User Guide for the ArcGIS Web Application OK-EFRA (EHS Flow and Risk Assessment)

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OK-EFRA

The purpose of the ArcGIS application OK-EFRA is to inform LEPCs, first responders, and other local bodies in Oklahoma counties as to what extremely hazardous substance (EHS) may be transported on county roads and highways with an assessment of EHS incident risk to serve as input to their emergency preparedness planning activities.

The information that forms the basis for OK-EFRA was derived from the results of a research effort funded by the Oklahoma Department of Emergency Management and Homeland Security and conducted by a research team at Oklahoma State University, Stillwater, OK with technical guidance and expertise provided by the Oklahoma Department of Environmental Quality.

The source data was collected by the OSU research team through an online survey of facilities in the state that store EHS on-site and send and/or receive such EHS materials on a regular basis. The OSU research team developed flow assignment and risk assessment methodologies and associated mathematical models to estimate the EHS flows and EHS incident risk on Oklahoma roadways. The information presented in OK-EFRA is limited to the data provided by Oklahoma facilities that responded to the survey. The estimates of EHS flow and risk levels could serve as input to emergency response planning activities.

The ArcGIS application has layers for EHS flow, incident risk, and risks related to NFPA categories. Filters are available for EHS material and flow volume, incident and NFPA category risk levels, and counties. These features allow the user to see the desired information at various levels of detail in a seamless manner. County-level filters allow LEPCs to focus on the regions that are of interest to them. The user can also click on a road link and scroll through the details (frequency, annual amount, etc.) of all the EHS flow information shown visually.

The user guide provided here has been prepared by the OSU research team to assist end-users in accessing and working with the ArcGIS application. It includes several illustrative examples and screenshots to make it easier for the user to work with the ArcGIS application.

For more information, please contact us.

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Section 1. Getting Started

The ArcGIS application has been designed to be accessible through web browsers on any desktop, laptop, tablet, or smartphone. At the time this document was prepared, no issues have been reported about compatibility with web browsers including Firefox, Chrome, Microsoft Edge, and Safari.

Figure 1 shows the home page of the application.

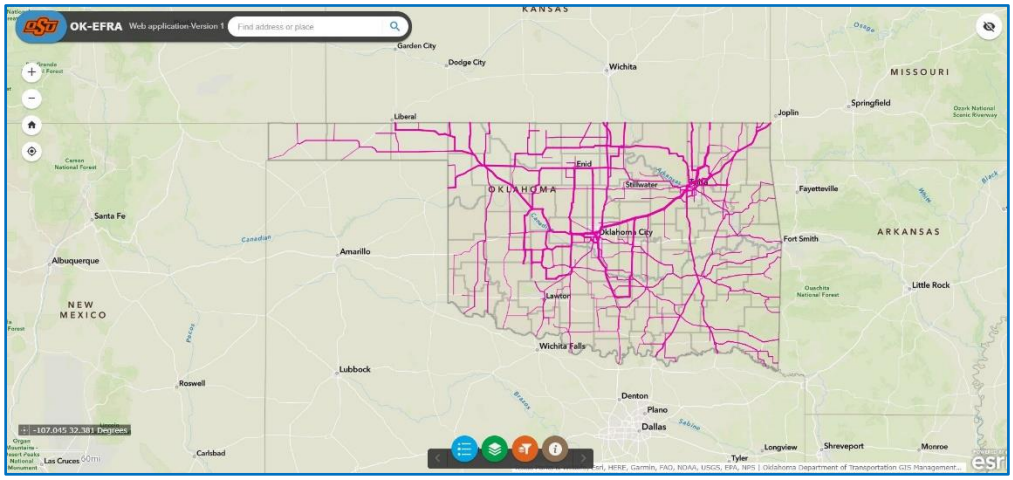


Figure 1. OK-EFRA Home Page

The home page displays the map of the state of Oklahoma. The colored lines are the road network within the state, on which the estimated EHS flows are shown. The county boundaries are also visible on the map.

Section 2. Understanding the Controls

The control buttons are available at the bottom and the left of the homepage, as seen in the snapshot in Figure 2.

