

# American Boulevard Travelshed Analysis

## **Prepared by**

Steven Aviles and Sanjay Dhir

Students in GEOG 5564: Urban Geographic Information Systems Analysis

University of Minnesota

Instructor: Jeff Matson

## **On behalf of**

The City of Rosemount

## **With support from**

The Resilient Communities Project

**Resilient Communities Project**

---

**UNIVERSITY OF MINNESOTA**

**Driven to Discover<sup>SM</sup>**

This project was supported by the Resilient Communities Project (RCP), a program at the University of Minnesota that convenes the wide-ranging expertise of U of M faculty and students to address strategic local projects that advance community resilience and sustainability. RCP is a program of the Center for Urban and Regional Affairs (CURA).



This work is licensed under the Creative Commons Attribution-NonCommercial 3.0 Unported License. To view a copy of this license, visit

<http://creativecommons.org/licenses/by-nc/3.0/> or send a

letter to Creative Commons, 444 Castro Street, Suite 900, Mountain View, California, 94041, USA. Any reproduction, distribution, or derivative use of this work under this license must be accompanied by the following attribution: “Produced by the Resilient Communities Project at the University of Minnesota, 2014. Reproduced under a Creative Commons Attribution-NonCommercial 3.0 Unported License.”

This publication may be available in alternate formats upon request.

**Resilient Communities Project**

University of Minnesota  
330 HHHSPA  
301—19th Avenue South  
Minneapolis, Minnesota 55455  
Phone: (612) 625-7501  
E-mail: [rcp@umn.edu](mailto:rcp@umn.edu)  
Web site: <http://www.rcp.umn.edu>



*The University of Minnesota is committed to the policy that all persons shall have equal access to its programs, facilities, and employment without regard to race, color, creed, religion, national origin, sex, age, marital status, disability, public assistance status, veteran status, or sexual orientation.*

## INTRODUCTION

In transit planning it is common practice to design transit routes that transport workers to their 9-5 jobs in major job centers. This is often the case for most suburban transit providers who provide a majority of their transit routes as express routes which transport their suburban residents to either central city job centers or suburban highway located job centers. This is the case for transit planners for the Minnesota Valley Transit Authority (MVTA) and the City of Rosemount who are interested in the job center on the American Boulevard corridor.

MVTA is a south twin cities suburban transit provider that operates local buses in its communities of Rosemount, Shakopee, Apple Valley, Eagan, Prior Lake, Burnsville, and Savage as well as express buses from these communities to job centers in Minneapolis, St. Paul and other suburban highway focused job centers. The City of Rosemount is interested in this analysis because of a partnership with the Resilient Communities Project (RCP) that focuses on connecting communities in Minnesota with the wide-ranging expertise of University of faculty and students to address pressing local issues in ways that advance sustainability and resilience.

The corridor in study, American Boulevard, is a suburban job center just south of I-494 in Richfield, Bloomington, and Edina. The scope of this project determined the locations to be bounded easterly by Minnesota Highway 77 (Cedar Ave), bounded westerly by Minnesota Highway 100, bounded southerly by American Boulevard and bounded northerly by W 78th St. The corridor itself is very autocentric and is underserved by transit. There are many large employers in this corridor and it has a wide variety of occupation types.

## OBJECTIVES

The preliminary objectives for this analysis will be to provide the transit planners within MVTA and the City of Rosemount with adequate data to determine:

- The amount of people who live in MVTA communities but work in American Boulevard
- The amount of people who live in American Boulevard but work in MVA communities
- Determine the current access to transit

The primary objectives for this analysis after discussing the preliminary objectives with the clients was to determine three possible routes from three different communities: Shakopee at Marshall Rd Transit Station, Apple Valley at Apple Valley Transit Station, and Burnsville at Burnsville Transit Station. The following parameters were in place:

- Total trips no longer than 1 hour.
- No more than 1 transfer.
- Determine service span needs (peak for traditional 8 am to 5 pm workers; multiple shift start/end times for retail and non-traditional employers; potential for a reverse commute market)

The primary objective also includes the type of routes, a schedule of the routes, potential ridership estimates, and the feasibility analysis of a reverse commutes.

