Integrating DSS-WISE™ Lite Results into RAPT

Resilience Analysis and Planning Tool

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FEMA

Argonne NATIONAL LABORATORY

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Overview

Viewing inundation modeling results, community characteristics, and infrastructure data together in a single geographic information systems (GIS) mapping platform allows emergency managers, dam owners and operators, flood plain managers, engineers, planners, and other community partners to conduct risk- and data-informed community analyses for improved planning and response operations.

This guide explains how to add inundation map results from the Decision Support System for Water Infrastructure Security (DSS-WISE™) Lite into the Resilience Analysis and Planning Tool (RAPT) to visualize and assess the unique population characteristics and infrastructure location features within the forecasted inundation area.

This integration will help users better understand the consequences their community partners may face as a result of a dam-related incident. Modeling results become more actionable by clearly establishing vulnerable population and infrastructure contexts when assessing the potential impacts of an operational action or dam-related incident. Finally, the visual nature of this type of product can facilitate communication with decision makers and support outreach to community partners.

FEMA supports using modeling tools like Decision Support System for Water Infrastructure Security (DSS-WISE™) Lite, with its Human Consequence Module (HCOM), in combination with RAPT, to help engineers, planners, dam owners, and emergency managers better understand their risk landscape and the potential consequences of dam-related incidents. This user guide provides instructions for integrating DSS-WISE™ Lite results with RAPT for further analysis. The guide assumes a working knowledge of DSS-WISE™ Lite, ArcGIS, RAPT, and related terminology. It is not meant to be tutorial on how to use these capabilities.

Any Questions?

Importing DSS-WISE™ Lite food inundation models into RAPT provides a powerful picture of at-risk populations and infrastructure. If you have questions or would like additional support in using the Resilience Analysis and Planning Tool, please email FEMA-TARequest@fema.dhs.gov.

Please send us examples of how you are using DSS-WISE™ Lite and RAPT to conduct analysis and inform planning for dam emergencies. Please also send recommendations for future improvements.

1. Decision Support System for Water Infrastructure Security (DSS-WISE™) Lite

DSS-WISE™ Lite is a web-based, automated two-dimensional modeling and mapping capability developed by the National Center for Computational Hydroscience and Engineering (NCCHE), the University of Mississippi. DSS-WISE™ Lite allows users to quickly set up dam-break/ levee-breach flood inundation simulations with minimum user input data. In addition, DSS-WISE™ Lite Human Consequence Module (HCOM) provides analysis of People at Risk (PAR) by combining the results of flood simulation using DSS WISE™ Lite with a population data set.

Figure 1. DSS-WISE™ Lite Homepage

DSS-WISE™ Lite provides maps of maximum flood depth, flood arrival time, flood hazard risk for people caught outdoors and indoors, and the potentially lethal flood zones (PLFZ) for children and adults. DSS-WISE™ Lite geospatial files are compatible with most GIS software and easily imported into other analysis tools including RAPT. FEMA fact sheets provide more information on DSS-WISE™ Lite and HCOM.

DSS-WISE™ Lite is a free-of-charge system available 24/7 to FEMA, state dam safety offices, and federal and state stakeholder agencies, but requires users to register and obtain approved access.[1]

[1] To request access to DSS-WISE™ Lite, click the green ***Click to Request Access*** button on the DSSWISE™ Web homepage and fill out the "New User Registration" form.

Users are required to apply for access to a specific user group(s), based on geographical location or agency affiliation. Local group managers, approved by FEMA, have the authority to approve or deny all new users. The capability is accessible to registered users via the web portal DSSWISE™ Web.

2. Resilience Analysis and Planning Tool (RAPT)

RAPT is a free GIS web map that allows federal, state, local, tribal and territorial emergency managers, planners, and other community leaders to visualize and examine the interplay of census data, infrastructure locations (e.g., fire stations, hospitals, schools, etc.), and hazards, including real-time weather forecasts (including extreme precipitation), historic disasters and forecasted climate risk (e.g., sea level rise). RAPT also includes a broad range of population and community characteristics that can assist with defining and describing the PAR, such as demographics, housing data, and social factors.

RAPT does not require a registration or login for access and is available at https://www.fema.gov/RAPT, along with video tutorials and other resources.

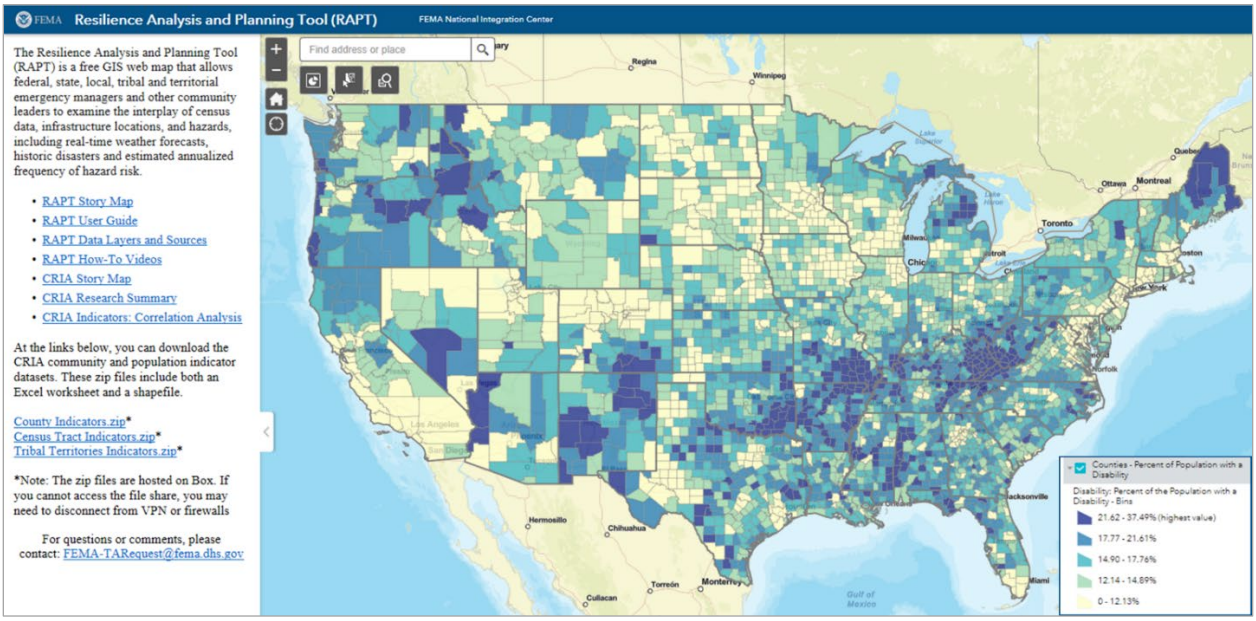

Figure 2. Resilience Analysis and Planning Tool (RAPT) Image

Getting Started

1. DSS-WISE™ Lite Results Files

DSS-WISE™ Lite simulations are run by trained and registered users. Once the user runs a simulation, results are available for viewing and downloading (as compressed, or zip, folder) from the ***Status & Results*** page.

The results package follows a naming convention such as "9999_All_Files_ Simulation.zip." If HCOM was also run, a second zipped folder will be created using a similar naming convention of "9999_All_Files_HCOM.zip."

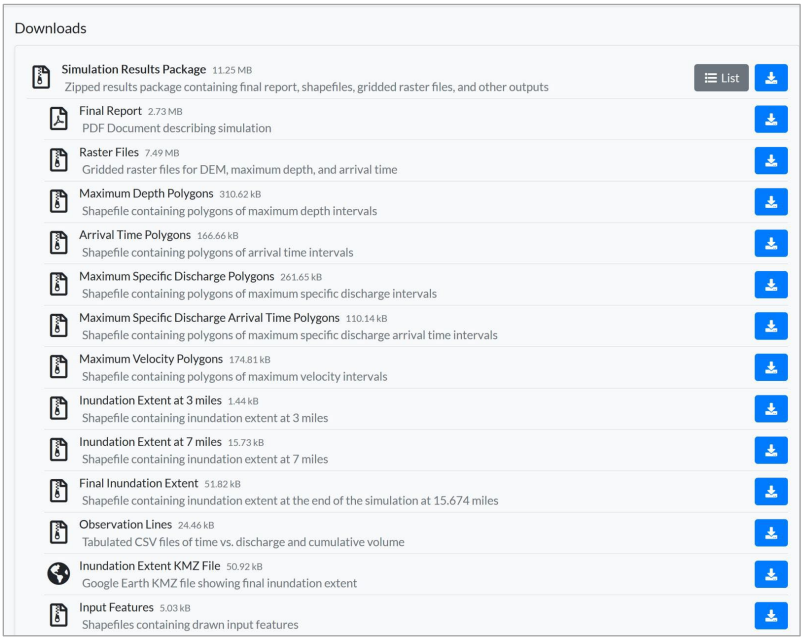

Figure 3. Downloaded Files

In this naming convention, the numeric at the beginning of the file name references the ID of the simulation run in DSSWISE™ Web.

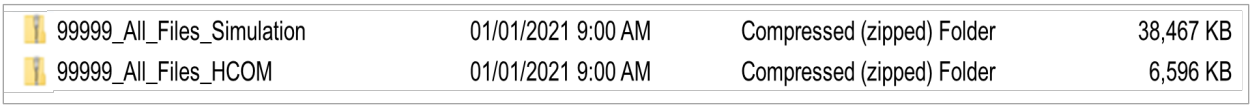

Figure 4. Compressed ZIP Files

Once downloaded and unzipped, the results package contains various shapefile folders that can be imported into RAPT for analysis with community datasets. Shapefiles are a data storage format for storing the location, shape, and attributes of geographic features. For dam incident planning, two particularly useful layers for analysis include:

- **Maximum Depth Polygons** – Shapefile containing polygons of maximum depth intervals.
- **Arrival Time Polygons** – Shapefile containing polygons of arrival time intervals.

The HCOM layers offer further insight into flood risk and emergency planning and include:

- **HCOM Hazard Level to People Outdoors** – Shapefile containing polygons of hazard levels to people caught outdoors in the flooded extent.

- **HCOM Hazard Level to People Indoors** – Shapefile containing polygons of hazard levels to people caught indoors in the flooded extent.
- **HCOM Potentially Lethal Flood Zones** – Shapefile containing polygons of flood zones potentially lethal to adults and children.

For a full list of folders contained in the results package, please visit DSSWISE™ Web.

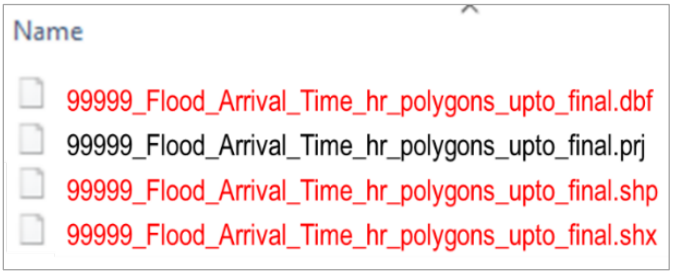

Figure 5. Unzipped Files

Each individual folder represents a single shapefile and contains several different files. These files cannot be used independently of one another and must remain grouped at the same folder level to be read into a GIS application or uploaded into RAPT. Note: The folder must contain at least three files (although others may be included): dbf, shp, and shx. After folder contents are confirmed to contain the appropriate files, it can be read using GIS or uploaded directly into RAPT.

2. Preparing DSS-WISE™ Lite Results for Input into RAPT

DSS-WISE™ Lite results shapefiles use a simple, monotone symbology (i.e., how each layer visually looks on the map). Although not necessary, to make the results more visually informative, the different contour layers can be symbolized with distinct colors using any GIS application. Shapefiles are then uploaded as a hosted feature service to URLs for importing into RAPT.[2] The section walks through the steps for opening and symbolizing the *flood arrival time* and *flood height max* output layers with color using ArcGIS. Information on colorizing HCOM layers is also provided.

2.1. Symbolizing the GIS Output using ArcGIS

ArcGIS is a GIS mapping and spatial analytics software developed and maintained by Esri. ArcGIS is a subscription-based service; however, free public accounts are available for noncommercial use. More information about ESRI and ArcGIS are available at https://www.esri.com/en-us/home.

The instructions provided for opening and symbolizing the shapefiles for DSS-WISE™ Lite results are for ArcGIS for Desktop 10.8. However, the directions will not be substantially different for any 10.x version of ArcGIS for Desktop. Directions may vary for earlier versions of the application.

[2] For users that do not want to colorize DSS-WISE™ Lite results, do not have access to ArcGIS Online, or are using the local "File" option for adding data into RAPT, please skip directly to the next section entitled "IMPORTING DSS-WISE™ LITE RESULTS INTO RAPT."

To symbolize the shapefile output layers and make the results more visually informative:

1. Open a blank ArcMap document by clicking on the ***New*** button, or choosing "New" from the ***File*** menu.

2. Click on "New Maps," chose the "Blank Map" option, and then click the "OK" button.

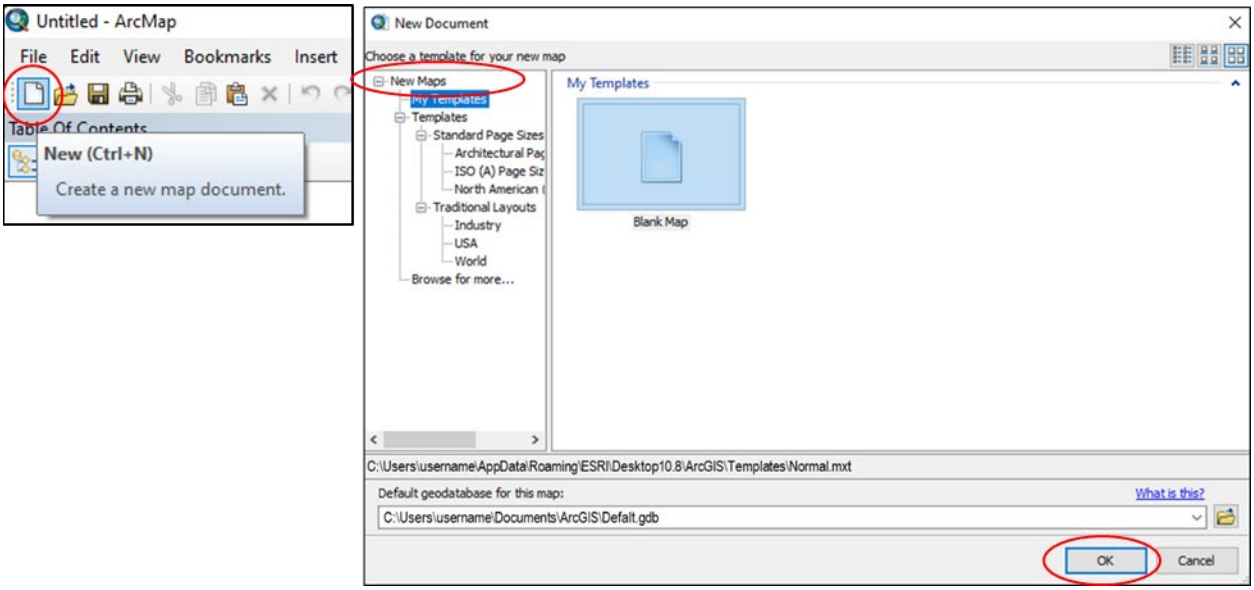

Figure 6. Blank Map Option Process

3. Click on the ***Add Data*** button and choose "Add Data." (Note: Toolbars may be located in different areas of the screen.)