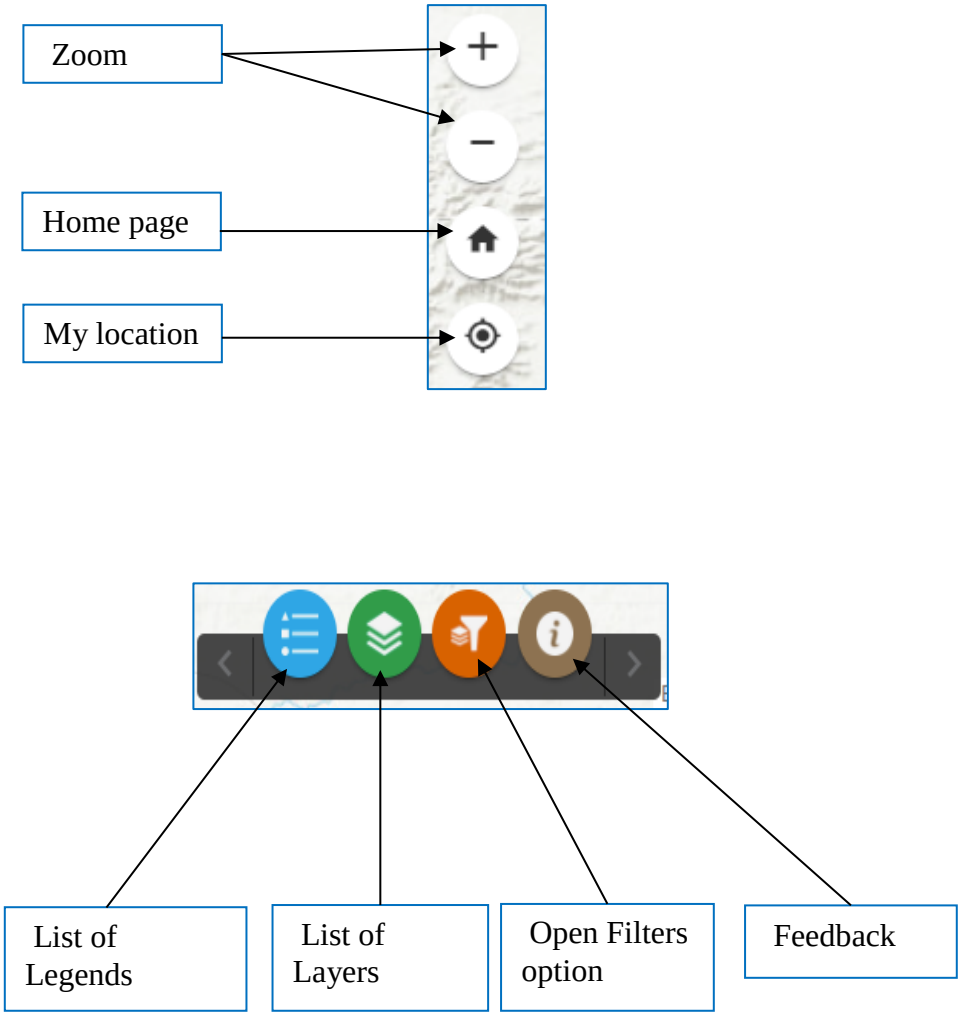


Figure 2. Control Buttons on the Home Page

Section 2.1 – List of Legends

Clicking on the 'List of Legends' button, the application will display all legends used in the map. This is shown in Figure 3.

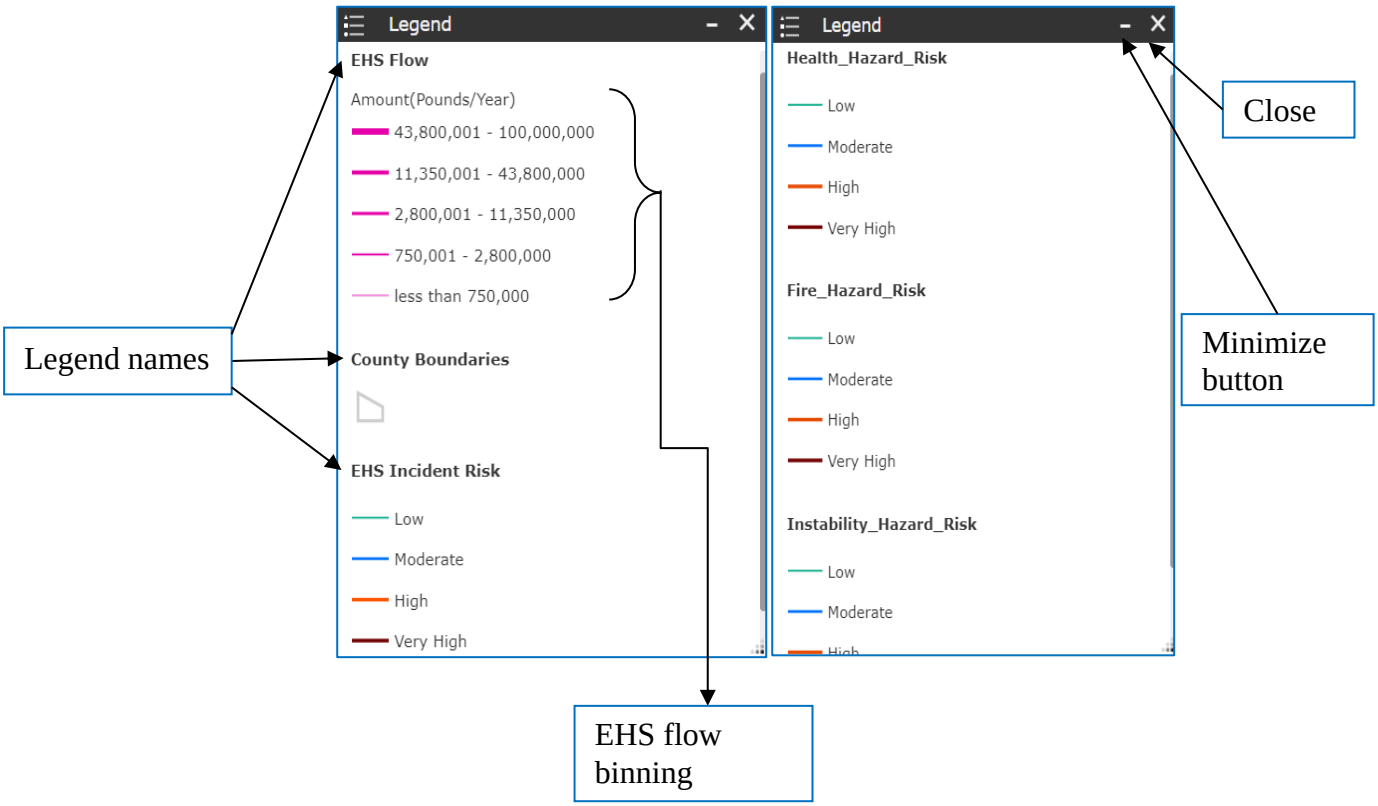


Figure 3. List of Legends

Section 2.2 – List of Layers

Clicking on the 'List of Layers' button, the application will display a list of all ArcGIS layers used in OK-EFRA application. Each layer can be added/removed from the map using the blue-colored check box seen on the left-hand side of the layer name (see Figure 4).

User can add one or more layers at any given time. Use the small triangular drop-down to the left of the layer names to get the list of legends used on the layer.

