Evaluating Community Building Effectiveness of Transportation Investments: Knowledge Transfer Webinar Series

Webinar I: MOE GIS Data Preparation

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Introduction

o Measures of Effectiveness (MOE)

- ◦ Property value change: Disaggregate parcel level data layers will be employed to compute the change in property value

- ◦ Changes to job accessibility: Census bureau data will be used to examine how the number of employment has varied

- ◦ Commuting time change: American Community Survey data will be used to measure changes to commute travel times

- ◦ Land use type change: Disaggregate parcel level data layers will be employed to identify the land use change from vacant to residential, industrial and commercial

- ◦ Changes to travel patterns for zero car households: Census bureau data will be used to measure job accessibility around MOE

Introduction

- MOE computation process is performed using ArcGIS and SPSS for the time period 2011-2017.

- For sake of brevity, we present the layer preparation steps for 2012 and for SunRail stations only.
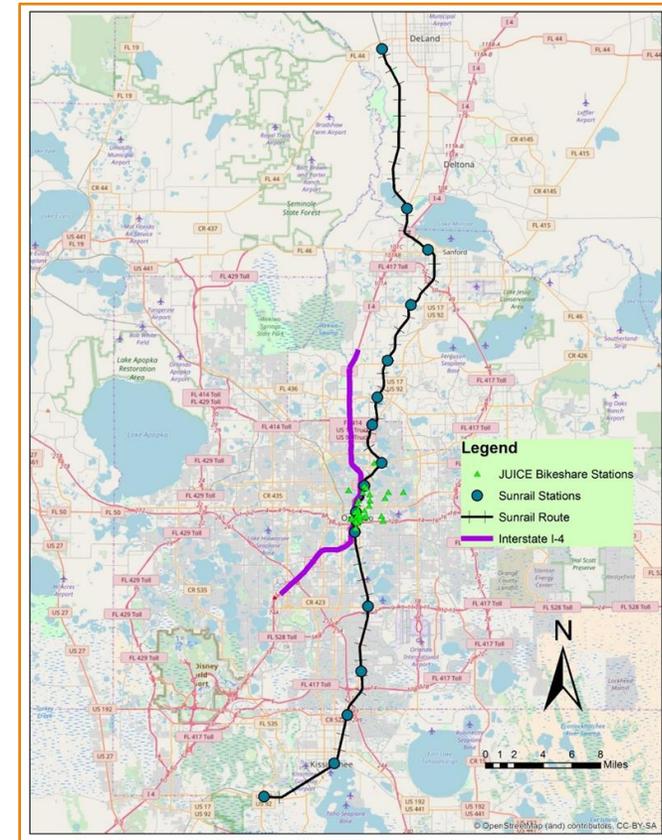
Property value

o County Parcel Shapefile is utilized in this study

◦ To capture the change in property value, parcel data for (2011-2017) is obtained from Florida Department of Revenue (FDOR)

◦ County parcel shapefile contains unique parcels within each county (Orange, Osceola, Seminole, Volusia)
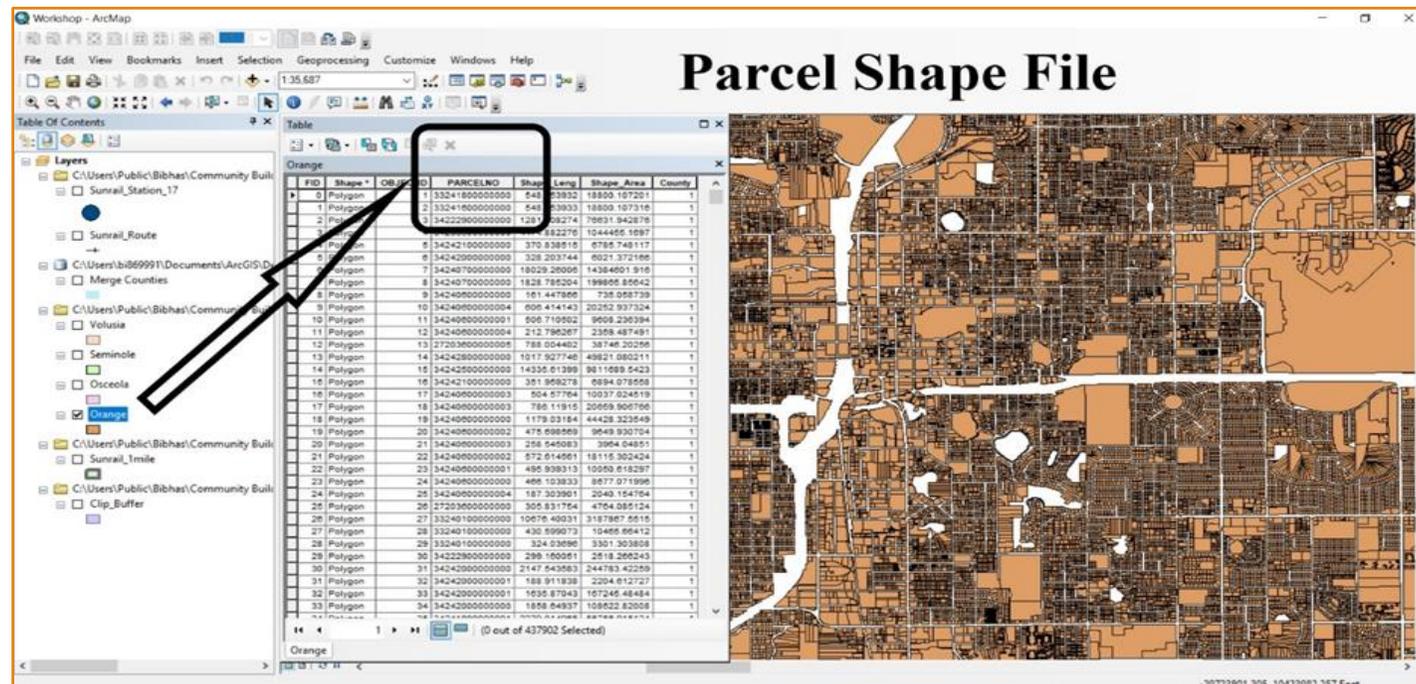
Parcel Shape File

Co-ordination System Projection

o Our aim is to project all the parcel shapefile to same coordination system.

o To perform this, we need to follow several steps in ArcGIS.
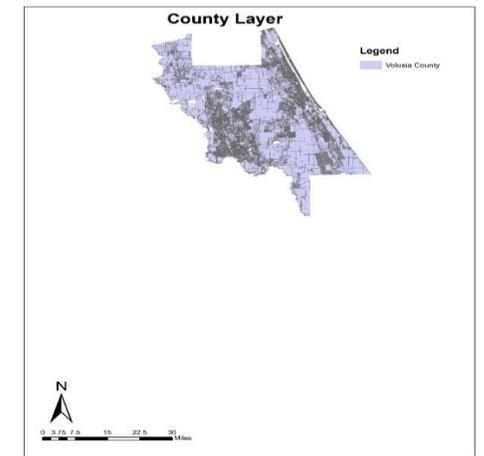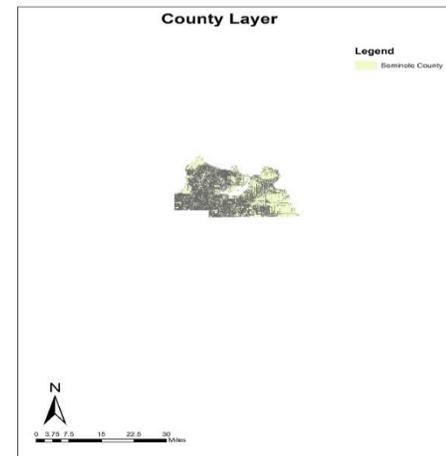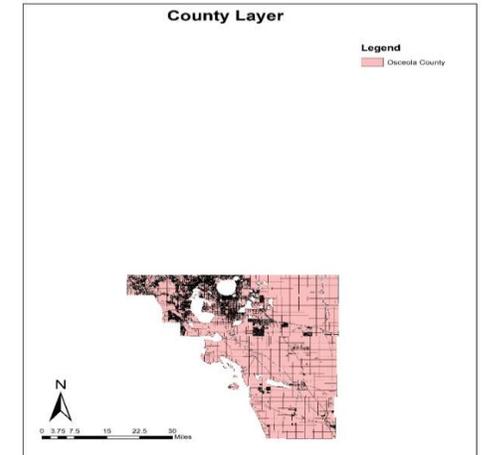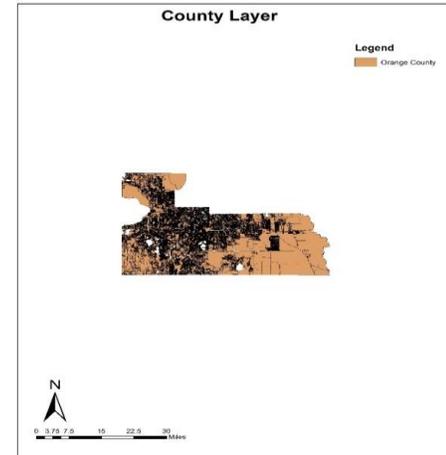
Co-ordination System Projection
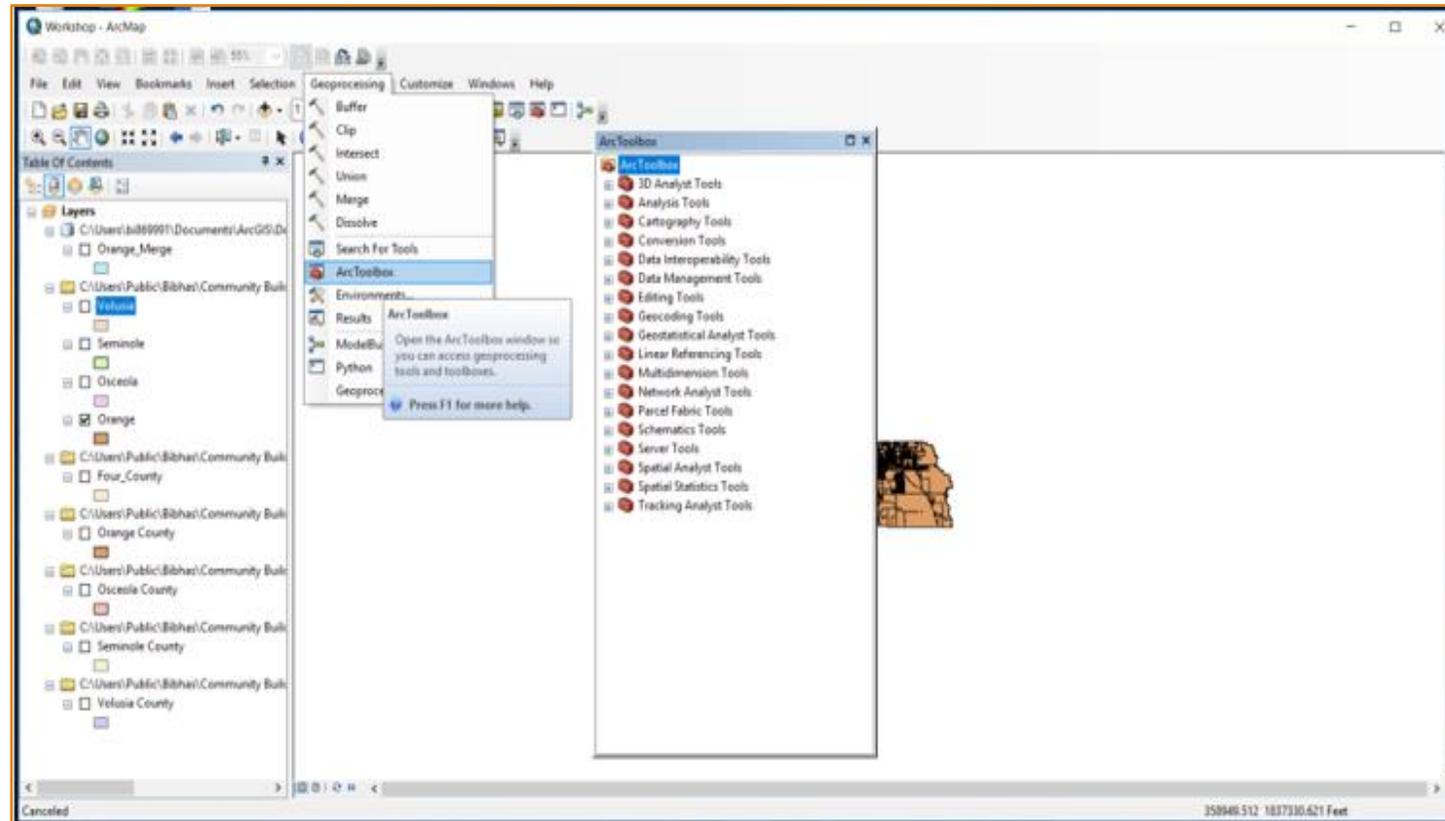
o Step 1:

Co-ordination System Projection

○ Step 2:
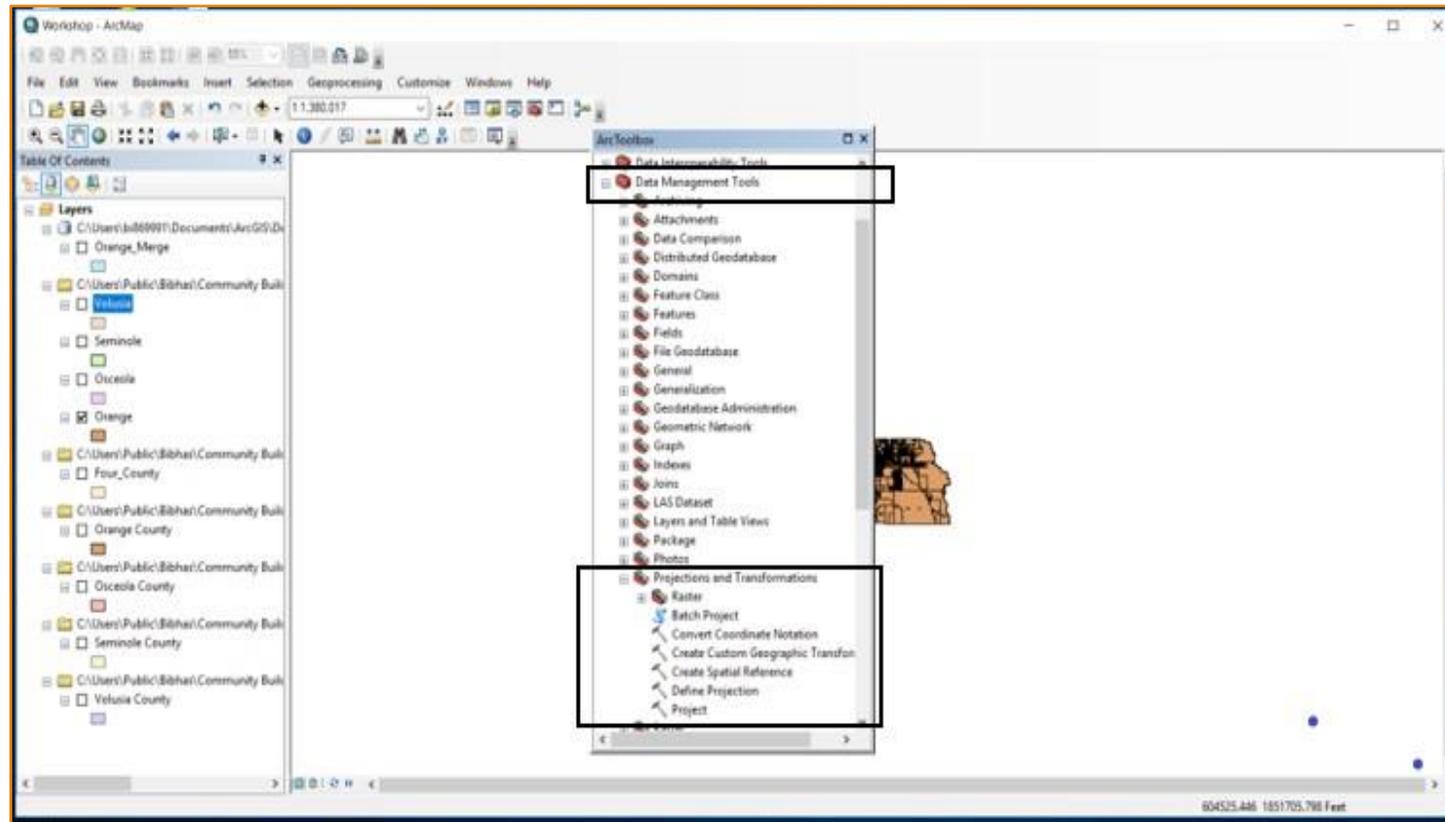
Co-ordination System Projection

○ Step 3:
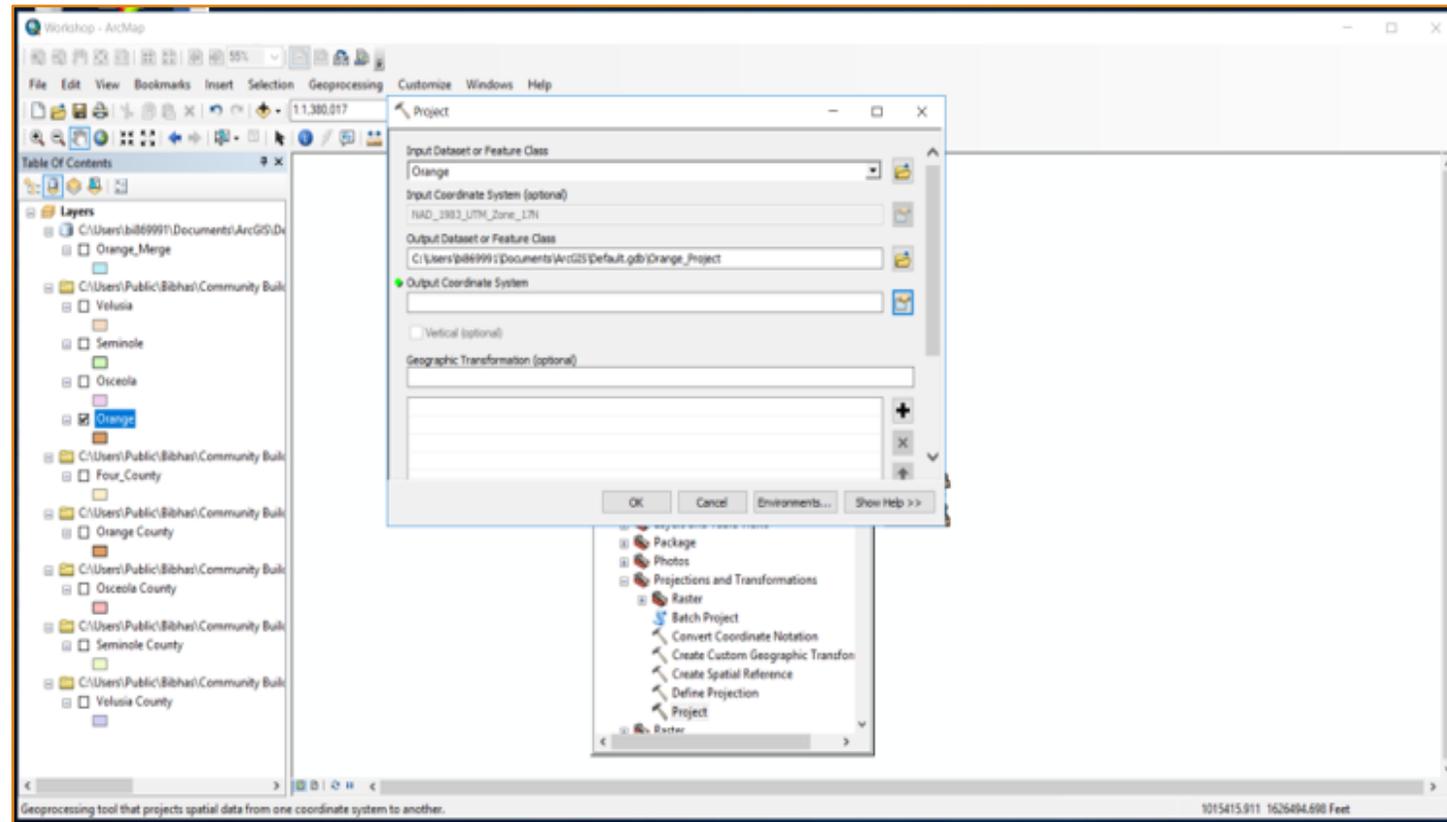
Co-ordination System Projection