4. Navigate to the folder that contains the shapefile output layers.

5. Select a shapefile layer to add to the map, and then click the “Add” button.

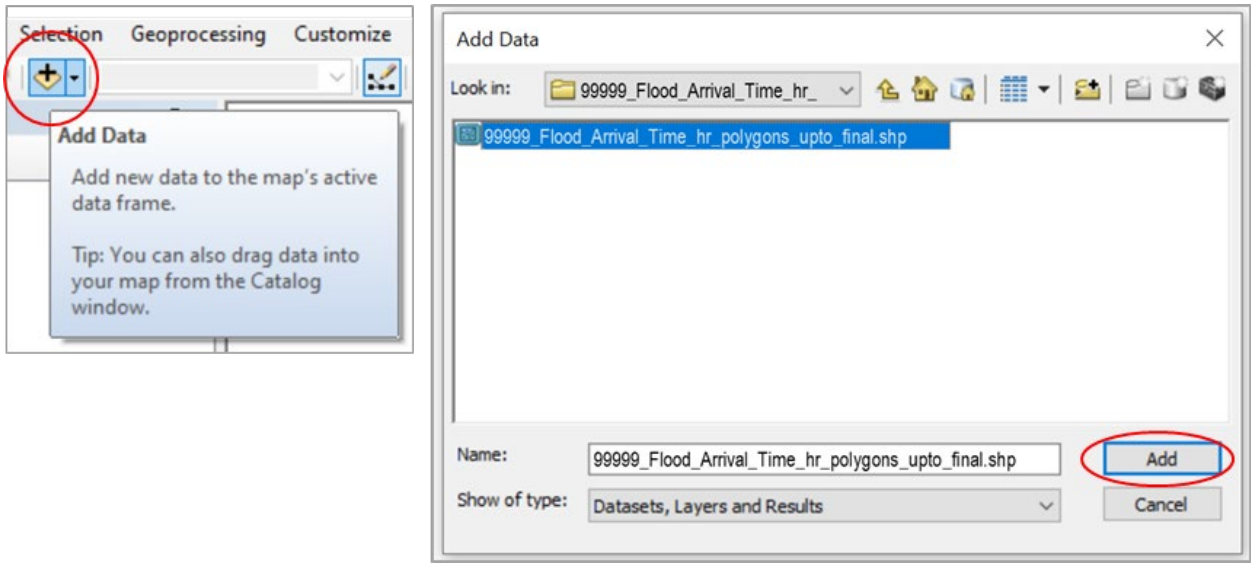

Figure 7. Adding Shapefile Layer to Map Process

6. The shapefile layer is now added to the map’s ***Table of Contents***. (Note: Colors may be different.)

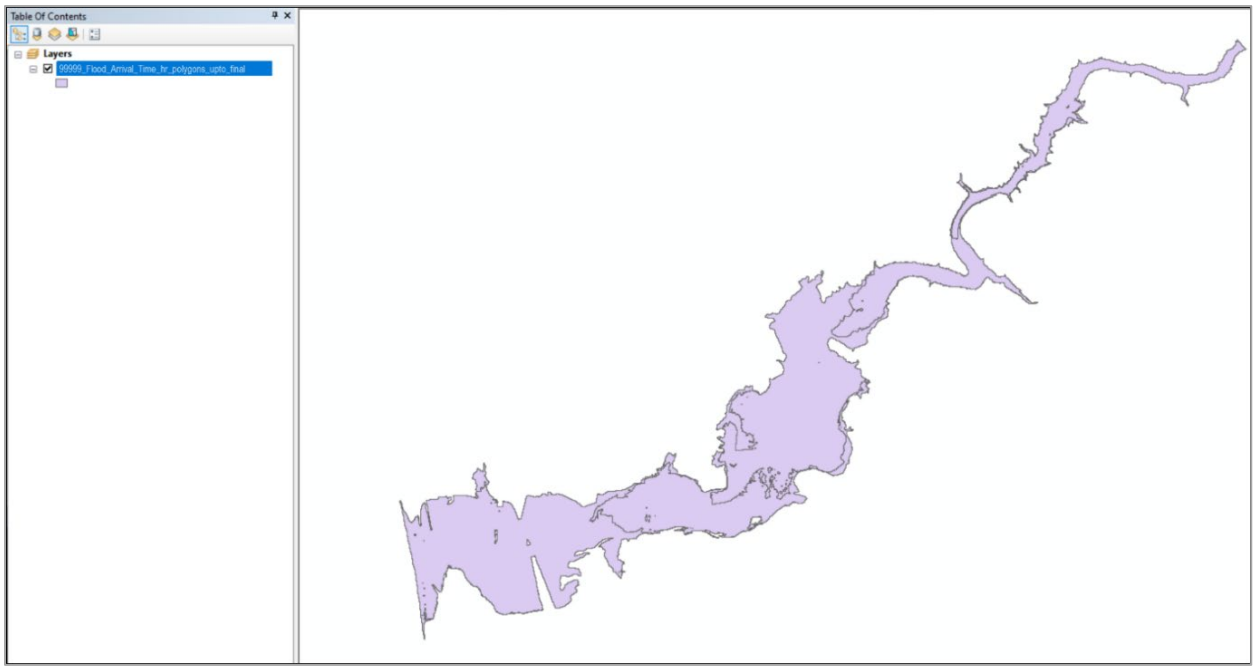

Figure 8. Shapefile Layer Map Example

7. To symbolize the inundation extent attributes, double click on the layer in the ***Table of Contents*** to open the ***Layer Properties*** pop-out window. Click the ***Symbology*** tab.

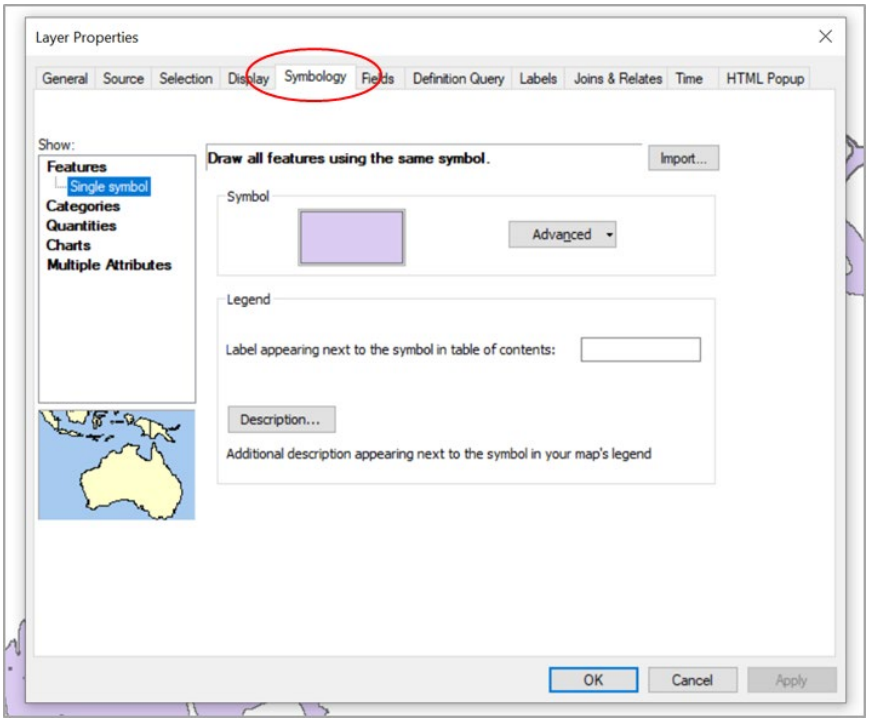

Figure 9. Symbology Tab

8. On ***Symbology*** tab, choose "Categories" from the ***Show*** panel on the left. Choose appropriate "Value Field" based on suggestions below.

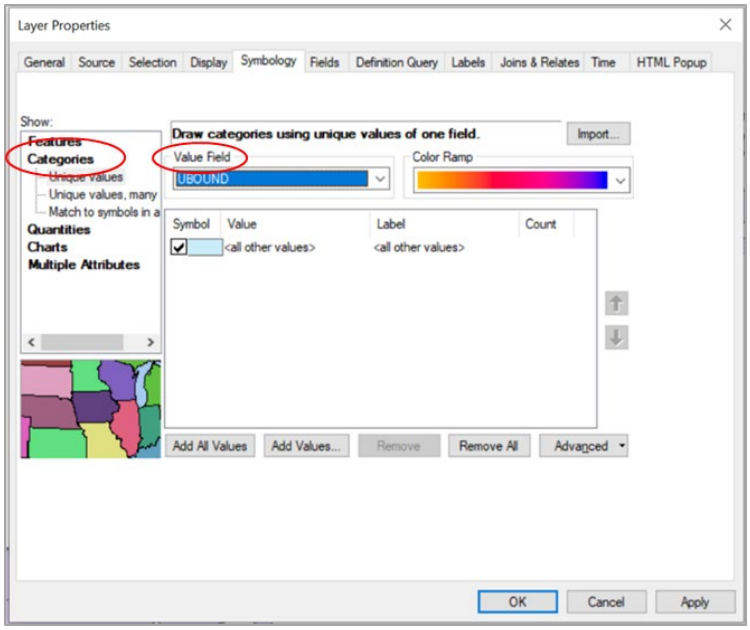

Figure 10. Symbology Tab and Value Field Process

9. For symbolizing the *flood arrival time* layer, change the “Value Field” to the field attribute called “UBOUND.”

10. For symbolizing the *flood height max* layer, change the “Value Field” to the field attribute called “LBOUND.”

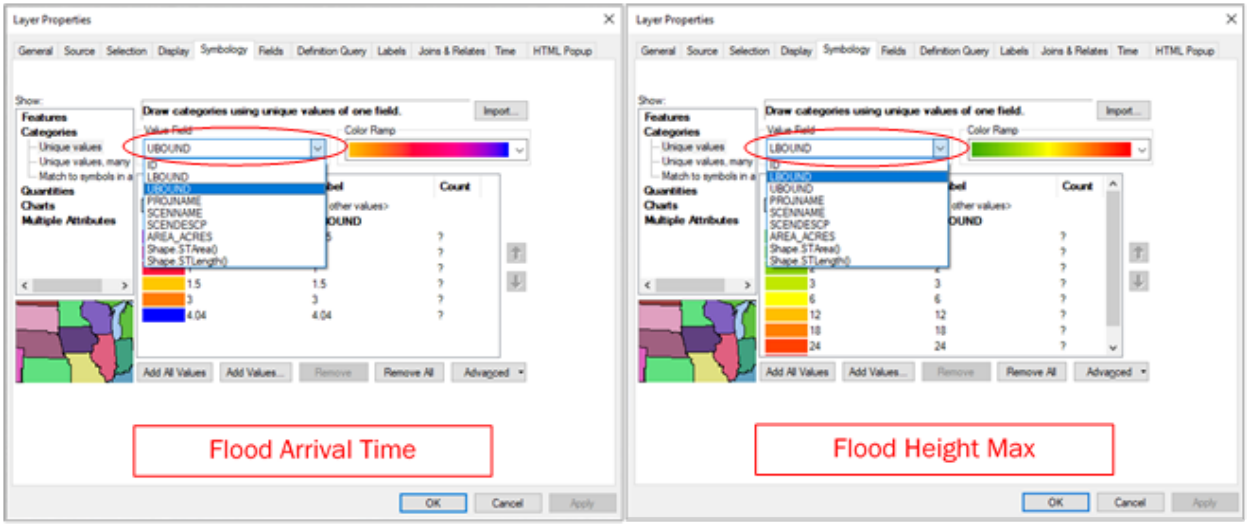

Figure 11. Unbounded Highlight in Value Field Example

11. For symbolizing HCOM layers, choose the “Unique values” option from the “Categories” list on the left. Change the “Value Field” to “INFO.”