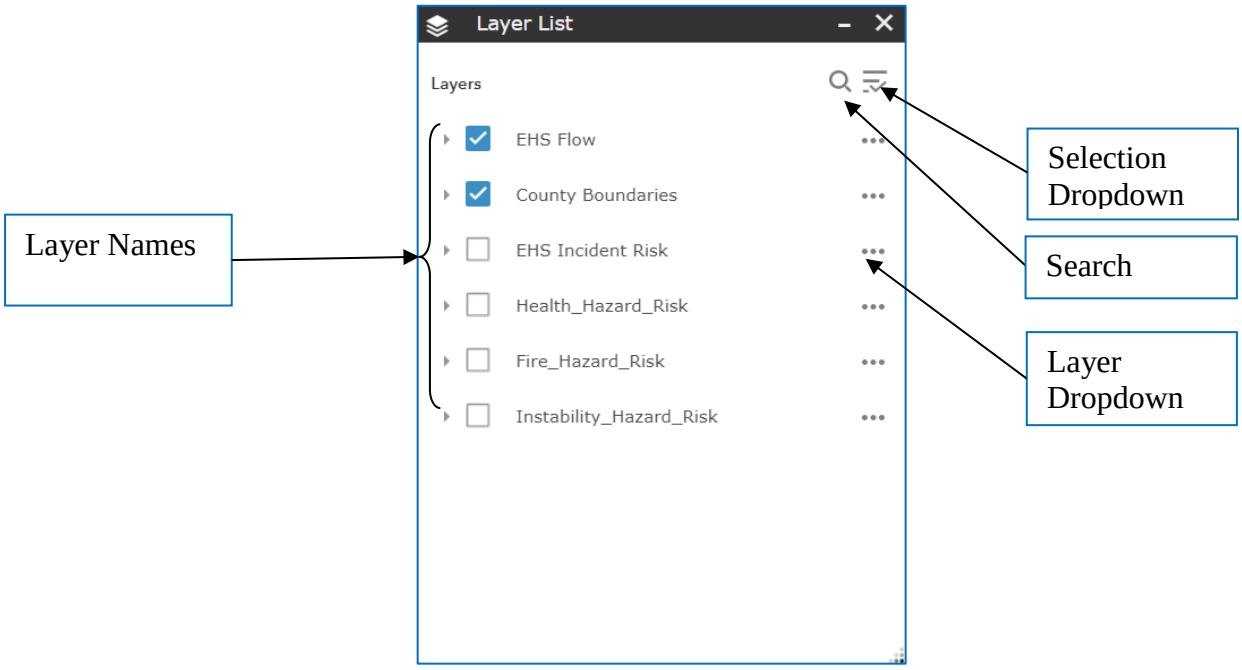
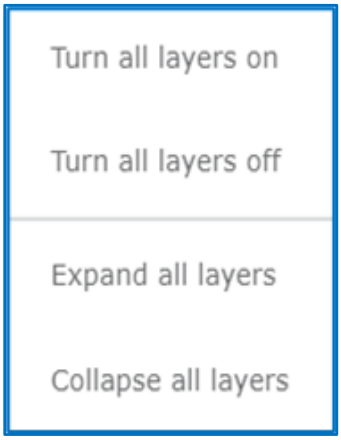


Figure 4. List of Layers

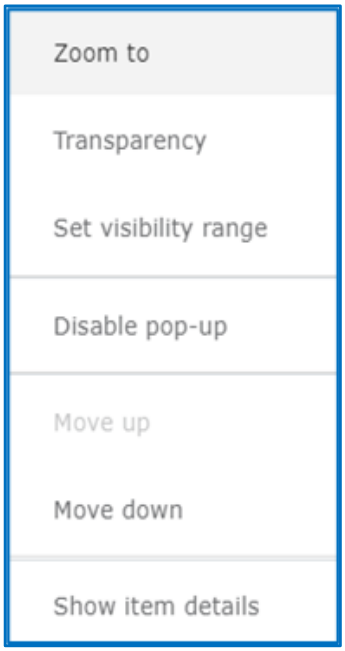
The details about the selection drop-down button are presented in Figure 5.



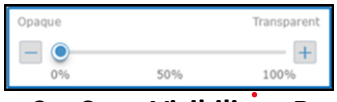
1. **Turn all layers on –** Clicking on this button will turn on all the ArcGIS layers in the map.
2. **Turn all layers off –** Clicking on this button will turn off all the ArcGIS layers in the map.
3. **Expand all layers –** Clicking on this button will expand dropdowns – all legends will be visible.
4. **Collapse all layers –** Clicking on this button will collapse all the expanded layers – all legends will not be visible henceforth.

Figure 5. Selection Dropdown

The details about the layer drop-down button are presented in Figure 6.



1. **Zoom to** – Zooms in and focuses on the layer.
2. **Transparency** – Clicking on this button will open a scroll bar, as seen below. Scroll left/right to adjust the transparency of the layer as per the requirement.



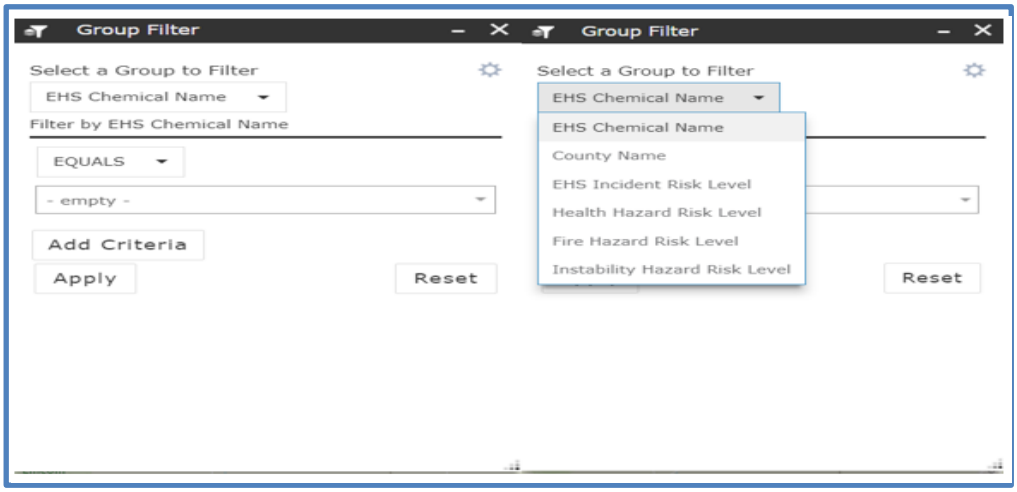
3. **Set Visibility Range** – Similar to above transparency button, here the scroll bar appears when this button is clicked on. Scroll to adjust the range.
4. **Disable/Enable Pop-Up** – Use to disable and enable the information pop-up for selected layer.
5. **Move up** – Use this to move the selected layer upward in the list.
6. **Move down** – Use this to move the layer downward in the list.
7. **Show item details** – Use this button to open the specific layer in a new tab.