## DATA SOURCES

The following datasets were provided by the staff from MVTA:

- GIS shapefile of MVTA bus routes: This shapefile was used to determine the current transit access for MVTA communities to American Boulevard.
- GIS shapefile of MVTA service area boundary: This shapefile was used to determine the amount of people that lived/work in MVTA communities as well as used as a reference to show the study area.
- GIS shapefile of MVTA park and rides and transit stations: This shapefile was used to pinpoint where the potential routes could start and stop as well as defining the path of the potential transit route.
- General Transit Feed Specification (GTFS) data for MVTA scheduling: These text file data were used to determine the fastest route as well as the scheduling times between each of the stops for the routes.
- TransitCenters\_MVTAandBlueXpress: This shapefile was used to determine the starting points for potential routes.

The following datasets were provided by MetroGIS Datafinder:

- Metro Transit - Transit Stops: This shapefile was used to determine the stops that were in existence that MVTA could use for transit stops.
- Metro Transit - Transit Routes: This shapefile was used to determine the current access to transit for the three cities: Shapokee, Apple Valley, Bunsville.

The following datasets were provided by US Census Bureau (OnTheMap)

- Longitudinal Employee-Household Dynamics (LEHD) Origin-Destination Employment Statistics (LODES): Employment destination and home destination shapefiles used to determine how many people in MVTA communities work in American Boulevard and how many people in American Boulevard work in MVTA communities.
- Census Blocks: This shapefile was used to find the American Boulevard area to be used as reference as we as used in finding LODES data in OnTheMap.

## GIS Methods

The first step was to bring in US Census Blocks downloaded from the census website in order to figure out the reference for the project's scope. We used Census Blocks because they are the smallest census unit that we can use to get demographic data for jobs in OnTheMap. Using ESRI's *Streets* Basemap we were able to determine which census blocks would be within the perimeter of American Boulevard. Using the *Select Features* tool we manually selected the Census Blocks and then exported them so we could use them in OnTheMap.

Using OntheMap we imported the the American Boulevard Census Blocks Using this shapefile we were able to perform an analysis on this geographic area to figure out the Home-Work Cities and Work-Home Cities for the MVTA Communities and American Boulevard. We exported these files so we could bring it into ArcMap.

Next we did a definition query for both shapefiles: Home-Destination Cities and Destination-Work Cities for only MVTA Communities. The Definition Query is as follows:

*"label" = 'Apple Valley city, MN' OR "label" = 'Prior Lake city, MN' OR "label" = 'Shakopee city, MN' OR "label" = 'Burnsville city, MN' OR "label" = 'Eagan city, MN' OR "label" = 'Rosemount city, MN' OR "label" = 'Savage city, MN'*

Looking at the metadata we determined the the attribute field *s000* was total jobs. We changed the symology by *Symbology>Quantities Graduated Colors: Fields = s000, Normalization = none, Color Ramp = pink to red, Classification = 3 Manual*. This was done to display to our clients the preliminary objects of the amount of people who live in MVTA communities but work in American Boulevard and the amount of people who live in American Boulevard but work in MVA communities.

Utilizing Google Maps we were able to figure out the current access to transit. Making the appropriate mode of transportation to transit and the right time of day and correct origin destinations we were able to see what routes it would take to get from point A to point B. In ArcMap we did a Definition Query for those routes that pertained to routes designated by Google Maps. Doing a Definition Query for each of the MVTA Transit Stations that we were of focusing (Marshall Rd Transit Station , Apple Valley Transit Station and Burnsville Transit Station) was completed to designate these terminals for the bus routes.

Next in order figure out the most feasible stops that our potential routes would stop at it, we used LED data that pertained to the number of jobs in the American Boulevard Census Blocks. Using Location Origin Destination data from the US Census we filtered in Excel for three cities, Shakopee, Apple Valley, and Burnsville. Then we brought those into ArcMap and because ArcMap didn't let us open our .csv file for some reason we used the Conversion tool of *Excel to Table* in order to make our .csv a dbase file. Once we had our LED Data we could do a

Join by Attributes by the *geoid10* for the Census Blocks and the field *geoid* for the LED dBase file. I exported this joined file as a shapefile called LED\_American\_Blvd. We then did a symbology change by *Symbology > Quantities Graduated Colors*: Fields = *total*, Normalization = none, Color Ramp = pink to red, Classification = 3 Manual in order to see where most of the jobs were. This gave us a good understanding where most of the jobs were so we then could decide where we wanted our transit stops to be.