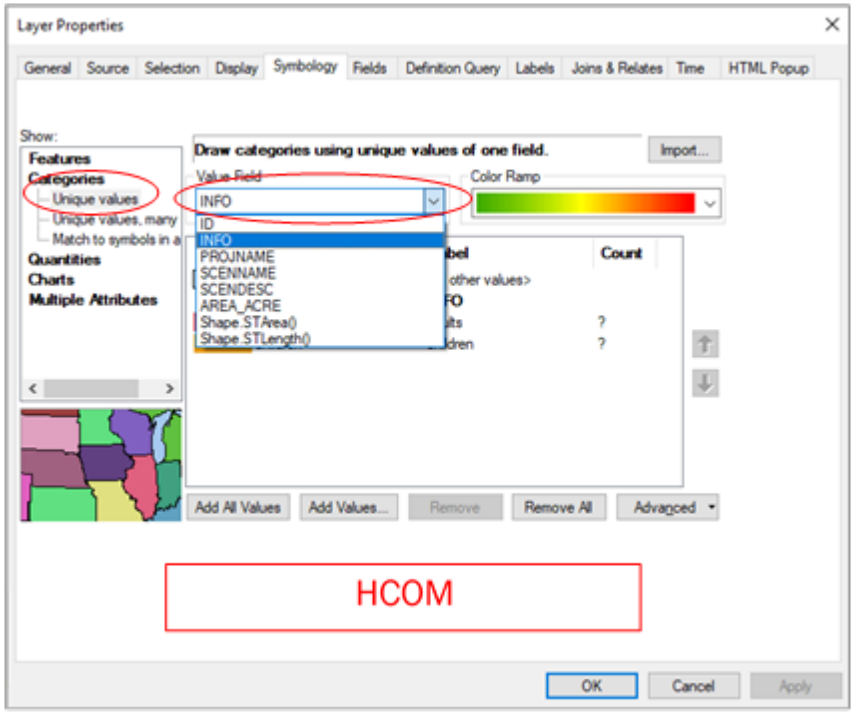

Figure 12. Unique Values in Value Field Example

12. Click on the “Add All Values” button to add in all of the different attributes for the layers.

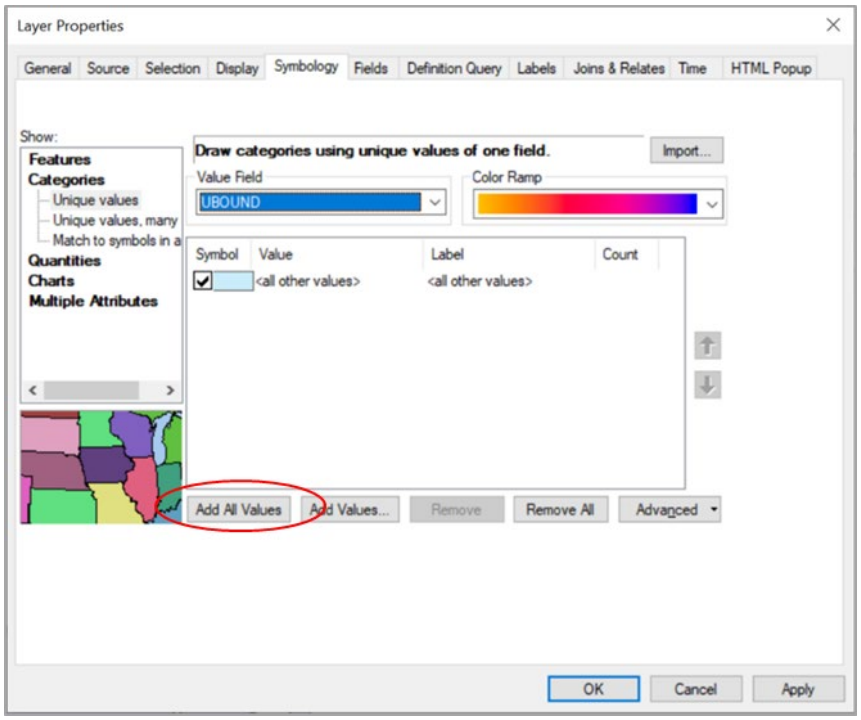

Figure 13. Add All Values Process

13. For the *flood arrival time* and *flood height max* layers, change the “Color Ramp,” as suggested and click “OK.” (Note: Recommended “Color Ramp” options help differentiate the DSS-WISE™ Lite results from each other and distinguish them from data layer colors used in RAPT.)

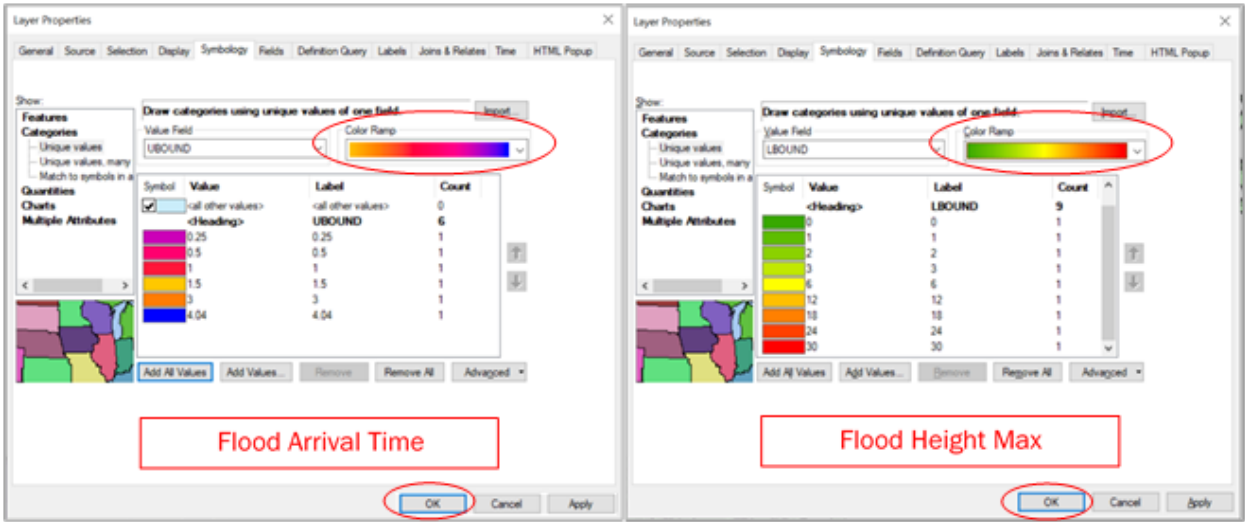

Figure 14. Color Ramp and Color Range Examples

14. For HCOM layers, polygon colors need to be changed manually. Double click on the colored polygon block next to each attribute. Click “Fill Color” and choose a color for that polygon. Click “OK.” Repeat for each polygon.

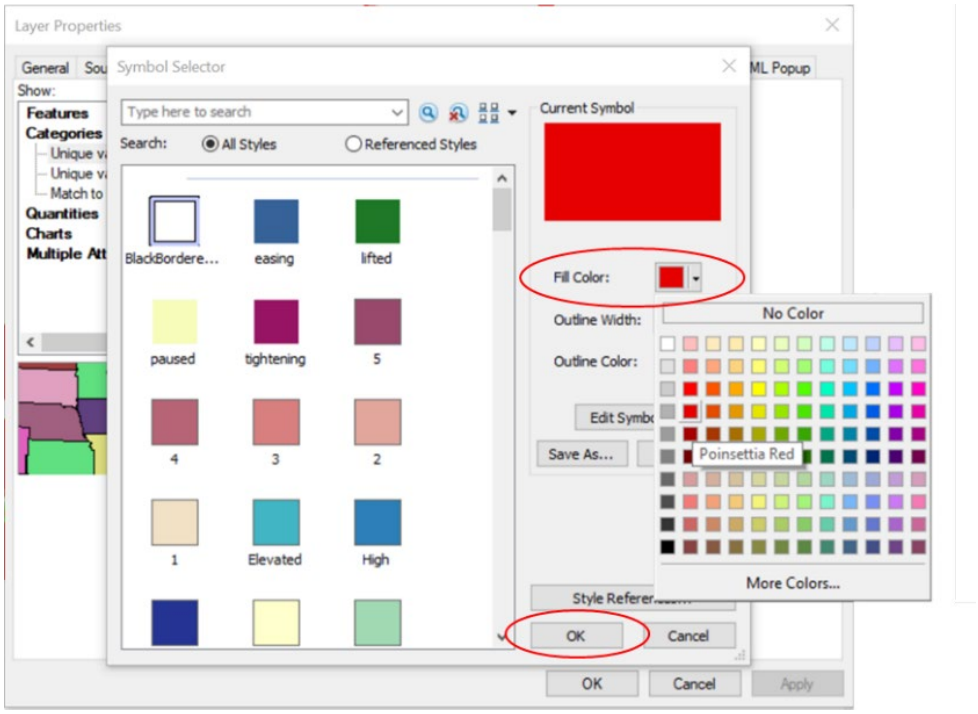

Figure 15. Manual Fill Color Example

15. The HCOM “Read Me” file included in the DSS-WISE™ results package provides suggested color fills for the HCOM output.

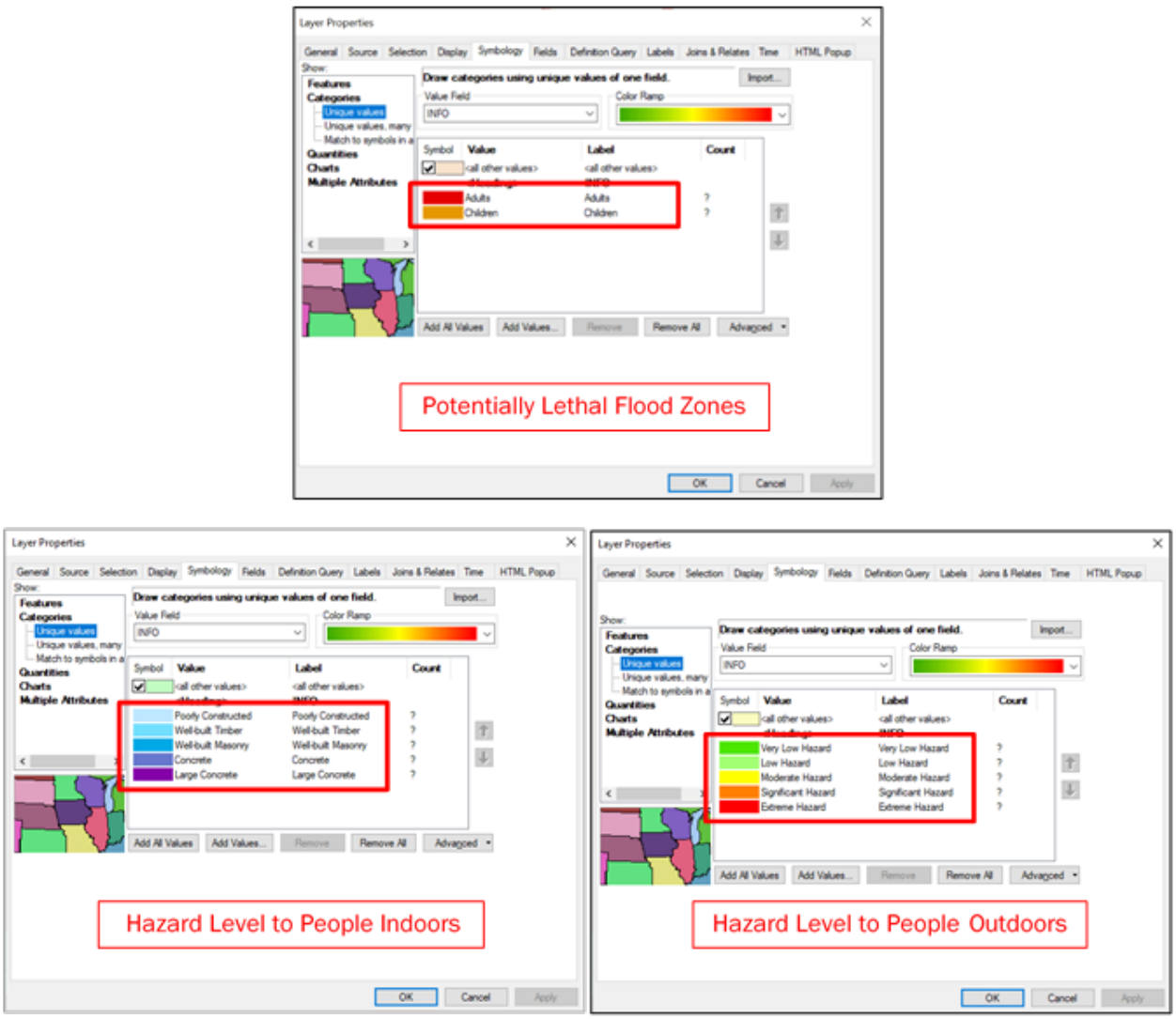

Figure 16. Recommended Color Fills for HCOM Output

16. Optional: To remove the outline around the categories, select all of the values, then right click and select “Properties for Selected Symbol(s)…”

