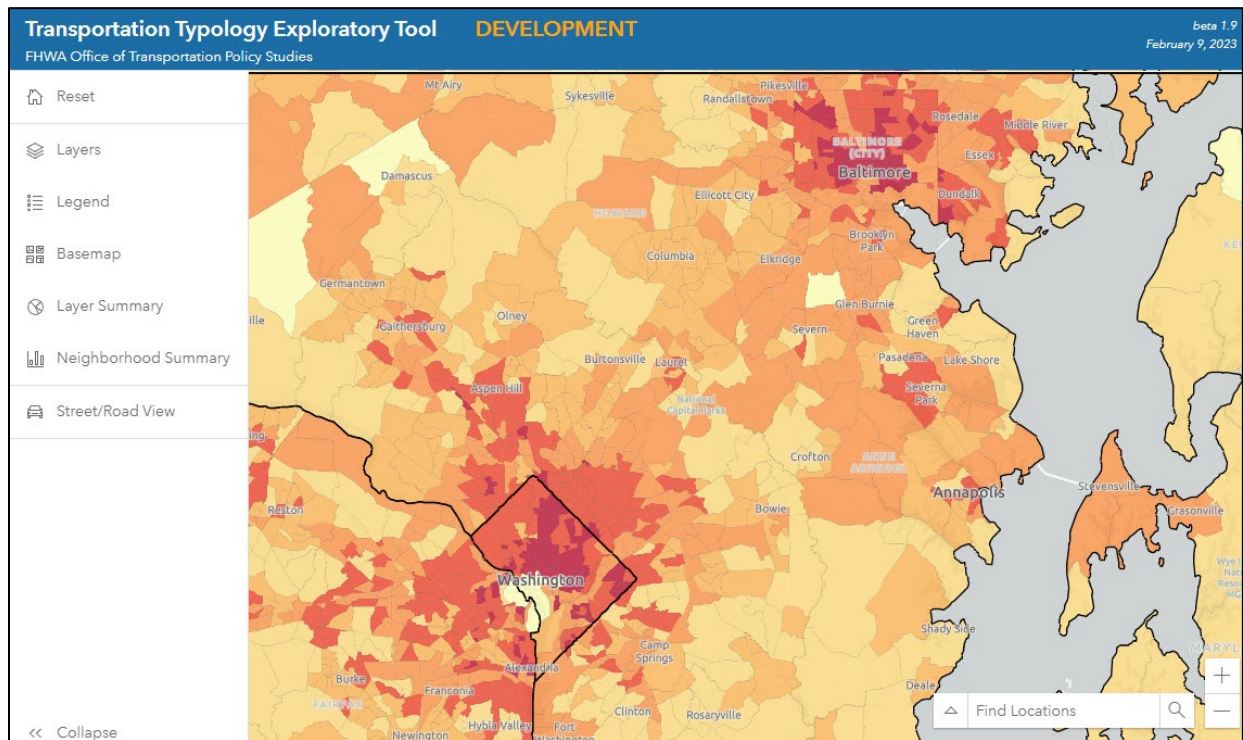# Transportation Typology Exploratory Tool (beta) User Guide

February 9, 2023

Office of Transportation Policy Studies
Federal Highway Administration
U.S. Department of Transportation

1. Background

The Transportation Typology Exploratory Tool is an interactive mapping tool that helps exploring typologies that group census tracts, and counties all over the country into similar neighborhood types (Microtypes) and Region types (Geotypes) that exhibit similar drivers of transportation demand and supply[1]. This tool helps analysts capture and assess features such as population densities, transportation network characteristics and conditions, and sociodemographic data at the census tract, county, and CBSA level. The tool allows for meaningful national and regional comparisons that go beyond traditional typologies of urban versus rural transportation networks.

2. Accessing The Transportation Typology Exploratory Tool

The introductory page for the Transportation Typology Exploratory Tool is located at https://maps.dot.gov/fhwa/ttet. The introductory page (Figure 1) provides a brief overview of the application, as well as additional resources. The interactive mapping application can be accessed by clicking on the blue "Access Tool" button.
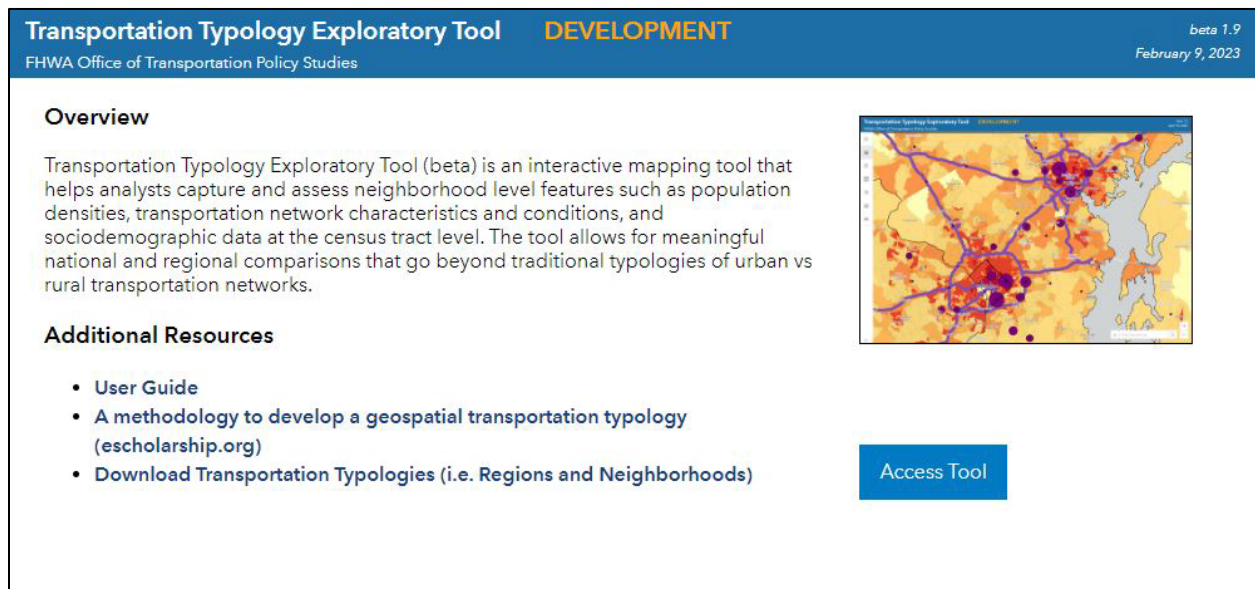

Figure 1 – Introductory Page

1

Popovich, Natalie, Spurlock, C. Anna, Needell, Zachary, Jin, Ling, Wenzel, Tom, Sheppard, Colin, and Asudegi, Mona. *A methodology to develop a geospatial transportation typology*. United Kingdom: N. p., 2021.