Using an Esri application for getting *General Transit Feed Specification (GTFS) data into a Network Dataset* within ArcGIS that was created by Melinda Morang from Esri called *Add to GTFS Data to Network Dataset Tool* we were able to incorporate GTFS data into our network dataset which allows us to use transit schedules to figure out the actual time it takes for transit to travel (the tutorial and tools can be downloaded at <http://www.arcgis.com/home/item.html?id=0fa52a75d9ba4abca6b88bb6285fae1>). First steps for this include creating a File Geodatabase, a Feature Dataset, and incorporating GTFS data as well as road data that we obtained from MetroGIS. We then ran the tools created by ESRI's Melinda Morang that run scripts in order to generate transit lines and stops from the GTFS data as well as stop-street connectors to connect points to the edges that are created in a network dataset. Then we had to designate the connectivity groups for the network dataset. Next we had to define the evaluator for the transit evaluator for our network dataset so we could get proper units of minutes when calculating routes.

**\*Due to the bugginess of this tool because it is in its beta stages, the tool was inconsistent and did not fully work.**



Once our network dataset was ready we ran a *Route* tool in the Network Analysis toolbar which finds the fastest route for a group of stops (this is done by creating a *New Route*). We loaded our transit stops into the *stops* field of tool. The stops for each route were definition queried to only include the stops that we chose the route should run on. An example of these stops definition query would be

```
(stop_id = 'GoogleTransit:41208' OR stop_id = 'GoogleTransit:1056' OR stop_id = 'GoogleTransit:1054' OR stop_id = 'GoogleTransit:52215' OR stop_id = 'GoogleTransit:4523' OR stop_id = 'GoogleTransit:42318' OR stop_id = 'GoogleTransit:51405').
```

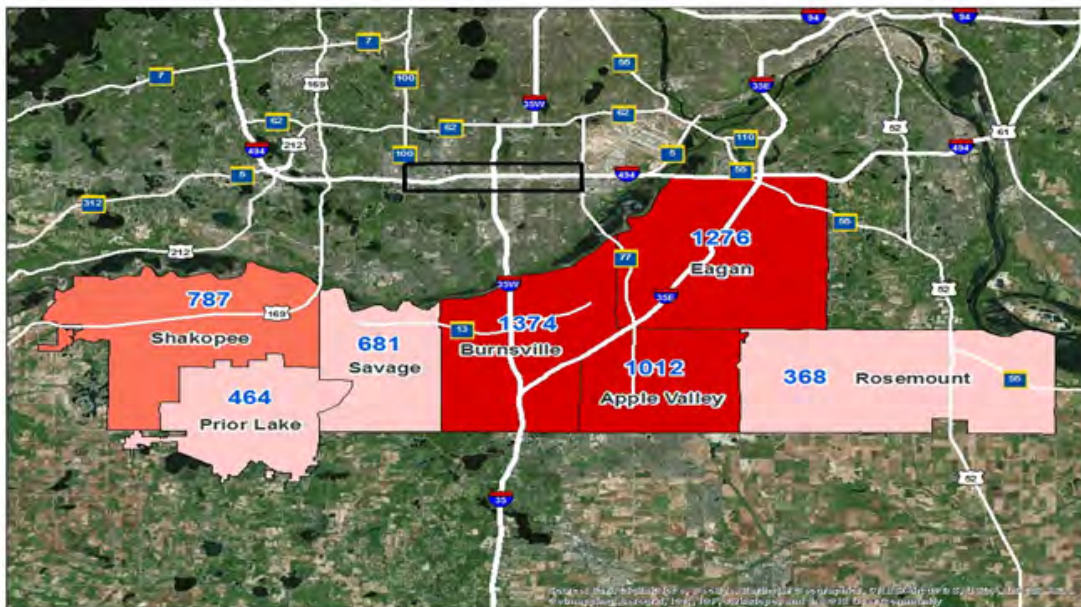
These stops were current Metro Transit stops on American Boulevard that had the most jobs in the adjacent Census blocks as well as being on the same side of the street as the rest of the routes. In the Analysis Settings of the Route Network Analyst Window we define the impedance as minutes since we wanted to figure how long the route. Also we had to use a streets shapefile that the GTFS data to Network Analyst tool created because Network Analysis automatically calculates the fastest route. We also set the settings to *Reorder Stops to Find Optimal Route* because it reorders the stops for the fastest route. This process was repeated for each of the transit stations of Marshall Rd Transit Station, Apple Valley Transit Station, and Burnsville Transit Station.