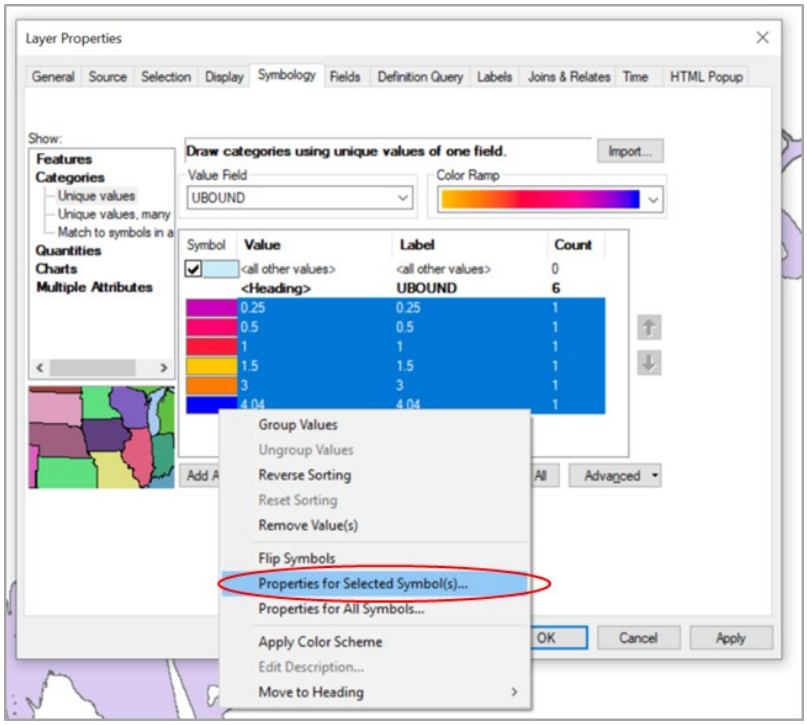

Figure 17. Properties for Selected Symbol(s) Example

17. Change the “Outline Color” to be “No Color.” Click the “Ok” button, then the “Apply” button.

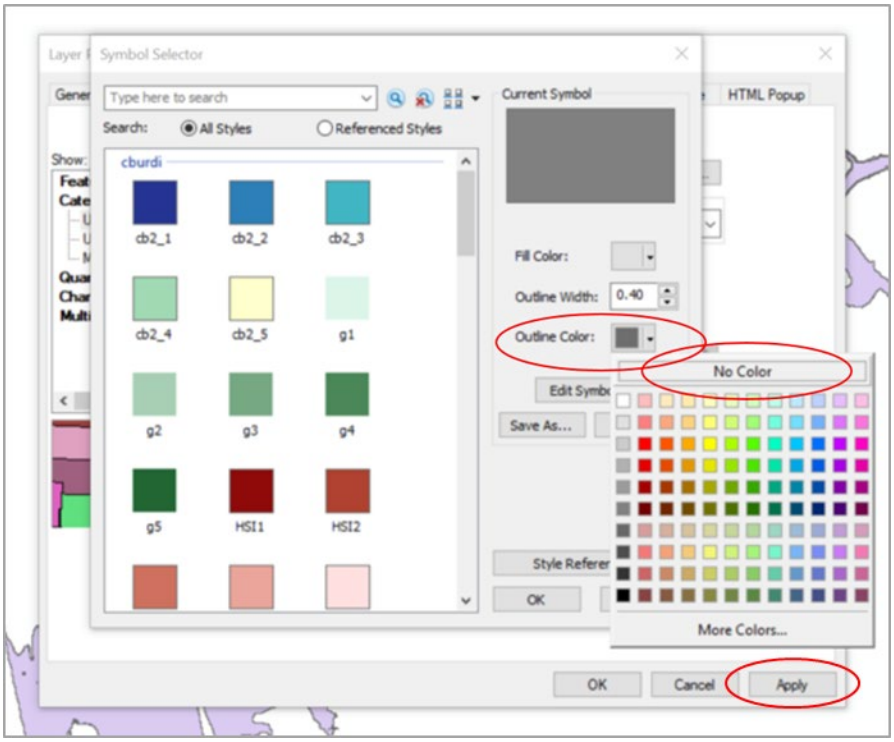

Figure 18. Remove Outline Color Example

2.2. Viewing Colorized Shapefile Layers

The results shapefile layer(s) should now be symbolized in the map viewer according to the "Value Field" and "Color Ramp" chosen. The "X" marks the dam's location. For the *flood height max* layer, the values correspond to the flood's maximum height in feet in a given area. For this example, the inundation height is up to 30 feet, with the maximum depth occurring closest to the dam.

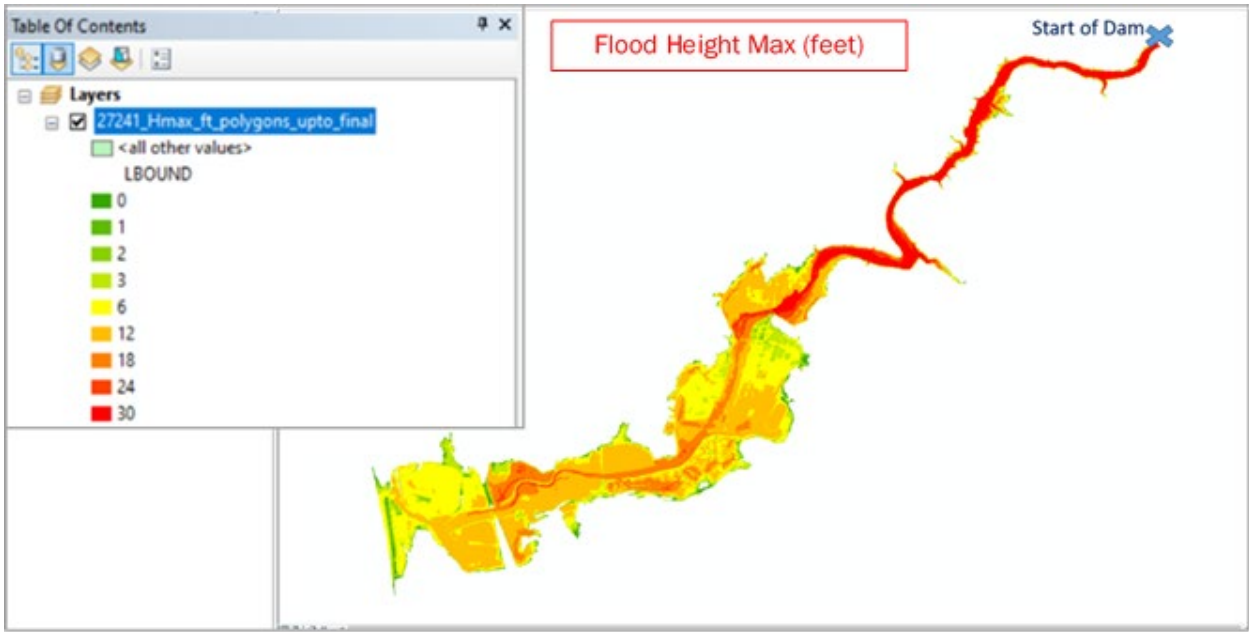

Figure 19. Flood Height Max (feet)

For the *flood arrival time* layer, the values correspond to the hours post dam breach that the flood

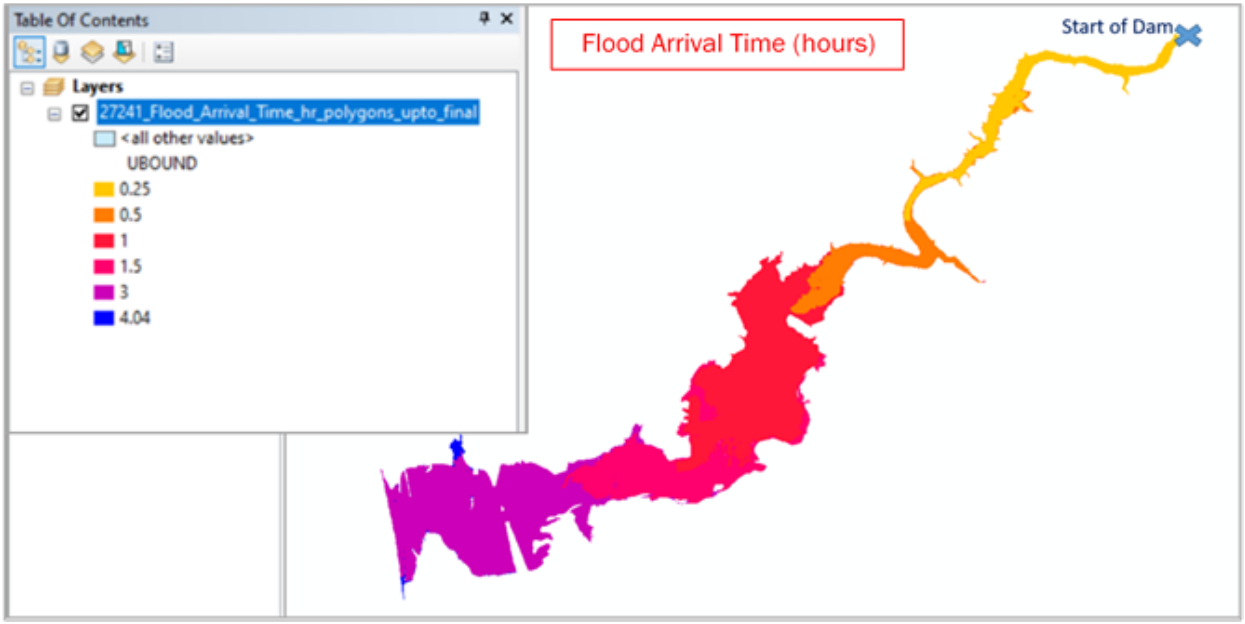

Figure 20. Flood Arrival Time (hours)

will arrive in each area. For this example, “0.25” equates to a quarter of an hour, or 15 minutes, which occurs closest to the dam. The highest value “4.04” equals to a time of just over four hours until the flood arrives at that given spot.

For the *HCOM Potentially Lethal Flood Zones* layer, the values correspond to the areas potentially lethal to adults and children based on the speed and depth of the flood water. For this example, nearly all of the inundation area is lethal to adults (and children). Just a few small sections are lethal to only children (who are susceptible to lower depth and velocity thresholds because to their smaller size).

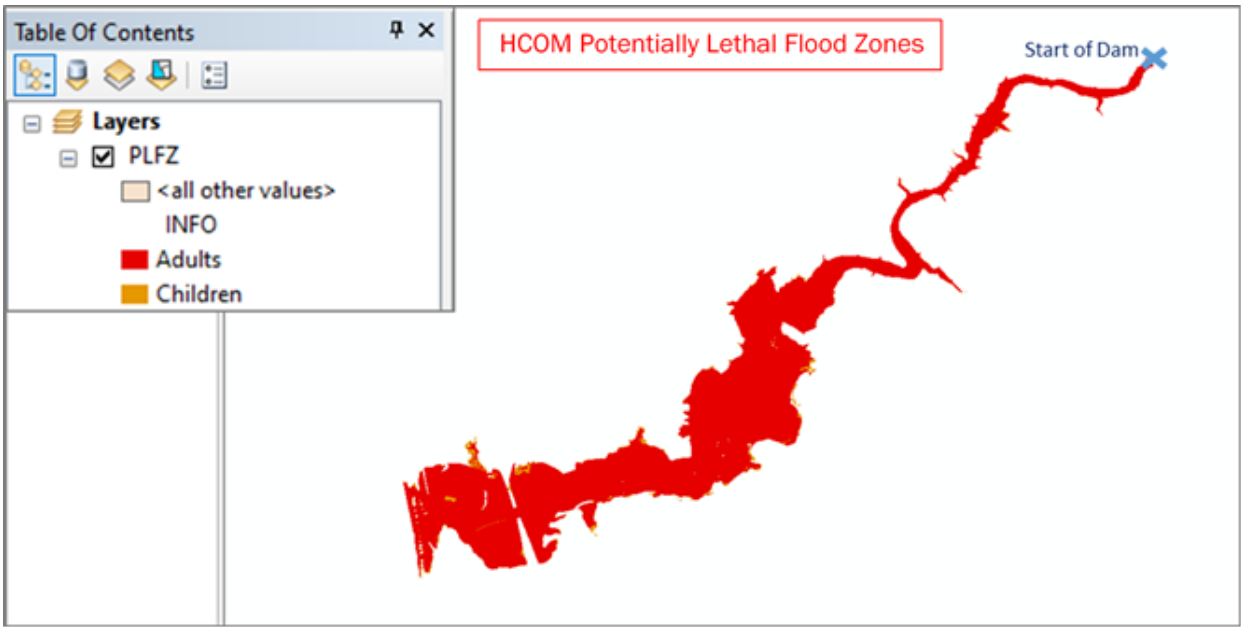

Figure 21. HCOM Potentially Lethal Flood Zones

For the *HCOM Hazard Level to People Indoors* layer, the values correspond to the potential danger associated with the collapse of different buildings based on the speed and depth of the flood water. For this example, building types range from poorly constructed units (e.g., mobile homes) to timber, brick (i.e., masonry), and concrete construction. In general, all structures, including large concrete structures, are at high risk closer to the dam; poorly constructed buildings are also risk further downstream.

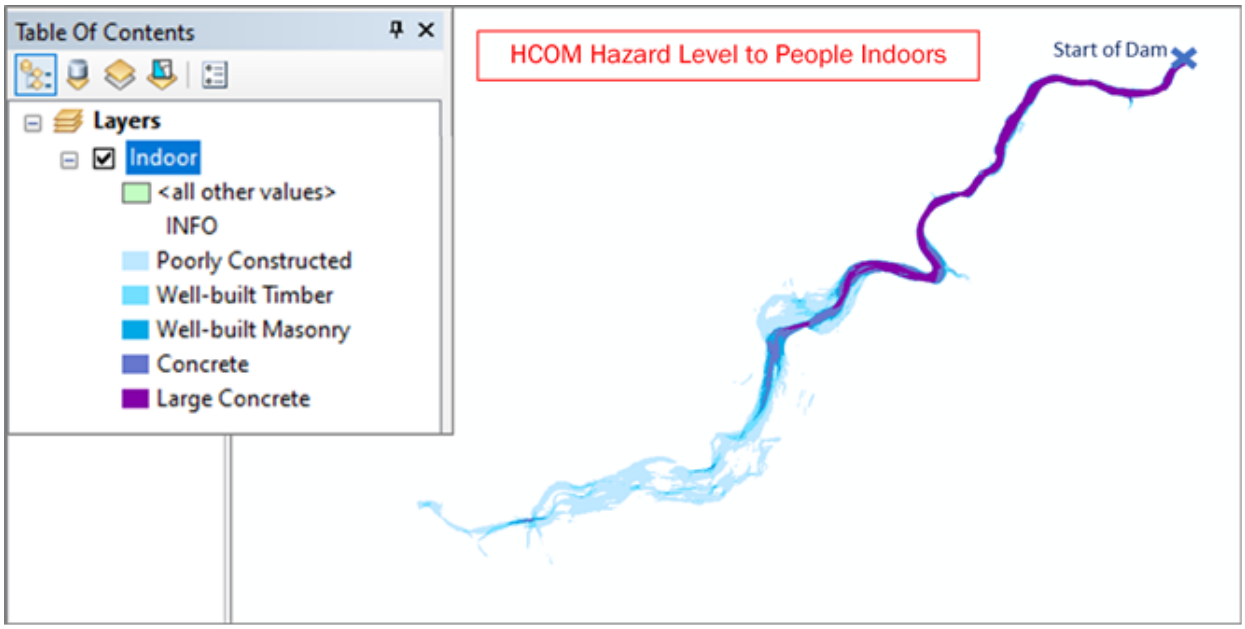

Figure 22. HCOM Hazard Level to People Indoors Map

For the *HCOM Hazard Level to People Outdoors* layer, the values correspond to the potential danger level (or hazard category) for people caught outdoors. In general, very low hazard corresponds to shallow flow or deep standing water. Low hazard is dangerous to only children. Moderate hazard is dangerous to some adults, while high hazard is dangerous to most adults. Finally, extreme hazard is considered dangerous to all people caught outdoors. For this example, most of the flood inundation area is considered extremely high hazard.