3. Using the Application

3.1 Application Layout

The layout of the interactive web mapping application is relatively simple. Figure 2 shows the main sections of the application that are visible when the application first opens.
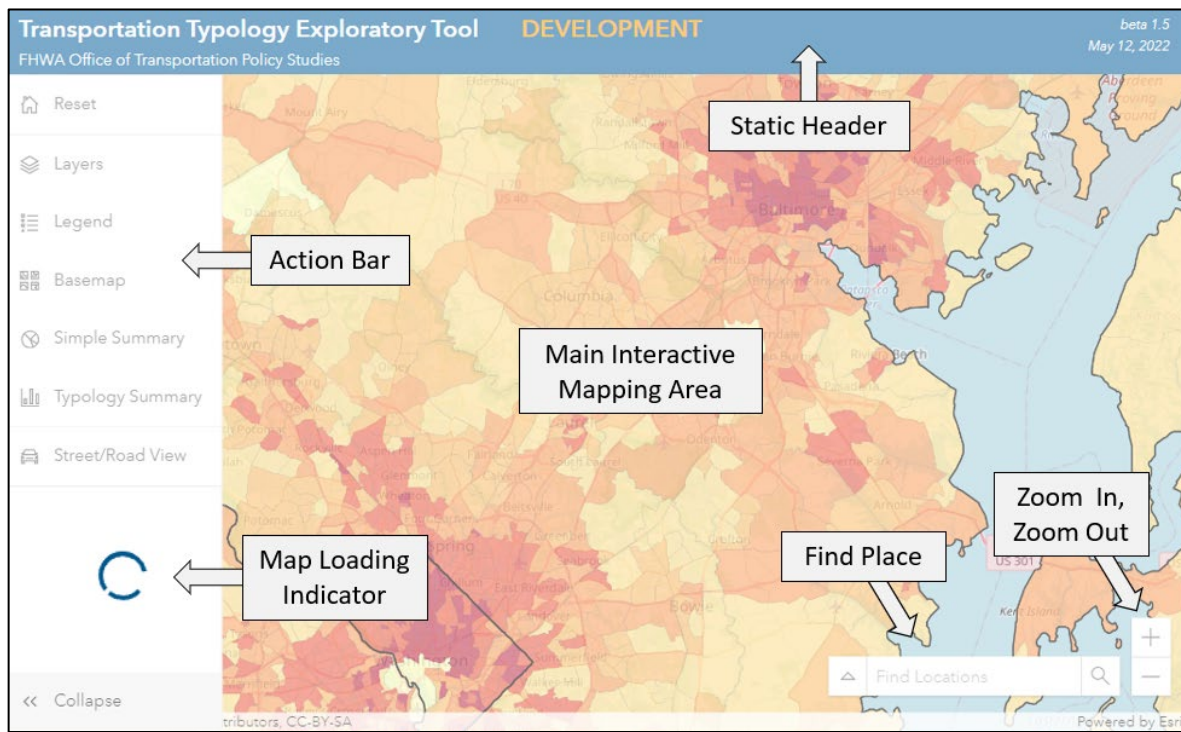

Figure 2 – Application Layout

The action bar on the left is collapsed at startup and can be expanded (as shown above) by clicking on the **">>"** icon in the lower left-hand corner of the application.

3.2 Map Navigation

The mapping application begins zoomed to the Washington D.C. – Baltimore metropolitan area. Users can interactively zoom in and out on the map in the following ways:

- Using the zoom in (**+)** and zoom out (**–)** buttons on the bottom right
- Double clicking on the map to zoom in one level, and double clicking while holding down the Ctrl key to zoom out one level

- Using the mouse scroll button, where scrolling back will zoom out and scrolling forward will zoom in
- Holding the shift button down, and drawing a rectangle on the map will zoom and recenter to cover that rectangle.

While the above ways of interacting with the map change the scale (i.e., zoom level) of the map, users can also click and drag the map to pan around at the same map scale.

To directly zoom to a specific place, the name of a place can be entered in the "Find Locations" bar in the lower right corner of the application as shown in Figure 3 below. As the user types the name, the options that match will be shown, and the user can then select the one they are looking for.
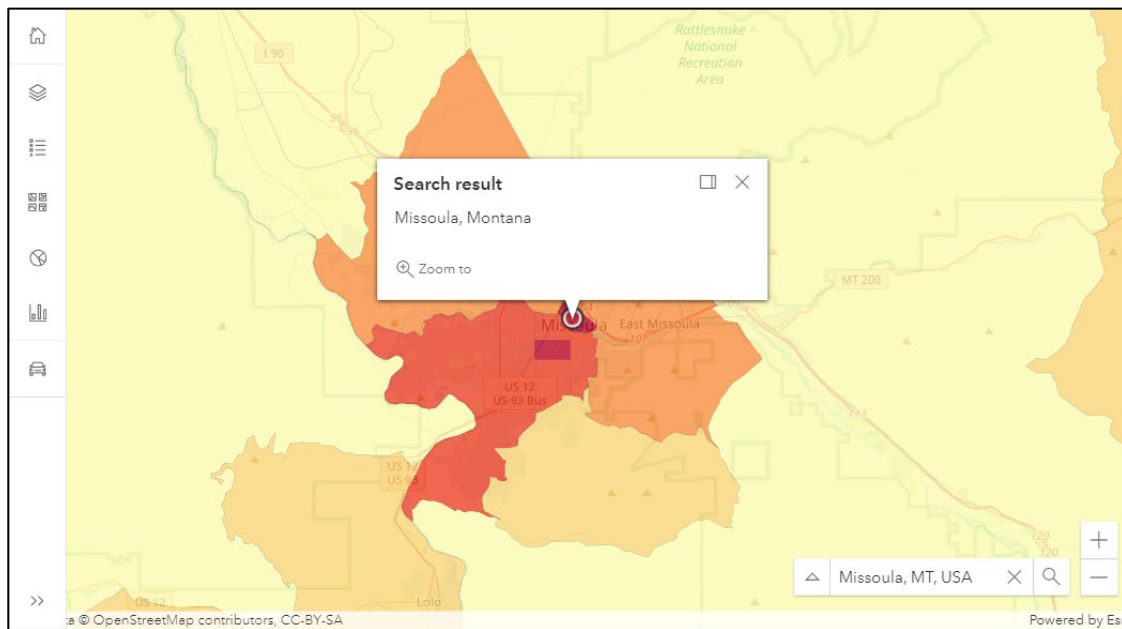

Figure 3 - Zooming to a Location

3.3 Action Bar Buttons

Figure 4 shows the action bar which contains 7 buttons, each of which will be described in detail below.
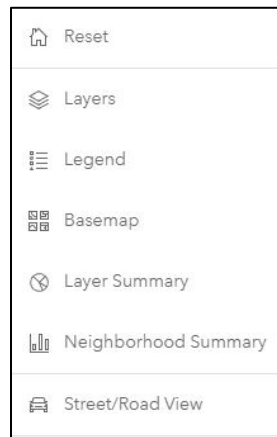

Figure 4 – Action Bar

Several of these buttons open a window just to the right of the action bar. In these cases, the opened window can be closed by pressing the "x" in the upper-right corner of the window, or by pressing the same or another action bar button.