When making a route in Network Analyst it does not split up the route line in segments which means we could not figure out the exact time it would take to travel from one stop to the other. This is problematic as one of our objectives was to make a schedule that designates when the bus will arrive at a stop and how long it will take to travel along the bus route. Instead we had to convert our *route\_stops* shapefiles into KML files using the conversion tool *Layer to KML*.

First we needed create our transit\_routes shapefiles into layers, and then use the *Layer to KML* conversion so we can import it into Google Maps. Once in Google Maps we are able to see how long it takes to travel from one stop to the next. The general rule of thumb in transit planning is to multiply the time it takes to travel by 1.3 in order to account for boarding and alighting times. We were then able to create a proper schedule for each of the routes for 6, 7, and 8 a.m.

## Results/ Recommendations

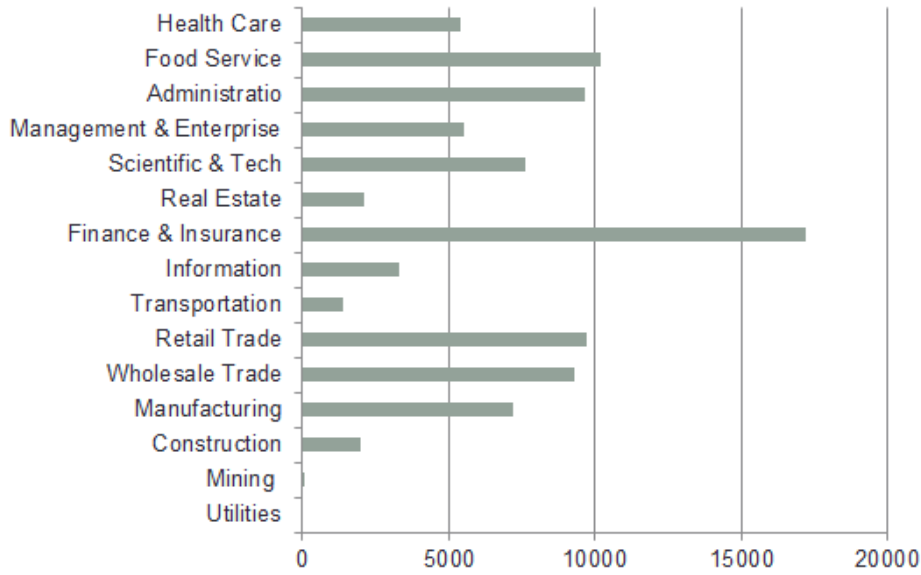
- After conducting an analysis on the number of MVTA residents that work in American Boulevard ( Using the U.S. Census OnTheMap application by importing the American Blvd census block shapefile), we noticed the majority lives in Apple Valley, Eagan and Burnsville. The corridor is visually defined as the black rectangle.



- The reverse analysis on the number of American Blvd corridor residents that work in MVTA communities was done using the same method, and the contrasting results (indicated below) suggest low ridership potential for a reverse commute.



- It was necessary to show what type industries exist in the American Blvd corridor so planners could broadly grasp a better understanding of what work schedules may look like for MVTA residents. The data, Local Origin- Destination Employment Statistics, was provided by MetroGIS, and we summed the type of jobs in all American Blvd census blocks and displayed the counts in the graph below. The jobs were classified by code according to the North American Industry Classification System (NAICS). We see that the majority of jobs are held in the Finance & Insurance sector. Therefore, implementing a fixed route service that adheres to early morning- afternoon work schedules could be considered MVTA



- Before our process of depicting what potential routes and bus stops would look like, we narrowed the options to buses leaving Shakopee and Burnsville . Subsequently, we acquired industry and population count information for census blocks of where stops would likely occur. Due to unclear or unprovided data, and unnecessary information, blank spaces are noted in the table below.