○ Step 4:
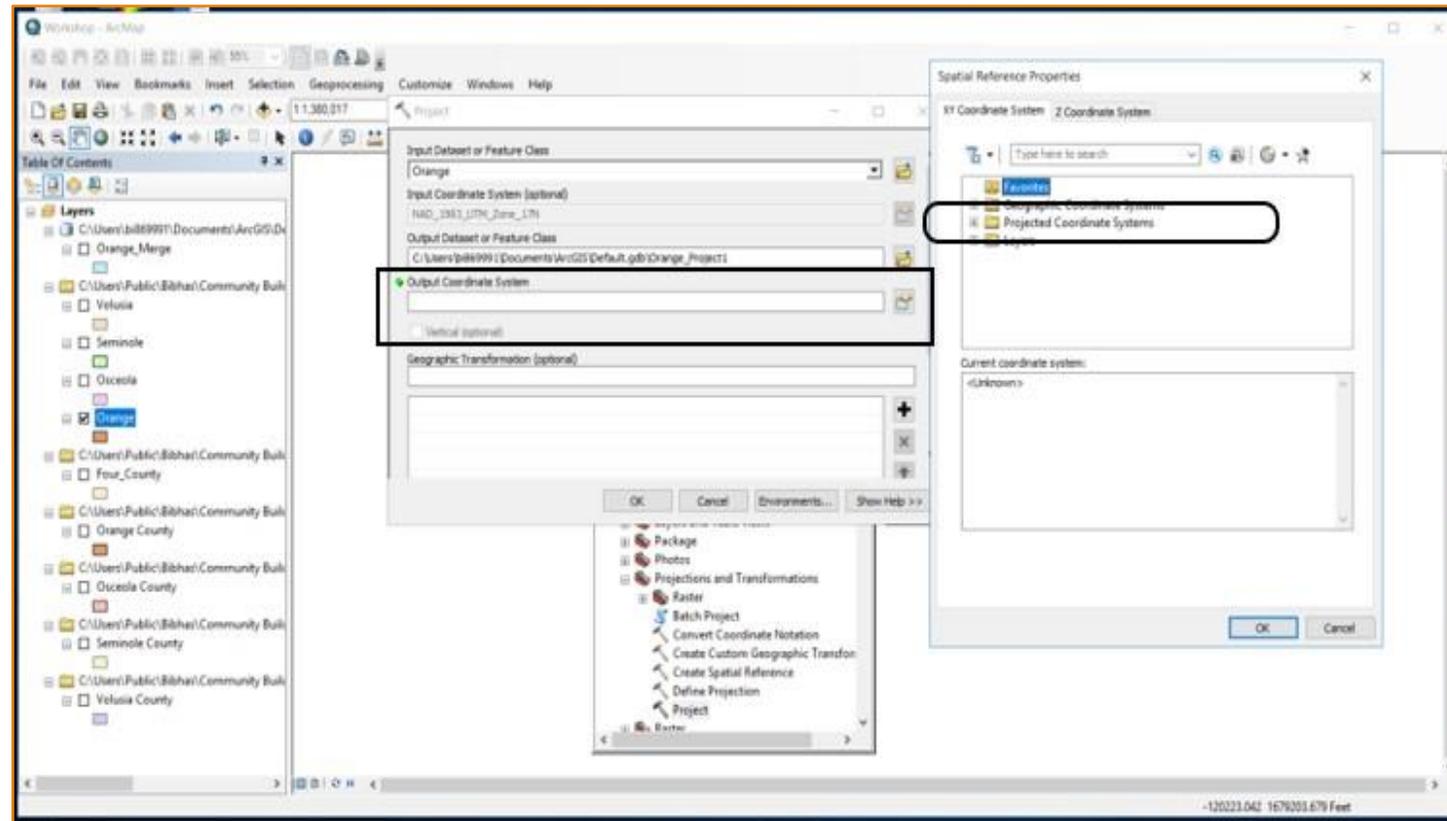
Co-ordination System Projection

○ Step 5:

Co-ordination System Projection

o Step 6:

Parcel Data Layer Preparation

o To capture the change in property value, parcel data for (2011-2017) is obtained from Florida Department of Revenue (FDOR)

o NAL file has unique parcel ID with equivalent parcel level attribute information

o We consider Just Value reported by DOR as a surrogate measure for direct property value and in the following sections
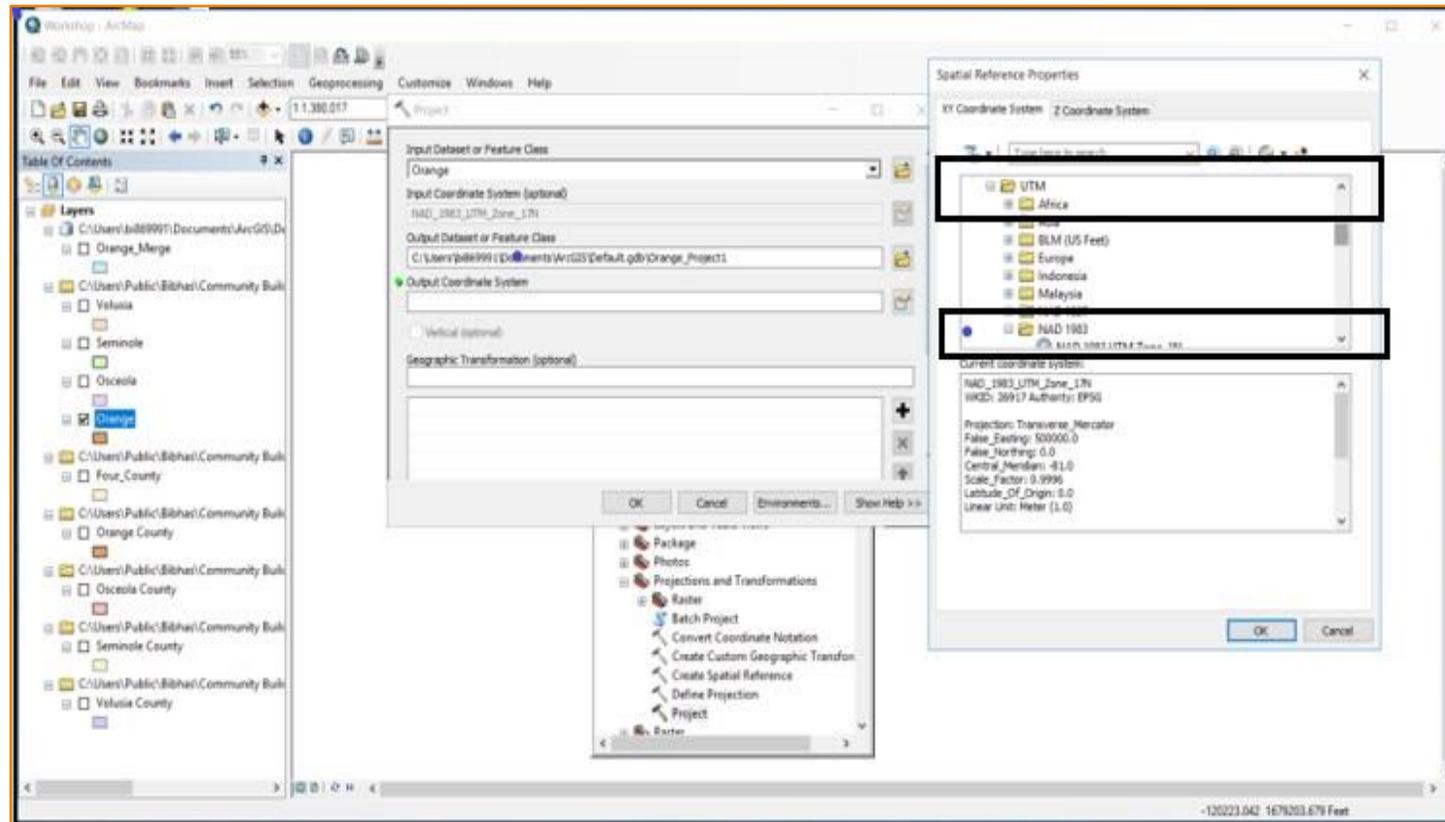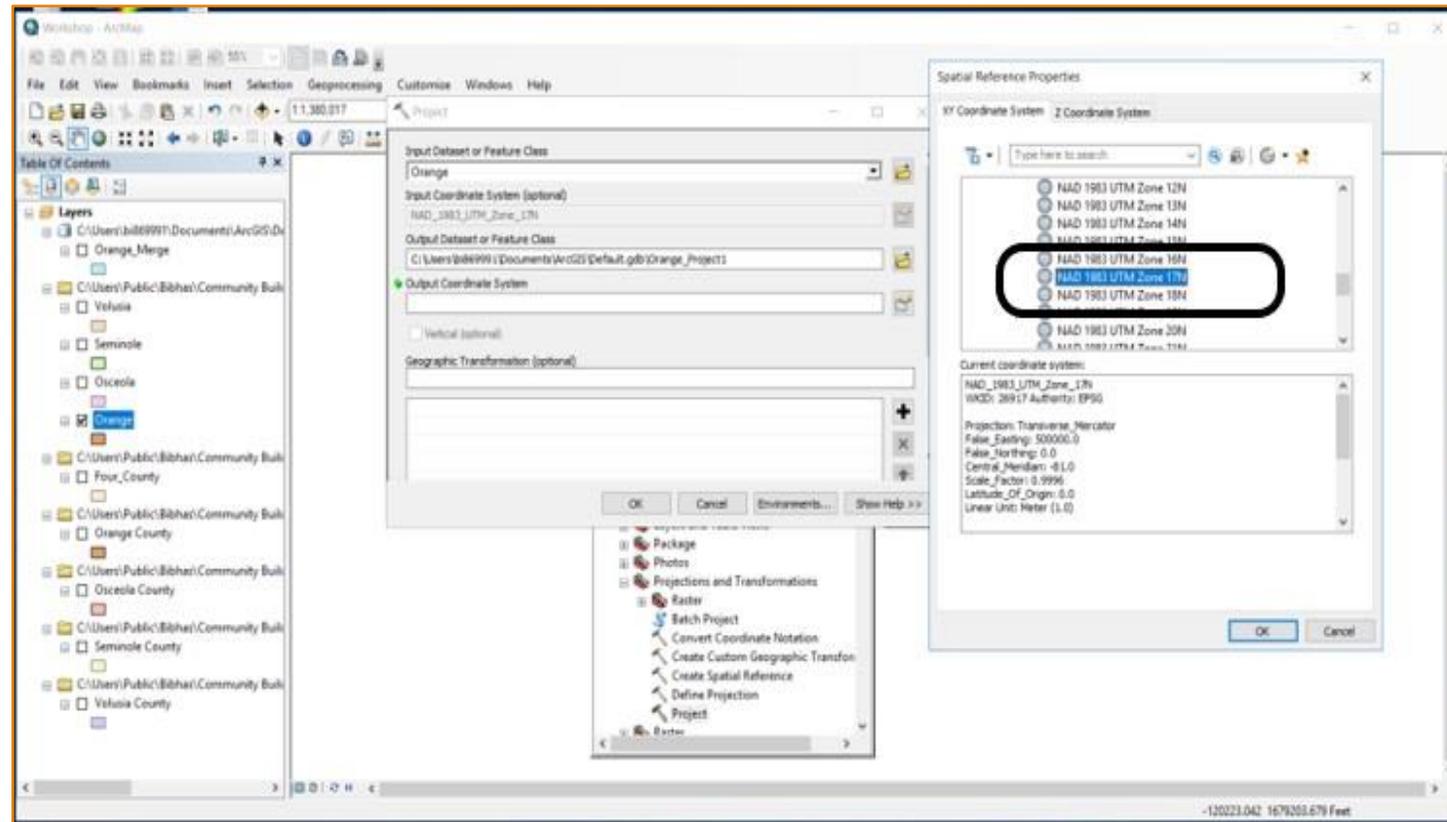
Parcel Data Layer Preparation

○ Step 1:
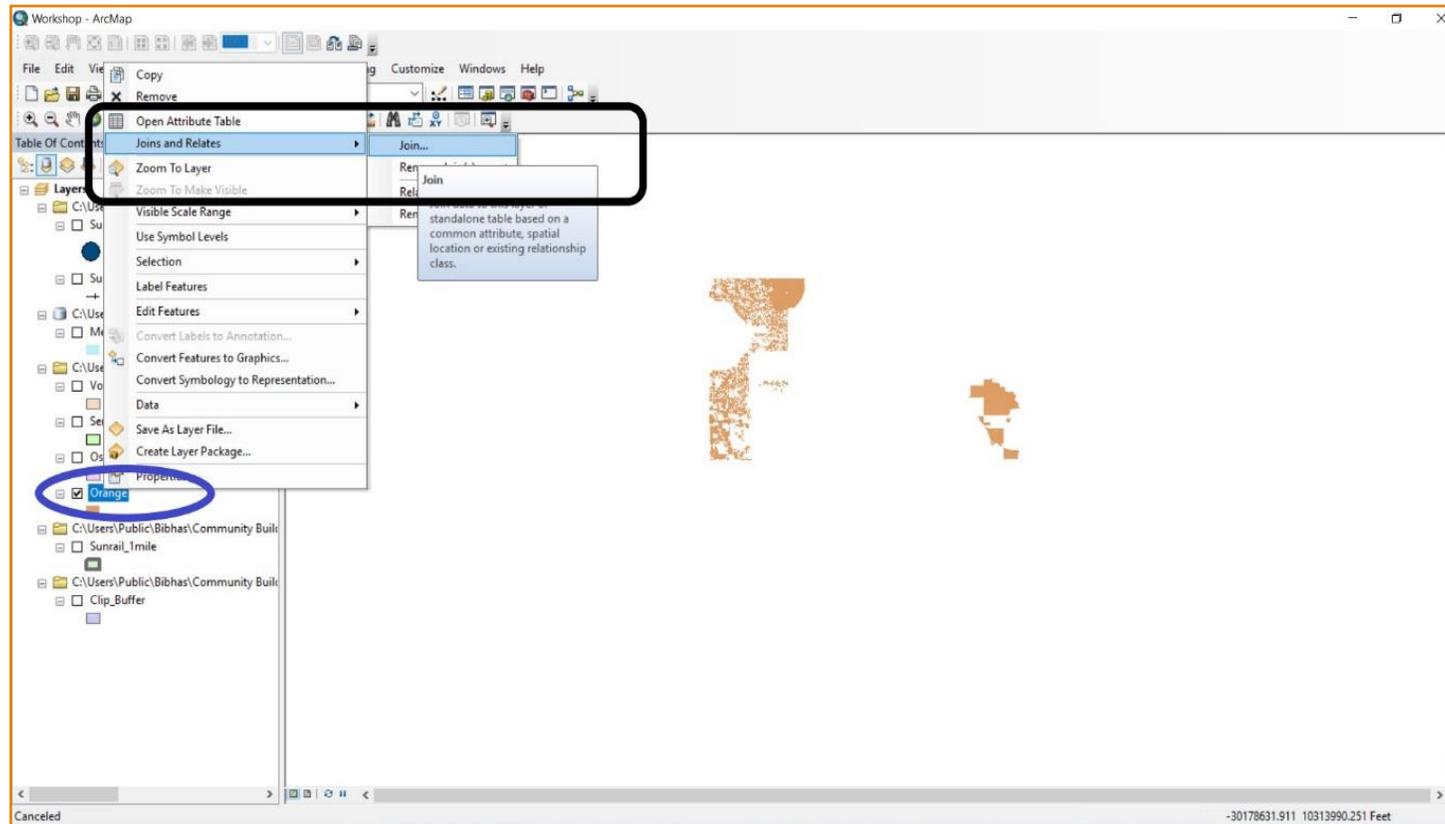
Parcel Data Layer Preparation

o Step 2:
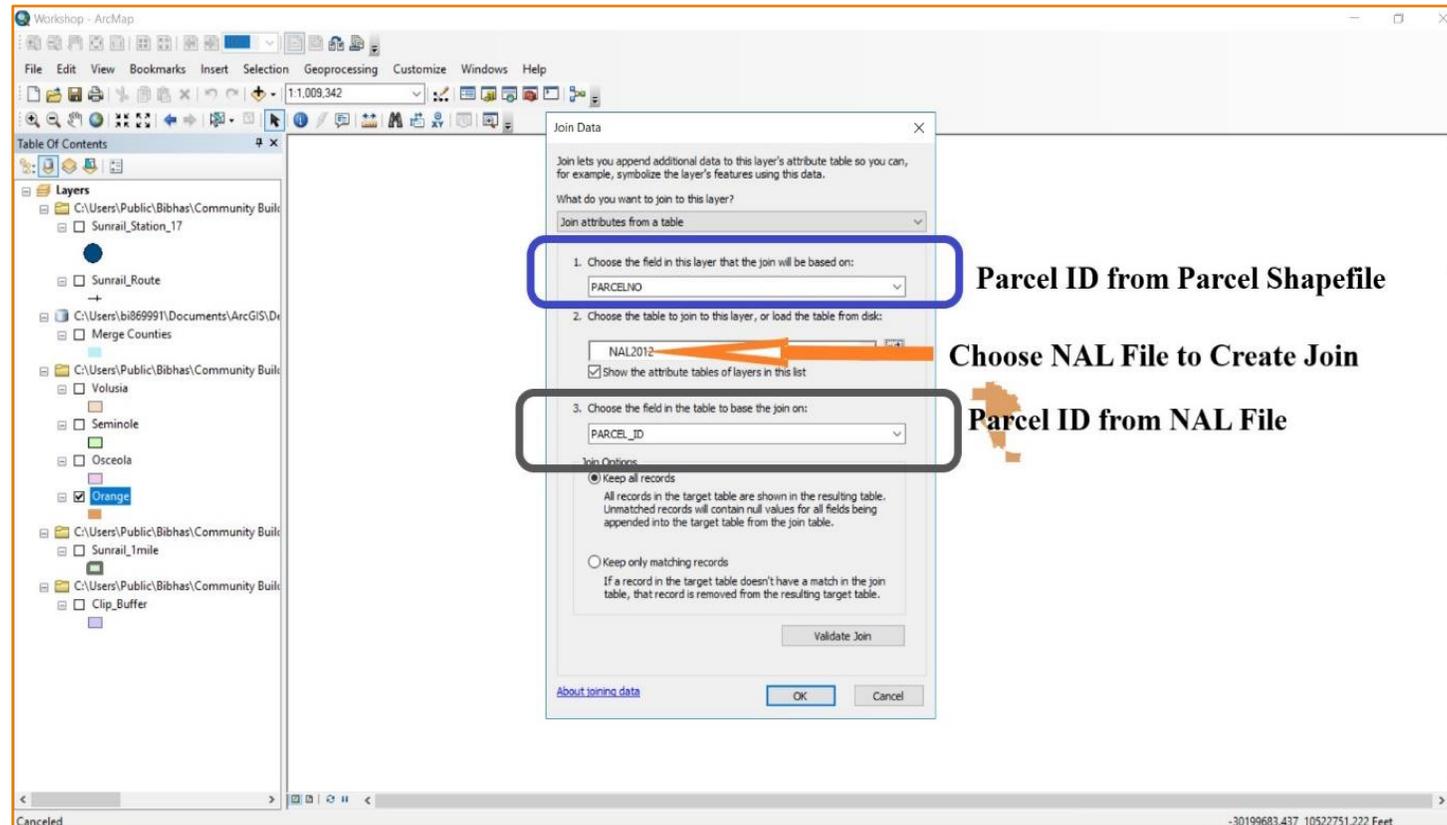
Parcel Data Layer Preparation

○ Information after joining:

Create Appropriate Information

o Now we need to create appropriate information in parcel layer in ArcGIS

o At first, we need to create land use type based on DOR_UC in the parcel data

o Secondly, we need to calculate area of the parcels in reasonable unit (square miles in our study).