3.3.1   Reset Button

The topmost button on the action bar is the reset button. When this button is pressed, a dialog will appear asking the user to confirm that they would like to reset the application. If 'Yes' is selected, the application is reset to its initial state. This resets the map display to its original extent and also sets visible layers and all layer queries (described below) to their initial state. An alternative to this is to press the F5 key to reload the application.

3.3.2   Layers Button

Figure 5 illustrates the Layers list that opens when the "Layers" button is pressed. The layers list has several different functionalities, each of which is described in the subsections below.
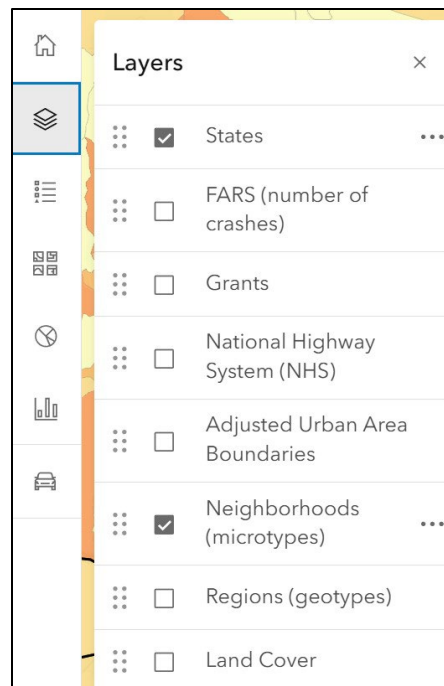
Figure 5 - Layers List

3.3.2.1   Layer Visibility

The checkbox to the left of each layer name indicates if the layer is currently visible. Clicking the checkbox with toggle the visibility of a layer.

Some users may find it useful to quickly toggle the visibility of a layer to better understand the relations between two layers, for example if both neighborhoods and regions are set to be visible, the neighborhoods layer can be quickly turned on and off to better understand the relationship between neighborhoods and regions.

3.3.2.2   Layer Order

There are times when a user may want to change the order of layers. This can be done by clicking and holding the 6 dots to the left of the checkbox to drag the layer up or down. Figure 6 shows an example where the "Adjusted Urban Area Boundaries" layer has been moved to the top (compare to Figure 6) and will therefore draw last and not be covered by any other layer.
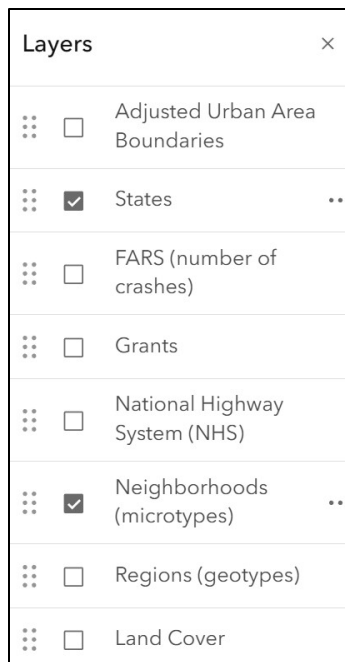
Figure 6 - Layer Order

3.3.2.3 *Layer retrieval*

When zooming in and out, layers will adjust (e.g., fill in) to the displayed extent. Layers are retrieved from a server and can take a few seconds to fully download. Figure 2 shows the location of the map loading indicator. This indicator will spin while the application is still downloading layers and will disappear once all layers are downloaded. Occasionally the download of layers can take longer due to internet or server delays.

Many of layers that are available in the tool are very large, for example neighborhood types are based on over 72,000 Census tracts and selected demographic information is also included in the layer. Since the intent of the tool is to allow users to compare different areas, there are no limitations on when layers are visible, for example, some applications may only allow Census tracts to be drawn when zoomed in to approximately a state level scale. As a result, if users don't apply layer filters (see section 3.3.2.5 below) and zoom out too far, the application will request large amounts of data from the server and data download limitations may be reached. Figure 7 shows an example where neighborhood types have not been filtered in any way and the map is zoomed to a large part of the United States. The map loading indicator has stopped, yet all neighborhood types have not drawn. For this reason, the application starts zoomed into a specific area. It should be noted that with recent improvements in the Esri software that this application is built on, this problem in not occurring nearly as frequently as in early beta versions.
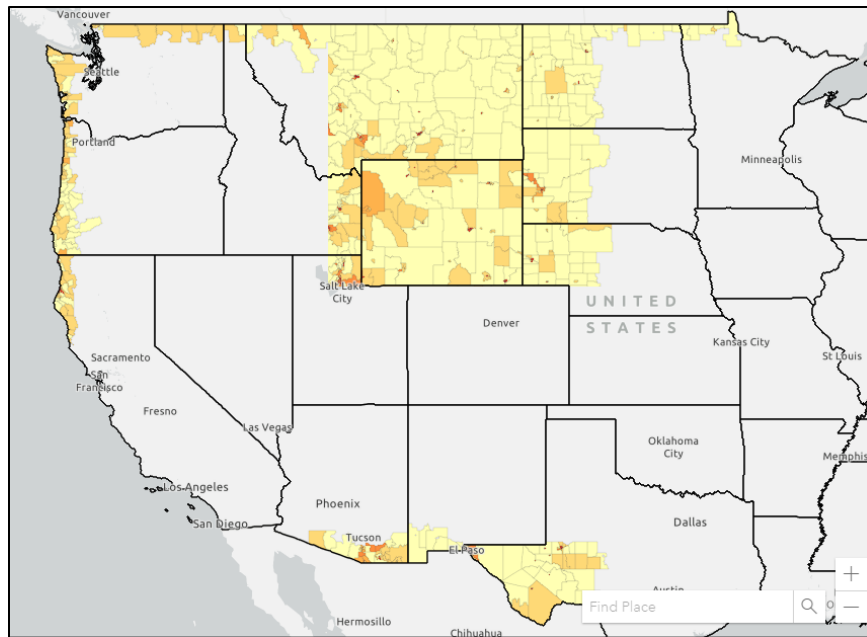
Figure 7 – Missing Census Tracts