### From Marschall Rd Transit Station to MOA

Stop Number on Map	Location at (Cross Street)	Business (Type or Name)	Employee pop. Per Census Block	Schedule Time	Schedule Time
1	Marschall Rd Transit Station			Leaving:6:10am	Leaving: 7:00am
2	Drew Ave S/ Northland Dr	Real Estate, IT, Financial Services	6,351 Employed	16min Departing: 6:26am	17min Departing: 7:27am
3	Queen Ave S	Target, Fast Food Chains	1,577 Employed	2min 36sec Departing: 6:28am	2min 50sec Departing: 7:29am
4	Morgan Crt	Smithtown Shopping Center	3,833 Employed	1min 18sec Departing: 6:29am	2min 05sec Departing: 7:31am

5	Lyndale Ave S	The Toro Company/ Goodwill	1,218 Employed	2min 36sec Departing: 6:31am	3min Departing: 7:34am
6	Chicago Ave		1,262 Employed	3min 54sec Departing: 6:34am	4min 3sec Departing: 7:38am
7	Bloomington Ave		1,574 Employed	1min 18sec Departing: 6:35am	2min Departing: 7:40am
8	24 <sup>th</sup> Ave S	MOA		2min 36sec Arriving: 6:37am	3min Arriving: 7:43am

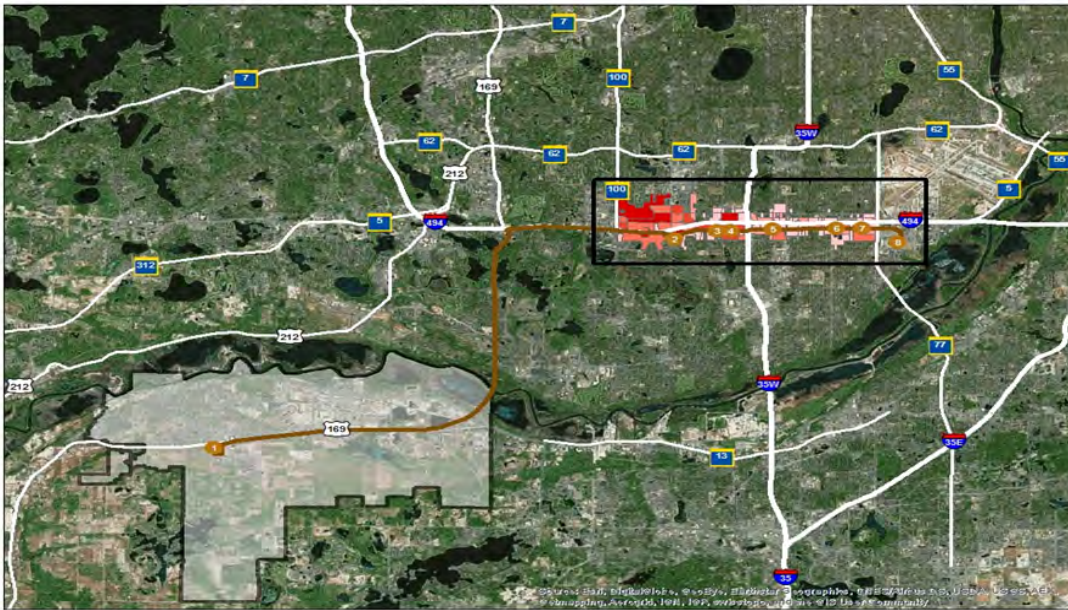
### From Burnsville Transit Station to MOA

Stop Number on Map	Street Location	Business (type or name)	Employee pop. Per Census Block	Schedule Time	Schedule Time
1	Burnsville Transit Station			N/A Leaving: 6:10am	Leaving: 7:00am
2	Penn Ave	Retail/ Restaurant	235 Employed	11min 42sec Departing: 6:22am	15min Departing: 7:15am
3	Drew Ave	Hotel Chains	6315 Employed	5min 12sec Departing: 6:27am	6min 30sec Departing: 7:21am
4	76 <sup>th</sup> St W		5063 Employed	3min Departing: 6:30am	4min Departing: 7:24am
5	76 <sup>th</sup> St W		3728 Employed	9min 6sec Departing: 6:39am	10min Departing: 7:34am
6	American Blvd	Home Depot/ Sam's Club	235 Employed	5min 12sec Departing: 6:44am	6min Departing: 8:00am
7	Nicollet Ave	Hotel Chains	178 Employed	1min 16sec Departing: 6:45am	2min Departing: 8:02am
8	Chicago Ave	Walmart Supercenter	204 Employed	2min 36sec Departing: 6:47am	3min 5sec Departing: 8:05am