Figure 6. Layer Drop-down

Section 2.3 – Filters

The Filter option acts as a sophisticated version of queries. The user can categorize, combine, and omit specific data to be displayed on the map.

Clicking on the 'Filter' button, the application will display a dialog box list to customize the map visualization. As per the filter criteria of the user's choice, different map layers are displayed as per different criteria. For example, the user can display the map as per 'EHS Chemical Name', as per each 'County Name' or as per 'the model/level of Risk'. Select the criteria and click 'Apply.' Finally, click 'Reset' to return to the original map.



EHS Chemical Name – Provides a list of options as per different EHS materials to be selected. Example: Ammonia, Chlorine, Sodium Cyanide, etc.
County Name – Provides a list of different counties from the State to be selected. Selecting one county would refine the map to display the data for only the county chosen. Example: Payne, Tulsa, etc.
Risk – Provides options segregated as per the risk model. To display Very High, High, Moderate, Low.

Four risk models are displayed in the Filter:

- *EHS Incident Risk*: incident risk on a road link based on incident probability, shipment frequency, and population density (impact factor).
- *Health Hazard Risk*: based on incident probability, weighted average of the NFPA* 704 ratings for health category of EHS on road link, and population density.
- *Fire Hazard Risk*: based on incident probability, weighted average of the NFPA* 704 ratings for fire category of EHS on road link, and population density
- *Instability Hazard Risk*: based on incident probability, weighted average of the NFPA* 704 ratings for instability category of EHS on road link, and population density

*NFPA - National Fire Protection Association

Figure 7. Filtering by Group

The user can customize the map to show the details of a particular EHS by using the “Filter by EHS Chemical Transported” Select the criteria and click ‘Apply.’ Click ‘Reset’ to go back to the original map.

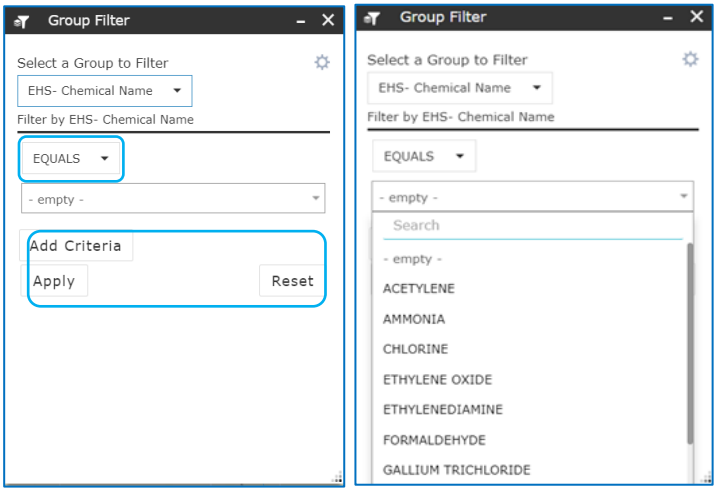


Figure 8. EHS Selection

The user has a drop-down menu to select the matching criteria as per their requirements. This is shown in Figure 9.

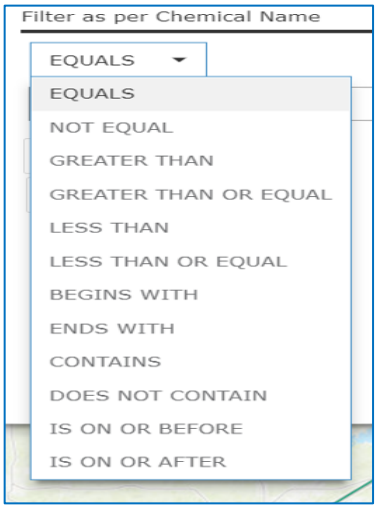
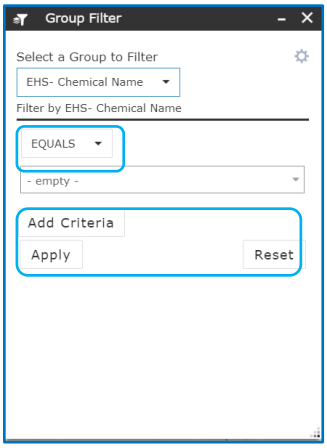


Figure 9. Criteria Selection

The user can apply multiple criteria to display more than one layer on the map. The user can use the option ‘Add Criteria’ to select your choice of criteria to be added. Select the criteria and click ‘Apply’. Click ‘Reset’ to get back to the original map.



1. **Add Criteria –** Option to place multiple criteria to refine your filter.
2. **Apply –** Click 'Apply' to add the selected filter or multiple filters selected.
3. **Reset –** Displays the original map, removing the previously applied filters.

Figure 10. Add Other Criteria

Section 3 – Interactive pop-ups (Roadways)

The information about a road link is shown in Figure 11.

