per hour or month of service.

⁽²⁾ The initial capital investment only includes spending on vehicles, it does not include costs of facilities, or communications equipment