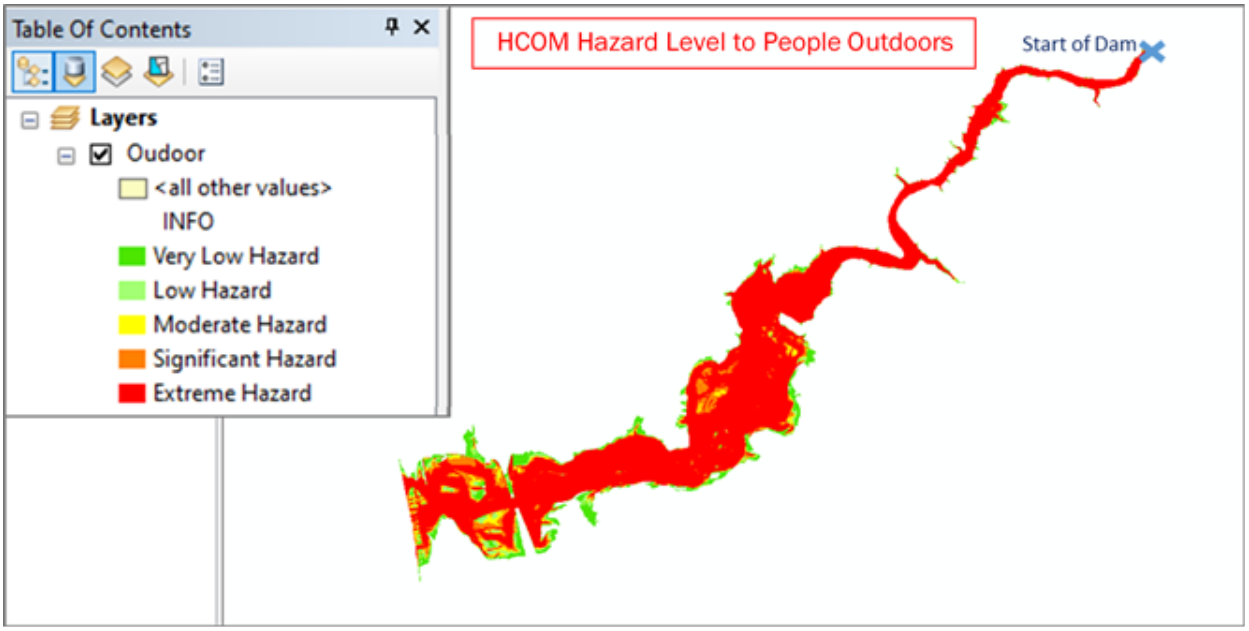

Figure 23. HCOM Hazard Level to People Outdoors Map

2.3. Saving and Uploading to ArcGIS Online

Save the map project in .mxd format to maintain shapefile symbology for future reference. Click on the ***File*** menu and choose "Save As." Set the location where the map document will be saved, choose a name, and click "Save." Note: For easy reference, choose a file location and name that aligns with the original naming convention the DSS-WISE™ Lite output file. Recommended practice is to save individual layer files because each DSS-WISE™ Lite simulation run is a unique scenario.

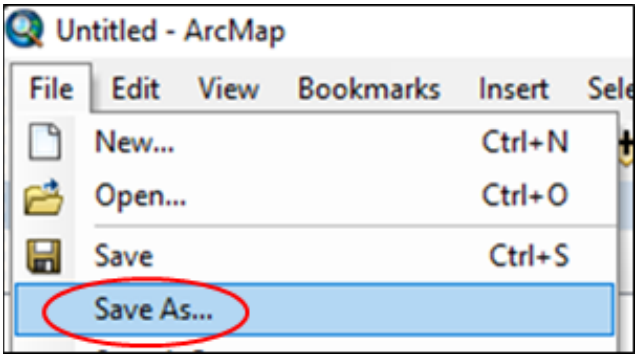

Figure 24. 'Save As' Option under File Tab

Therefore, the values in the UBOUND and LBOUND fields, respectively, will change with each scenario.

To bring map layers into RAPT while retaining colorized symbology, shapefiles must be uploaded as a hosted feature service to ArcGIS Online (to make them URLs). For instructions on uploading and hosting a feature service on ArcGIS Online, see Publish to ArcGIS Online and ArcGIS Enterprise on the Esri website. This opton uses Esri's ArcGIS for Desktop or ArcGIS Pro to publish a hosted feature service.[3]

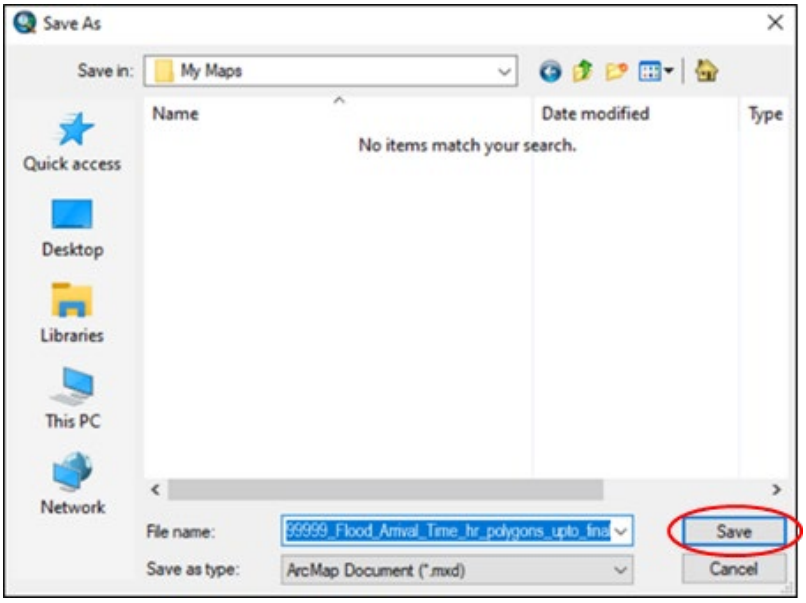

Figure 25. 'My Maps' Folder Example

[3] Although non-Esri GIS applications exist (i.e., QGIS), there is no direct connection from these to ArcGIS Online.

Importing DSS-WISE™ Lite Results into RAPT

1. Adding Modeled Inundation Data Layers

The ***Add Data*** tool, located in the navigation tool bar on the top right-hand side of the RAPT application window, allows users to add modeled inundation data layers to the interactive map.

Figure 26. 'Add Data' Icon on Toolbar

Users can add data using two methods: URL data source or local file. Note: Only the "URL" option (as shown at the end of the previous section) will retain the colorized symbology set previously using ArcGIS; the "File" option will apply the default simple, monotone symbology. However, even though colorized maps are more visually informative, the results are the same and RAPT analysis tools are available on either map type.

Once uploaded, RAPT will show the modeled inundation data layers on the map and will list the inundation layer on all ***Layers*** lists. For easy identification, the beginning part of the layer name will match the original file name.

RAPT only allows the temporary addition of DSS-WISE™ Lite layers and they will no longer appear whenever the browser window is refreshed or closed. As RAPT is a nationally available GIS tool, added layers cannot be saved to the map and retained for future review. However, users can re-load DSS-WISE™ Lite layers at any time using the ***Add Data*** tool.

1.1. URL Data Source

In order to bring DSS-WISE™ Lite map layers into RAPT while retaining colorized symbology, shapefiles must be uploaded as a hosted feature service to ArcGIS Online. Online data is added by entering the data source URL using the "URL" option in the ***Add Data*** tool window and clicking the "Add" button. The shapefile will then be populated within the web application using the color symbology set previously using a GIS application.

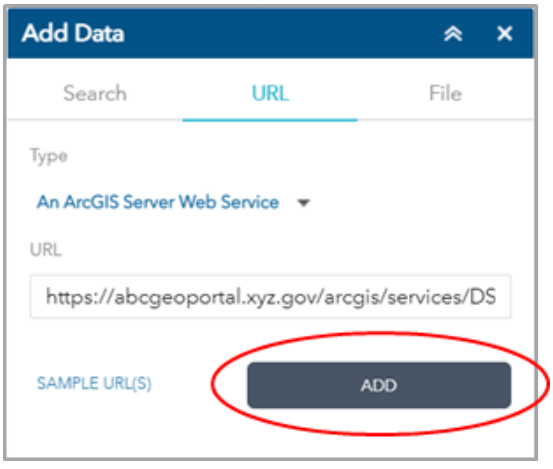

Figure 27. Add Data Tool URL

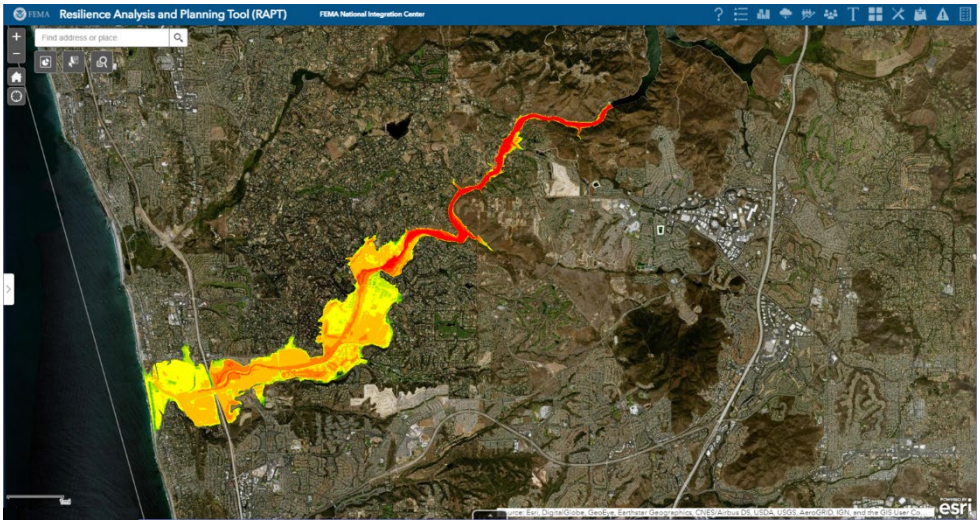

Figure 28. RAPT Map Example Highlighted in Orange and Yellow

1.2. Local File

Users can upload GIS layers directly from a user's hard drive through the "File" option. Before uploading, compress shapefiles into individual zip files. Drag and drop the zipped shapefile directly into the ***Add Data*** tool window, or chose the file manually using the "Browse" feature. The shapefile will then be populated within the RAPT web application using the default simple, monotone symbology. It will not retain any color symbology set previously using the ArcGIS application.

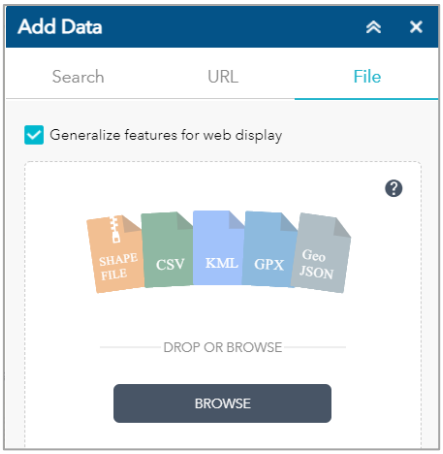

Figure 29. Add Data Tool

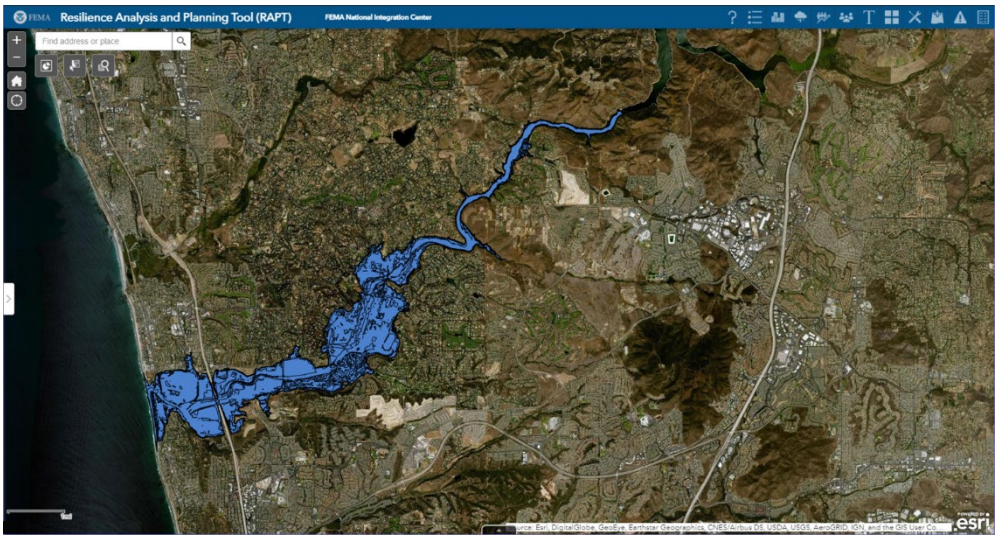

Figure 30. RAPT Map Example Highlighted in Blue

2. Adjusting DSS-WISE™ Lite Layer Appearance

Once uploaded into RAPT, the DSS-WISE™ Lite modeled inundation data layers default to the top of the Infrastructure ***Layers*** list. RAPT displays layers on the map hierarchically; layers toggled on that are listed higher on the drop-down layer list will be shown on the map on top of those that are listed lower down. Thus, it may be necessary for users to adjust the layer transparency to view multiple layers more clearly.