Create Appropriate Information

○ Land use type (Step 1):
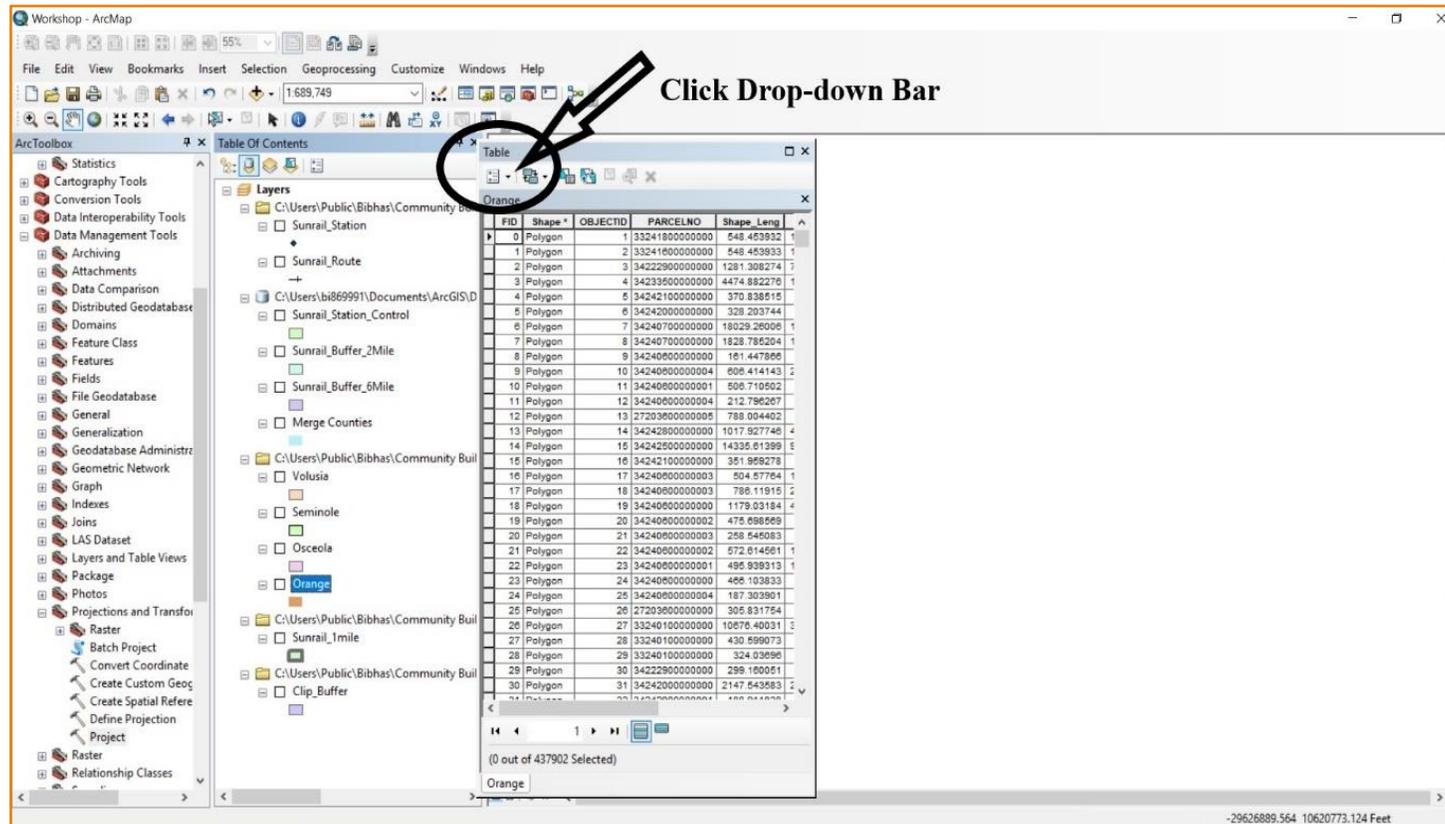
Create Appropriate Information

○ Land use type (Step 2):

Create Appropriate Information

○ Land use type (Step 3):

Create Appropriate Information

o Land use type (Step 4):
  ◦ Selection of Land Use Category

Land Use Category	DOR Land Use Code
Single Family Residential	1
Multi-Family Residential	3,8
Other Residential	2,4-7,9
Retail/Office	11-39
Industrial	41-49
Agricultural	50-69
Institutional	71-79, 81, 84
Public	83, 85-91
Recreational	82, 97
Water	95
Vacant	0, 10, 40, 70, 80
Others	92-96, 98, 99, 100, 995, 999

Create Appropriate Information

○ Land use type (Step 5):

Create Appropriate Information

o Land use type (Step 6):

Create Appropriate Information

○ Area Unit Conversion (Step 1):

Create Appropriate Information

○ Area Unit Conversion (Step 2):

Create Appropriate Information

○ Area Unit Conversion (Step 3):

Merging Counties

o After preparing parcel data layer for all four counties (Orange, Seminole, Seminole and Volusia), a merged county shapefile was created. Following steps were followed to merge all four counties.

◦ At first, select 'Geoprocessing' toolbar

◦ Then click on 'Merge' option

◦ Then put all of the counties within 'Merge' toolbar

◦ Finally, click 'Ok'

Merging Counties
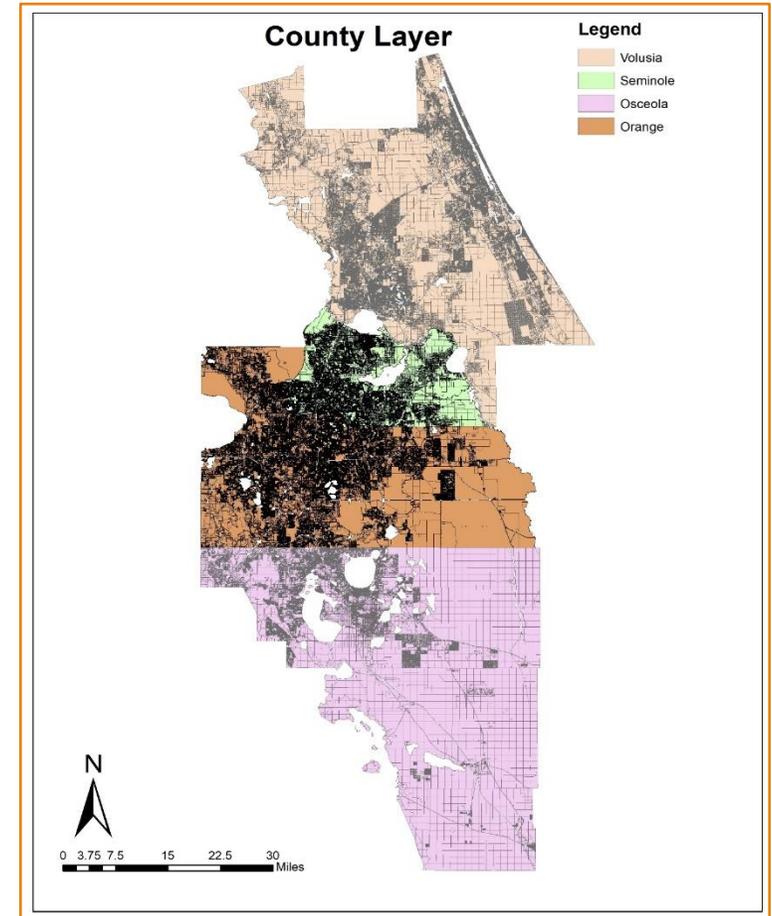
o   Step 1:
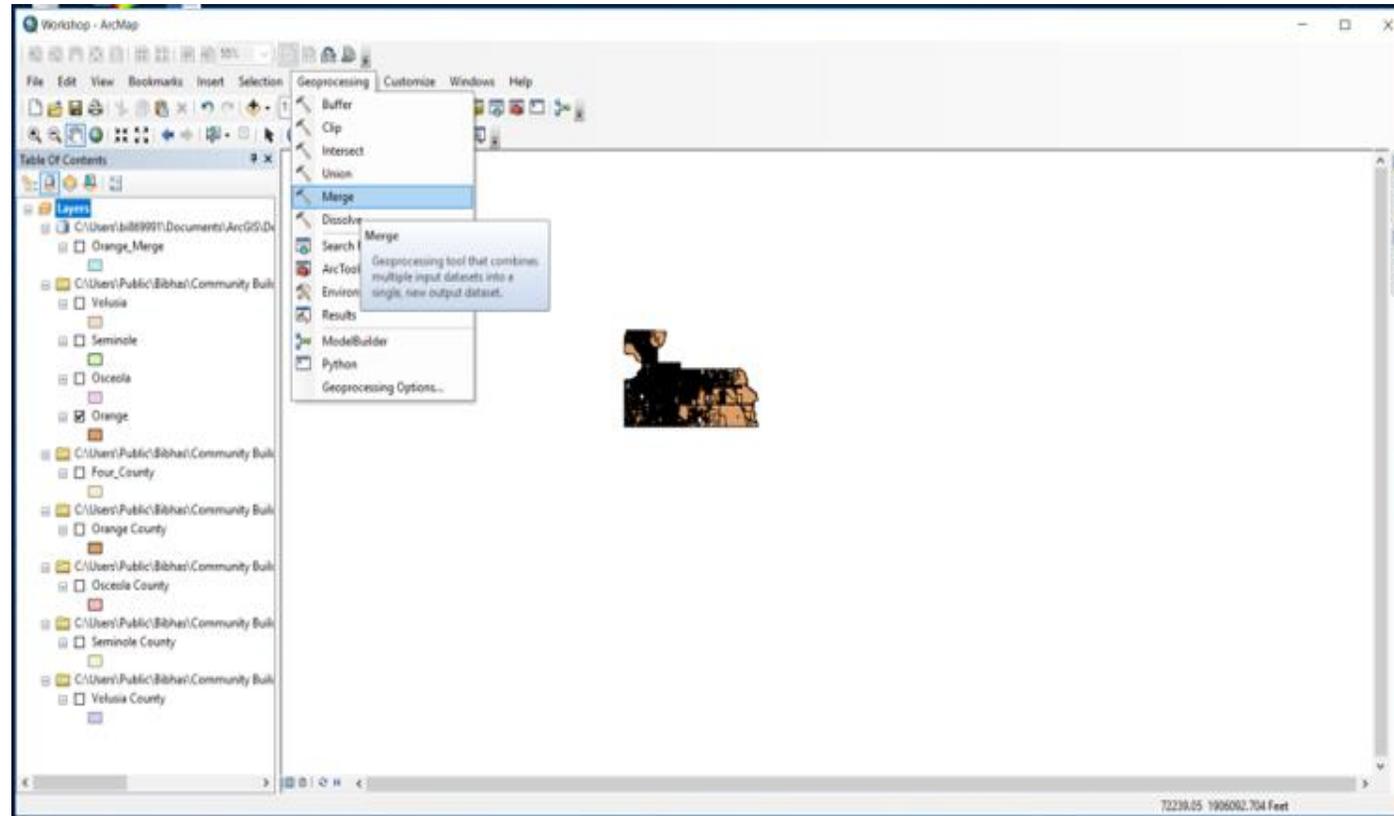
Merging Counties

○ Step 2:
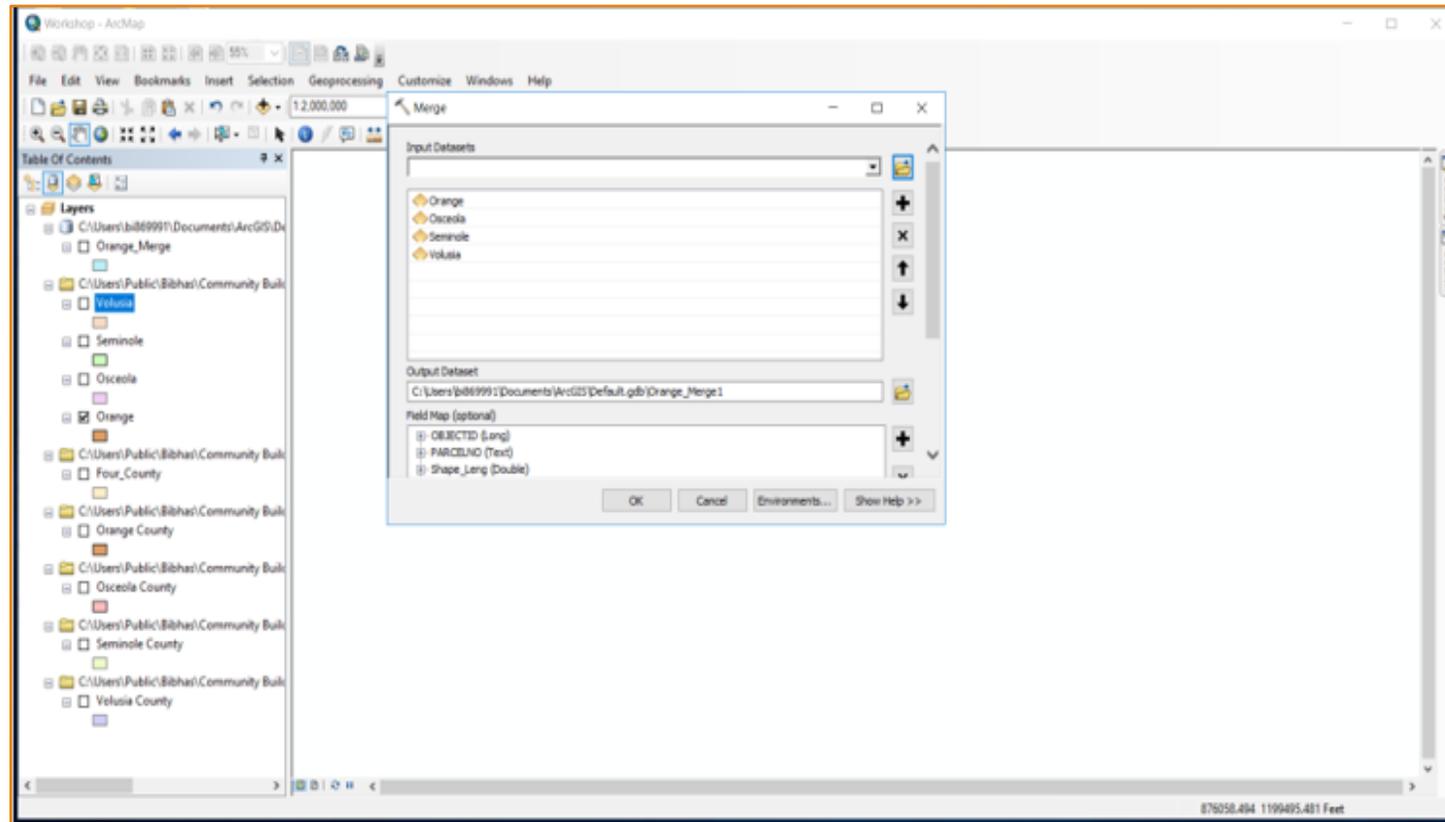
Layer Preparation

o We divided the stations into three segments:

- ◦ Downtown Stations including Lynx Central station, Church Street station, and Orlando Health/Amtrak station

- ◦ Outside Downtown Stations comprised of DeBary, Sanford, Lake Mary, Longwood, Altamonte Springs, Maitland, Winter Park, Florida Hospital Health Village, and Sand Lake Road stations

- ◦ Phase-2 stations including northbound DeLand and Southbound Meadow Woods, Osceola Parkway, Kissimmee Amtrak, and Poinciana stations
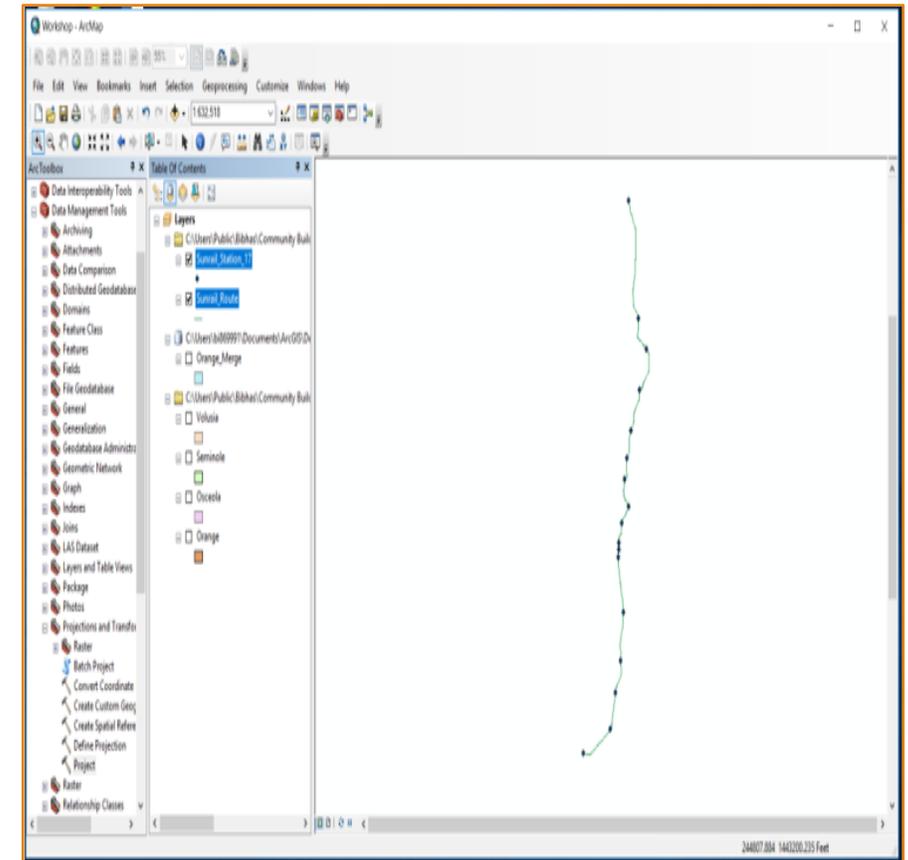
Case Area Selection

o   Step 1: Creating Buffer

◦ At first, select 'Geoprocessing' toolbar

◦ Then click on 'Buffer' option

◦ Then put SunRail station's shapefile in 'Buffer' toolbar

◦ In 'Linear Unit' option put the numeric value such as 1 and choose mile as unit

◦ Select default buffer type 'Round'

