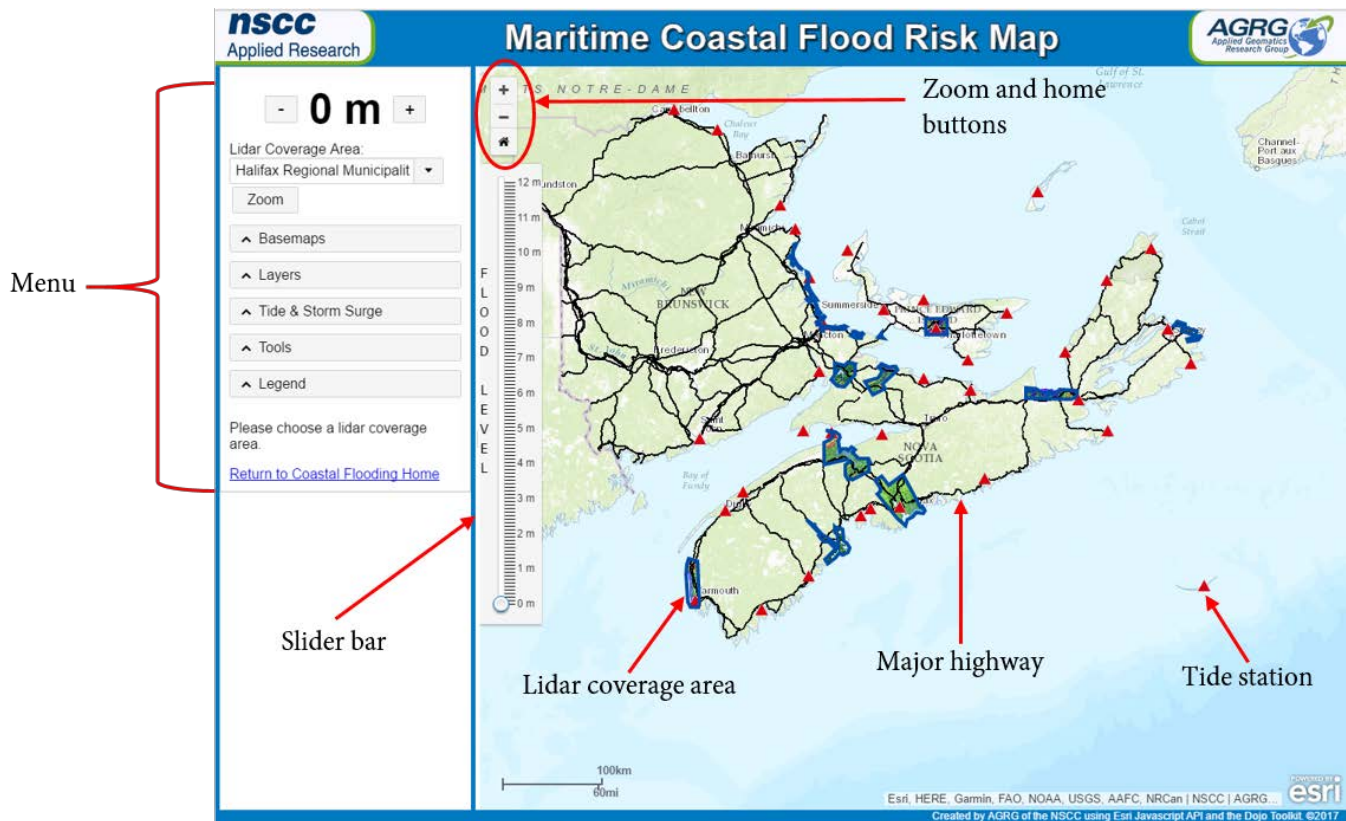


USING THE MARITIME COASTAL FLOOD RISK MAP

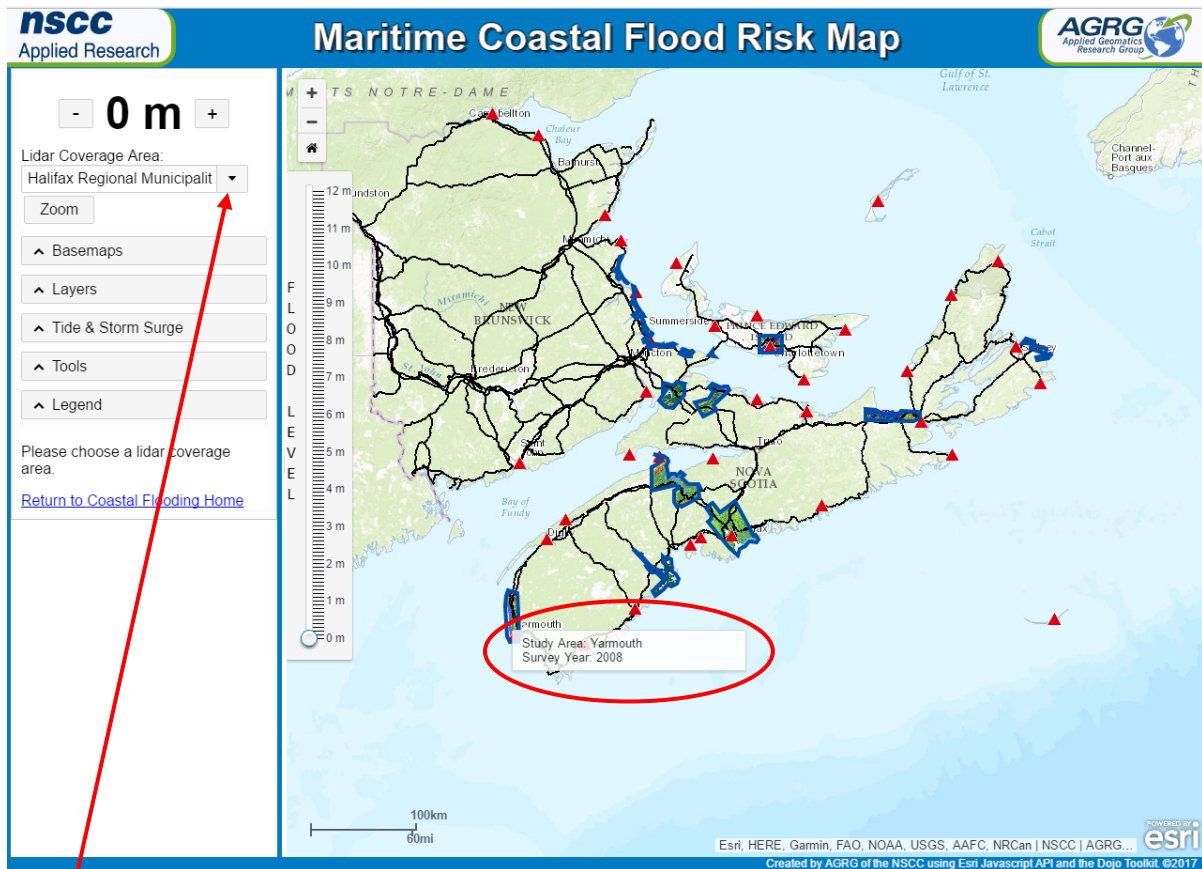
Note: The preferred browser for this web mapping application is Google Chrome. If you find the response time of the system slow, turn off the elevation model maps under the “Layers” tab.

- When initially landing on the main page of the coastal flood risk map the user will see sixteen lidar coverage areas (outlined in blue) throughout the Maritime provinces as well as a menu and slider bar on the left side of the page.
- A red triangle on the map indicates the location of a tide station and is a GIS “Layer” that is displayed by default
- Black lines indicate major highways and are also a GIS “Layer” displayed by default



- To zoom in and out on the map click the “+” and “-” buttons above the slider bar and to pan around, hold down on the right mouse button while dragging the mouse. To go back to the default map extent, click the home button below the zoom in and out buttons.
- To begin interacting with this flood map, it is recommended that the user start at the top of the menu and work downwards.