3.3.2.4 *Layer Clustering*

Unlike other layers, the FARS (Fatality Analysis Reporting System) layer uses dynamic clustering, which groups individual crash points into clusters that dynamically change size as the user zooms in and out. Figure 8 below shows 75 fatal crashes in the Washington, DC area, while the more zoomed in Figure 9, shows the dynamically generated clusters are more broken apart. It should also be noted that the 75 crashes in Figure 8 clearly represent crashes from outside of Washington, DC since figure 9 shows that the number would be closer to 28.
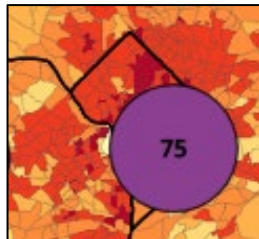

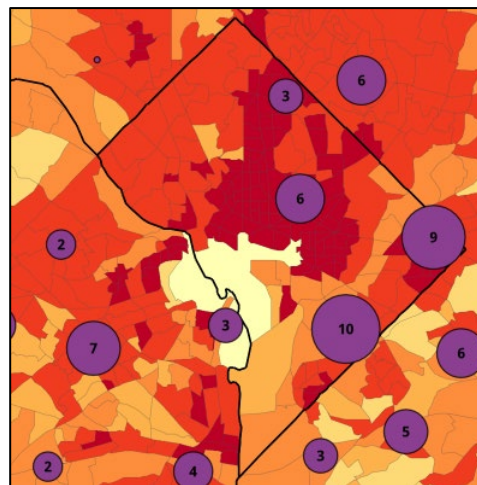**Figure 8 – Clustering Zoomed Out**

Figure 9 – Clustering Zoomed In

3.3.2.5 Layer Filtering

One of the most powerful features of this application is that the various layers can be quickly filtered to gain meaningful insights. Filters can be applied to visible layers by clicking on the filter/funnel icon to the right of the layer name. Figure 10 shows an example of a layer specific filter dialog that opens when the filter icon is clicked.
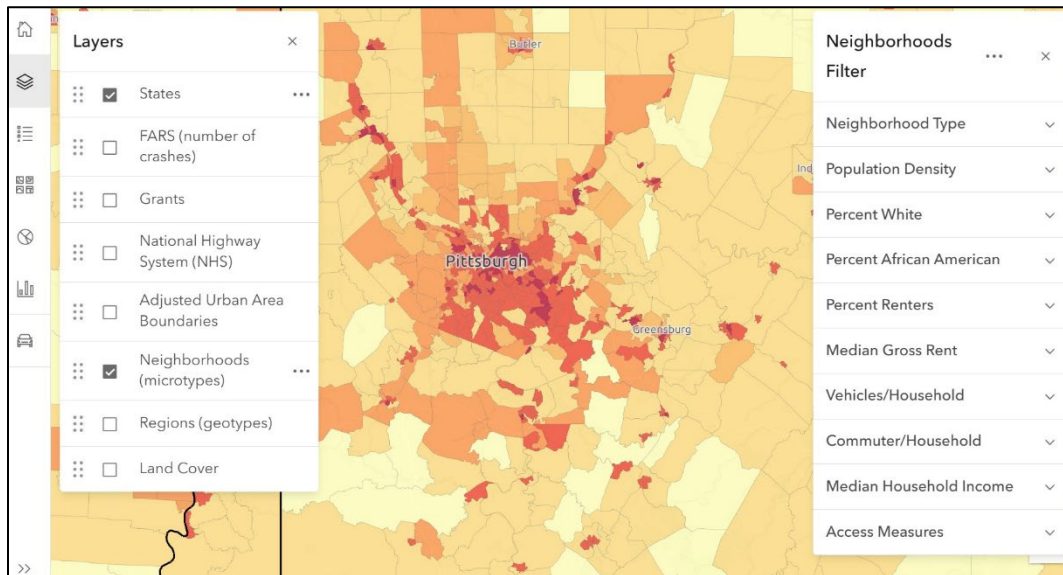

Figure 10 - Layer Filtering

Users can then choose from any of the available filters. Figure 11 illustrates filtering to only show neighborhood types 1 and 2.
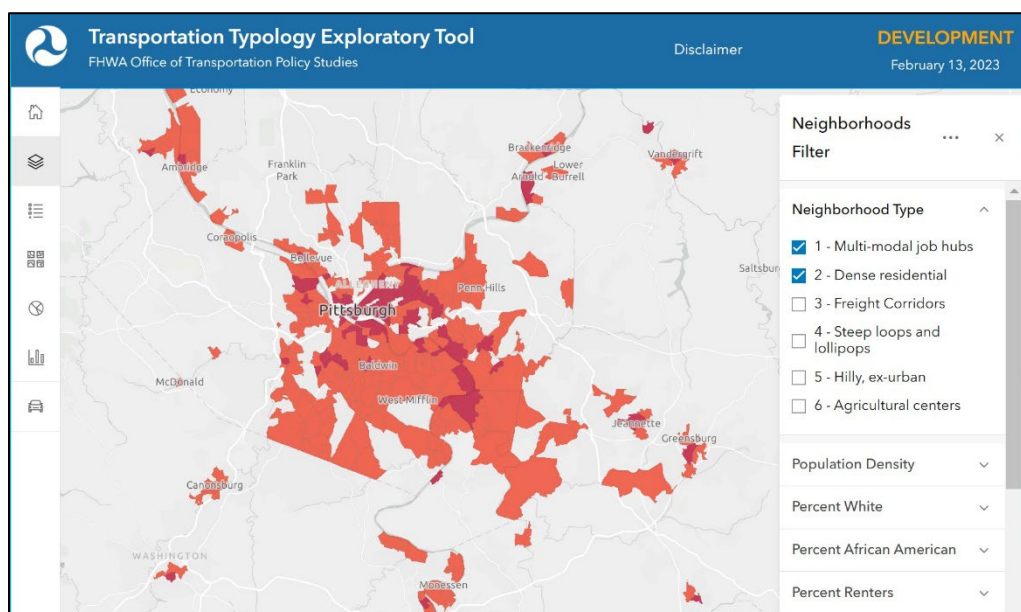