◦ Finally, click 'Ok'
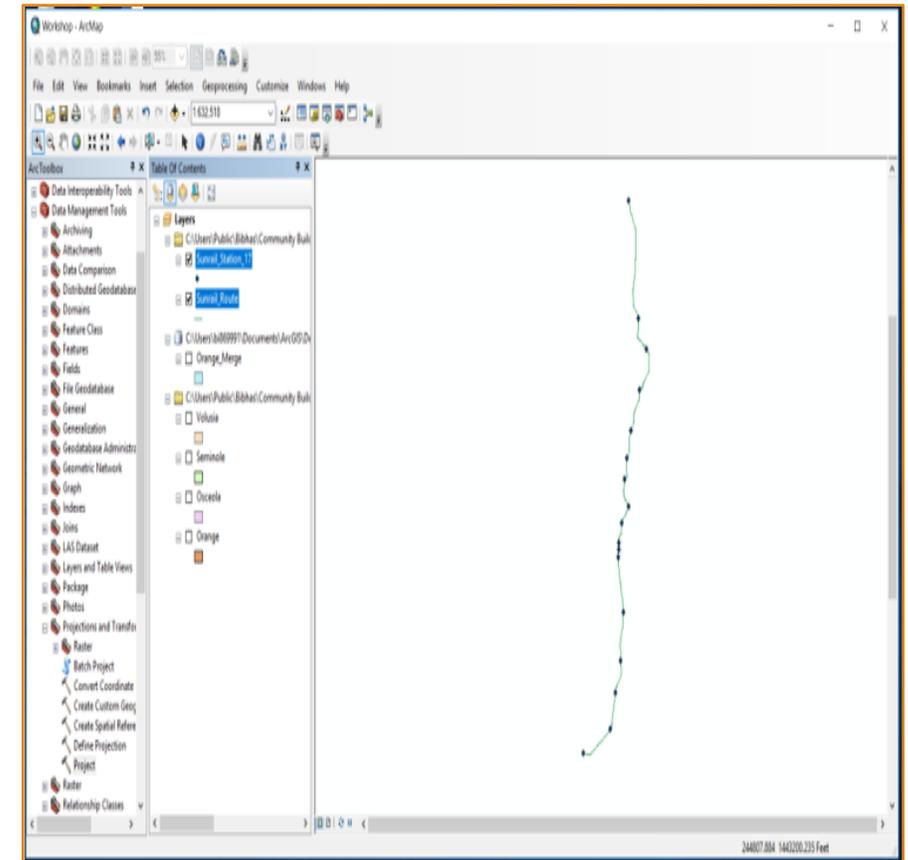
Case Area Selection

o Creating buffer area (Step 1):
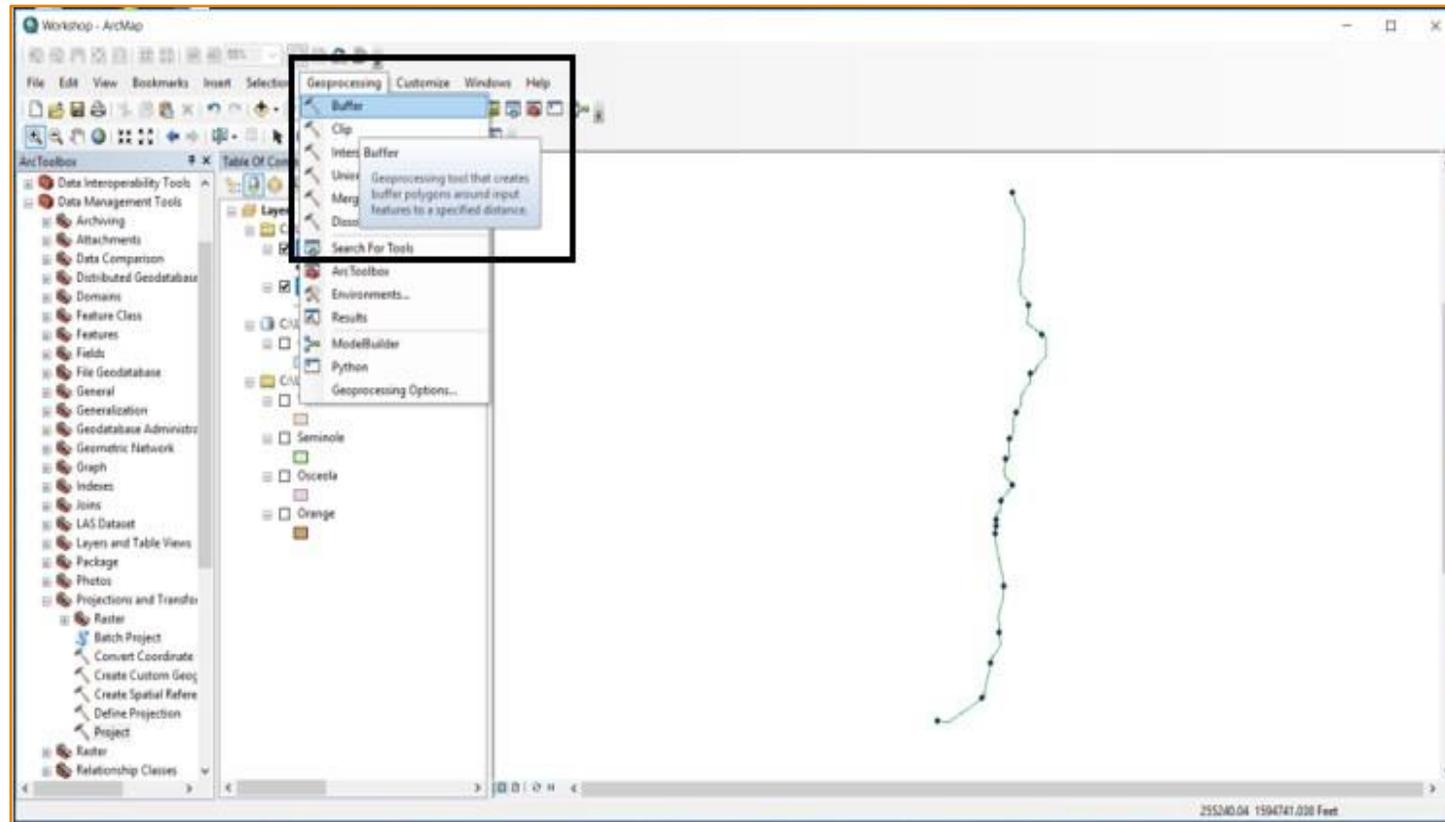
Case Area Selection

o Creating buffer area (Step 2):
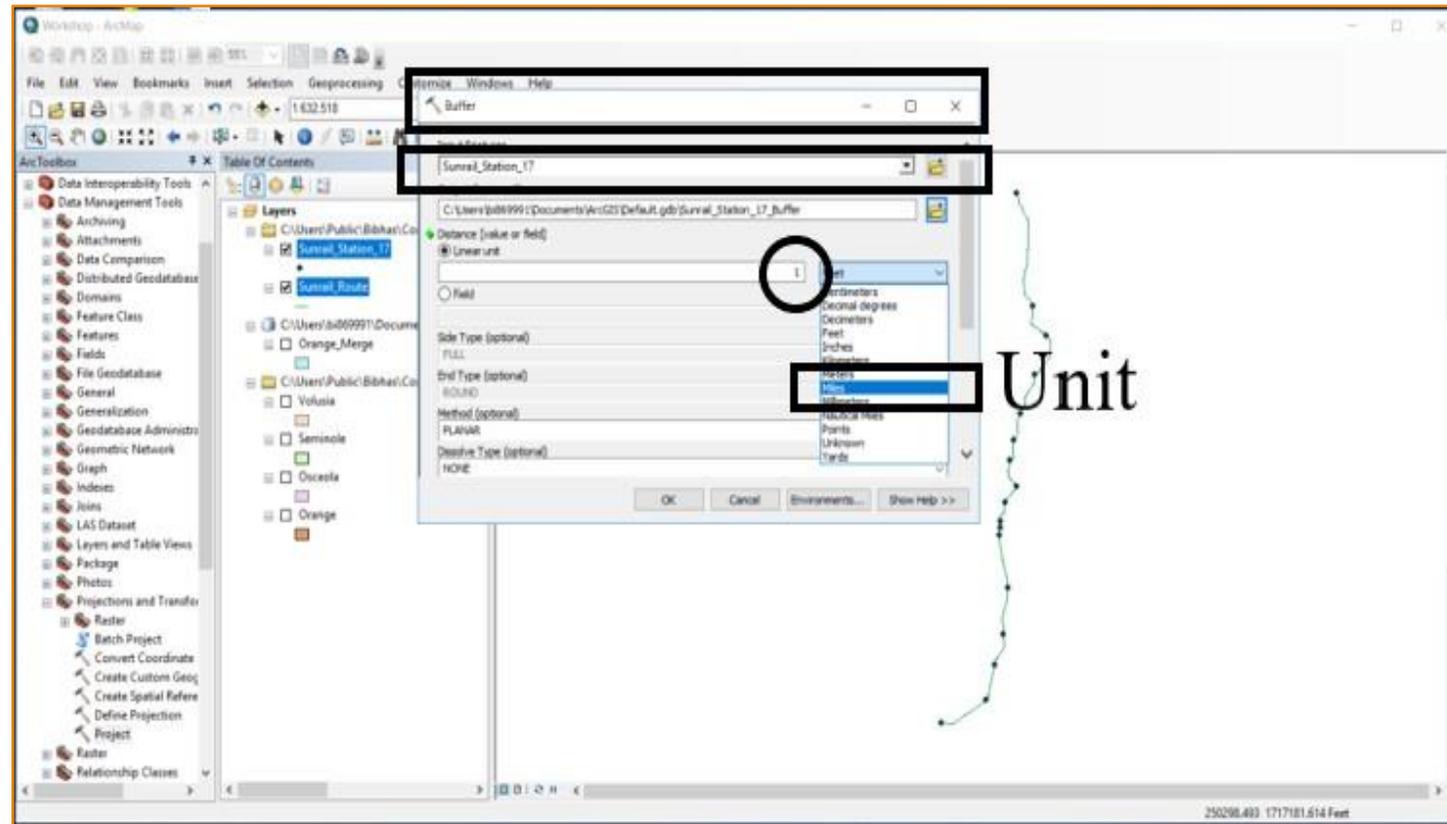
Case Area Selection

o Creating buffer area (Step 3):
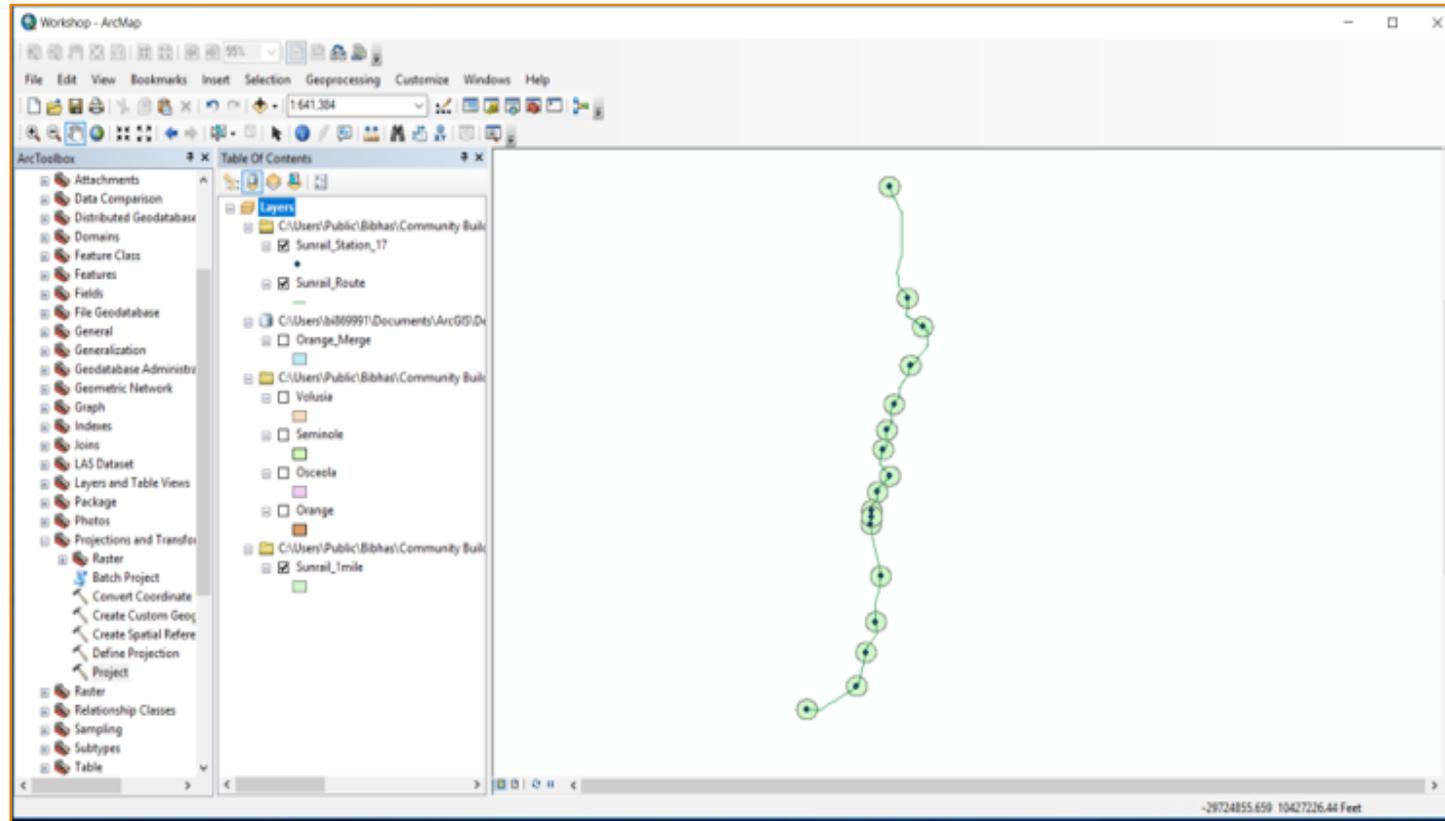
Case Area Selection

o Step 2: Clip the buffers with merge counties

◦ At first, select 'Geoprocessing' toolbar

◦ Then click on 'Clip' option

◦ In 'Input Features' section put Merge counties

◦ Upload SunRail buffer created in previous step on 'Clip Features' section

◦ Finally, a new buffer layer was created contains corresponding parcel level information such property value, land use type, area etc.

Case Area Selection

○ Clip from merge counties (Step 1):

Case Area Selection

o Clip from merge counties (Step 2):

Case Area Selection

o Clip from merge counties (Step 3):
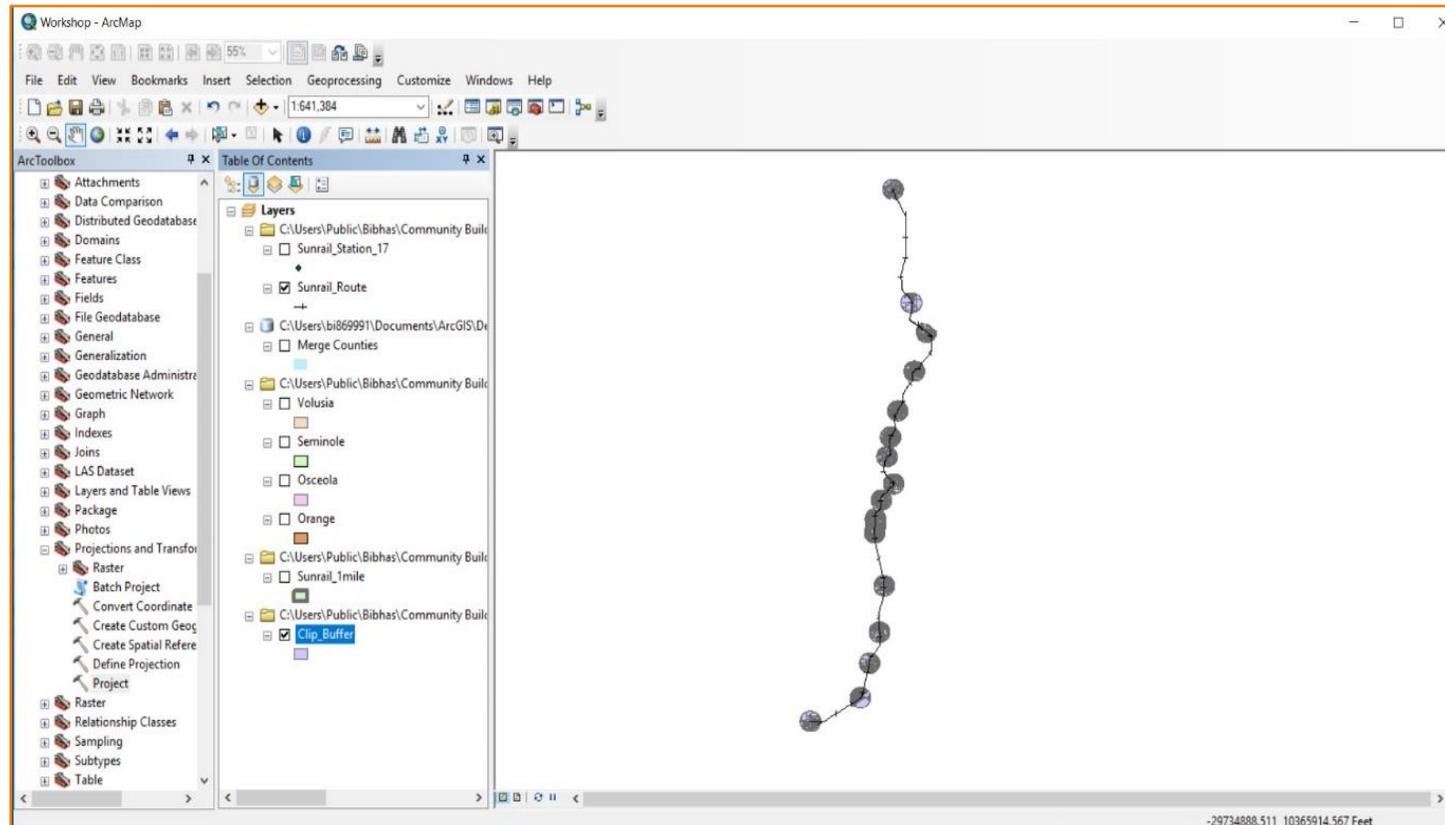
Proximity Analysis

o Clip the buffers with merge counties

- A 1-mile buffer was created around each of the SunRail stations. Please note that the nearness of the stations, particularly in the downtown areas, cause overlapping problem.

- As a result of the overlapping, the same parcel might be part of two different stations.

- ArcGIS proximity tool (Near Generate Table operation) was used to assign a parcel to a unique station.