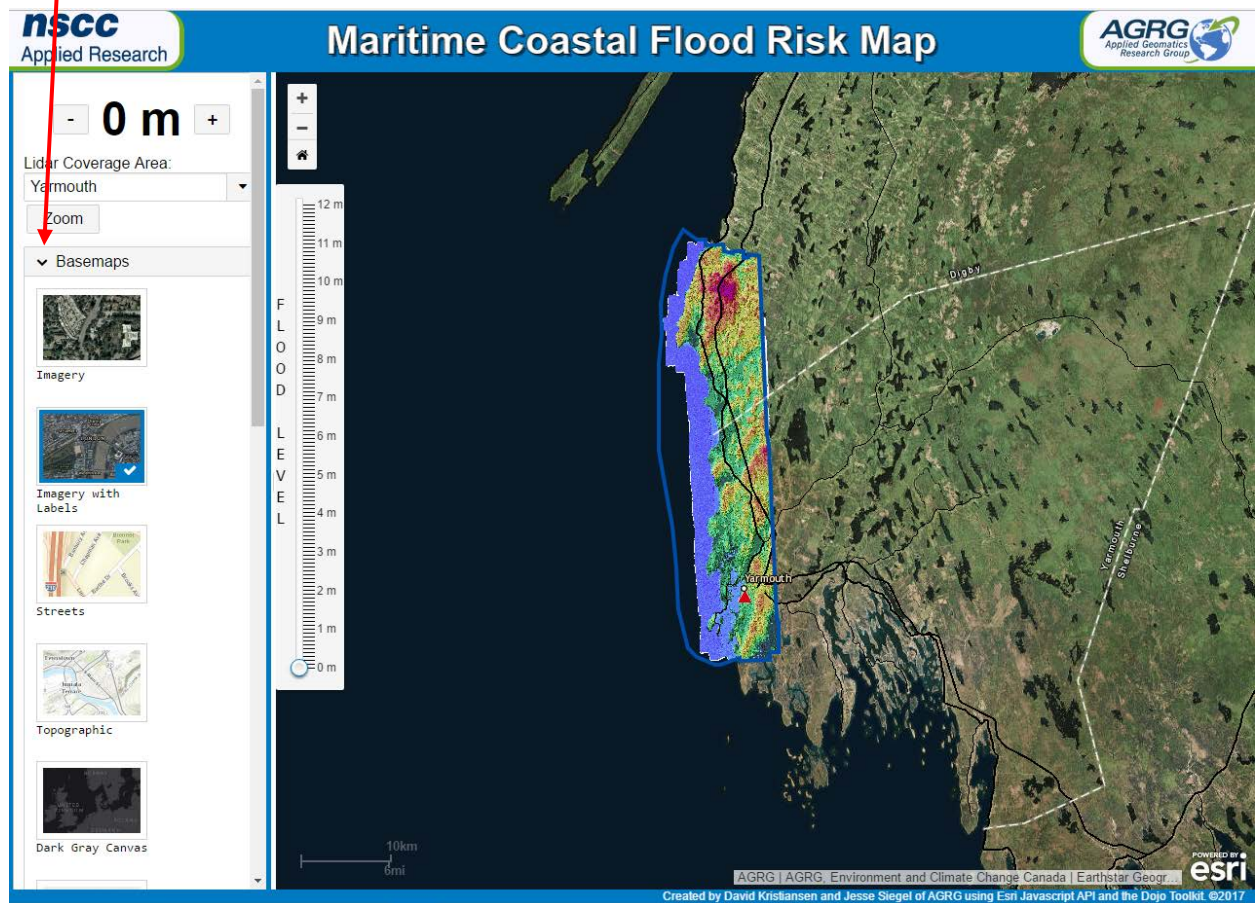
- Hover a specific lidar coverage area and information regarding the name of the study area and lidar survey year are displayed in a white box.



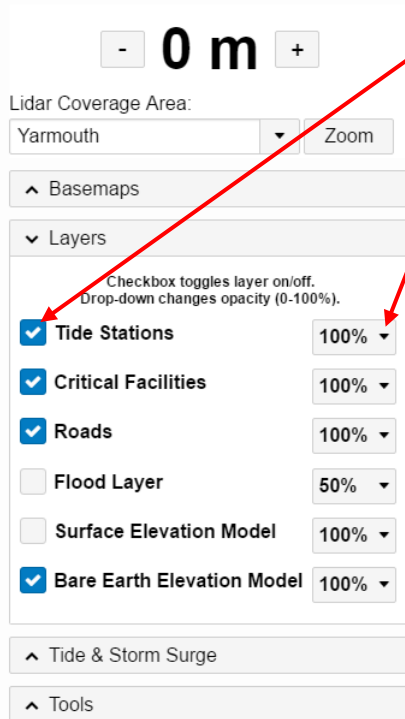
- The user also has the option of zooming farther into a study area by selecting a coverage area from the drop down on the left side menu under “Lidar Coverage Area” and clicking the “Zoom” button, or by clicking on the study area hovered over.
- **Note:** The correct lidar coverage area of interest must be selected in order to see the flood layers
- A description of the Basemaps, Layers, Tide & Storm Surge, Tools and Legend tabs in the menu and how to use them are outlined below.

BASEMAPS

- In the example below, the user has set the lidar coverage area to Yarmouth and has zoomed in
- Click on the “^ Basemaps” tab to access a drop-down menu with ten different background maps from ESRI.
- The basemap on the flood risk map will change according to which map the user selects. In the example below, “Imagery with Labels” is the selected basemap.



LAYERS



- Under the “Layers” tab are GIS data layers which can be toggled on and off by checking the box to the left of the name of a layer.
- There is an option to change the percentage of opacity related to how the layer is displayed on the map by clicking the downward facing arrow in the box next to the layer name which indicates a percentage (%).
- 100% opacity will result in not seeing anything underneath a selected layer, while 50% opacity will allow the map underneath this layer to be partially visible.



Tide Stations

- Department of Fisheries and Oceans tide stations provide data regarding the predicted tides and predicted storm surge for a 10-day period is provided by Environment Canada.
- This data layer is available at all scales and is present by default.

Critical Facilities

- Point locations for emergency and critical services and facilities including ambulance depots, fire stations, police stations, hospitals and continuing care facilities are displayed on the map when the user activates this layer.
- **Note: The user must zoom in farther than 1 map unit = 6 km for this layer to appear - this functionality was implemented for aesthetic and performance purposes.**