To adjust the transparency of any layer:

1. Click on the ***Infrastructure*** icon, then click on the three dots next to the layer name and select transparency.

Figure 31. 'Infrastructure' Icon on Toolbar

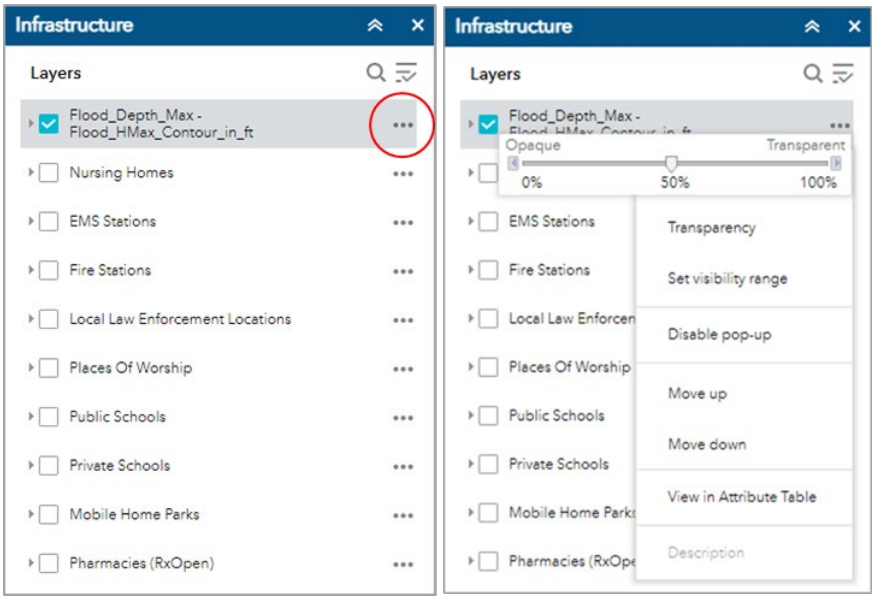

Figure 32. Infrastructure Tool Example

2. Click on the data layer checkbox next to any infrastructure layer name (e.g., "Flood_Depth_Max-Flood_HMax_Contour_in_ft" for the DSS-WISE™ Lite modeled flood height max), then click on the three dots next to the layer name and select transparency.

3. The slider allows users to adjust the transparency as needed.

4. The order of the layers can also be changed using the "Move up" and "Move down" options. The selected layer listed higher in the drop down layer list will show on the map on top of layers lower on the drop down list.

RAPT Analysis using DSS-WISE™ Lite Results

1. Infrastructure Data

Community infrastructure data layers (listed below) pull information from the Homeland Infrastructure Foundation-Level Data (HIFLD) Subcommittee. The HIFLD Open data portal contains national foundation-level geospatial critical infrastructure data in the public domain. HIFLD Open can be accessed at https://hifld-geoplatform.opendata.arcgis.com/.

Table 1: Infrastructure Data Layers Available in RAPT

Infrastructure Data Layers Available in RAPT		
▪ Hospitals ▪ Nursing Homes ▪ Pharmacies (RX Open) ▪ Urgent Care Facilities ▪ Dialysis Centers ▪ Fire Stations ▪ Local Law Enforcement Locations	▪ Public Health Departments ▪ 911 Service Area Boundaries ▪ Mobile Home Parks ▪ Places of Worship ▪ Private Schools ▪ Public Schools ▪ SNAP (Supplemental Nutrition Assistance Program) Authorized Retailer Locations	▪ Colleges and Universities ▪ Prison Boundaries ▪ Power Plants ▪ Electric Power Transmission Lines ▪ Wastewater Treatment Plants ▪ High-Hazard Dam Lines

Infrastructure data can be added to and visualized on the map, as well as downloaded using the attribute table. To turn on the various community infrastructure data layers, click on the *Infrastructure* icon. Then select the box next to the layers of interest and the data points will appear on the map. For more information on how to use the infrastructure data, please refer to the RAPT User Guide available online at www.fema.gov/rapt.

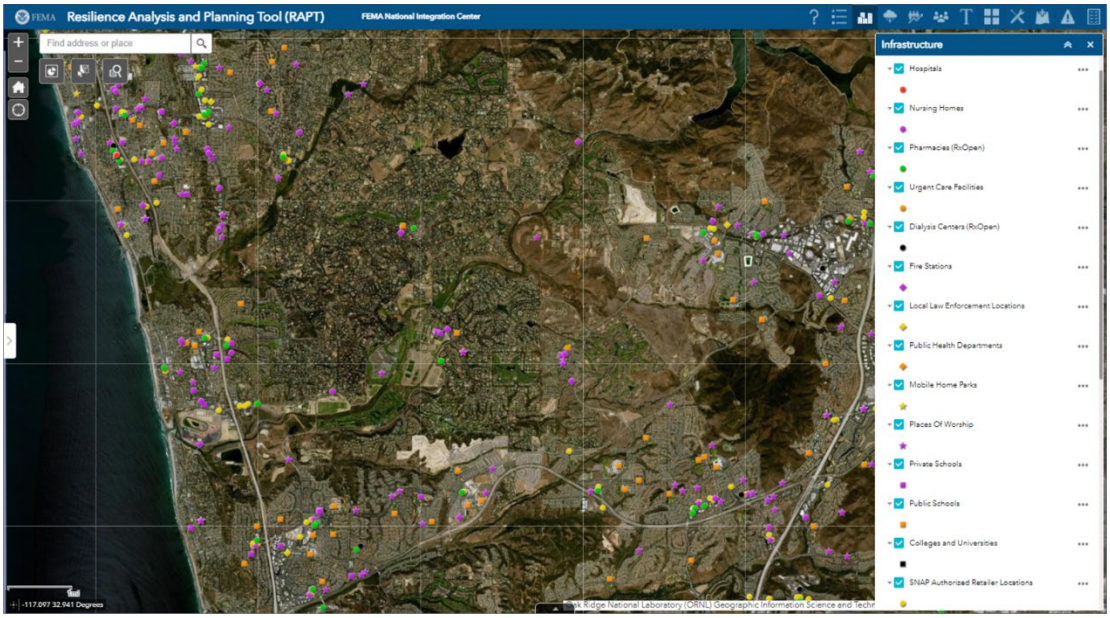

Figure 33. RAPT Map with Infrastructure Points Highlighted Example

For a modeled dam incident, the user can view and identify the various community assets that may be at risk because they exist within, or near the boundary of, a flood inundation area (based on a specific DSS-WISE™ Lite simulation run). For this example, *flood arrival time* indicates that floodwater will reach two private schools, a Fire station, and one place of worship within about one hour of the dam incident. Within approximately three hours, floodwaters will also inundate a nursing home, a major highway, and another Fire station further downstream. Additionally, there is a public school, private school, nursing home, and two pharmacies on the edge of the inundation area.

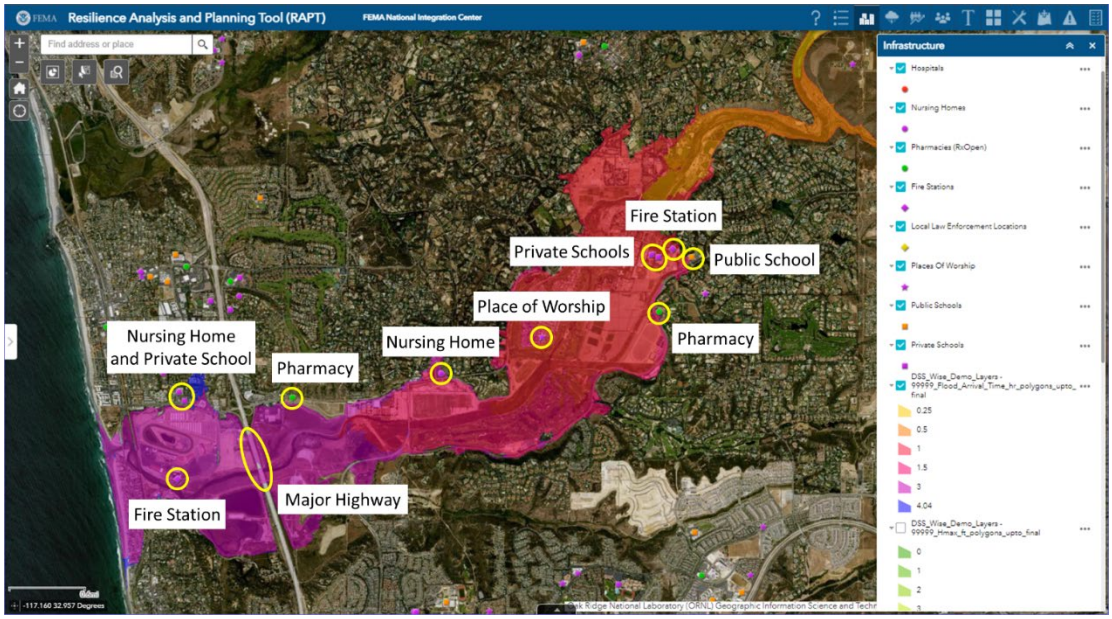

Figure 34. RAPT Map Emphasizing Infrastructure Points Example

Note: To access additional information on any facility or community assets, click on a data point and a pop-up box will appear with available information (from HIFLD Open). For example, nursing homes and hospitals list number of beds at each facility; schools include grade levels, student enrollment, and number of teachers.

Looking at the *flood height max layer*, all the identified community assets within the dam inundation area will experience between one to six feet of flooding. Assets on the edge may additionally be at risk of minor flooding. Multiple roadways will also be affected by floodwater.

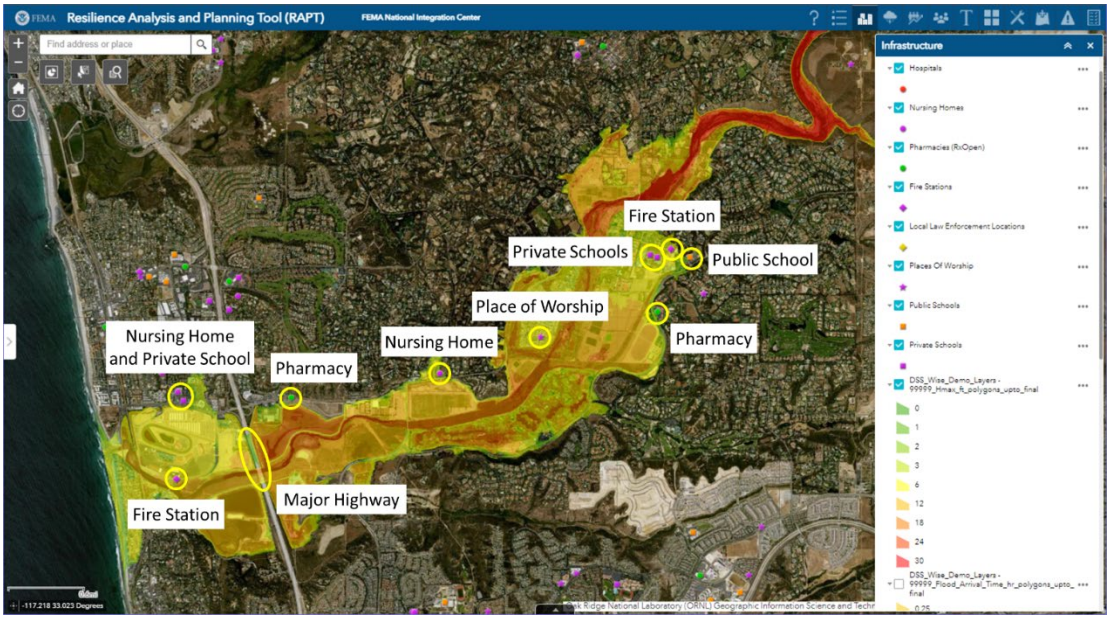

Figure 35. RAPT Map with the 'Flood Height Max' Layer Example

2. Resilience Indicators

RAPT includes several resilience indicator layers that researchers have used to identify and quantify characteristics that make a community more resilient to disasters. These indicators fall into two different buckets: population-focused indicators and community-focused indicators. Many of the resilience indictors are available at both the county and census tract level.

To turn on the various resilience indicator layers, click on either the ***County Indicators*** or ***Census Tract Indicators*** icon located in the navigation tool bar on the top right-hand side of the application window. Then select the box next to the layers of interest and the data points will appear on the map.

Figure 36. 'County' Indicators and 'Census Tract' Indicators on Toolbar

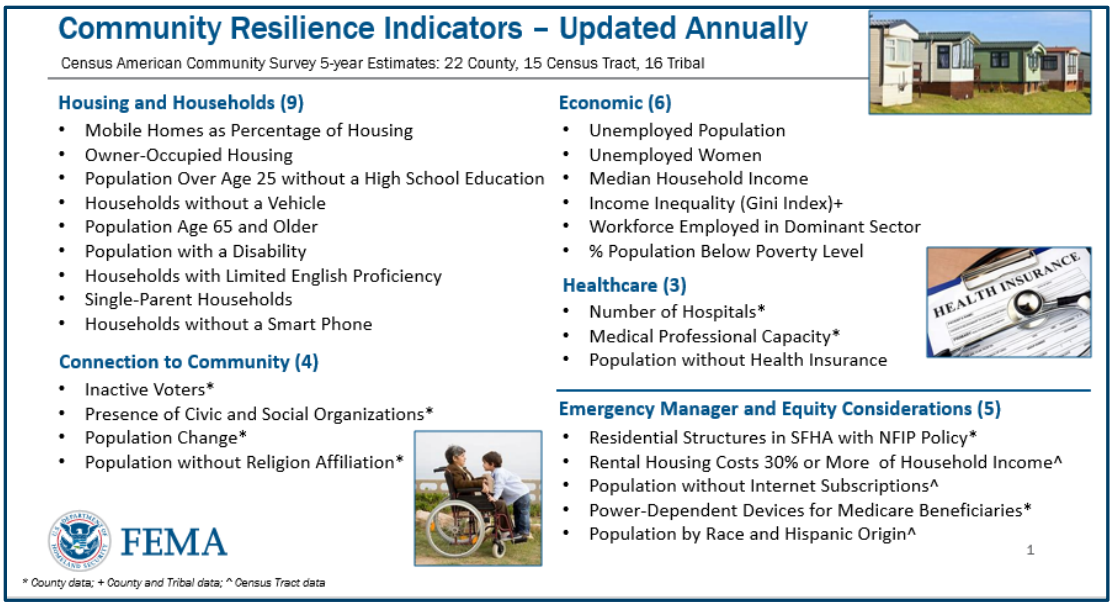

Figure 37. Community Resilience Indicators Page

For more information on how these indicators were chosen, please refer to the Community Resilience Indicator Analysis Report available on the web at www.fema.gov/rapt.