Legend
- Church Street Station
- LYNX Central Station
- 1 Mile Buffer from LYNX Central Station
- 1 Mile Buffer from Church Street Station
- Parcels within 1 mile Buffer of Church Street Station
- Parcels within 1 mile Buffer of LYNX Central Station
- Parcel ID: 292225000000082

1955.22 feet

2090.88 feet

0 0.08 0.1 0.2 0.3 0.4 Miles
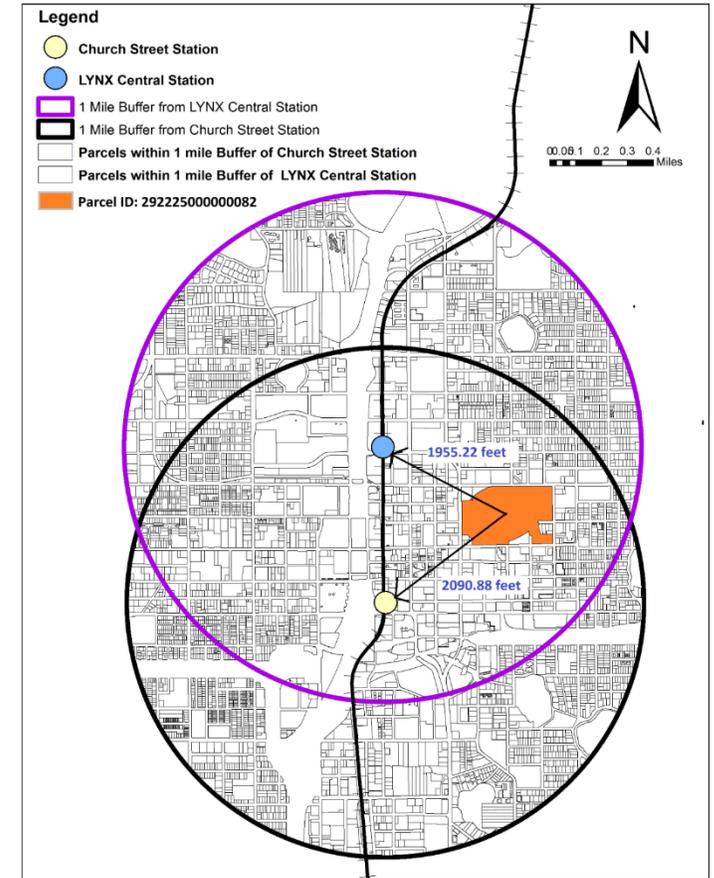
Proximity Analysis

○ Finding nearest station (Step 1):

Proximity Analysis

o Finding nearest station (Step 2):

Proximity Analysis

o Finding nearest station (Step 3):

Property Value Estimation

o After allocating all parcels to their nearest stations, dbf file was converted to SPSS file for estimation of property value by land use type. Following steps were followed:

◦ Select 'Data' toolbar

◦ Click on 'Aggregate' option

◦ Put 'Land Use Type' as break variable

◦ For 'Summary of Variables' section choose JV as property value and Area (Acres)

◦ Also change the 'Function' option from default 'Mean' to 'Sum'

Property Value Estimation

o Property Value Estimation (Step 1):

Property Value Estimation

o Property Value Estimation (Step 2):
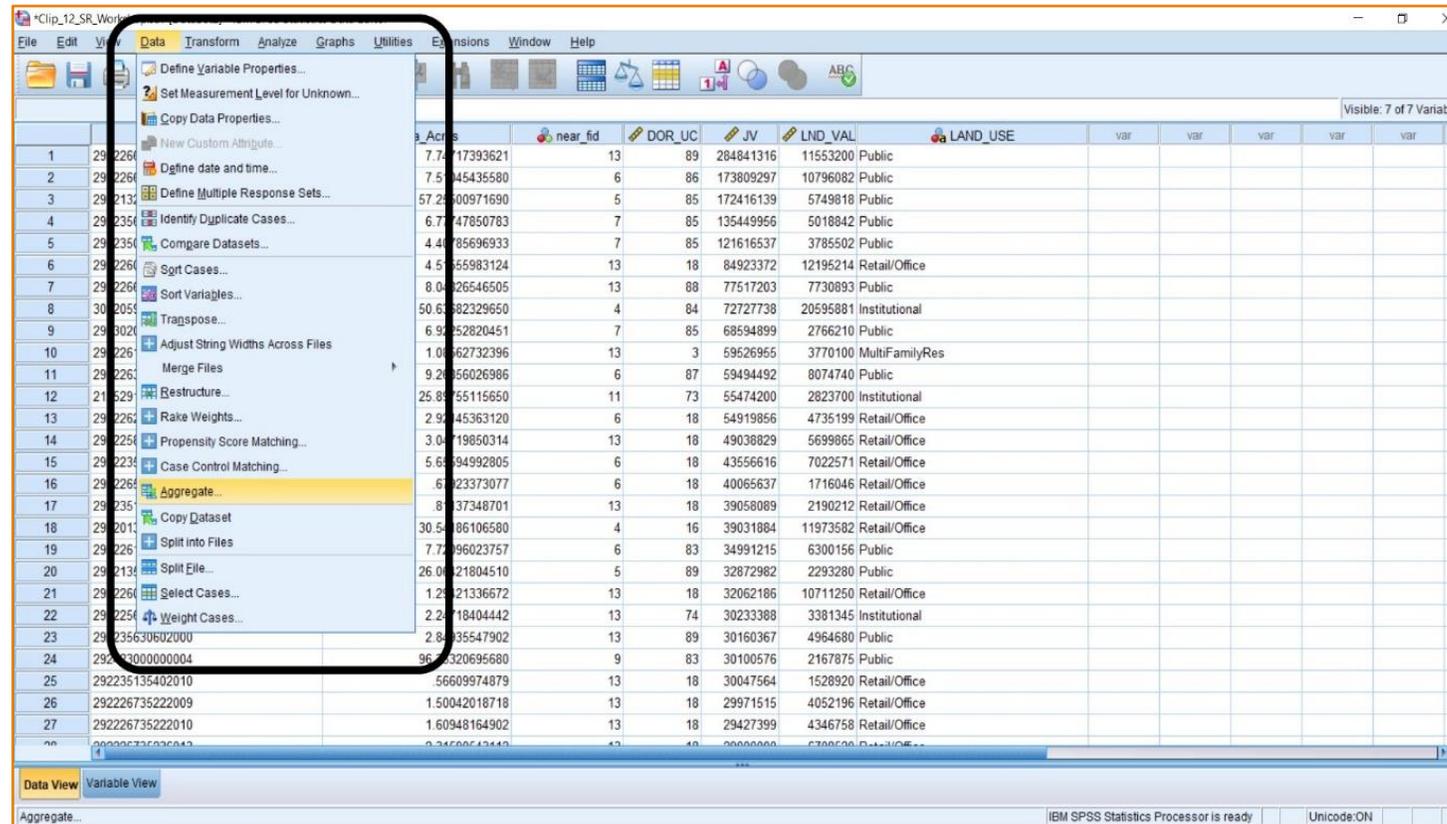
Property Value Estimation

○ Property Value Estimation (Step 3):

Property Value Estimation

o Property Value Estimation:

Station	Single Family Residential (USD)	Multi- Family Residential (USD)	Retail/Office (USD)	Industrial (USD)	Institutional (USD)
Downtown Stations					
LYNX Central Station	906,590	988,491	1,790,503	630,578	1,462,136
Church Street Station	981,280	2,401,727	5,214,377	281,022	4,683,842
Orlando Amtrak/Sligh Blvd Station	625,409	474,380	1,159,111	419,089	1,492,057

Control Area Selection

o First, we created 2 and 8 mile buffer, respectively around the stations. The parcels located within that 6 mile buffer were selected to be the candidate control areas.

o Next, based on land use type and property value range (within 15% of the mean property value found for each land use type for case areas), control areas for analysis were identified.

o Finally, The same number of control parcels were selected for each land use type. Second, the control parcels were assigned to a unique station by using the nearest distance analysis.

Control Area Selection

o Control Buffer Generation (Step 1):
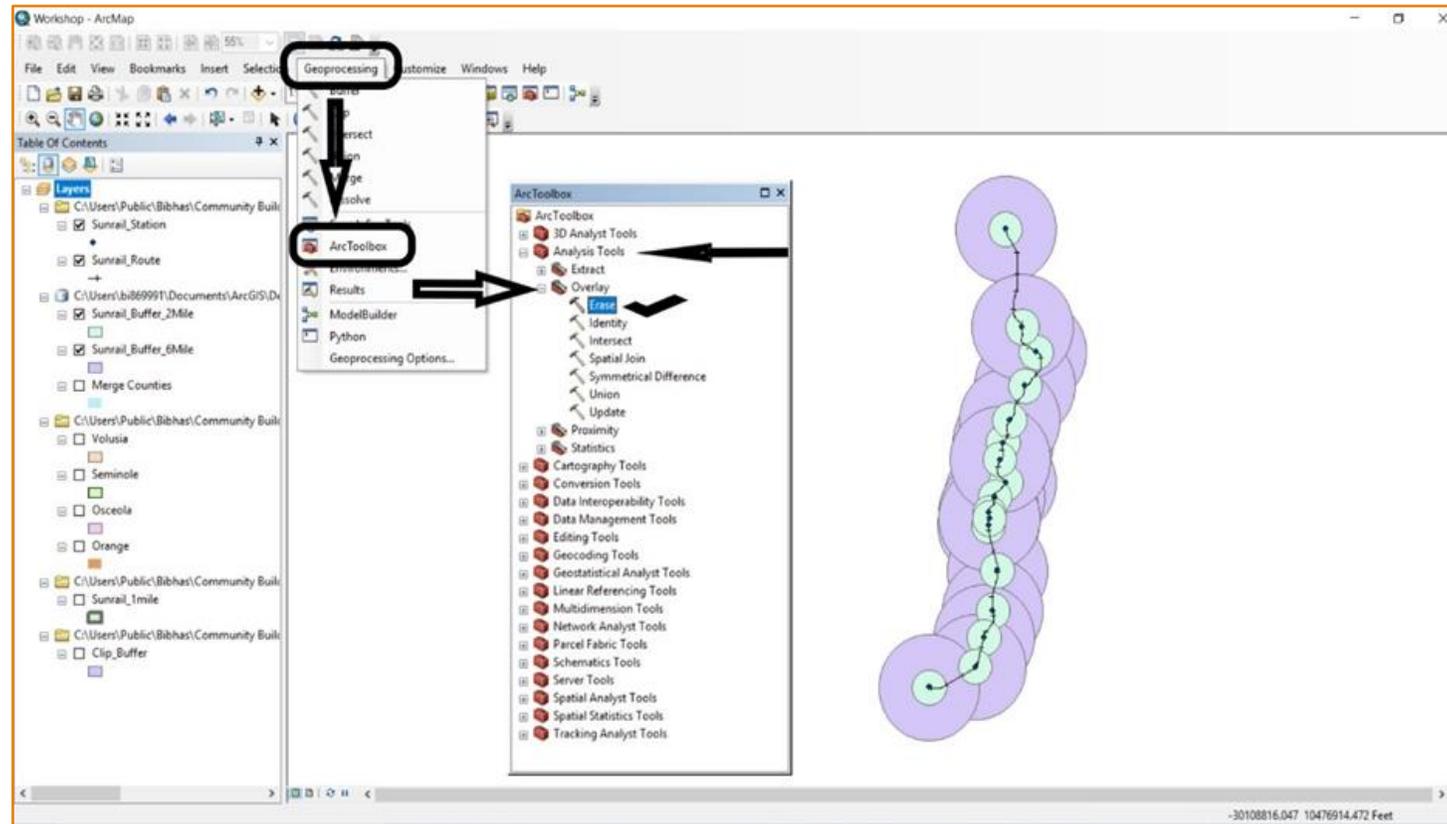
Control Area Selection

o Control Buffer Generation (Step 2):
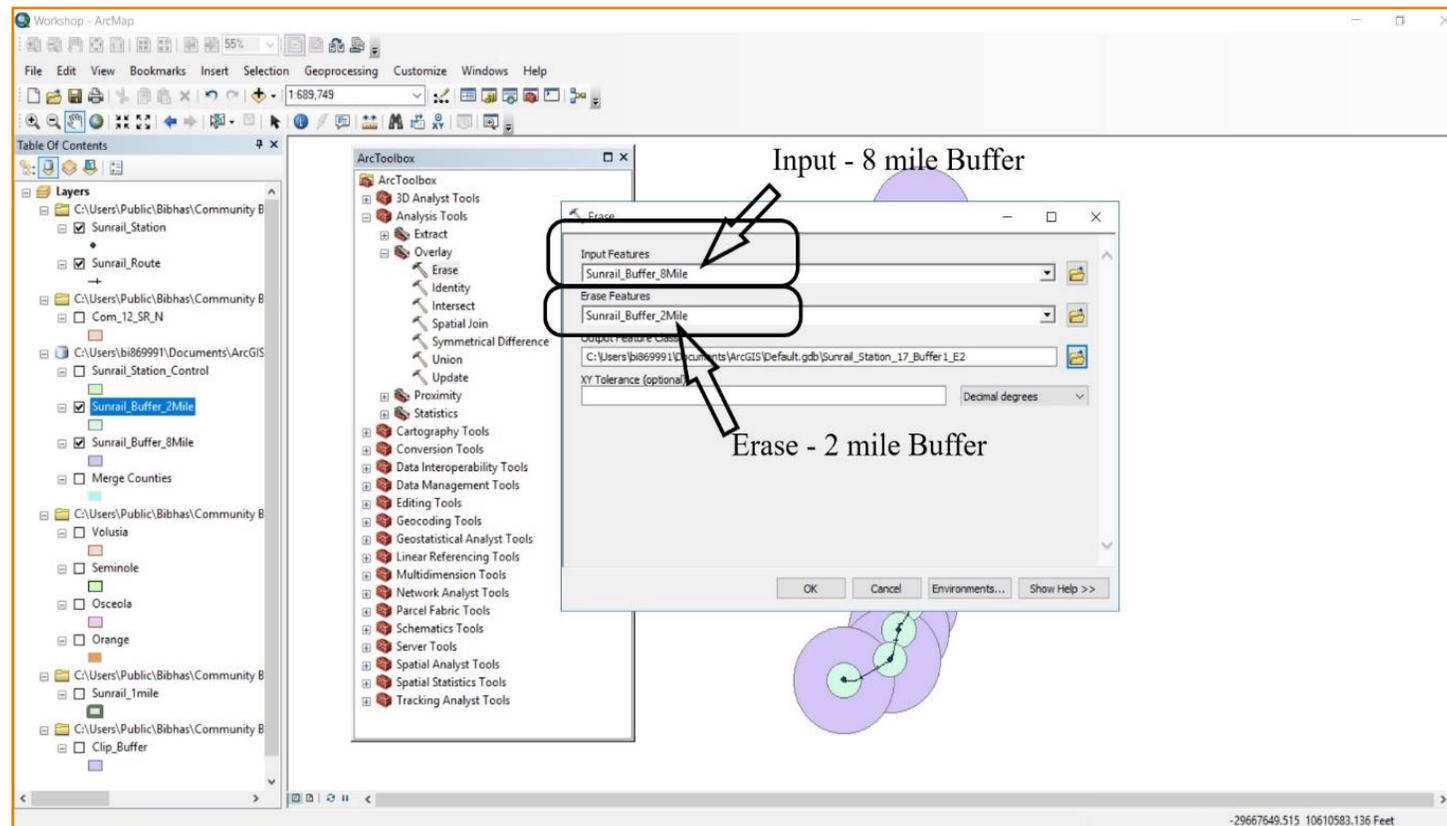
Control Area Selection

o Control Buffer Generation:
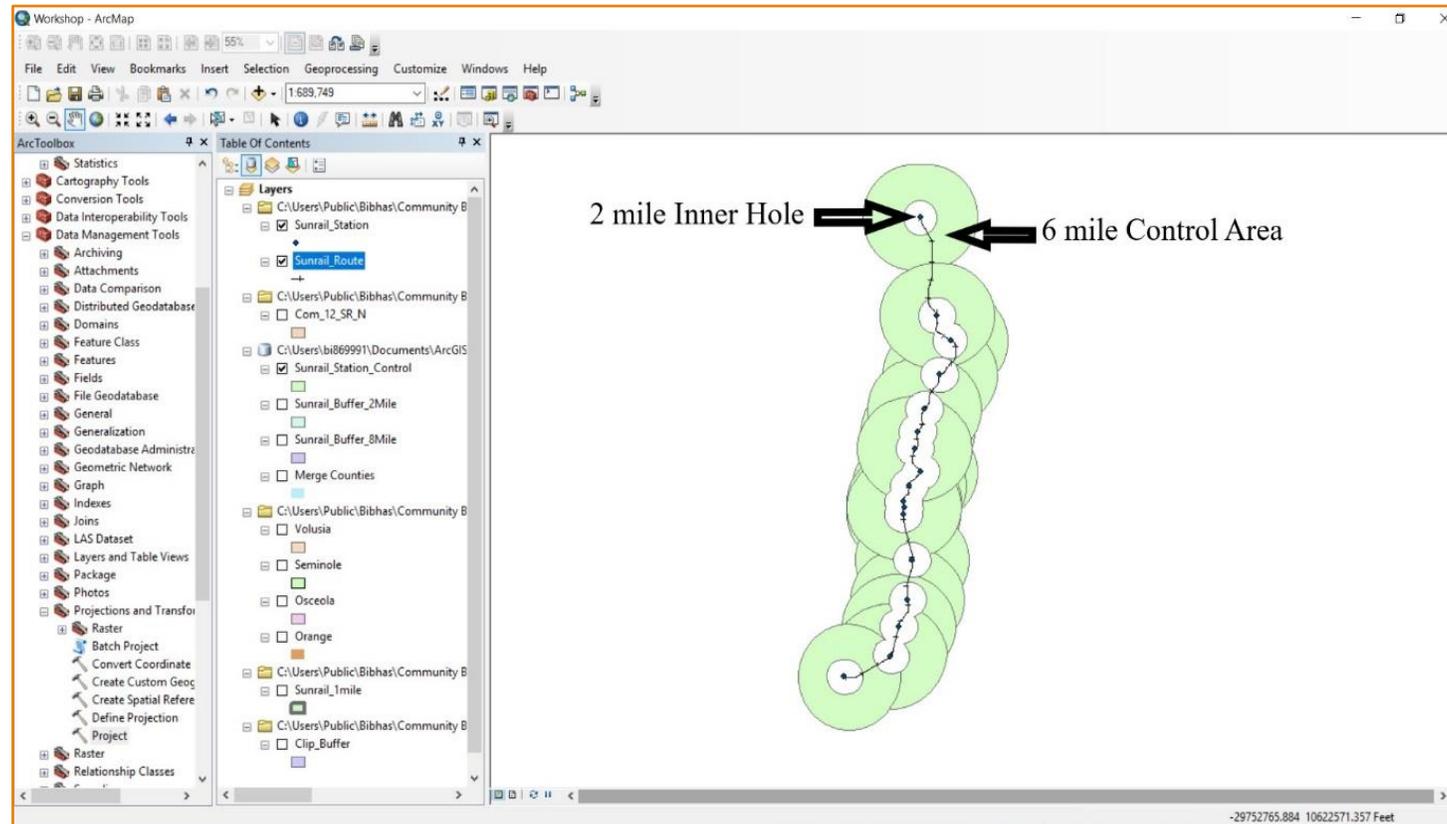
Accessibility to Employment

o Job accessibility can be defined as number of jobs accessible from a desirable point.

o The employment (number of workers in the labor force) data for the years 2011-2016 was drawn from American Community Survey (ACS).

o This data contains information on total employment of individuals aged 20 through 64 years.

o These data were merged with the Florida census tract shapefile using the unique ID created by concatenating county and census tract IDs.

Case Area Selection

o Job accessibility was computed using jobs accessible within a particular driving distance.

o In our study, we used 10 minutes' drive time from our origin of interest as the appropriate threshold.

o The driving distance was computed using weekday peak period (8am on Tuesday).

o Street network of Florida has been used to draw driving area for both driving time and driving distance. 2011-2016 street network of 'NAVSTREET' data was used.

Case Area Selection

o To estimate driving time, we need speed limit of the corresponding street.

o We define a fixed speed for a street from variable called 'Speed Category'.