Ambulance Depot



Continuing Care



Fire Station



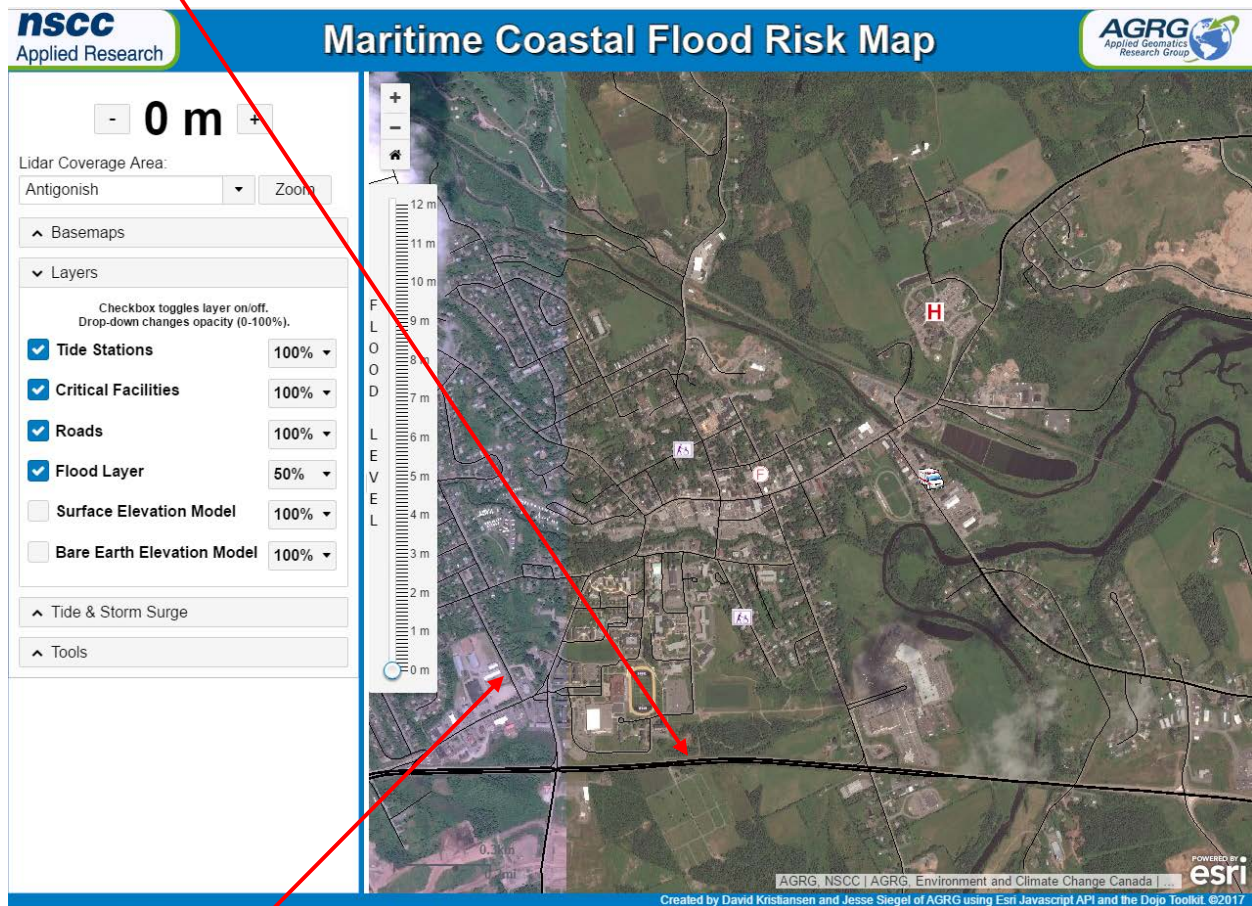
Hospital



Police Station

Roads

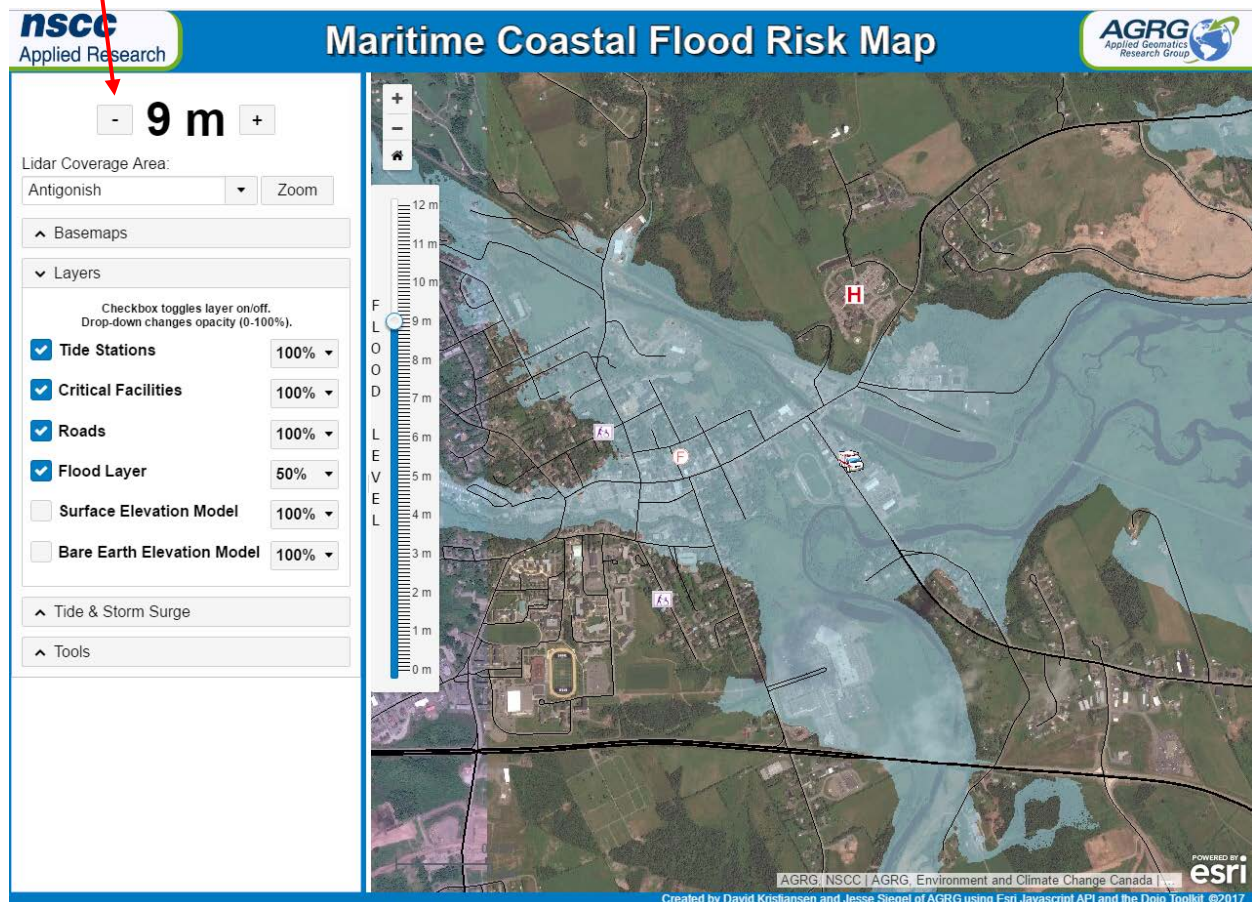
- In this example, the user has changed the lidar coverage area to Antigonish.
- Major highways are displayed on the map by default depicted by thick, black lines.



- When the user zooms in closer, the local road networks become visible and are represented by thin black lines.

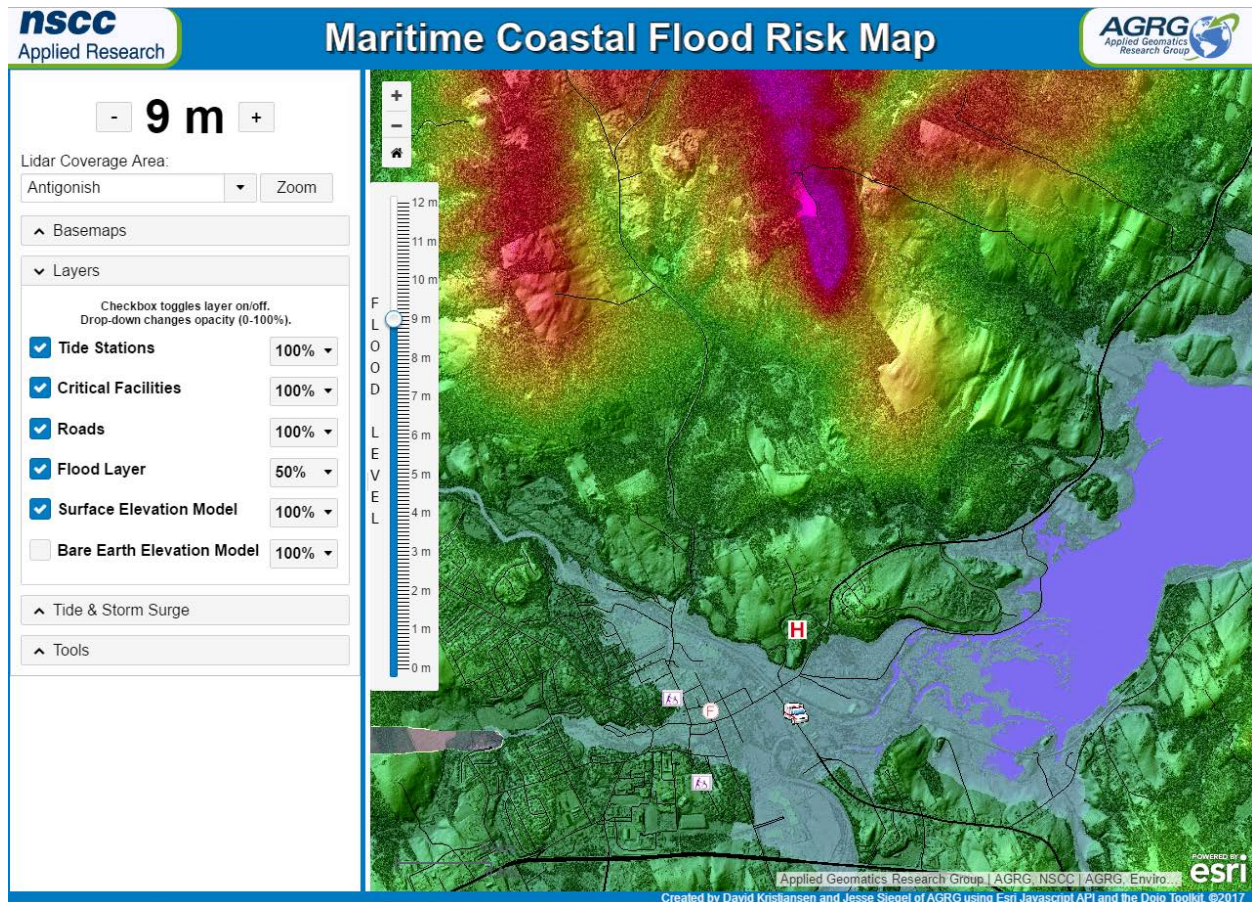
Flood Layer

- To activate the flood layer, check the box to the left of “Flood Layer.”
- The “+” and “-“ scale at the top of the menu corresponds with the “Flood Level” scale bar to the right of the menu. Either the vertical slider bar or the “+” and “-“ scale at the top of the menu can be used to display areas of inundation at a desired flood level on the map.
- Flood levels are shown at 10 cm increments to a maximum level of 12 m relative to the Canadian Geodetic Vertical Datum of 1928 (CGVD28) in order for flood layers to correspond with terrestrial environments.