Figure 11 - Neighborhoods (Census Tracts) Filtered by Neighborhood Type

Similarly, Figure 12 shows the application of a filter based on population density.
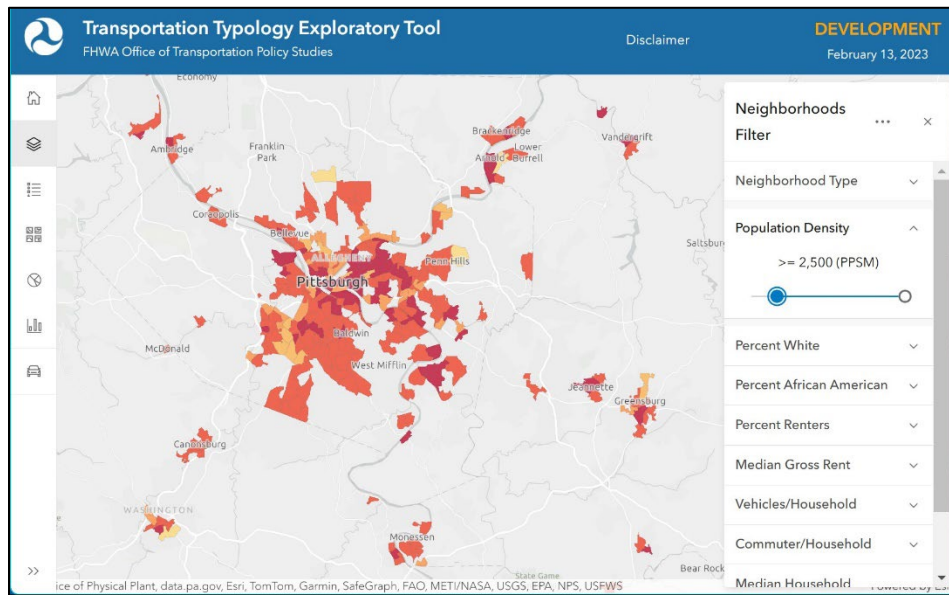

Figure 12 - Neighborhoods (Census Tracts) Filtered by Population Density

If multiple filters are applied, the filters are combined using 'and'. That means that if both queries from figures 11 and 12 are applied at the same time, the result is a query like "neighborhood type in (1, 2) and (population density <= 2500)". It is not currently possible to use "or" in filters (e.g., neighborhood type in (1, 2) or population density <= 2500). Figure 13 shows the result when both filters are applied.
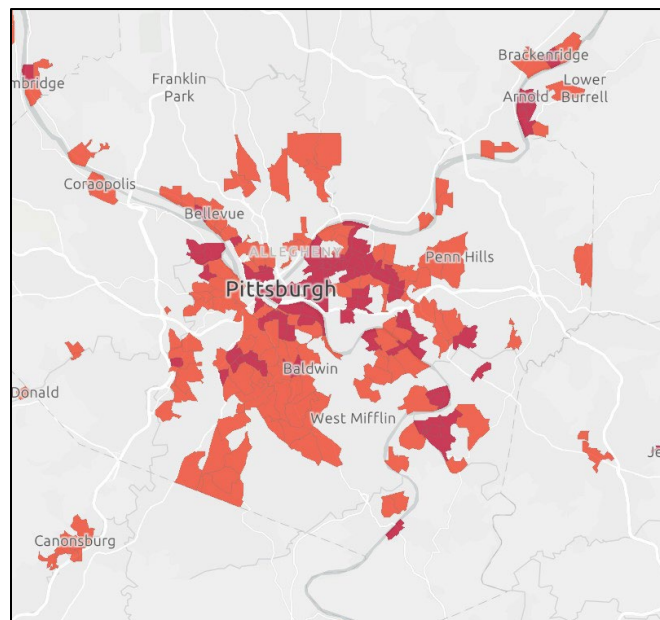

Figure 13 – Multiple Filters Applied

As multiple filters are set, it can be difficult to keep track of all the filters that have been applied. By clicking the ellipses in the upper right corner of the layer filter, two additional buttons are shown (Figure 14)
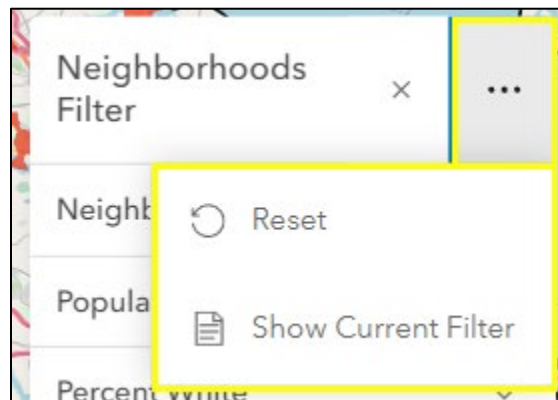

Figure 14 – Reset and Show Current Filter

The "Reset" button resets all filters in the layer to their default value. It should be noted that in some cases the default value is not all features, for example the National Highway System only shows functional classes 1 and 2 by default.

Figure 15 shows an example of the modal dialog box that is displayed when the "Show Current Filter" button is pressed. This shows the actual SQL query that is being applied to the layer, something that may be of interest to some users.
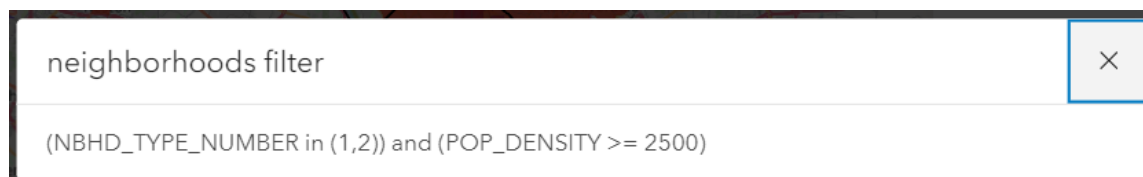

Figure 15 – Show Current Filter

Some layers cannot be filtered. The Adjusted Urban Area Boundaries layer cannot be filtered because no additional attributes have been included at this time as its primary purpose is to simply show areas defined as being urban. Filtering on the land cover layer has not been implemented at this time and the layer simply serves as an alternate base map.