Speed Category	Definition (MPH)	Speed, V (MPH)
1	Above 80	80
2	65-80	70
3	55-64	60
4	41-54	50
5	31-40	40
6	21-30	30
7	6-20	20
8	Below 6	6

Case Area Selection
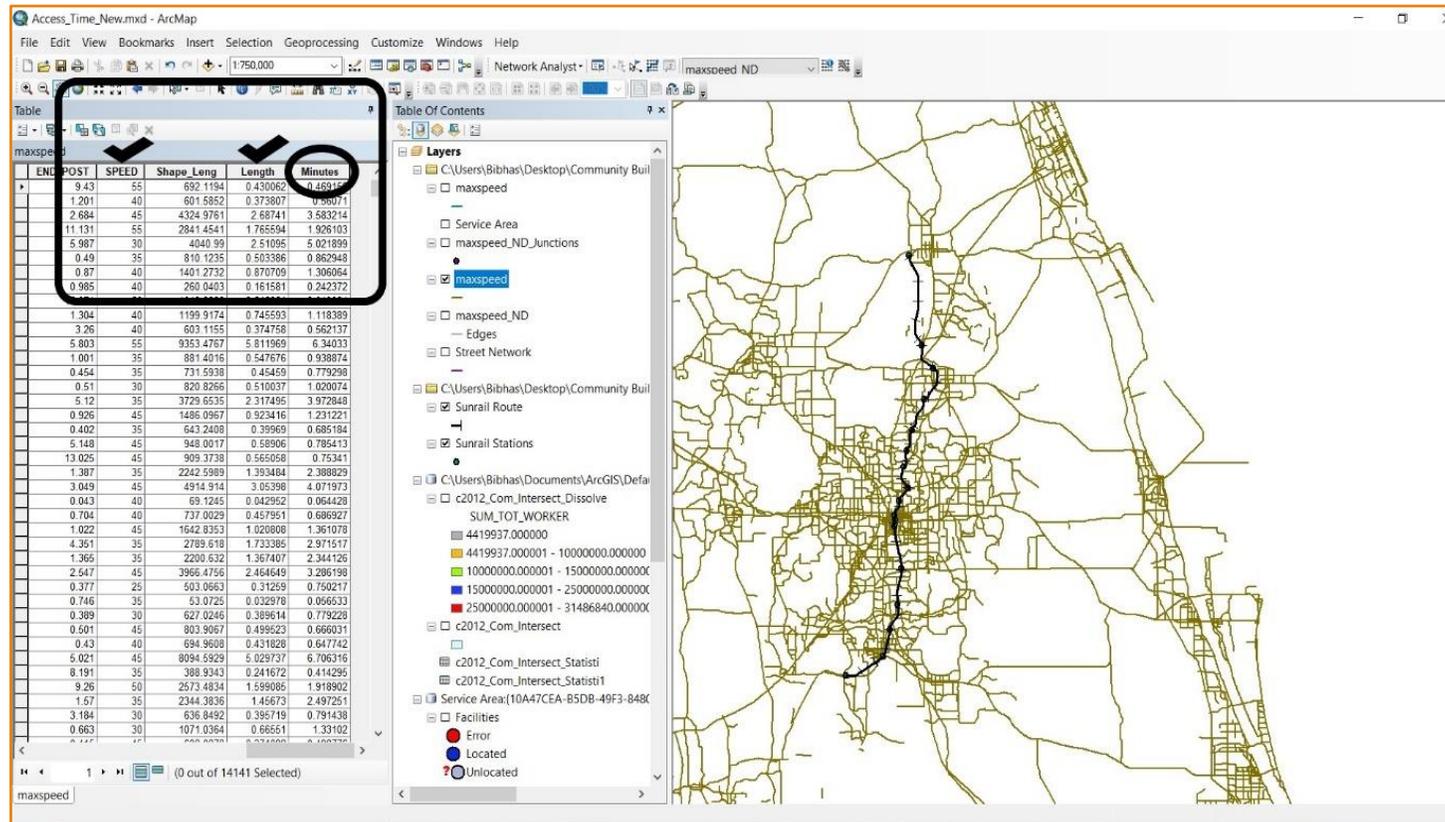
Creating Road Network

o Several steps were followed to create 'Road Network' by using Network Analyst tool on ArcGIS

◦ Select 'Catalog' from 'Windows' toolbar

◦ Select Road Network shapefile by using 'Catalog'

◦ Click on the 'New Network Dataset' from 'Road Network' file

◦ Follow all the required steps

◦ All the above steps will create a new road network with 'junction' and 'edges'

Creating Road Network

o Step 1:
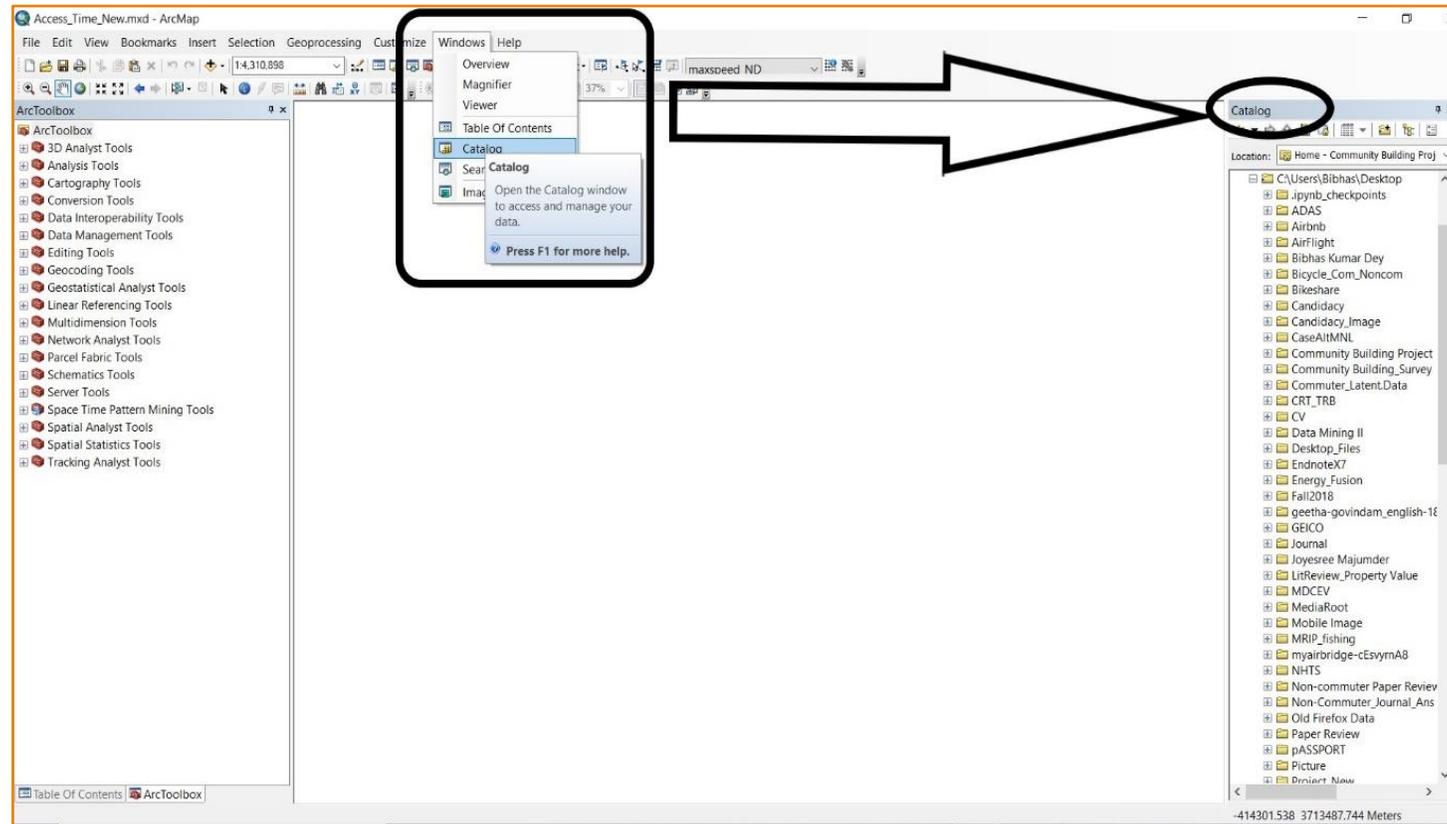
Creating Road Network

o Step 2:

Creating Road Network

○ Step 3:

Select 'New Network Dataset' from Road Network Shapefile
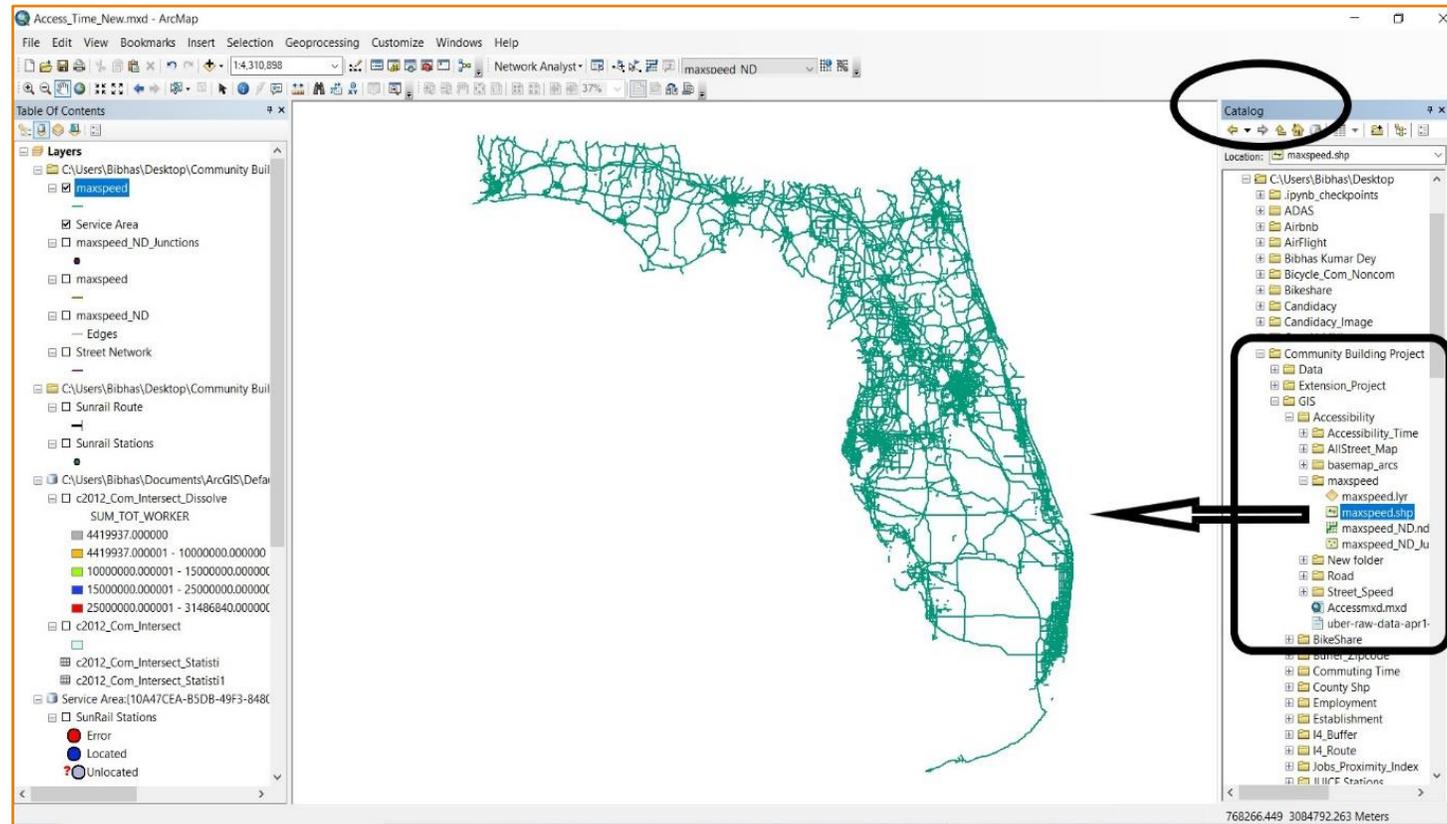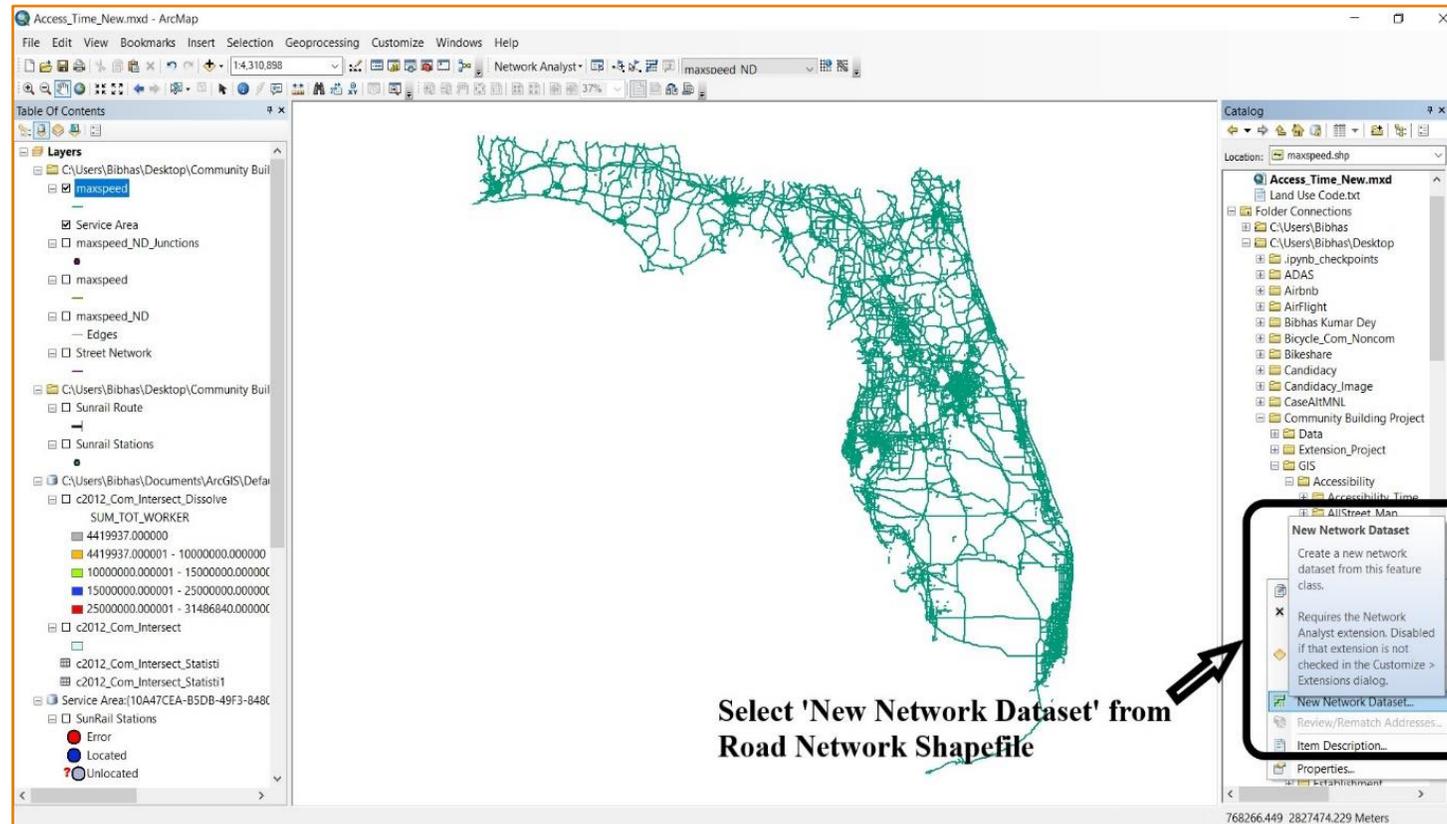
Creating Road Network

○ Last Step:
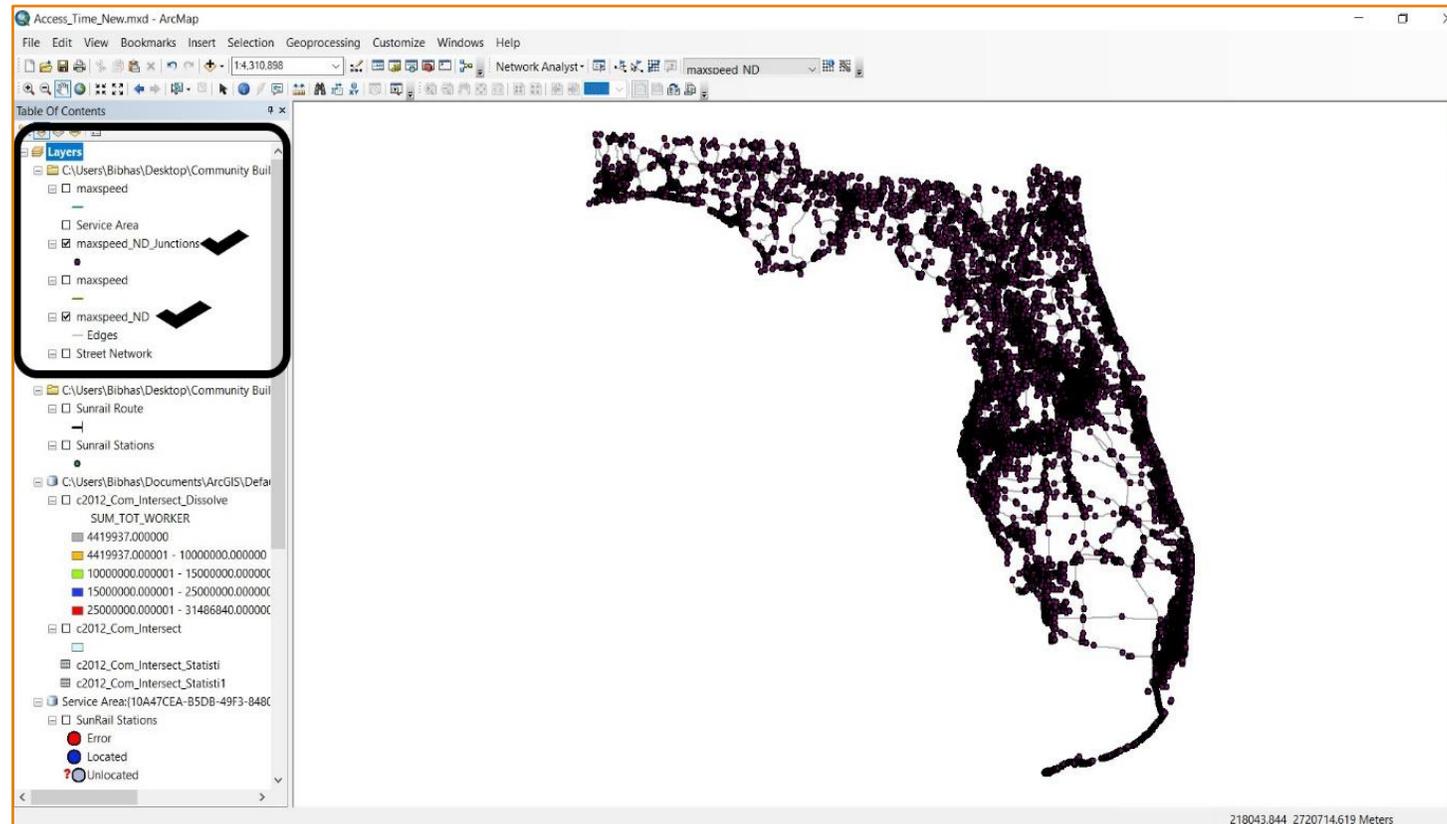
Driving Area

o Several steps were followed to create a 10 minutes driving area by using road network in ArcGIS.

o First, we need to create a new service area.

o Second, load the stations as the facilities.

o Third, we need to edit the properties of the service area.

o Finally, solve and export the 10 minute driving area from ArcGIS.