For a modeled dam incident (based on a specific DSS-WISE™ Lite simulation run), the user can view resilience indicator layers to help identify at risk populations located within, or near the boundary of, a flood inundation area that may need additional outreach before and/or extra assistance during a dam incident. In this example, the area north of the inundation zone includes three census tracts with larger percentage of individuals over the age of 65 (at around 30 percent of the population).

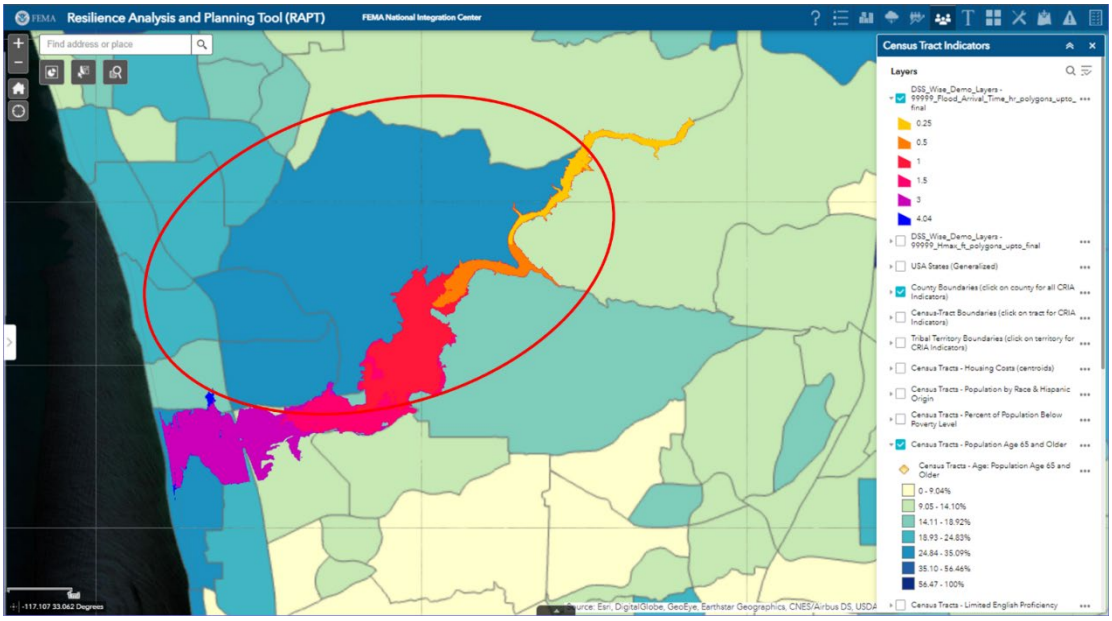

Figure 38. RAPT Map Showing Census Tract Indicators Example

Note: Clicking on any census tract area will bring up a pop-up box with county-level summary information for all resilience indicator (page 1) and detailed census-tract data for the specific resilience indicator chosen (page 2), including a comparison to the overall U.S. population data.

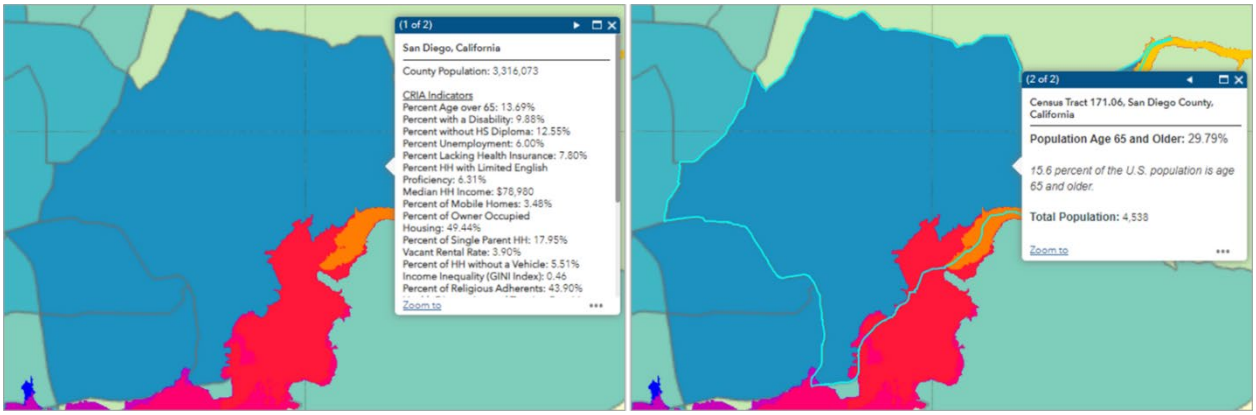

Figure 39. Census Tract Area Tool and County Summaries Examples

Alternately, the area south of the inundation zone includes three census tracts with a greater percentage of individuals with limited English proficiency (ranging from about 7 to 12 percent).

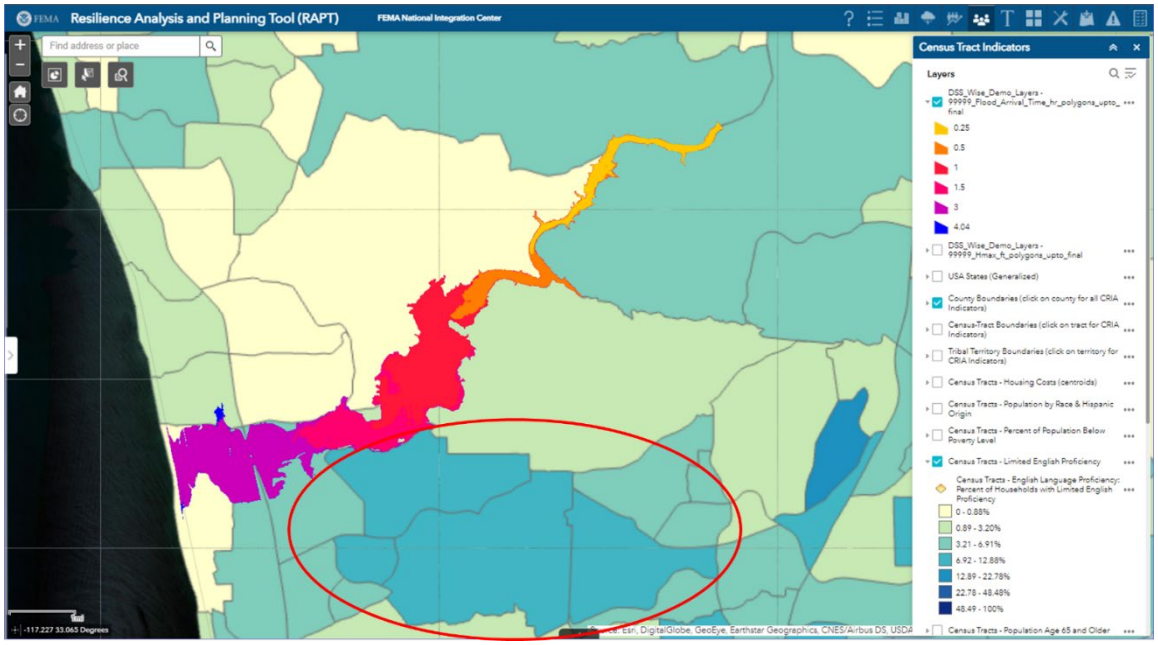

Figure 40. RAPT Map Showing Census Tract Tool for English Proficiency Example

3. Incident Analysis Tool

The ***Incident Analysis Tool*** allows users to draw a shape around an incident or area of interest (single point, linear, and polygonal) and identify and visualize infrastructure entities within this zone. This tool can provide a comprehensive list and visuals of the locations of infrastructure entities within the buffer zone.

The ***Incident Analysis Tool*** is in the navigation tool bar on the top right-hand side of the application window (users may need to click the "more" icon in the upper right to find the tool). The tool will open at the bottom of the page. For more information on the ***Incident Analysis Tool***, please refer to the RAPT User Guide available online at www.fema.gov/rapt.

Figure 41. 'Incident Analysis' on Toolbar

The polygon option can draw a rough outline around the modeled inundation area. The ***Incident Analysis Tool*** can set a buffer distance[4] of 1 mile or more. In this example, there is a 1-mile buffer zone around the drawn polygon. This extended buffer zone can help users identify additional community assets that may be at risk and/or support for emergency planning activities (e.g., establishment of evacuation and shelter-in-place zones).

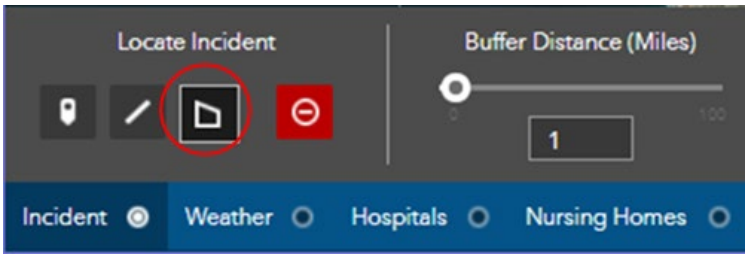

Figure 42. Incident Analysis Tools Options

In this example, the inundation area buffer zone of 1-mile contains a total of six nursing homes, 20 schools, six fire stations, and nine pharmacies. Clicking on the specific infrastructure group name along the bottom bar allows the user to view additional information on each of the various assets or facilities within each infrastructure group as well as allows the user the option to download the information.

[4] The buffer distance can range from 1 to 100 miles. The initial default is set at 10 miles. To change this value, use the slider or type in the desired value in the box.

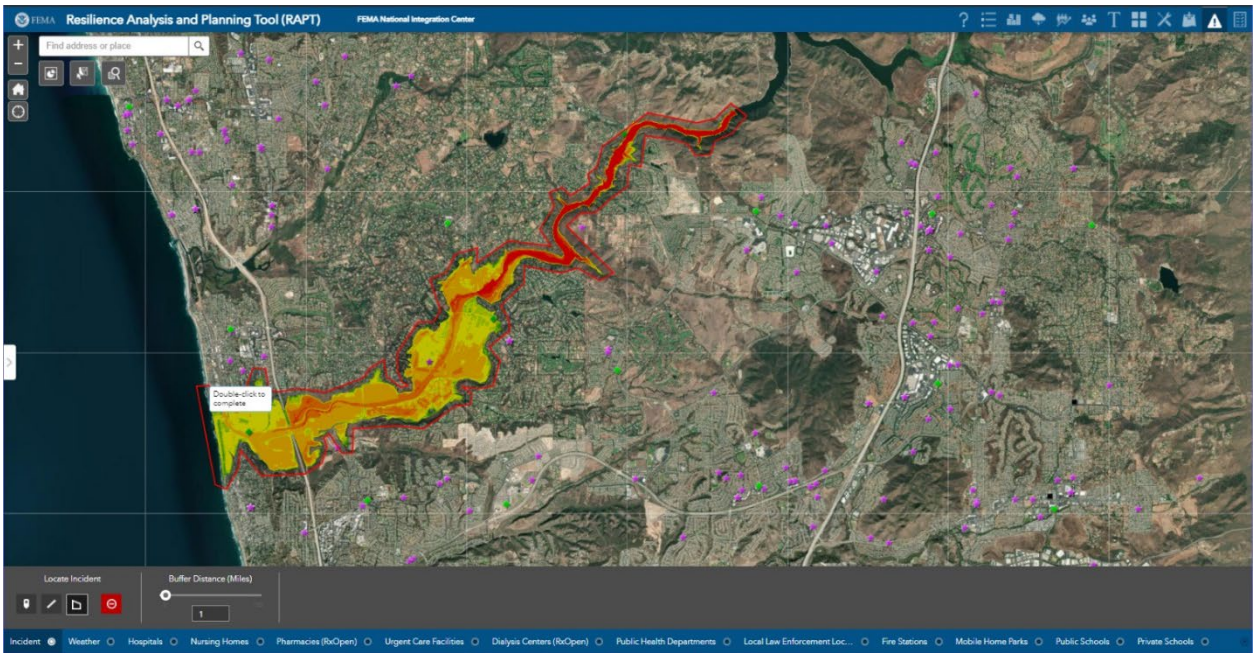

Figure 43. RAPT Map Highlighting 1-Mile Buffer Zone

Note: The user must add the Infrastructure layers to the map before running the ***Incident Analysis Tool***. Clicking on the ***Infrastructure*** icon after the tool is used will cause the delineated buffer zone to disappear.

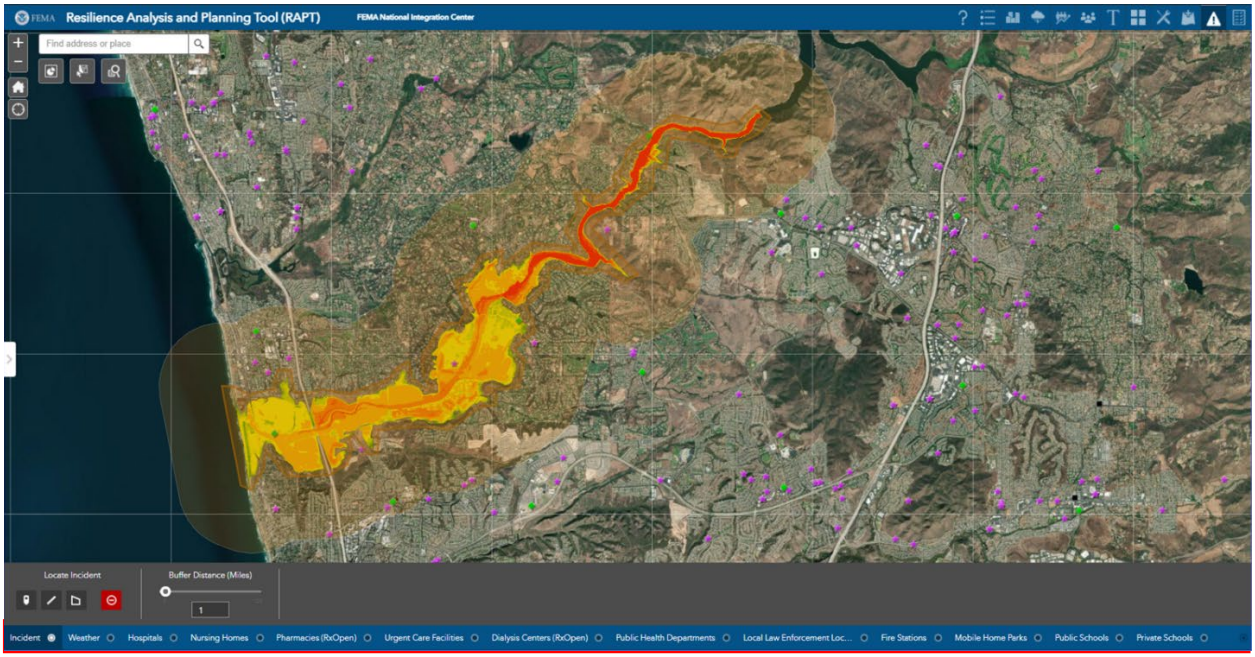

Figure 44. RAPT Map Highlighting Bottom Bar

4. Population Counter Widget

The ***Population Counter*** allows users to draw a specific shape on the map (e.g., circle, rectangle, polygon etc.), select all the census tracts within or touching that shape, and calculate the estimated population of individuals with specific resilience indicator characteristics (e.g., age over 65, disability, unemployment, etc.) in those selected census tracts. This tool can provide a visual of all census tracts that touch the shape, as well as the estimated total number of individuals with the chosen indicator characteristic.