The filter for the states layer behaves slightly differently because its primary purpose is to filter the other layers by state. Figure 16 illustrates an example where Massachusetts and New Hampshire are selected in the states filter and other visible layers, regions, and FARS crashes in this example, are automatically filtered to these states as well. The land cover layer is not currently filtered by states.
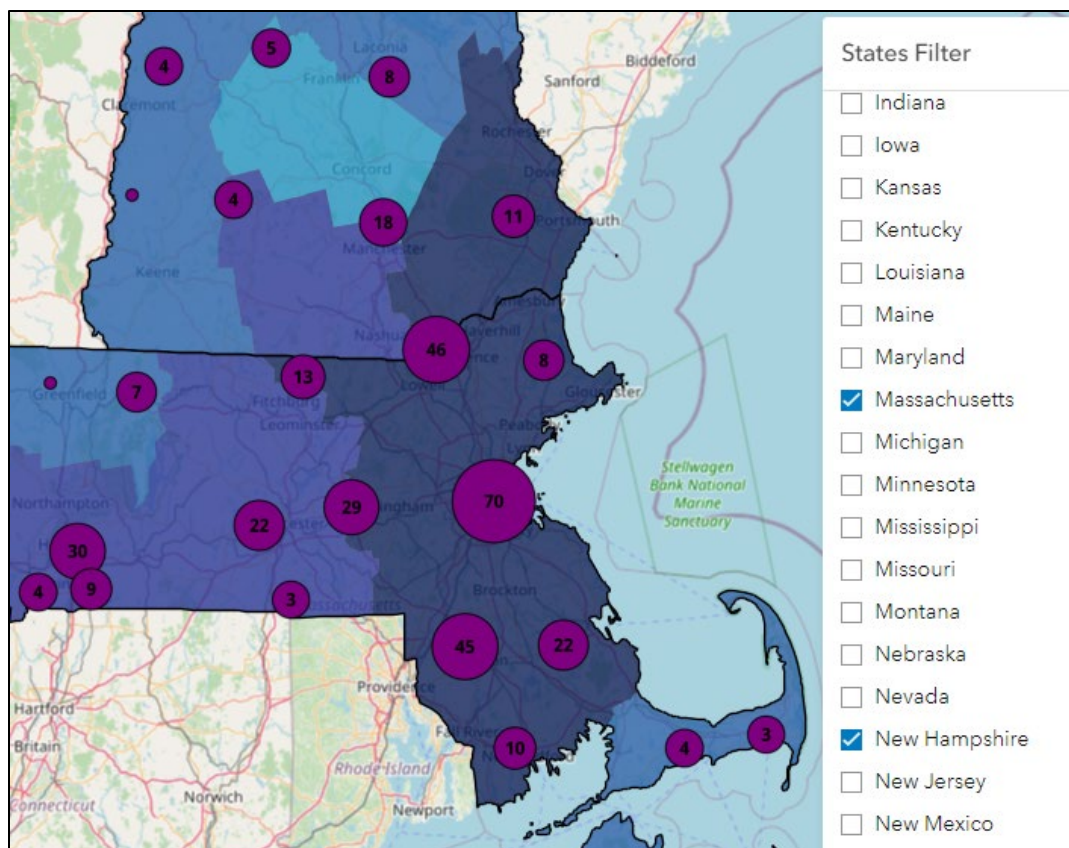
Figure 16 - Filtering by State

3.3.2.6   Layer Transparency

The transparency of layers can also be changed. The transparency slider button is located to the right of each visible layer in the layer list. Figure 17 shows an example where both the neighborhoods layer and the FARS layers are made more transparent to add additional context with the basemap. Users should be aware that applying transparency on layers can make it difficult to interpret the map symbology.

It should also be noted that in some cases, when trying to use the transparency slider, the entire layer may be dragged as if the user was trying to change the layer order, an issue which may be related to screen resolution. If this occurs, a suggested work around is to change the transparency by clicking at locations along the slider rather than trying to drag the slider.

Figure 17 - Layer Transparency
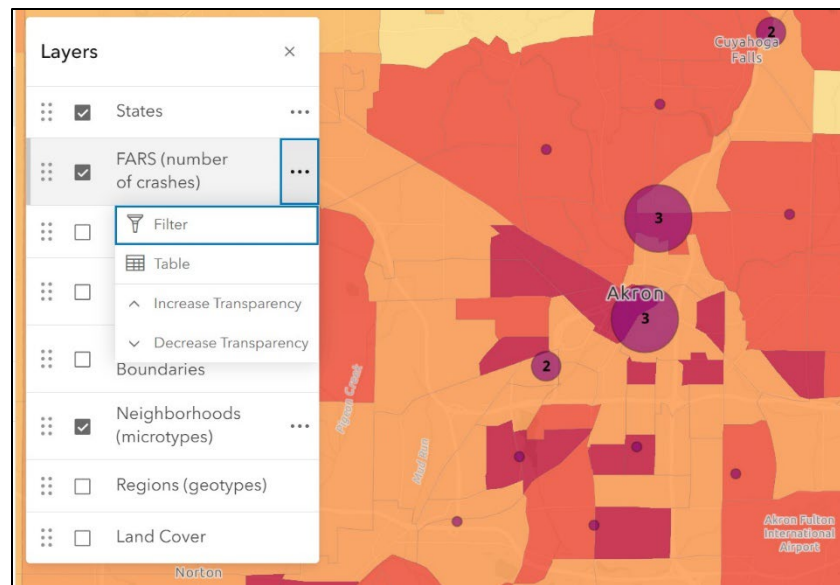
3.3.3 Legend Button

When the legend button is clicked, it opens a map legend which shows the layers which are currently set to be visible. It should be noted that while the legend shows all categories for the layer, it doesn't mean they all appear in the current view.
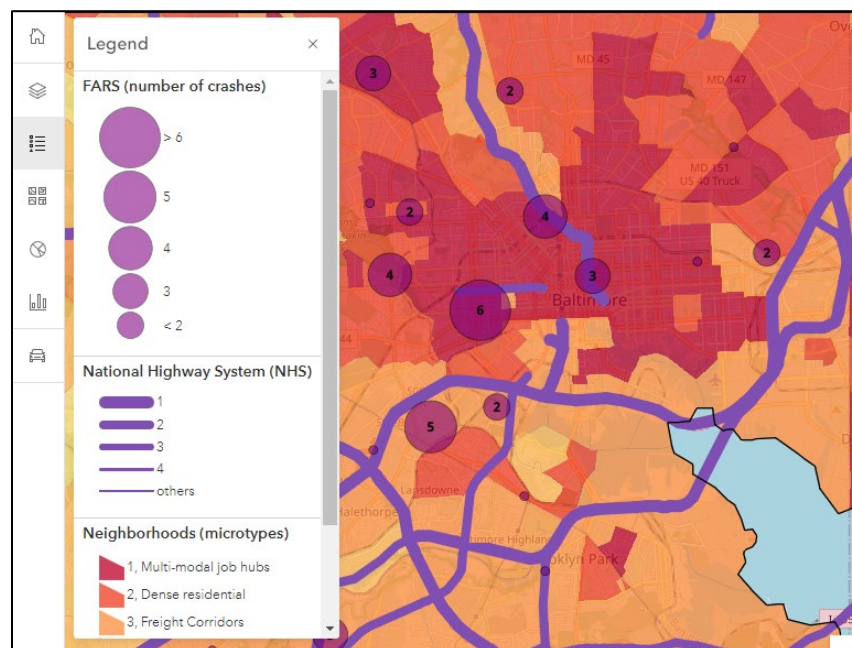