Legend
• SunRail Stations
— SunRail Route
■ Driving Area (0-10 Minutes)
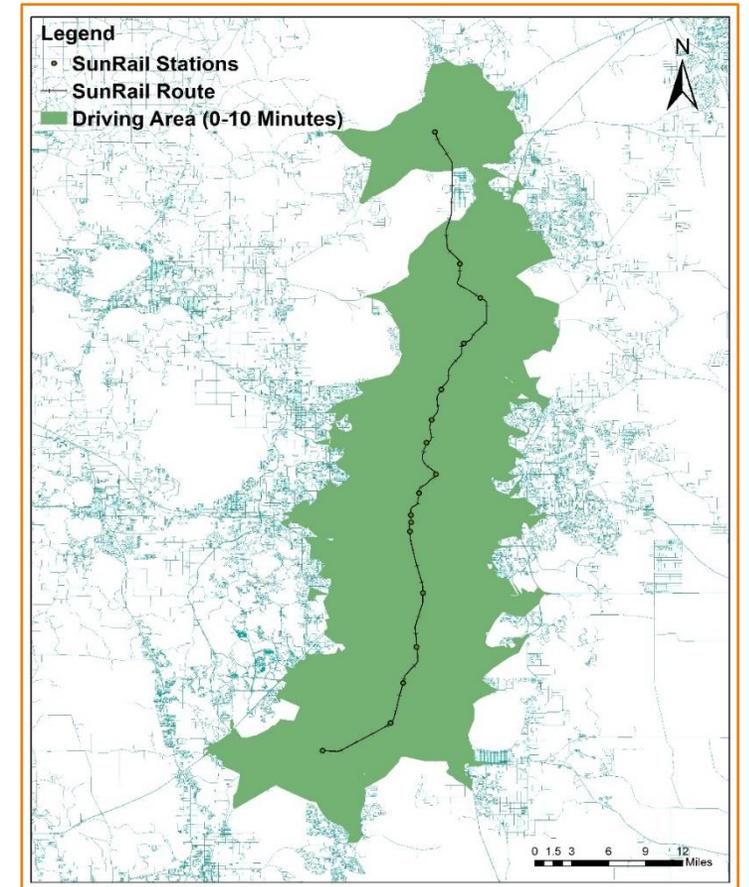
Driving Area