The ***Population Counter*** is located in the navigation tool bar on the top right-hand side of the application window (users may need to click the "more" icon in the upper right to find the tool). The tool will open at the bottom of the page. For more information on the ***Population Counter***, please refer to the RAPT User Guide available online at www.fema.gov/rapt.

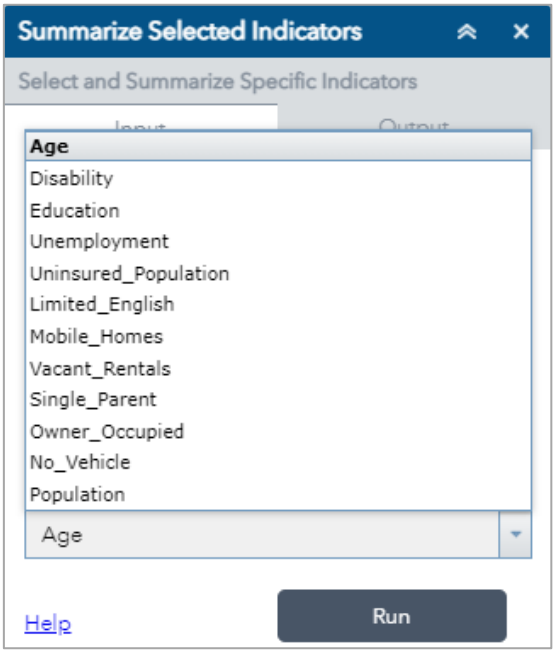

Figure 45. Select Indicators Tab Example

Figure 46. 'Population Counter' on Toolbar

In this example, the widget can create a rough outline around the modeled inundation area. Then the user can choose any indicator of interest from the drop-down list and click the "Run" button. The ***Population Counter*** provides the population estimates (based on census tracts) for select sub-populations that may need additional outreach before and/or extra assistance during a dam incident because they are located within, or near the boundary of, a flood inundation area (based on a specific DSS-WISE™ Lite simulation run). Examples of these populations include the number of individuals over the age of 65, with a disability, limited English proficiency, or no personal vehicle.

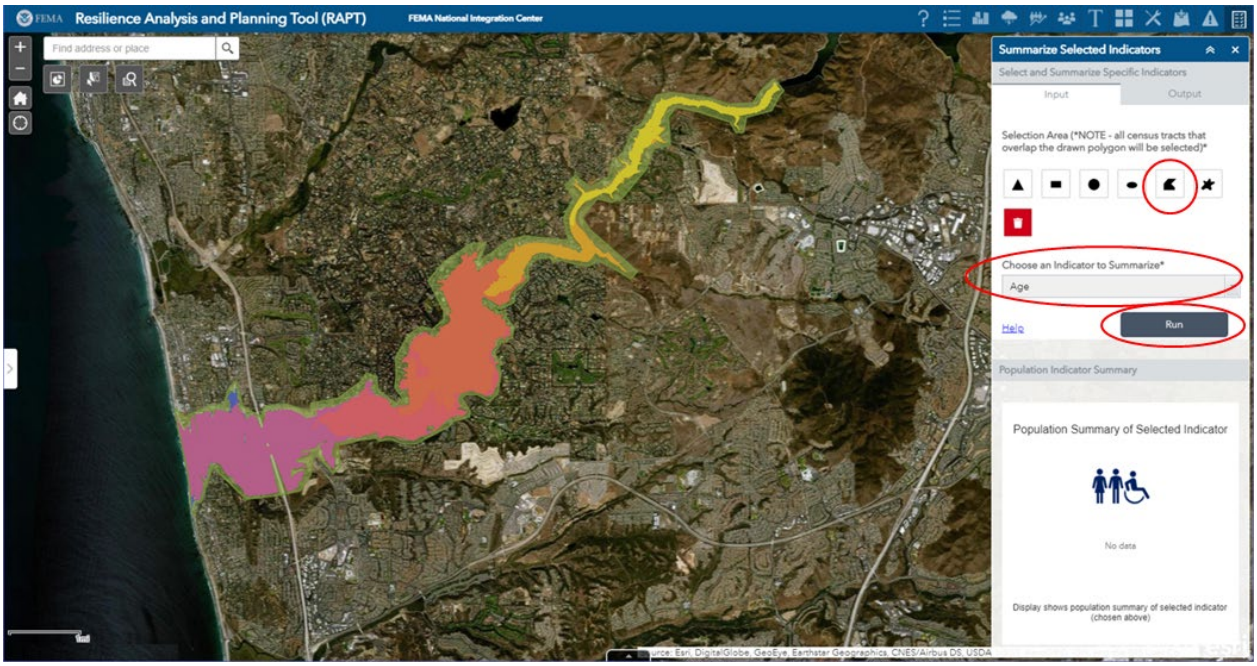

Figure 47. RAPT Map with Population Counter Tool Open Example

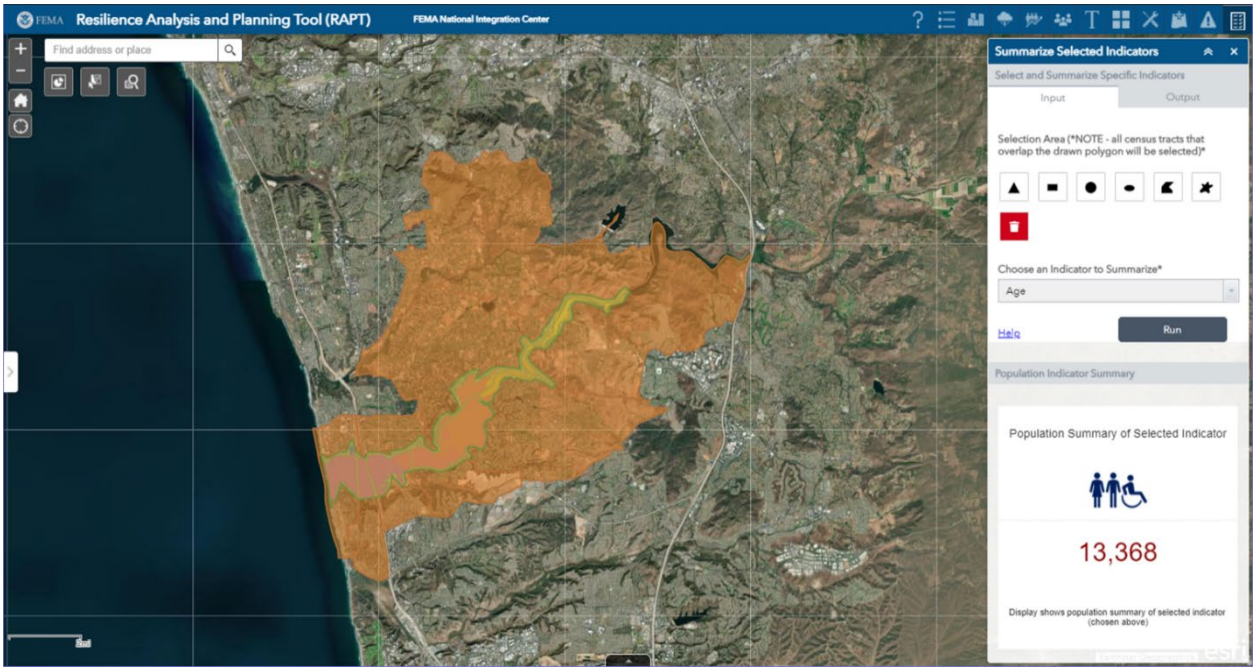

Figure 48. RAPT Map with Population Counter Tool Results

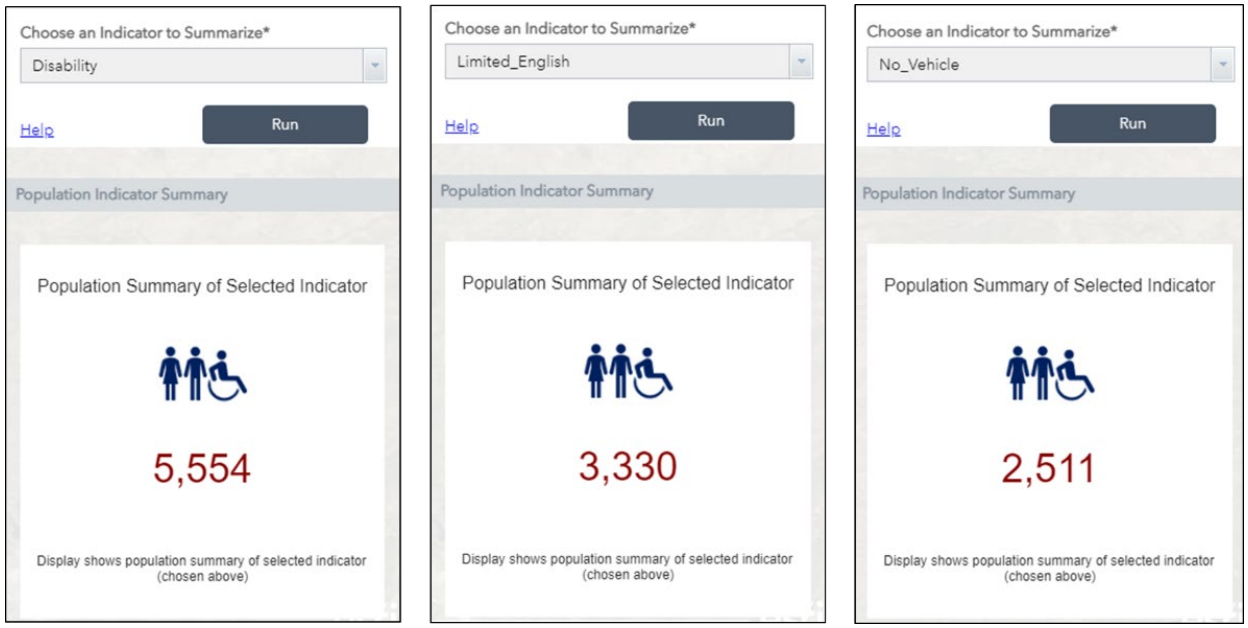

Figure 49. Population Counter Tool Breakdown

Adding infrastructure layers to the map can help users identify additional community assets that may benefit from additional emergency planning activities.

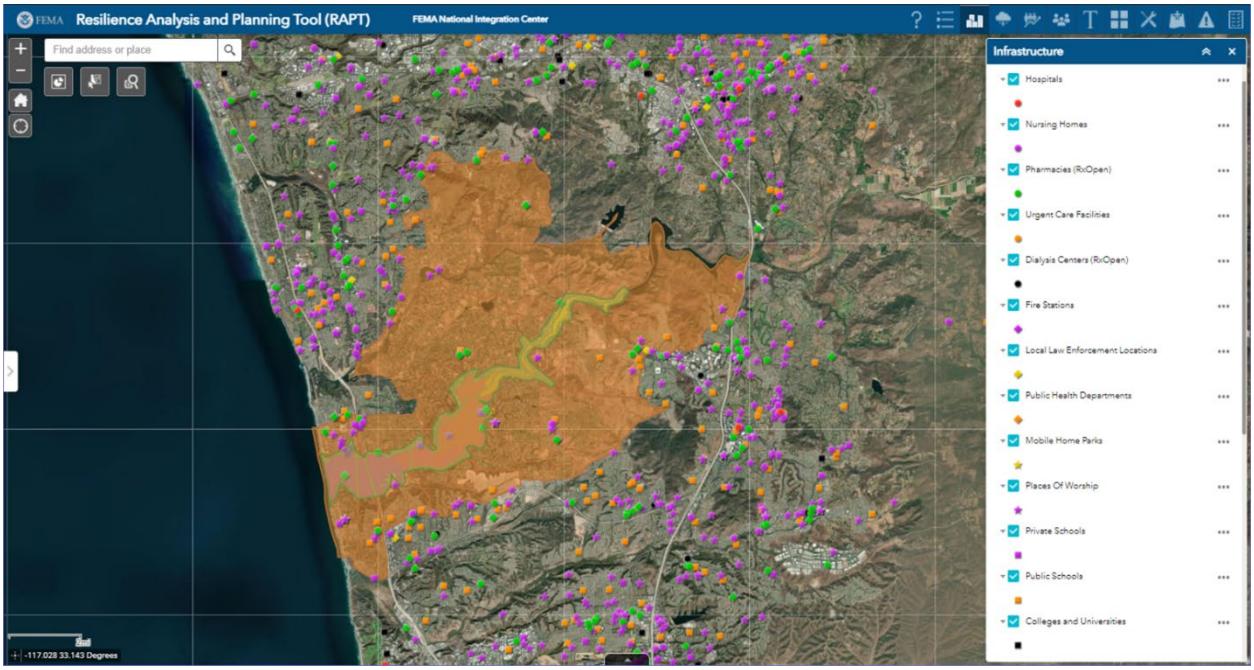

Figure 50. RAPT Map with Infrastructure Layers Added Example