Figure 18 - Legend

3.3.4 Basemap Button

Several basemaps are available in the application and changing the basemap, for example from a street map layer to an imagery layer can provide additional insight. Figure 19 shows and example of changing to the "Imagery with Labels" basemap.
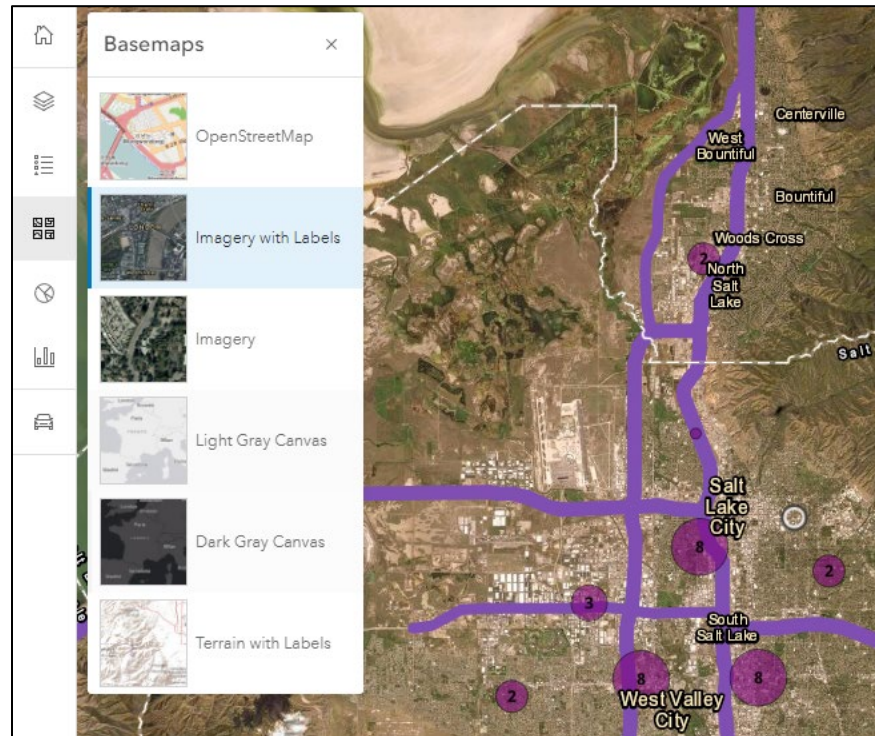

Figure 19 – Changing the Basemap

3.3.5 Layer Summary Button

The Layer Summary functionality allows users to see selected statistics for the area currently being shown on the map. Figure 20 shows the population, Population, NHS mileage, and FARS fatalities for the area shown on the map. The Layer Summary also shows a breakdown of neighborhood types in a donut chart. The user can hover over the donut chart to see specific neighborhood types, counts, and percentages. It should also be noted that the statistics and chart also reflect any filters that have been applied, so if for example, a filter was applied to only show neighborhood type 1, then the population would be for neighborhood type 1 and donut chart would only show one neighborhood type.
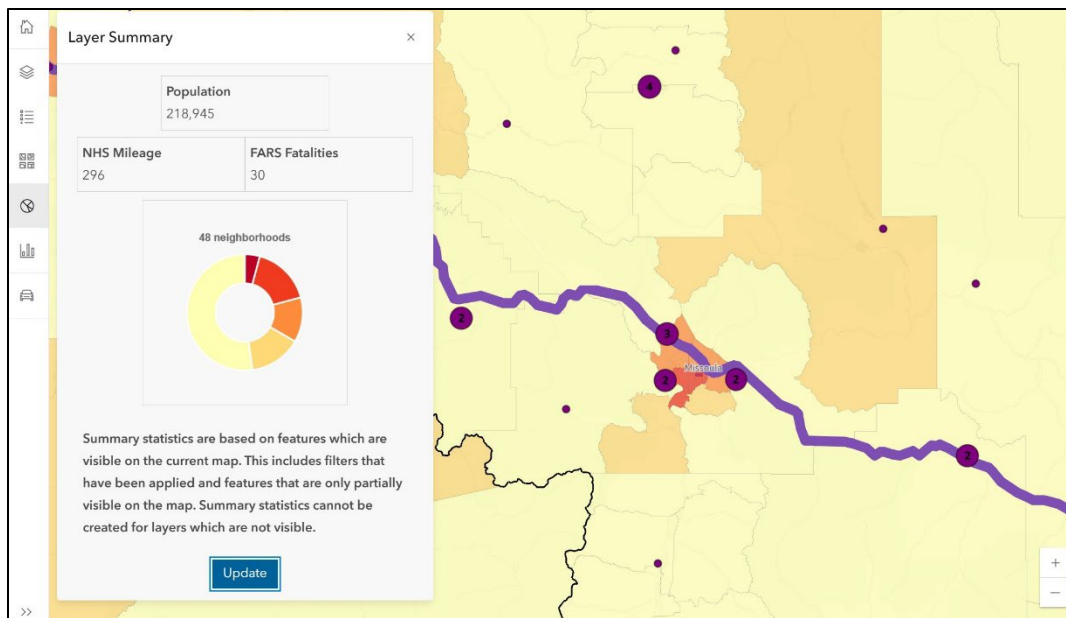
Figure 20 – Simple Summary Example 1

Figure 21 illustrates an example where the NHS Mileage and FARS Fatalities layers have been turned off. Because numbers are derived from the features on the map, NHS Mileage and FARS Fatalities cannot be determined when the layers aren't visible.
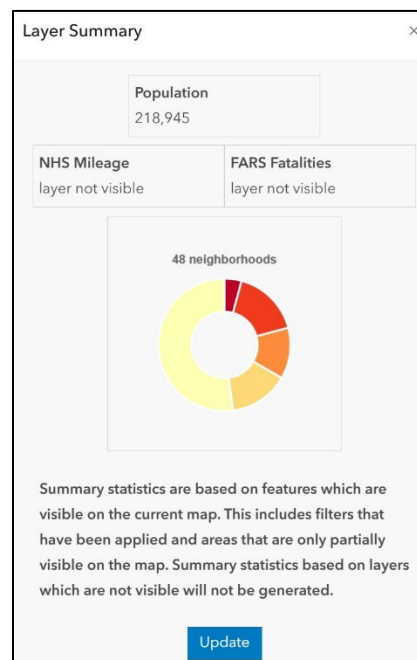