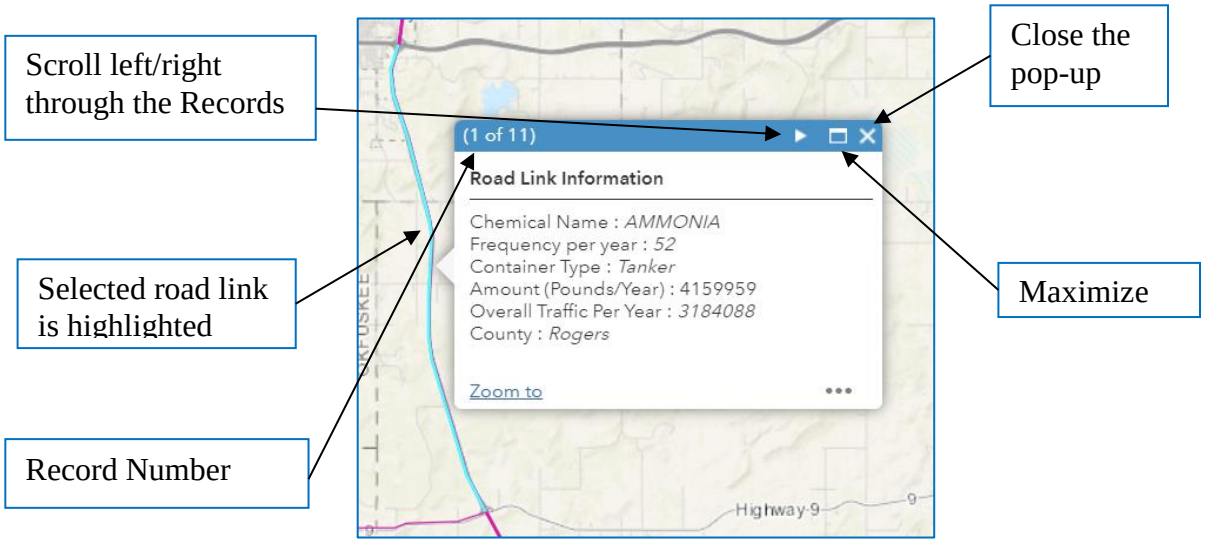


Figure 11. Interactive Pop-Up (Roadways)

The information about the road link is displayed in a pop up. The snapshot in Figure 11 shows the record for the selected road link.

The key information that could be retrieved from the pop up in Figure 11 is as follows:

- EHS on that Road (Frequency and weight per year).

A different pop up is assigned if there is a different EHS, varying quantity or a different container type on the same road link. Thus, multiple pop ups may be present for the same road link.

- Overall Traffic per year
- County information

The county shown represents the one in which the major portion of the road link under consideration is present.

*Note that road link information is based on the EHS flow layer that was selected. Selecting a risk layer will provide some additional (or different) information.

Section 4 – Examples

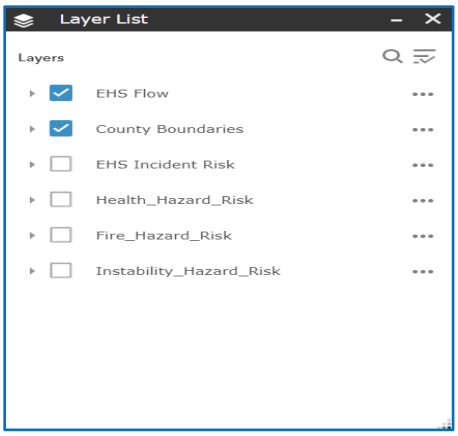
Example 1

Objective – Show all roadways in the state that transport EHS.

Steps: Home → Click on 'Layers List' option → Check 'EHS Flow' layer and 'County Boundaries' layer → Uncheck all other layers → Click on close ('X') to see the map

Step 1

Step 2



Result

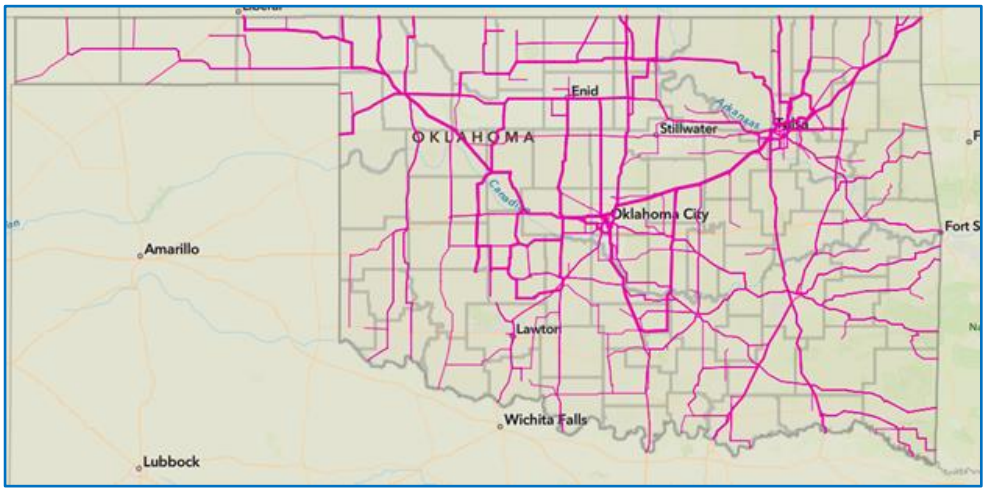


Figure 12. EHS Flow on Oklahoma Roadways

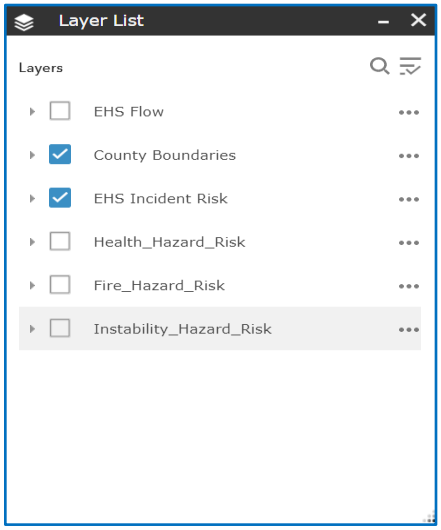
Example 2

Objective – Know more about the EHS Incident risks associated with Oklahoma counties and identify all risk levels for the road links.

Steps: Home → Click on 'Layers List' option → Check 'EHS Incident Risk' layer and 'County Boundaries' layer → Uncheck all other layers → Click on close ('X') to see the map.

Step 1

Step 2



Result

Figure 13. EHS Incident Risk on Oklahoma Roadways

Example 3

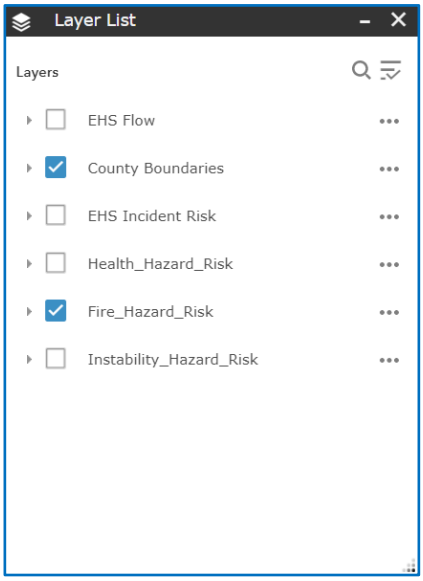
Objective – To visualize the Fire Hazard Risk in a specific county.