o Step 1:
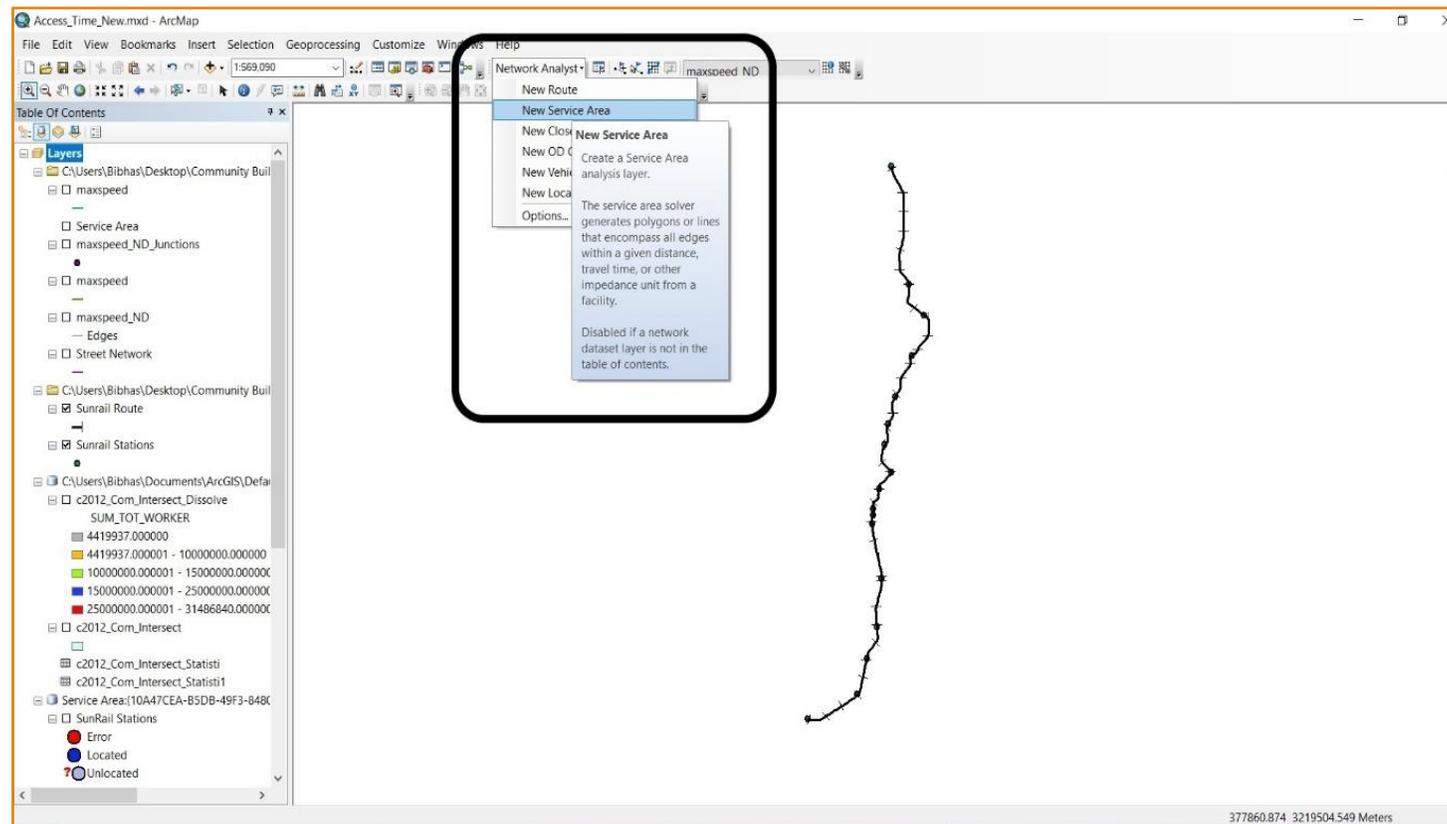
Driving Area

o Step 2:
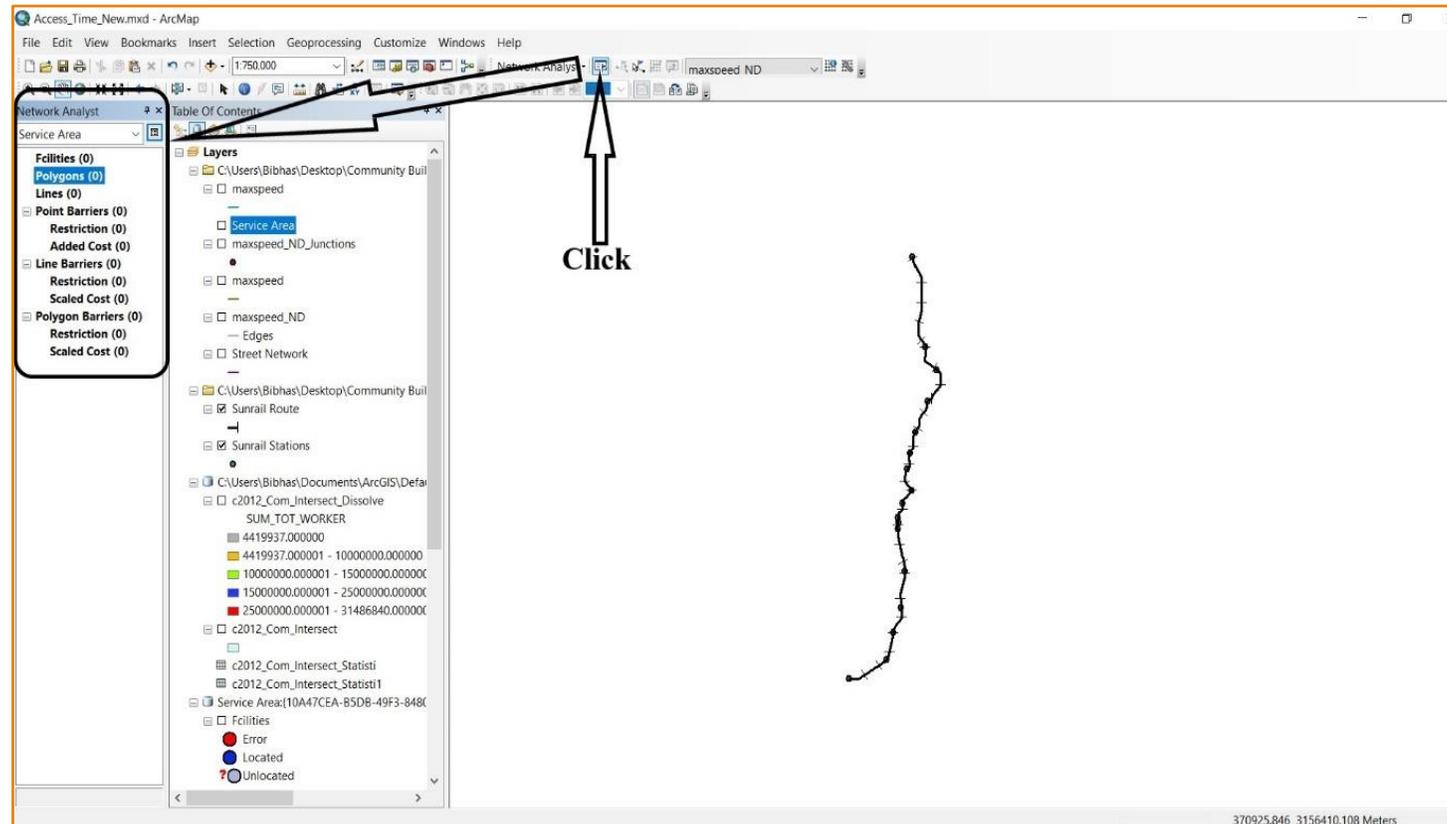
Driving Area

○ Step 3:
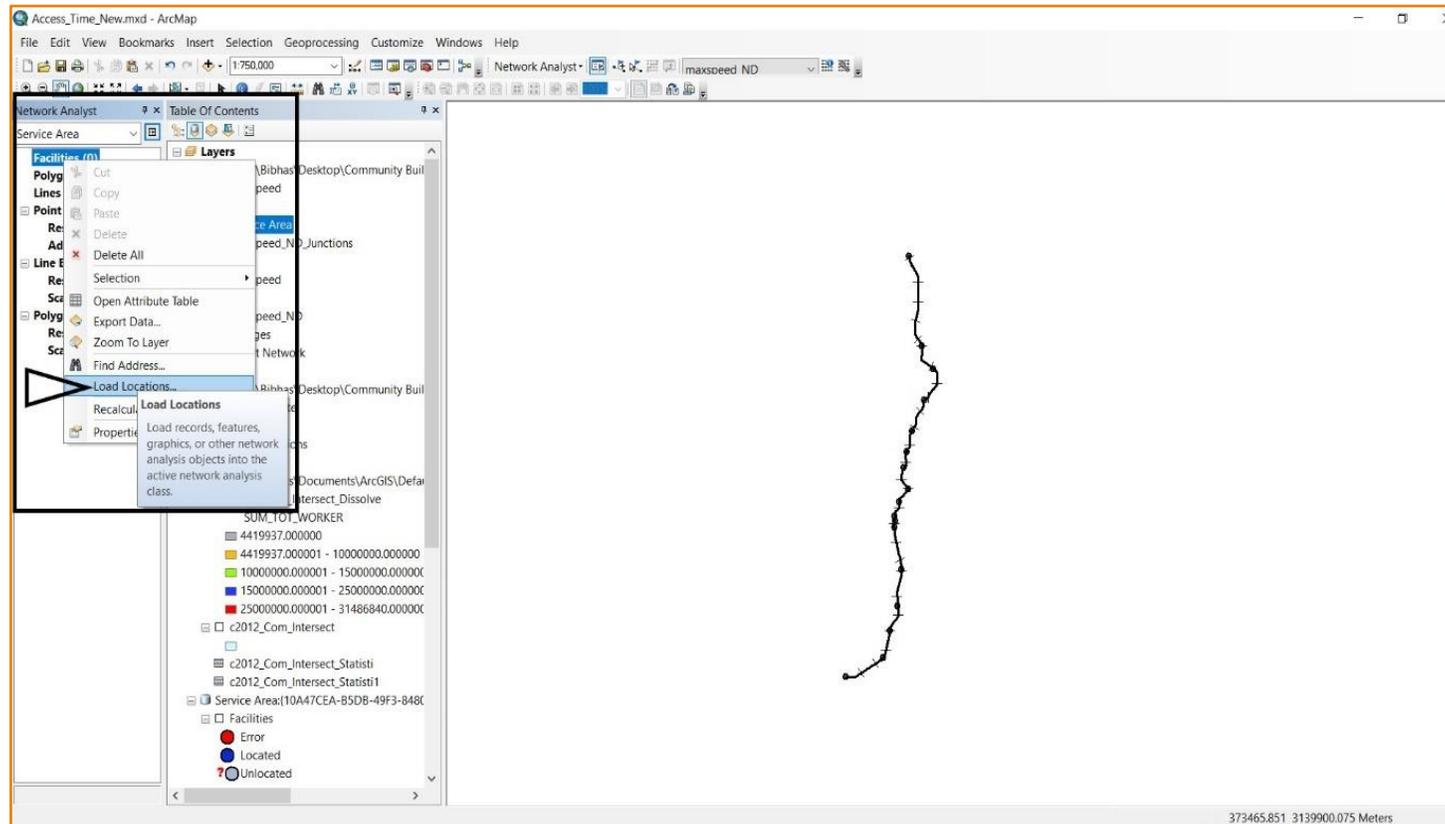
Driving Area

○ Step 4:
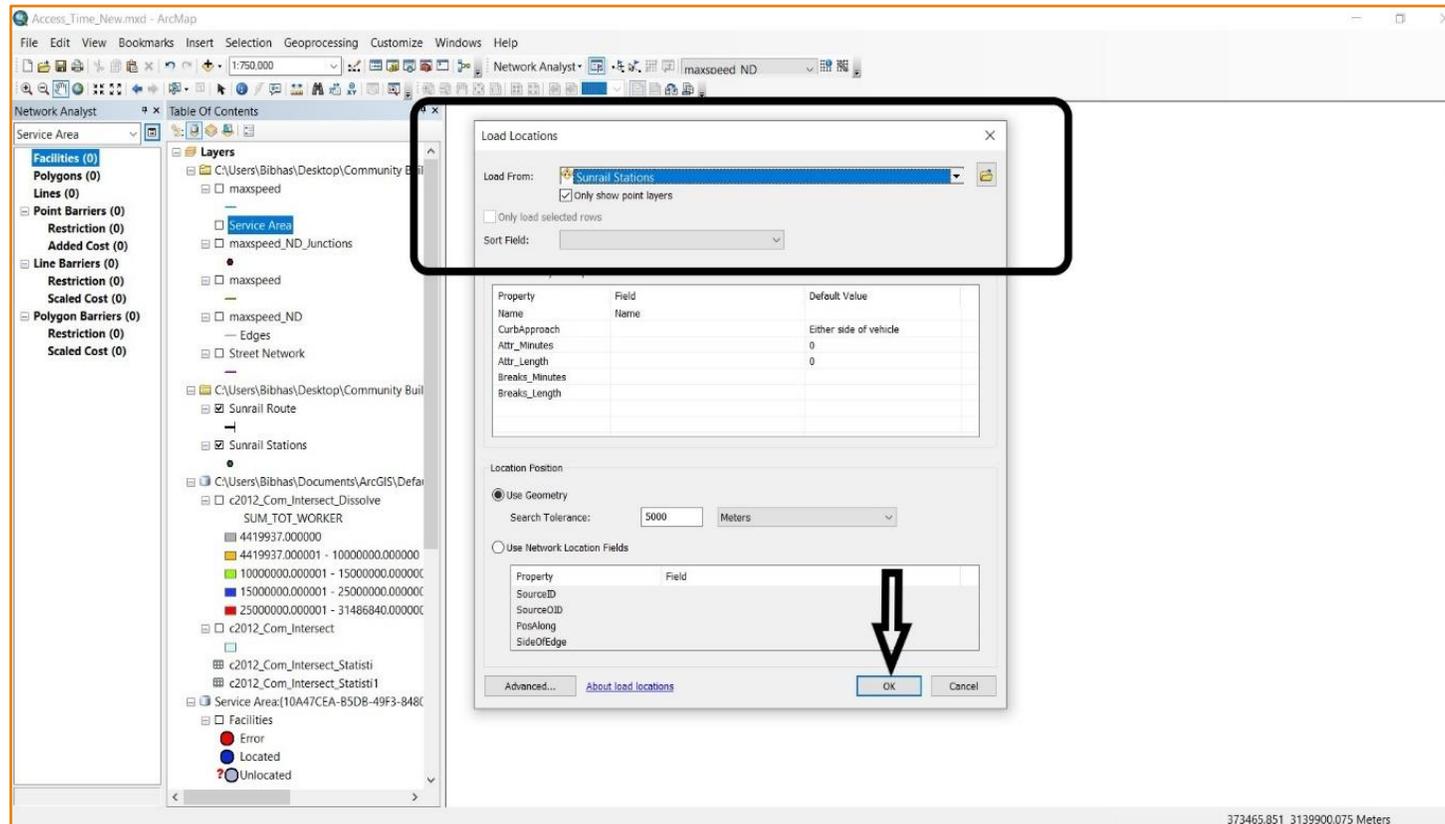
Driving Area

○ Step 5:
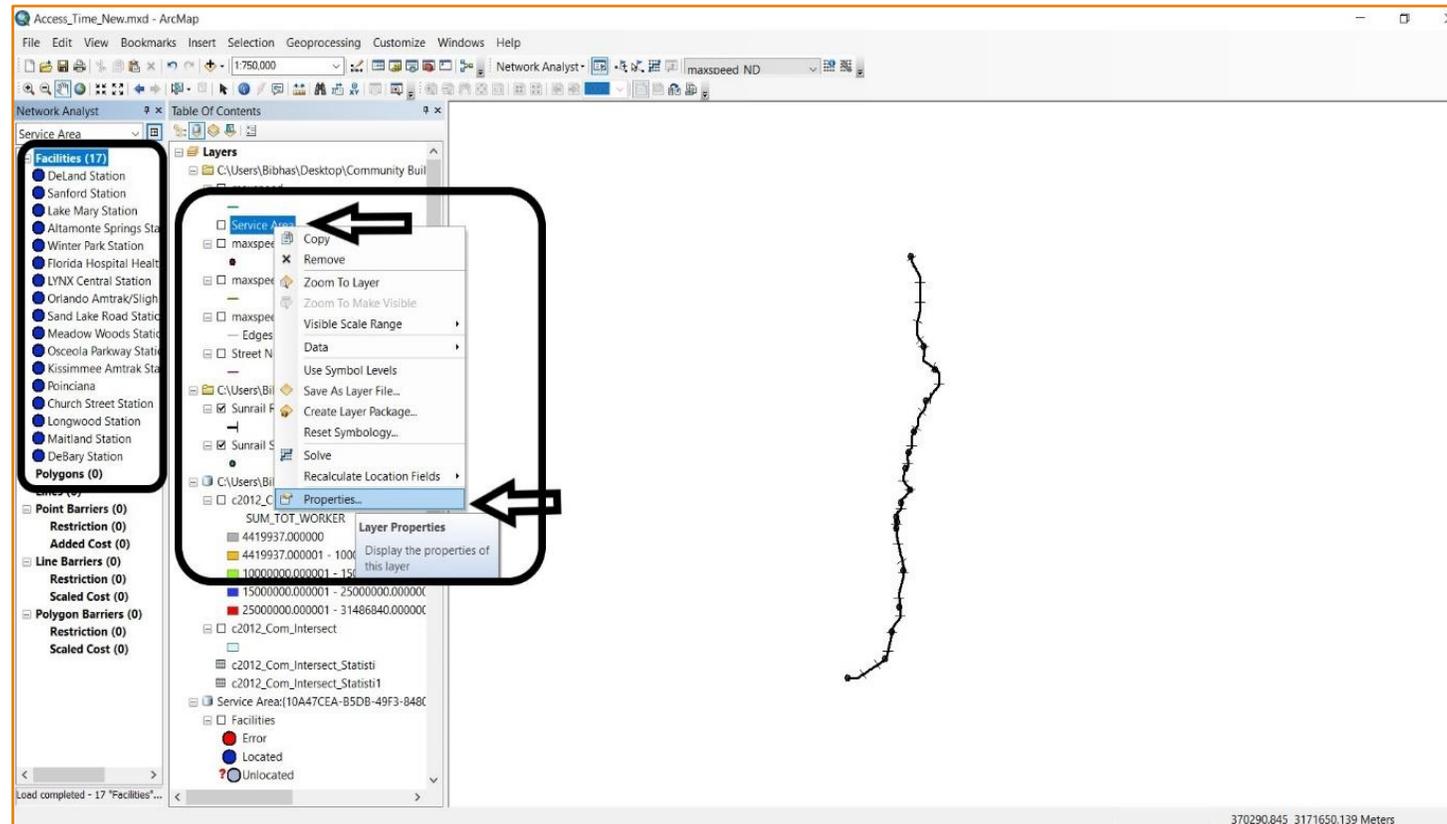
Driving Area

o Step 6:
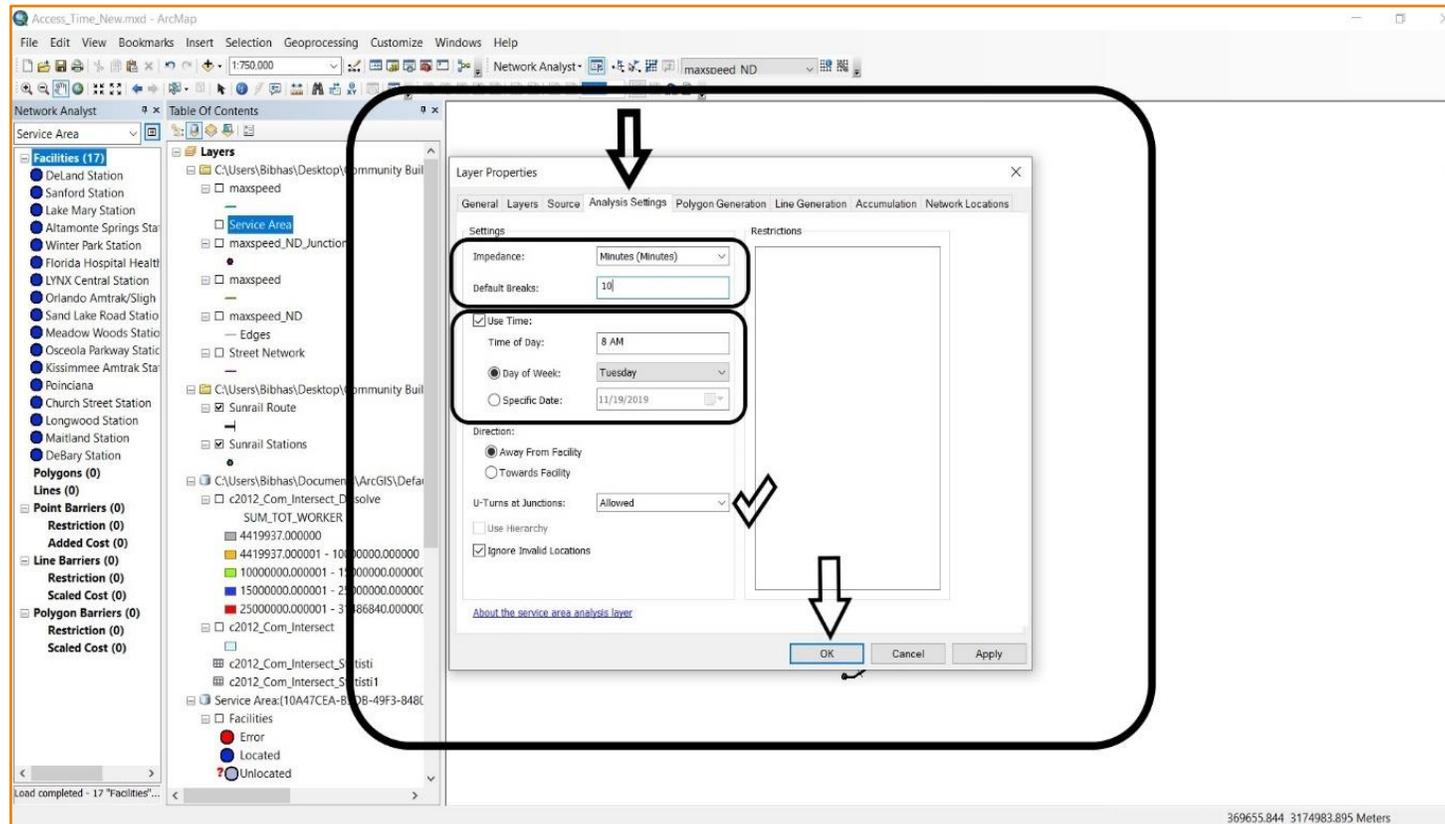
Driving Area

o Step 7:
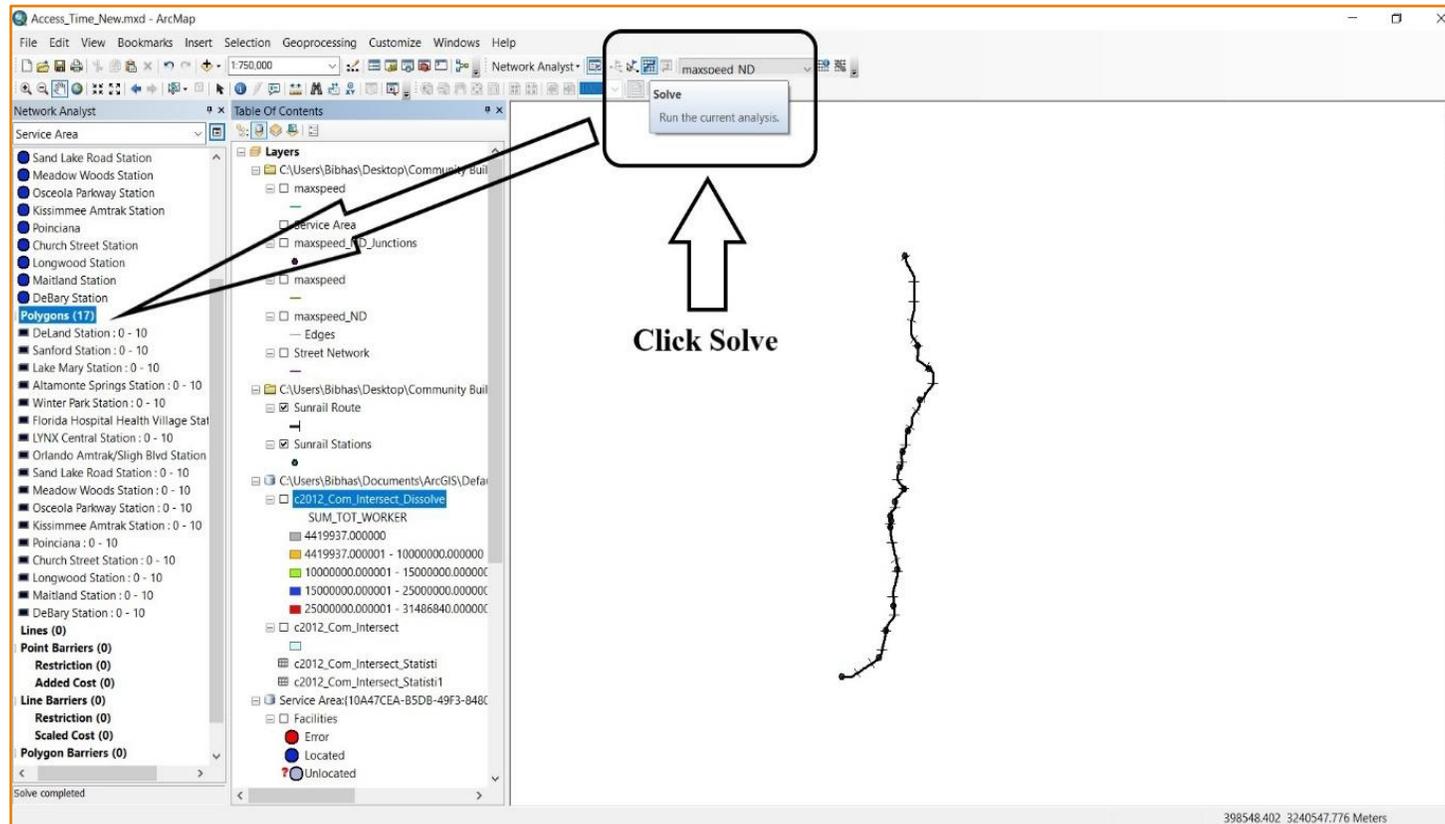
Driving Area

○ Step 8:
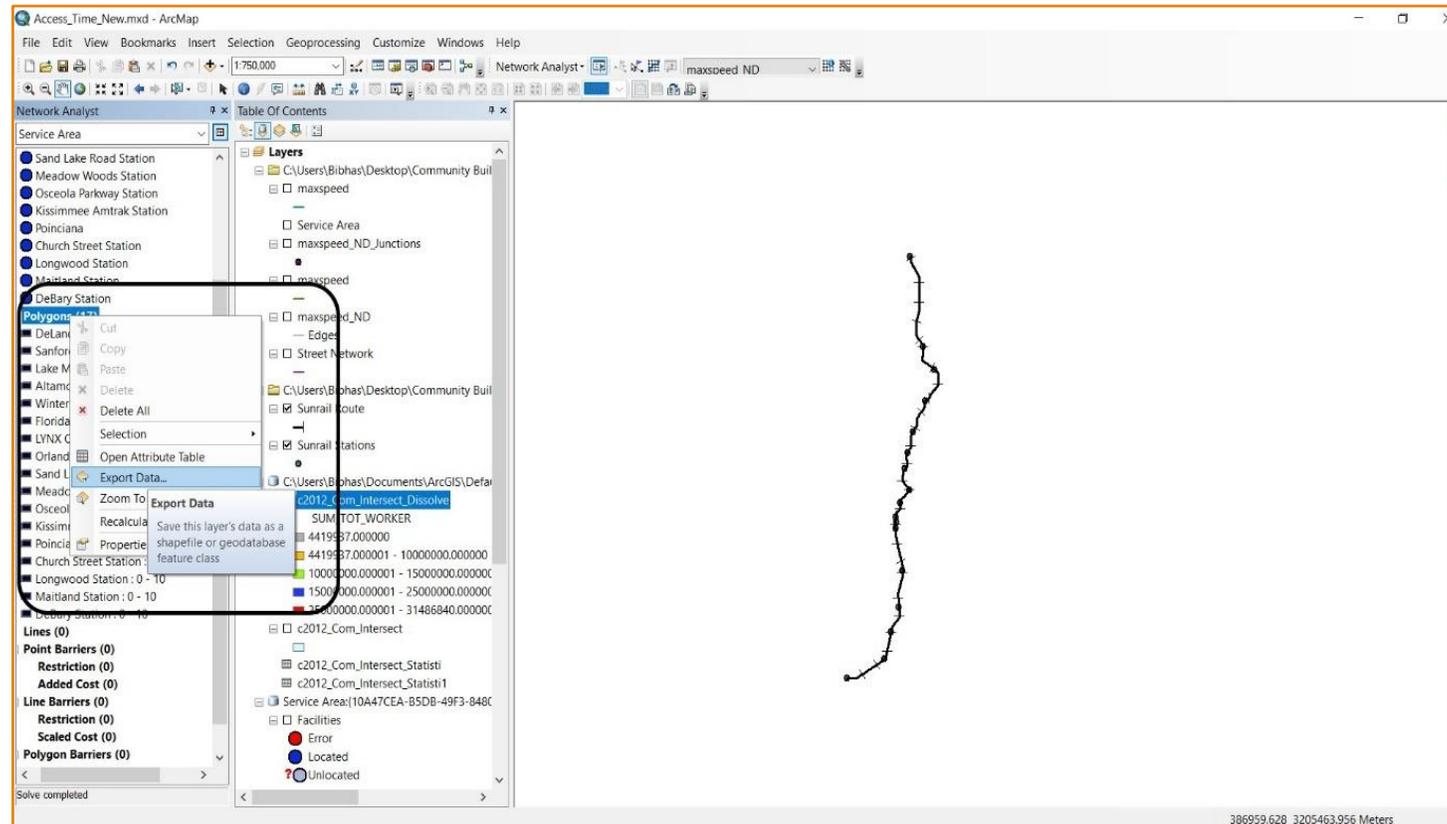
Control Area Selection

- We select 20-30 minutes car driving time as our control threshold.

- The census tracts located within this 10 minute threshold area (between 20 and 30 minutes) were selected to be the candidate control.

- Control area selection procedure is almost same as case area. We put 20 and 30 minutes in 'Default Breaks' option instead of 10 for case area.
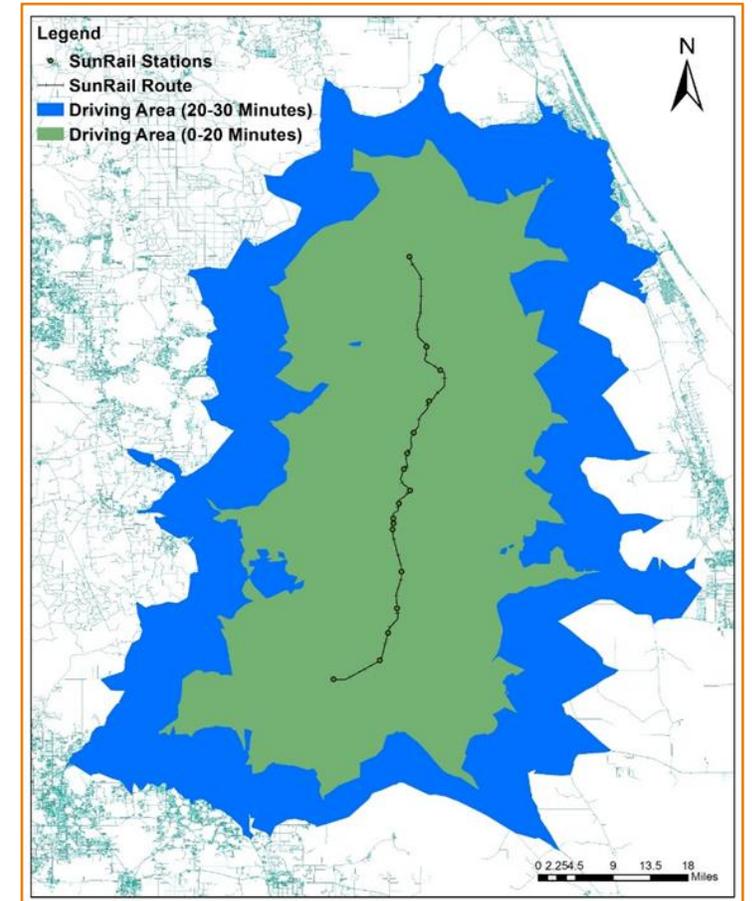
Control Area Selection

o Only Difference from Case:
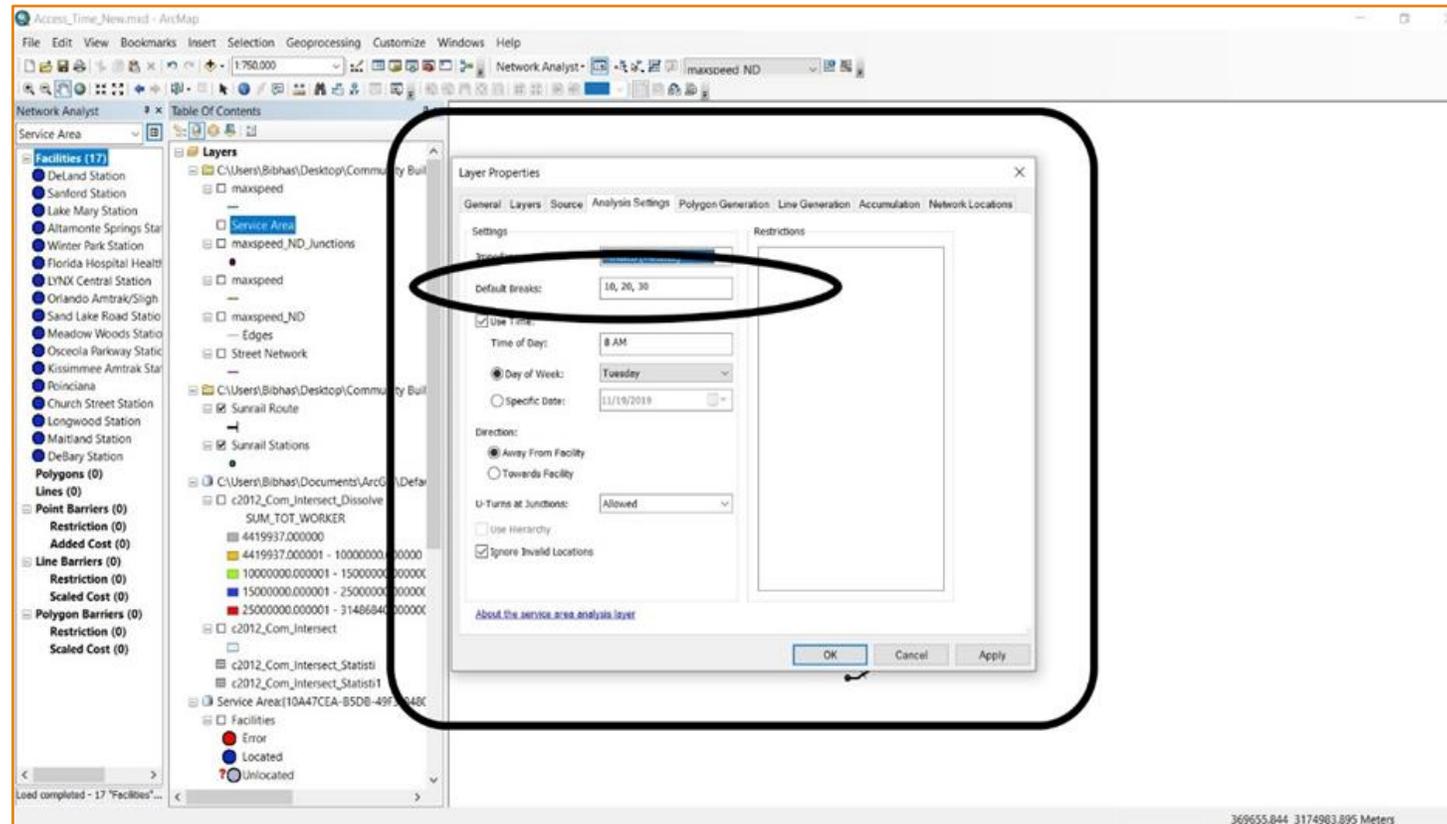
Other MOEs

o Commuting time
  ◦ The whole procedure is similar to property value estimation except average commuting time data (journey to work in minutes) per census tract of Florida drawn from American Community Survey (ACS) were used as an alternative of parcel data.

o Land use change
  ◦ The same parcel data similar to property value was used to estimate land use change. After case and control area selection, SPSS file was used to estimate the total area change from vacant to various land use type.

o Travel pattern for zero car households
  ◦ The means of transportation to work by household vehicle fleet size data at the census tract level for 2011-2016 was extracted from American Community Survey (ACS) was used to estimate the percentage of trip number by various modes for zero car households. The estimation procedure is similar to property value estimation.

Questions