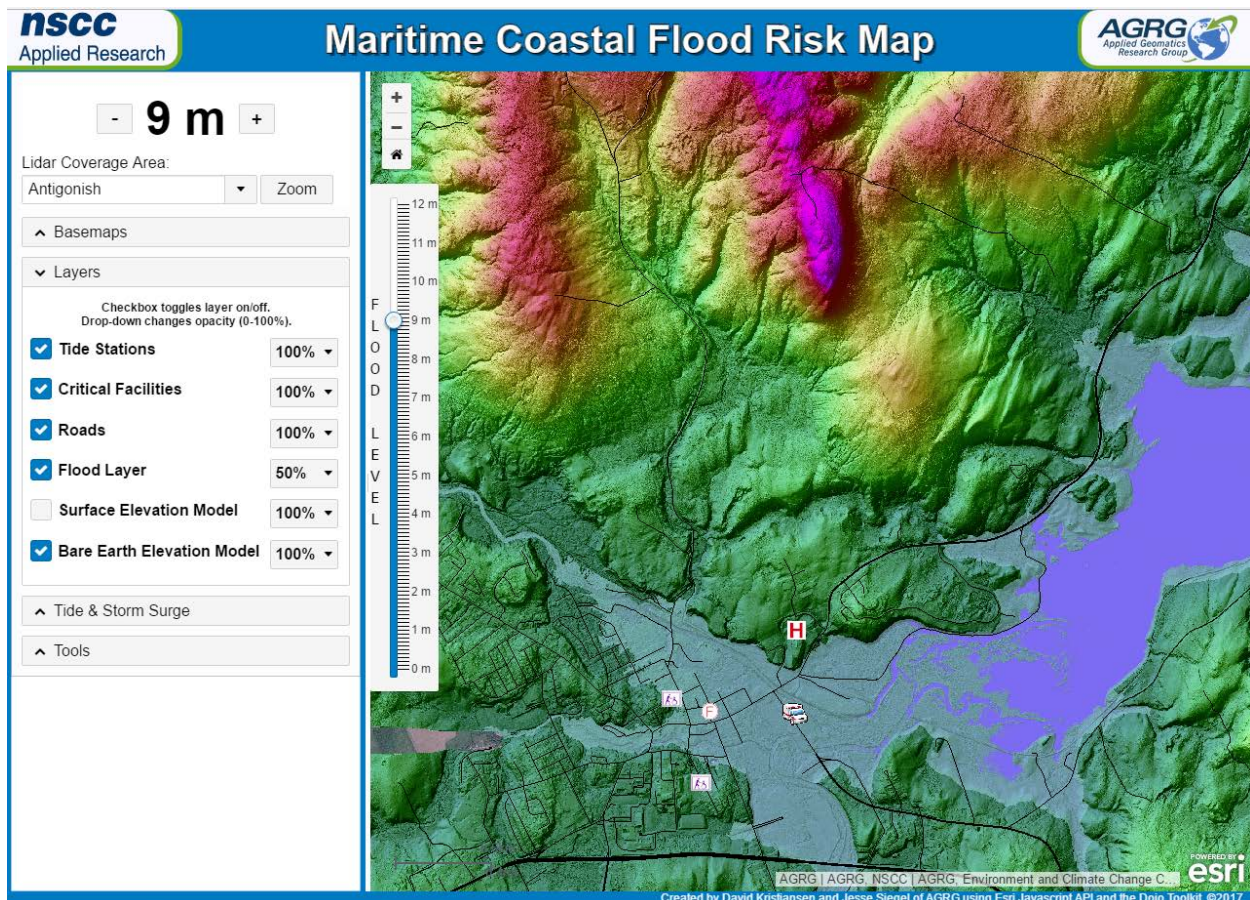
Surface Elevation Model

- **Note:** If you have a slow internet connection turning on this layer will degrade performance.
- To turn this layer on, check the box to the left of the layer name.
- This lidar-derived elevation model is portrayed as a color shaded relief (CSR) map and has a 2 m spatial resolution.
- The color ramp progresses from green to red representing areas of low relief to areas of high relief, respectively.
- The points collected from the lidar system used to construct the surface elevation model include 'ground' points and 'non-ground' points, including buildings and trees.



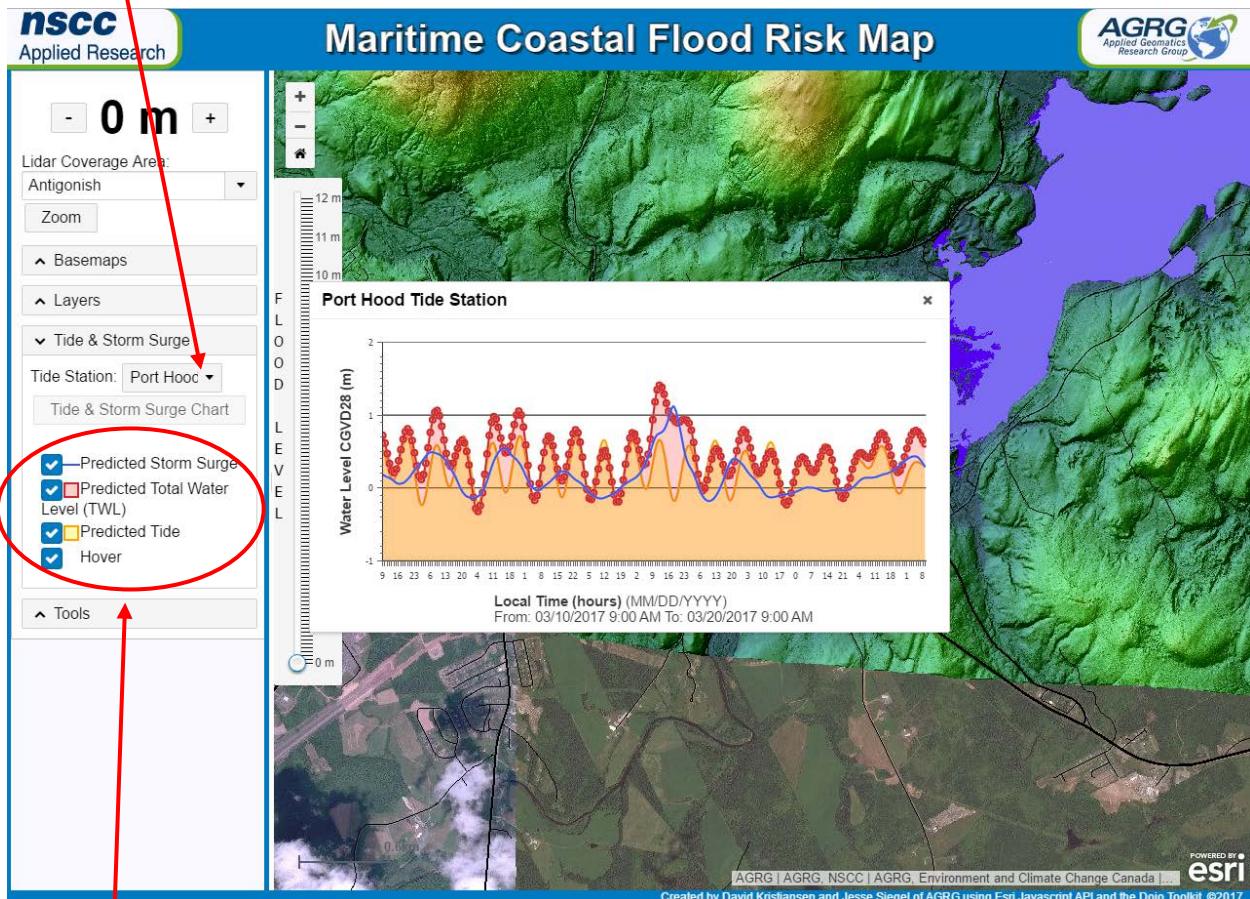
Bare Earth Elevation Model

- Note: If you have a slow internet connection turning on this layer will degrade performance.
- To turn this layer on, check the box to the left of the layer name.
- This lidar-derived elevation model is portrayed as a color shaded relief (CSR) map and has a 2 m spatial resolution.
- The color ramp progresses from green to red representing areas of low relief to areas of high relief, respectively.
- The bare earth elevation model include just ground points, excluding non-ground points such as trees and buildings.
- This type of model was used to generate the flood inundation layers.



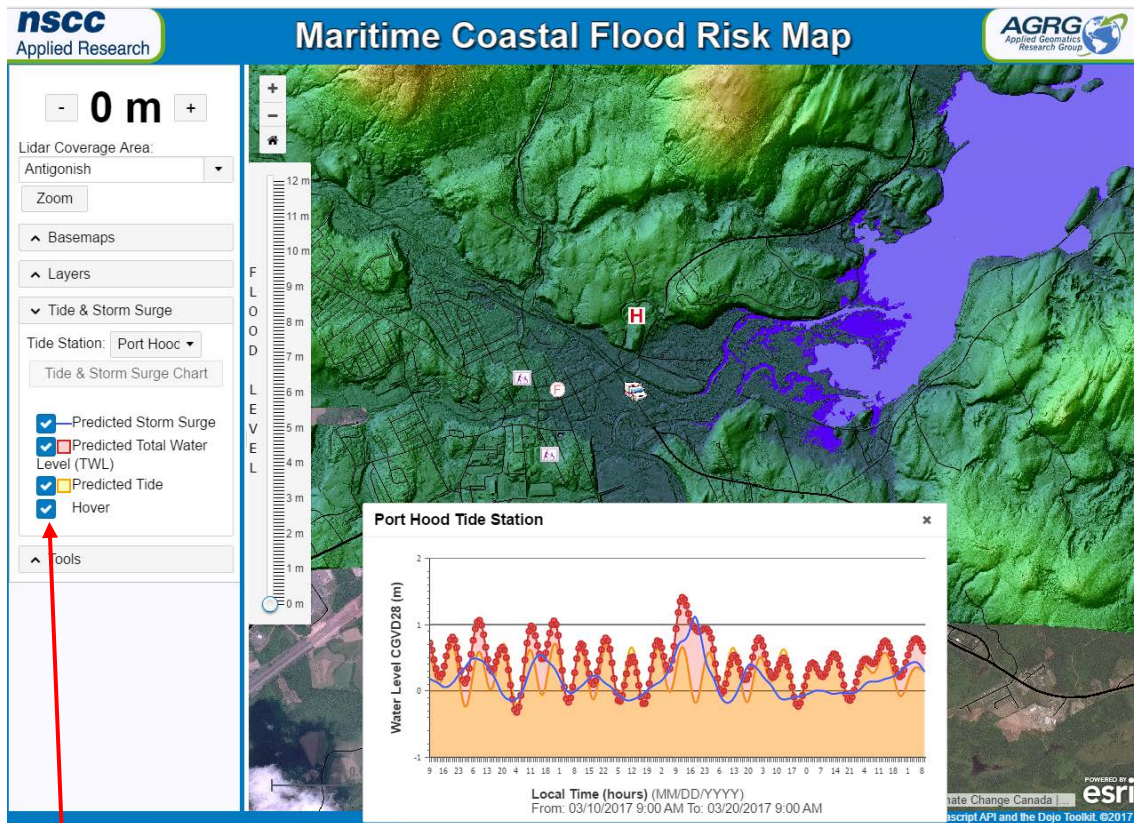
TIDE & STORM SURGE

- This section of the mapping application allows users to view a predicted tide and storm surge chart for the next 10 days which displays the tide (orange line), predicted storm surge (blue line) and predicted total water level (TWL) (red line and dots) relative to CGVD28.
- Pre-defined tide stations are linked to the lidar coverage areas, however the user can change to use a different tide station for flooding if desired.