It is necessary to click ‘Reset’ prior to applying any new Filter, so that the previous filtered layer does not affect the current results. ‘Reset’ button is available in the ‘Filter’ option.

Steps: Click ‘Layers’ option → Check ‘Fire Hazard Risk’ & ‘County Boundaries’ option → Close the layers option → Click ‘Filters’ option → Select ‘County Name’ in the first dropdown menu → Select ‘EQUALS’ as the criteria → Select your choice of county (here Oklahoma) → Click ‘Apply’ → Click on close (‘X’) to see the map.

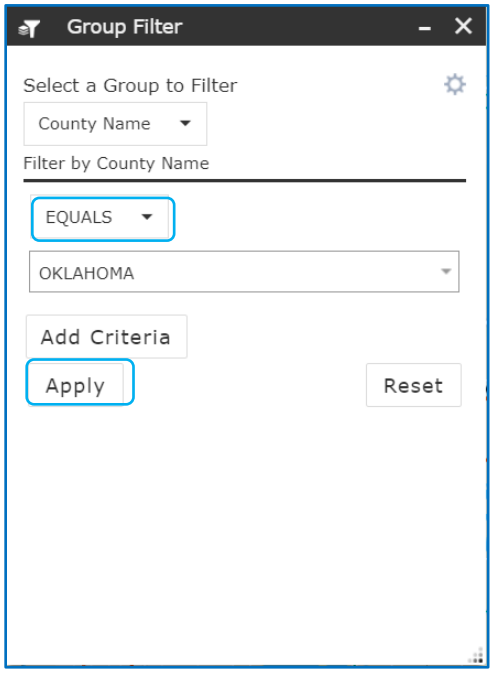
Step 1

Step 2



Step 3

Step 4



Results

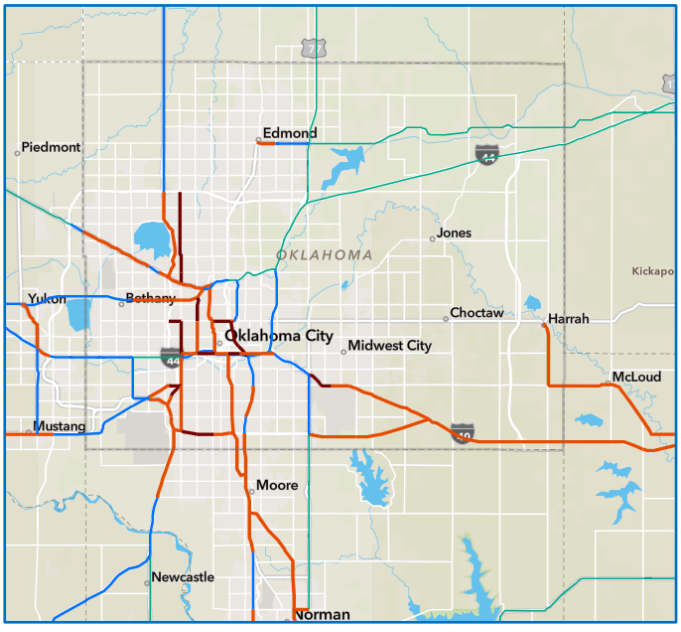


Figure 14. Oklahoma County Fire Hazard Risk

Note: It is important to reset the filter when the task is completed, so that it does not affect the results displayed for the succeeding filters applied. ('Reset' button is available in the 'Filter' option)

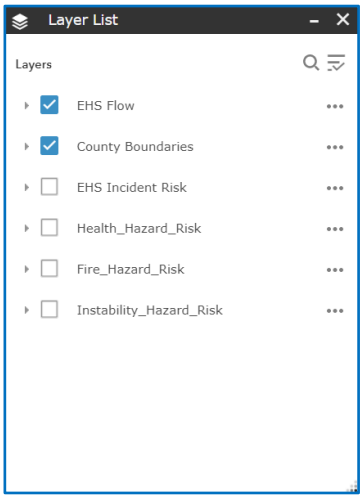
Example 4

Objective – To visualize the flow of a specific EHS (here Chlorine).

Steps: Click ‘Layers’ option → Check ‘EHS Flow’ & ‘County Boundaries’ option → Uncheck all other layers → Close the layers option → Click ‘Filters’ option → Select ‘EHS Chemical Name’ in the first dropdown menu → Select ‘EQUALS’ as the criteria → Select Chlorine → Click ‘Apply’→ Click (‘X’)