Figure 21 – Simple Summary Example 2

3.3.6 Neighborhood Summary Button

The Neighborhood Summary functionality allows users to make charts which summarize selected layer by neighborhood types. Figure 22 shows the neighborhood summary for the FARS dataset. As with the Layer Summary functionality described in the previous section, the relevant layers must be visible for the chart to be generated.
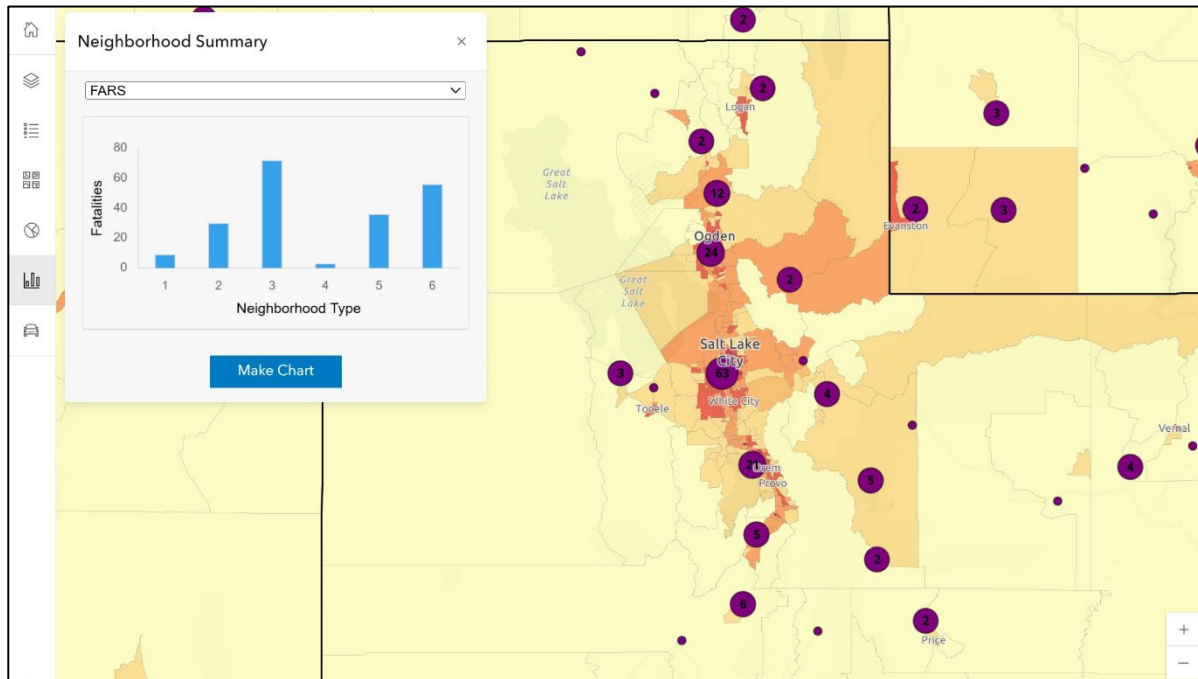

Figure 22 – Typology Summary Window

3.3.7 Street/Road View Button

The street/road view option on the menu allows users to quickly open Google Maps, in Street View Mode, at a selected location. To do this, the user should click on "Street/Road View" button in the action bar, at which point the button should appear selected and the user should see a message that says "Click on a Road" next to the pointer when hovering over the map (Figure 23).
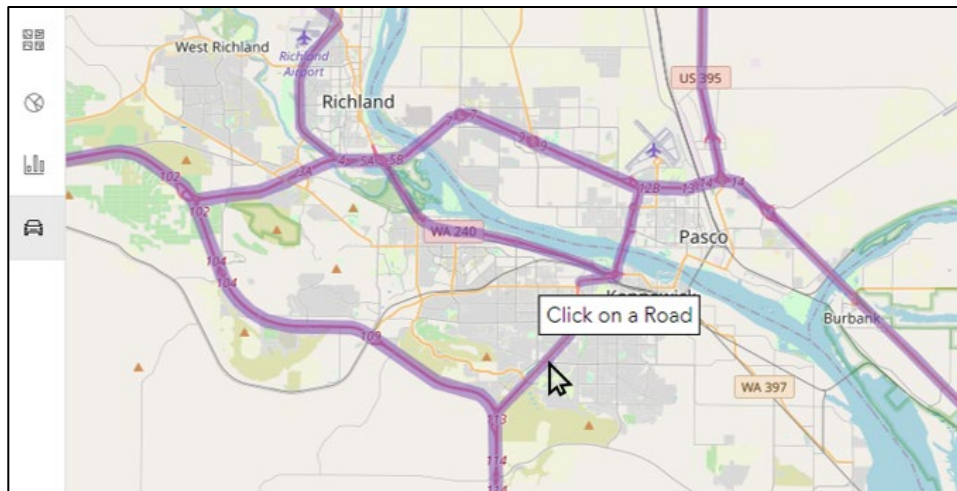
Figure 23 – Street/Road View Button

When the user then clicks on the map, for example on route 395 near W 27th Ave in Figure 24, a separate Google Maps tab opens in the browser (Figure 24).

Figure 24 - Google Street View

If a user clicks on an area that is not close to a road (e.g., the green area just south of W 27th Ave in Figure 24), the Google Street View will appear black as in Figure 25 below. If the user still wants to explore the area, they should use the back arrow (i.e., left pointing arrow) in the upper left corner of the Google Street View page to return to the standard Google Map view of the area.
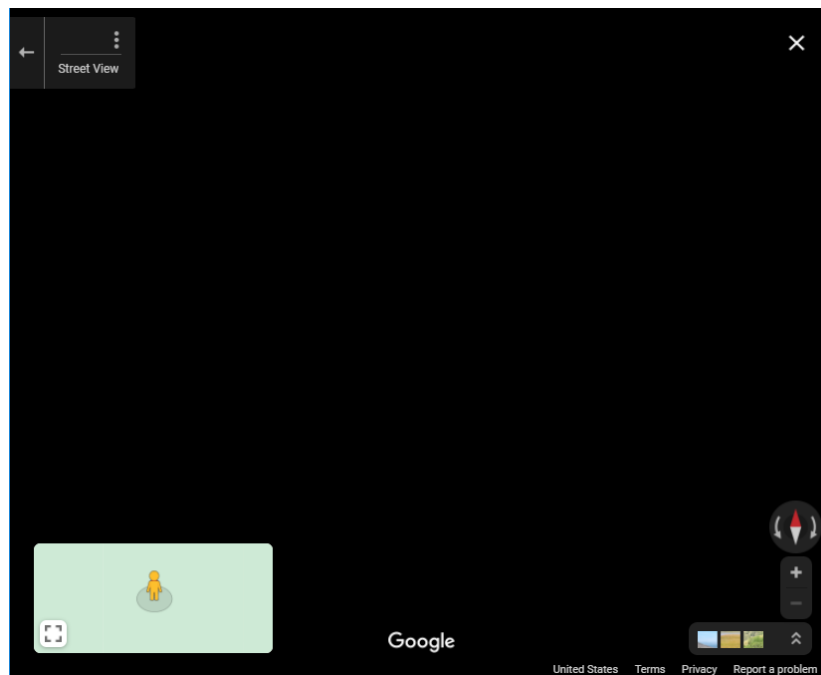
Figure 25 - Black Google Street View

The Street/Road View functionality only works while the Street/Road View button is highlighted. For example, if a user was to use Street/Road View functionality and then clicked the legend, a mouse click on the map would no longer open Google Street View. This helps to prevent users from wanting to click on layers for information and inadvertently opening a Google Steet View tab instead.

4. Contacts

Please direct all questions and comments to Mona.Asudegi@dot.gov.