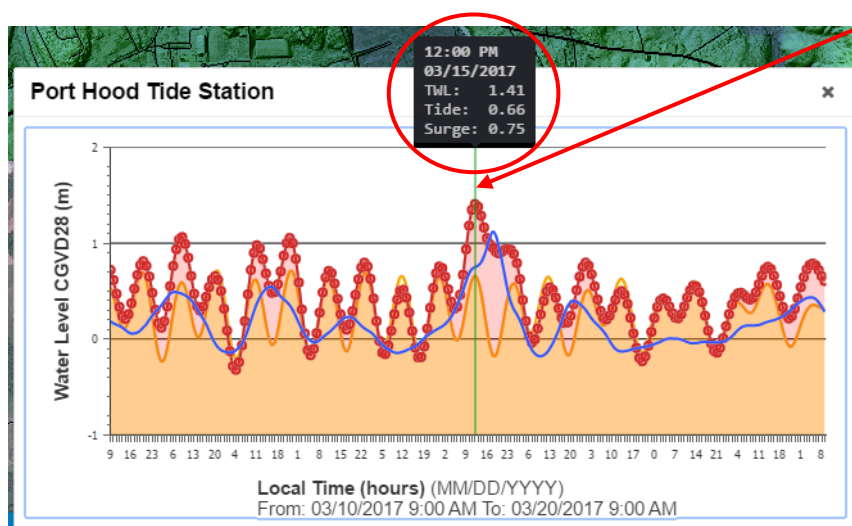


- The legend corresponding to the chart is generated underneath the Tide & Storm Surge Chart button.
- Each variable represented on the chart has the ability to be turned on or off by checking the box to the left of its name.
- The y-axis on the chart represents water level in metres relative to CGVD28 with the x-axis representing time, in hours, over a 10-day period.
- The start and end date of the prediction is listed below the chart.

- To move the chart to the bottom or side of the map to interact with the chart and the map at the same time, click on the chart and drag it to the desired location.

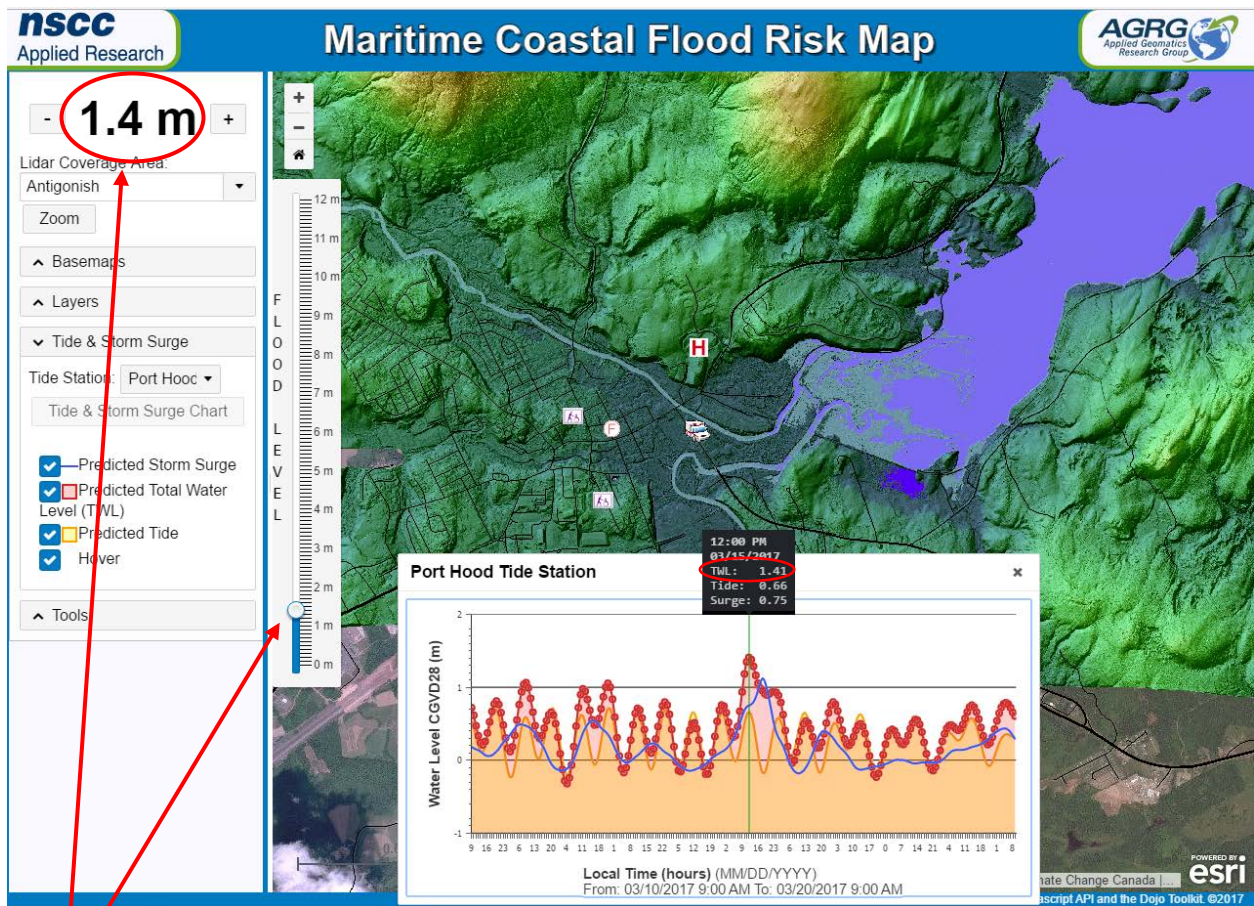


- To interact with the Tide & Storm Surge Chart, the “Hover” option must be checked in the menu generated.



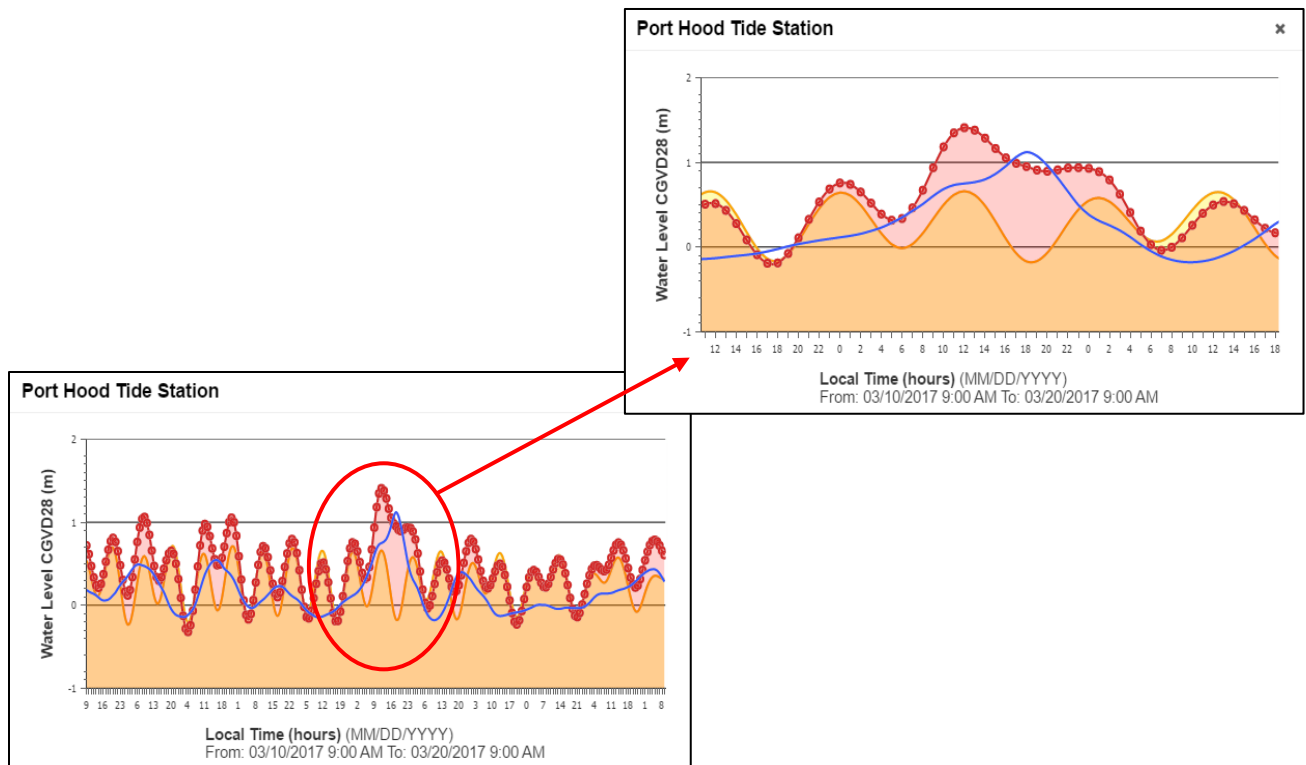
- When the user hovers in the chart area, a thin green bar appears which corresponds to an hourly data point. A black box also appears informing the user of the time of the prediction (in local time), the date, TWL, tide level, and surge level in metres.