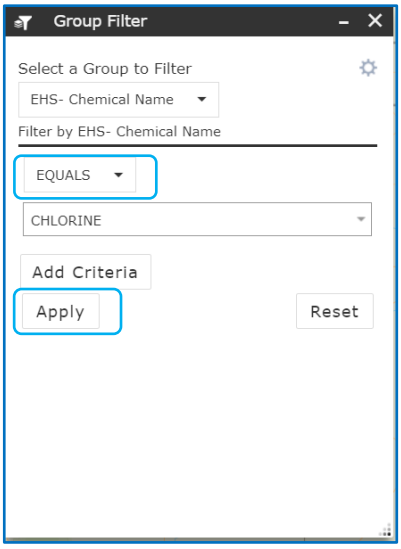
Step 1

Step 2



Step 3

Step 4



Result

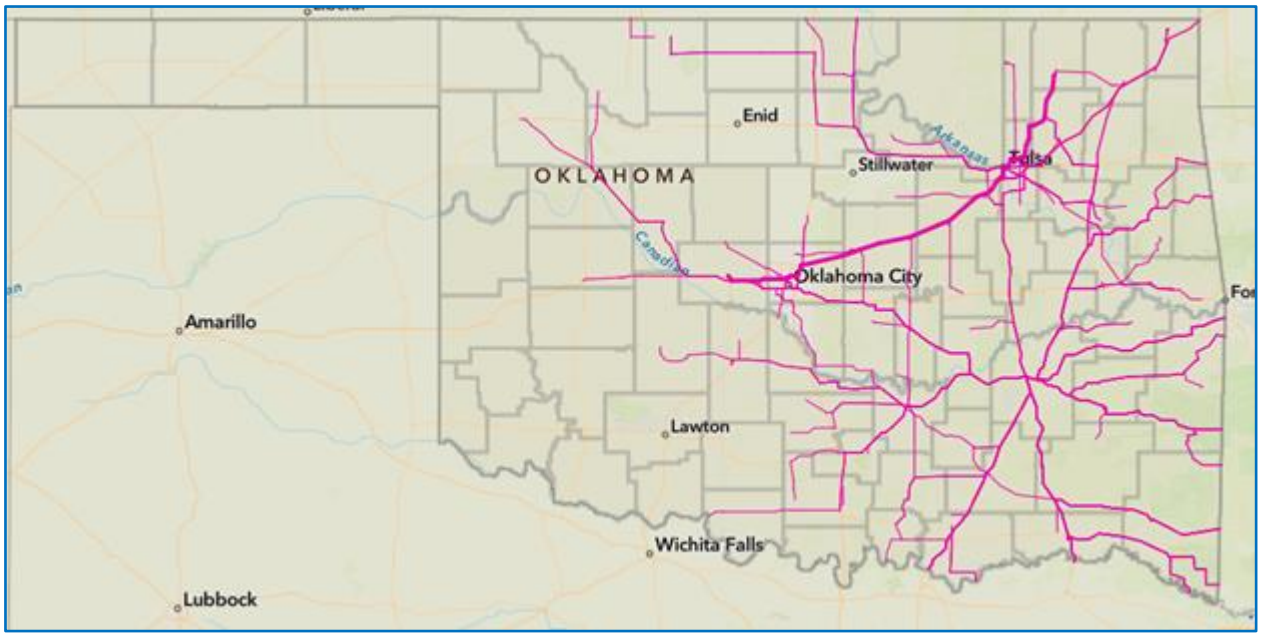


Figure 15. Chlorine Flows on Oklahoma Roadways

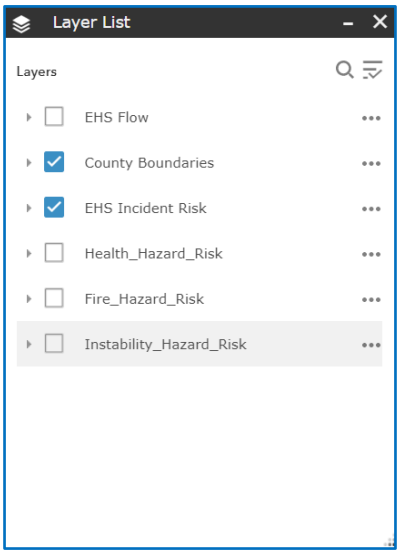
Example 5

Objective – Identify road links with high EHS incident risk levels in a specific county (here Tulsa)

Steps: Home → Click on 'Layers List' option → Check layer 'EHS Incident Risk' layer & 'County Boundaries' layer → Uncheck all other layers → Click on close ('X') → Click on the 'Filter' option → Choose 'County Name' from 'Select a group to filter' drop-down → Choose 'Equals' from the next drop-down → Choose 'Tulsa' from the counties drop-down → Click on 'Apply' → Click on close ('X') → Click on the 'Filter' option → Choose 'EHS Incident Risk Level' from 'Select a group to filter' drop-down → Choose 'Equals' from the next drop-down → Choose 'High' from the drop-down → Click on 'Apply' → Click on close ('X')

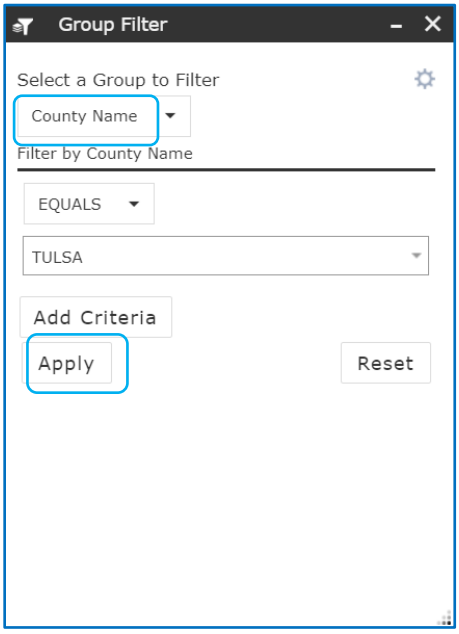
Step 1

Step 2

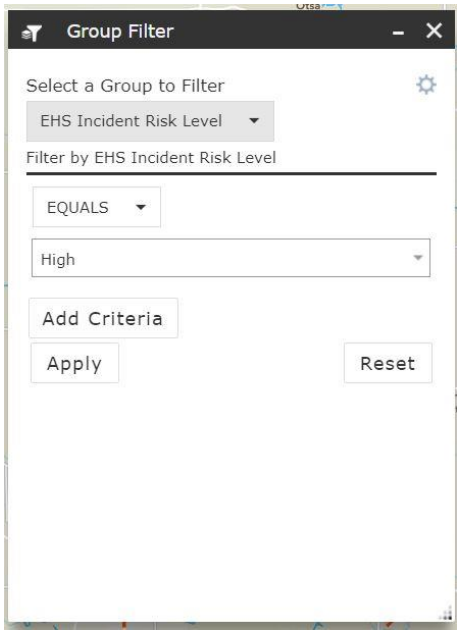


Step 3

Step 4


Group Filter
Select a Group to Filter
County Name
Filter by County Name
EQUALS
TULSA
Add Criteria
Apply
Reset

Step 5


Group Filter
Select a Group to Filter
EHS Incident Risk Level
Filter by EHS Incident Risk Level
EQUALS
High
Add Criteria
Apply
Reset

Results

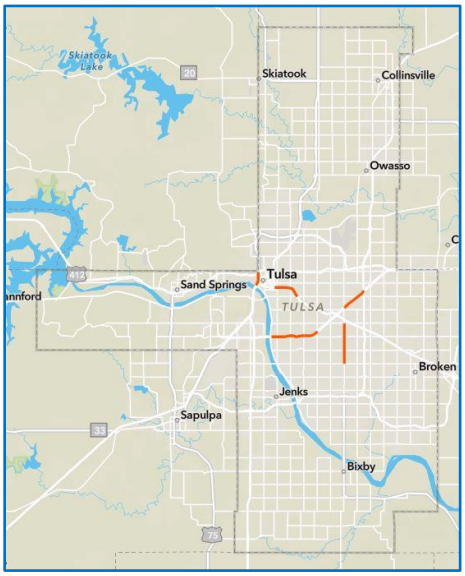


Figure 16. EHS Incident Risk on Roadways in Tulsa County

Example 6

Objective – Reading the pop ups for the risk levels identified in Example 5.