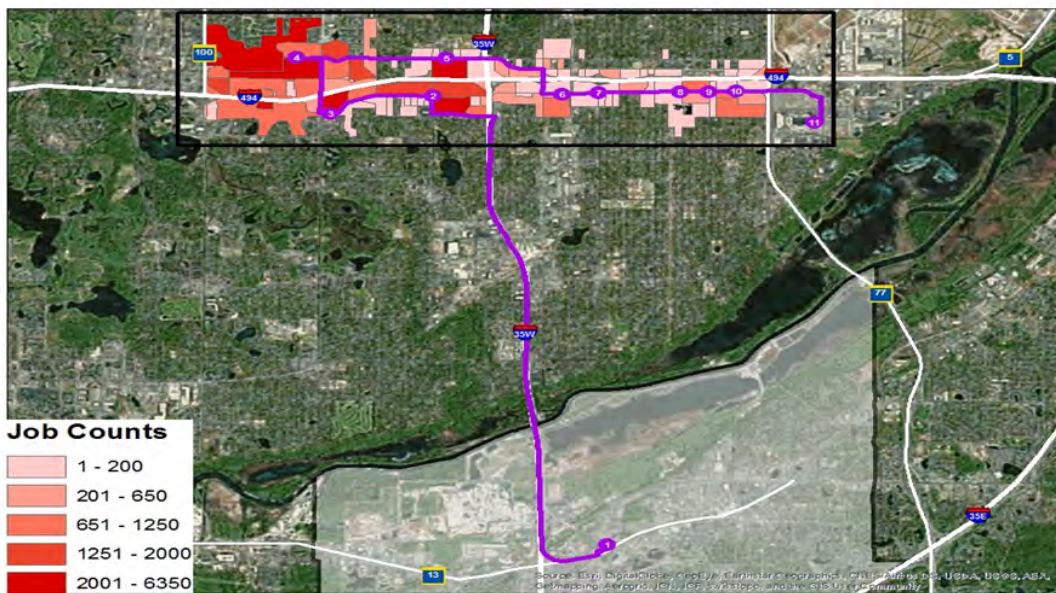
9	13 <sup>th</sup> Ave S	Diverse Industries	1058 Employed	56sec Departing: 6:48	1min 30sec Departing: 8:07am
10	Bloomington Ave S	Hotels/ Service Industry	751 Employed	29sec Departing: 6:48am	1min Departing: 8:08am
11	24 <sup>th</sup> Ave S	MOA		3min 54sec Arriving: 6:51am	5min Arriving: 8:13am

The information depicted in both tables should be used for further analysis on potential route development. Knowledge of the type of industry within a census block could be used for determining necessary service times. The route leaving Marshall Rd Transit Station would roughly take 43 minutes to reach the MOA if leaving at 7am, as opposed to the service taking 27 minutes at 6:10am. The route leaving Burnsville Transit Station would take 41 minutes to reach the MOA when departing at 6:10am and 1 hour 13 minutes at 7am. Although our routes are supposed to stay within the time frame of 1 hour, having an idea of the calculated service time is an important preliminary step. An attempt at making the route time stay within an hour by testing pilot service projects is strongly recommended as a next step. A reconfiguration of stops may be inevitable to this step. For the route leaving Shakopee, stops are numerically ordered and are located along American Blvd in census blocks of highly concentrated employers. To account for several high employment-concentrated census blocks, the Burnsville route travels east of 35W before making its way west to MOA. Therefore, the service would deviate from American Blvd for a large part of the ride.

## The Proposed Route from Shakopee (Marschall Rd) to MOA



## The Proposed Route from Burnsville Transit Station



The existing service that one could take from Apple Valley to MOA should be utilized by residents that work in the American Blvd corridor. Under the parameter of a travel time less than 1 hour and no more than 1 transfer, one could travel from Apple Valley Transit Center to a location slightly east of Minnesota highway 100 by simply taking the MetroTransit Red line service to MOA and then transfer to MetroTransit route 540. Although this existing service is not operated by MVTA, it provides an efficient commute for Apple Valley residents who work at the Best Buy headquarters in Richfield, MN. The existing routes are shown in the image below. Unfortunately, the transit stops shapefile provided by MetroTransit did not consider route specific attribute fields so we could not depict stops for route 540.

### **Existing Route Service from Apple Valley Transit Center**