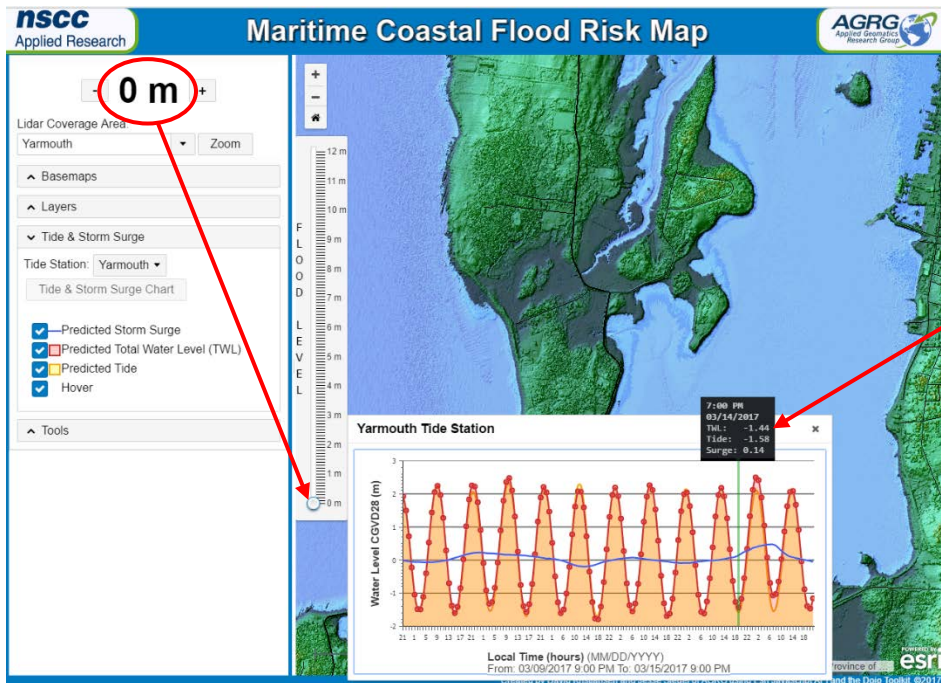
- By left-clicking once on the point being hovered over, the flood level on the map changes in accordance to that specific prediction to the nearest 0.1 m or 10 cm.



- The user will also notice both the Flood Level slider bar and water level at the top of the left menu change in accordance with the same prediction.

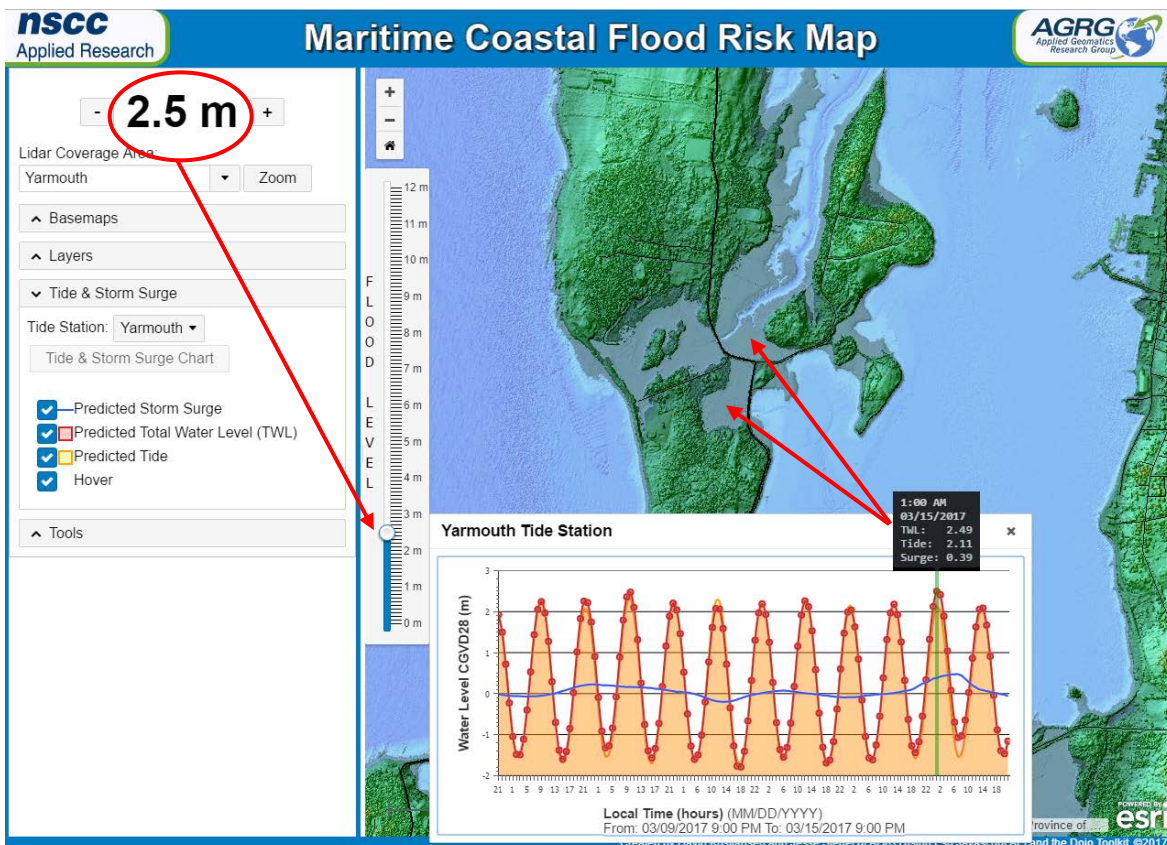
- To zoom in on a specific portion of the chart, the user must turn the wheel on top their mouse away from them. The user can also pan around the chart when zoomed in by clicking on the chart and dragging the mouse to the desired area.
- To zoom back out, turn the mouse wheel in the opposite direction.





*In this example the lidar coverage area is changed to Yarmouth and the user is hovered over a total water level of -1.44 . As there have been no flood layers generated less than 0, the flood level slider bar and the water level on the top of the menu are set to 0.

As the user clicks on a specific data point, in this case, the prediction for 3/15/2017 at 1:00 am, the flood layer corresponding to the TWL is drawn on the map above the chart (figure below), and the change in water level is reflected on both the slider bar and at the top of the menu.*



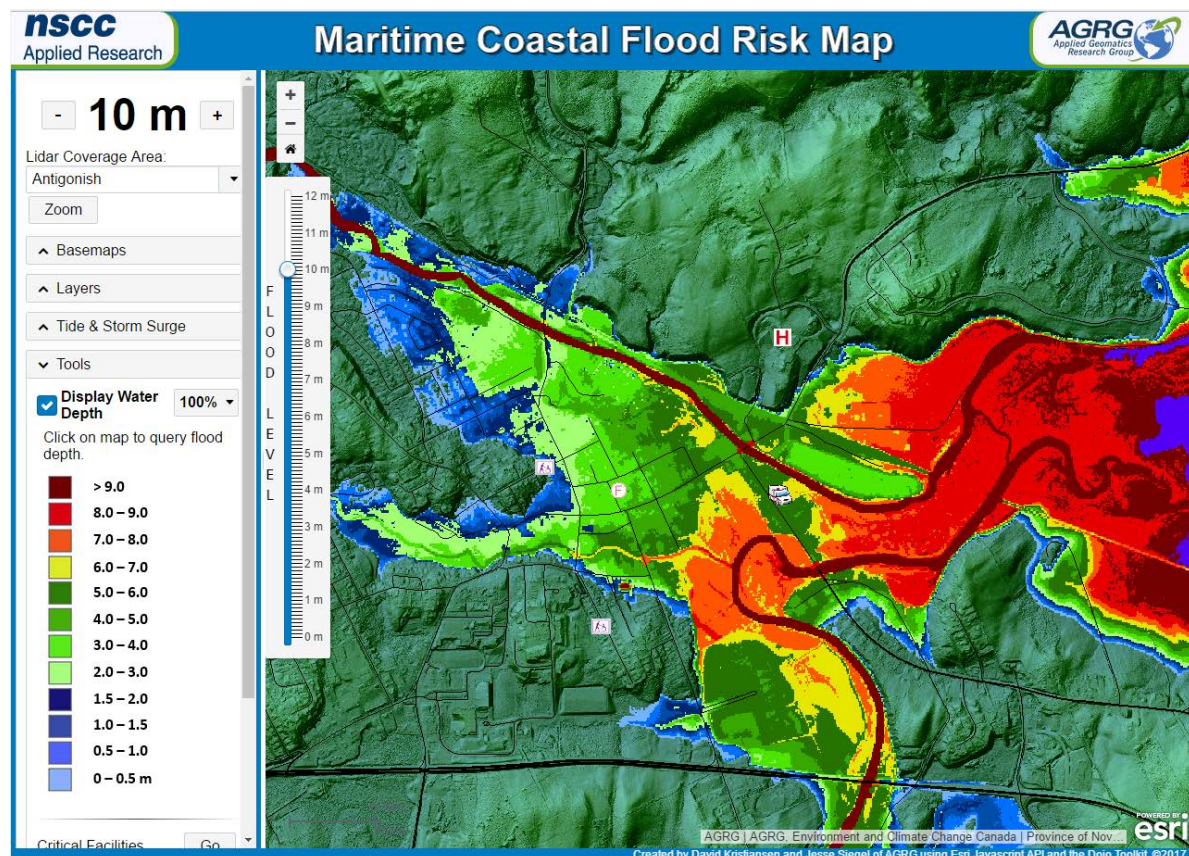
- **Note:** There is a minimal storm surge predicted in this case, so the flood level corresponds to high tide at this time.
- To close the tide station chart and zoom to a different study area, click the “X” located at the top right of the chart.