Steps: After completing the steps in Example 5 →Click on the road links highlighted in orange.

The pop ups display various information associated with the road link corresponding to the layers and filters currently active.

The key information that could be retrieved from the pop ups is as follows:

- EHS on that Road (Frequency and weight per year).

A different pop up is assigned if there is a different EHS, varying quantity or a different container type on the same road link. Thus, multiple pop ups may be present for the same road link.

- Overall Traffic per year
- County information

The county shown represents the one in which the major portion of the road link under consideration is present.

*Note that road link information is based on the EHS incident risk layer that was selected. Selecting a different risk layer will provide some additional (or different) information. Similarly selecting the EHS flow layer will display the information related to the EHS on that road.

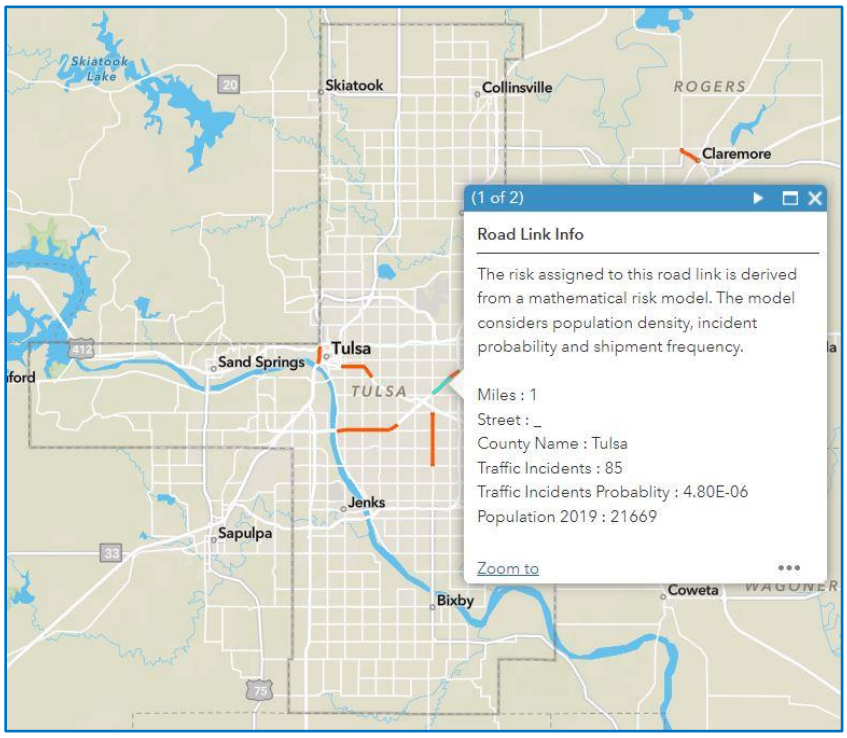


Figure 17. Pop-up of EHS Incident Risk on Roadways in Tulsa County

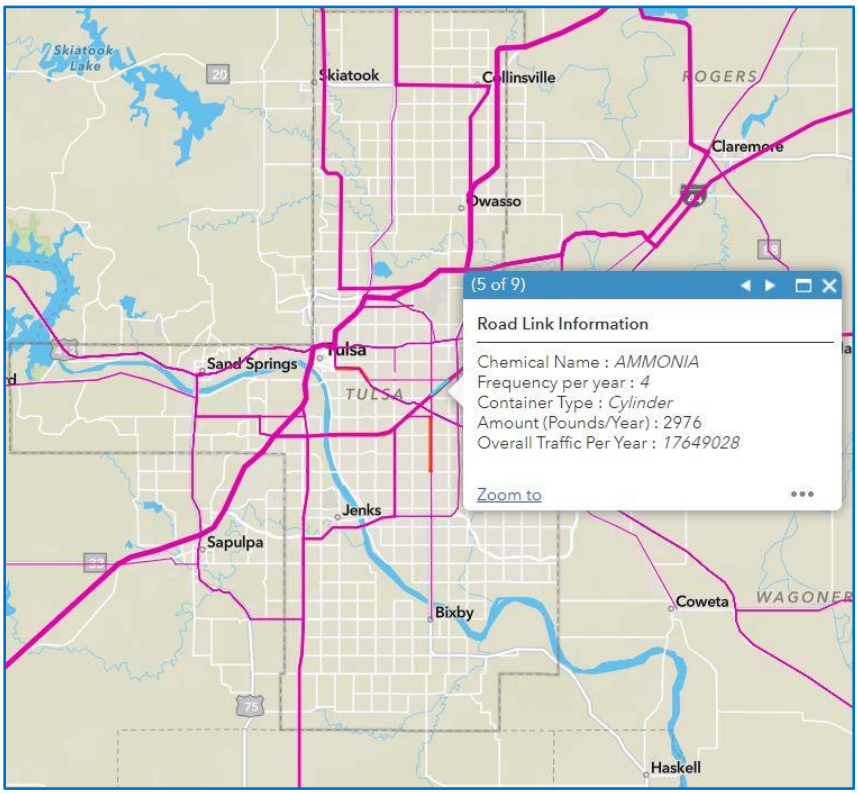


Figure 18. Pop-up of EHS Flow on Roadways in Tulsa County