TOOLS

- When clicking on the “^ Tools” option bar in the menu, a dropdown is populated with GIS tools designed to allow the user to further interact with the mapping application and conduct analysis.

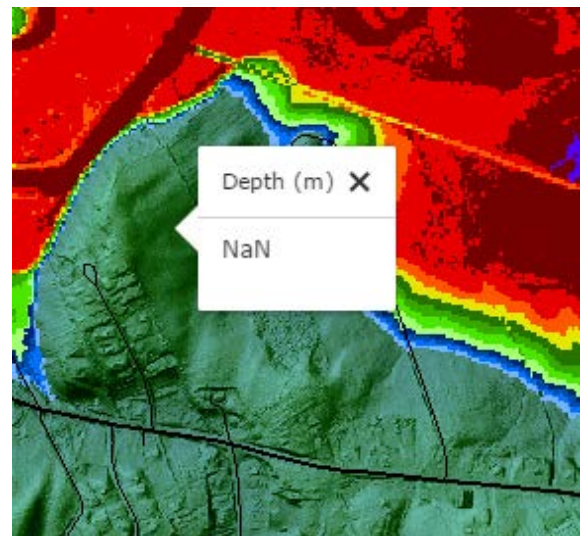
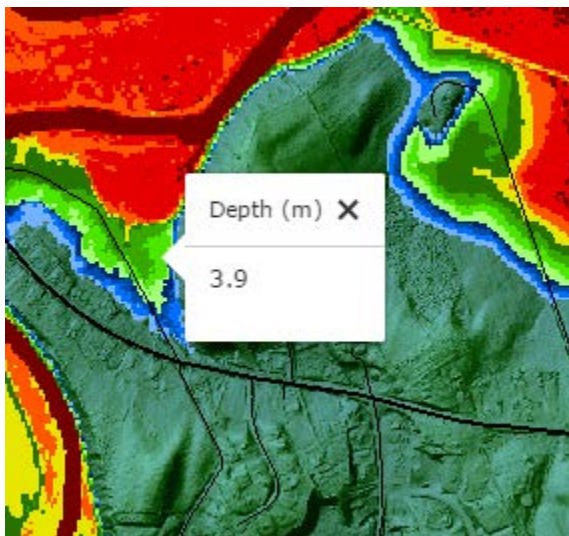
Display Water Depth

- This tool displays the depth of water relative to the elevation model at a specific flood level.
- To activate the tool, the user must first ensure that they have selected the correct lidar coverage area they are viewing at the top of the menu.



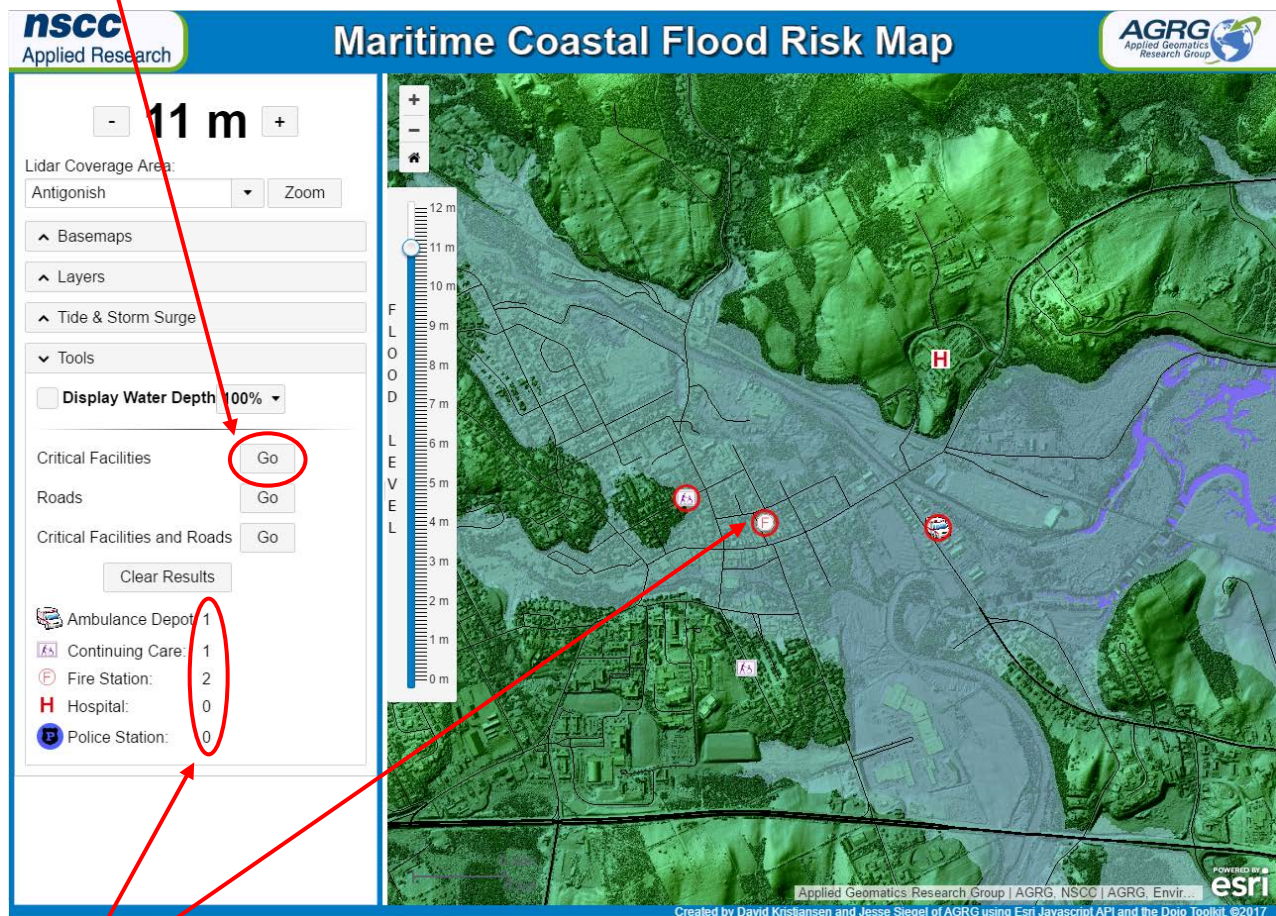
- Choose a desired flood level by using either the manual slider bar to the right of the menu or the scale bar at the top of the menu, or via the tide surge chart. In the example above, the user has zoomed to Antigonish and has selected a flood level of 10 m.

- By activating the tool and checking the box next to “Display Water Depth” the legend for the water depth map is displayed
- The transparency or opacity of the water depth map can be changed by clicking on the downward facing arrow in the drop-down next to the tool and selecting a percentage.
- The user can also query water depth values on the map by right-clicking on any area where the depth map is present. If the user clicks on an area outside of the depth map, a pop-up box will show “NaN” meaning “no data.”



Critical Facilities

- This geoprocessing tool allows the user to calculate the number of critical facilities which would be inundated at a certain flood level.
- To use this tool, ensure that the Critical Facilities layer is turned on under the “Layers” tab.
- Zoom in to an area of interest far enough so that the Critical Facilities layer is displayed.
- Select a flood level by using the manual slider bar or by increasing or decreasing the flood level at the top of the main menu.
- Once the desired flood level has been selected, clicking the “Go” button to the right of the tool initiates the processing. This tool may take some time to do the analysis of intersecting the flood layer with the facility points. Once the “Go” button is clicked the system will provide feedback as to the status of the analysis (eg. Submitting, executing).

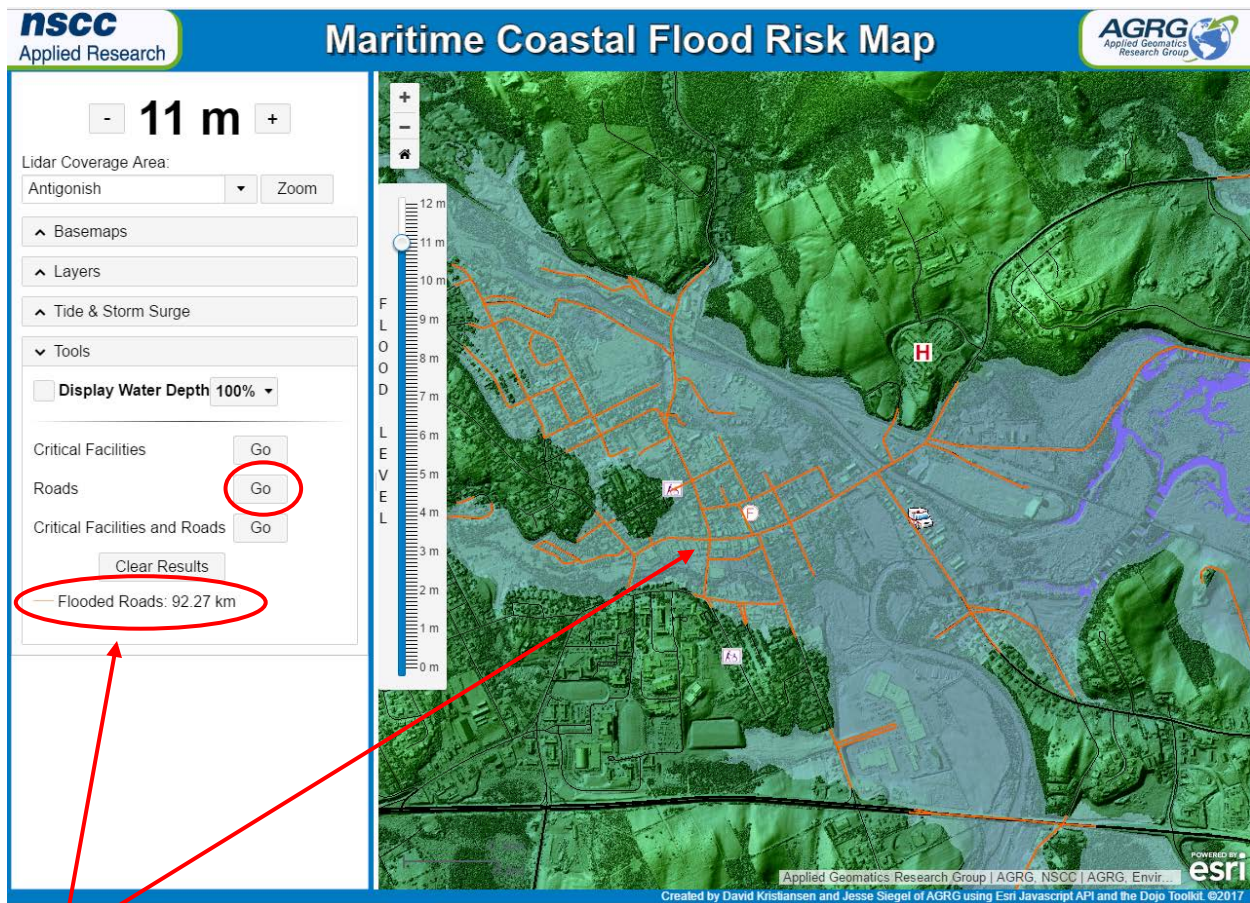


- When the tool has finished running, the results are displayed in two ways.

- A count of inundated critical facilities at the user-specified flood level (in this case, 11 m) are populated below the “Clear Results” button and the corresponding inundated facilities are identified by a red circle on the map.
- To clear the results and run the tool again for a different flood select, click the “Clear Results” button.
- **Note: This analysis is conducted for the entire lidar coverage area and not just the extent that the user is zoomed to. Therefore, the user can pan to other areas in the lidar coverage to see if additional facilities may be flooded.**

Roads

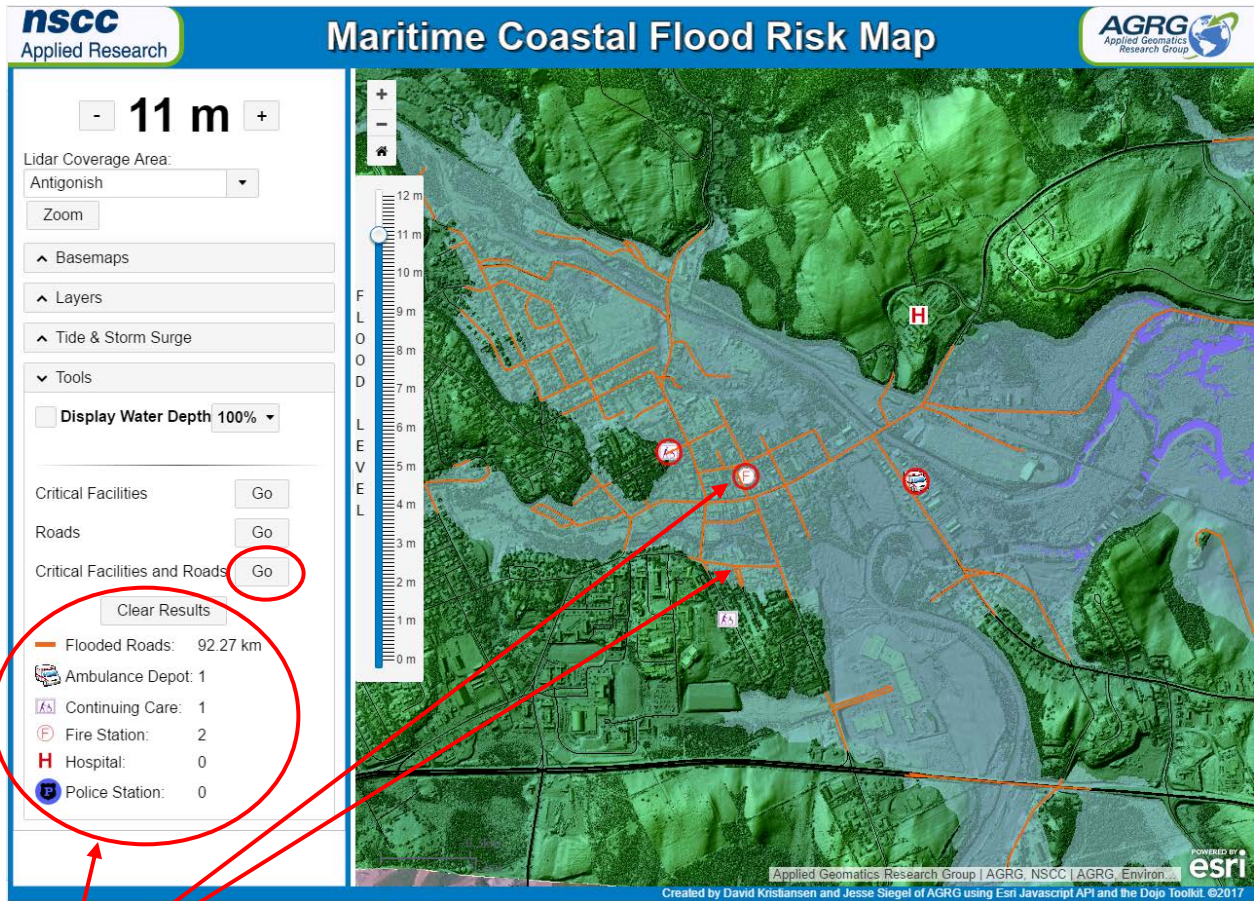
- This tool allows the user to calculate the length of roads which would be inundated at a certain flood level.
- **Note: This process overlays the road network on the flood polygons and roads which are inundated are selected with the exception of bridges that were removed from the lidar model during the flooding process to ensure hydraulic connectivity between the ocean and low lying areas upstream. Therefore, road segments representing the bridges may be incorrectly selected during this analysis.**
- To use this tool, ensure that Roads layer is turned on under the “Layers” tab.
- Zoom to an area of interest and choose the desired flood level. Click the “Go” button to initiate the tool (see figure on next page).



- Roads which are affected by the flood level are highlighted on the map in orange, and the calculated total length of affected roads is populated under the “Clear Results” button.
- To clear the results to run the tool again for a different flood select, click the “Clear Results” button.
- **Note:** This analysis is conducted for the entire lidar coverage area and not just the extent that the user is zoomed to.

Critical Facilities and Roads

- To calculate both affected critical facilities and roads at a specific flood level, zoom to a lidar coverage area and ensure both the Critical Facilities and Roads layer are turned on under the “Layers” tab.
- Choose desired flood level and click the “Go” button next to Critical Facilities and Roads.



- The results are populated in the menu and are also displayed on the map.
- The same work flow can be followed for all lidar coverage areas.

LEGEND

▼ Legend

Tide Stations

 Tide Station

Critical Facilities

 Ambulance Depot

 Continuing Care

 Fire Station

 Hospital

 Police Station

Roads

 Major highway

 Arterial road

 Local road

Please choose a lidar coverage area.

[Return to Coastal Flooding Home](#)

- The legends for the tide stations, critical facilities and road network are located in the drop-down of this tab.
- Click on the tab to view the legend.

- To go back to the main map and explore other lidar coverage areas, please click the “Return to Coastal Flooding Home” link at the bottom of the menu.