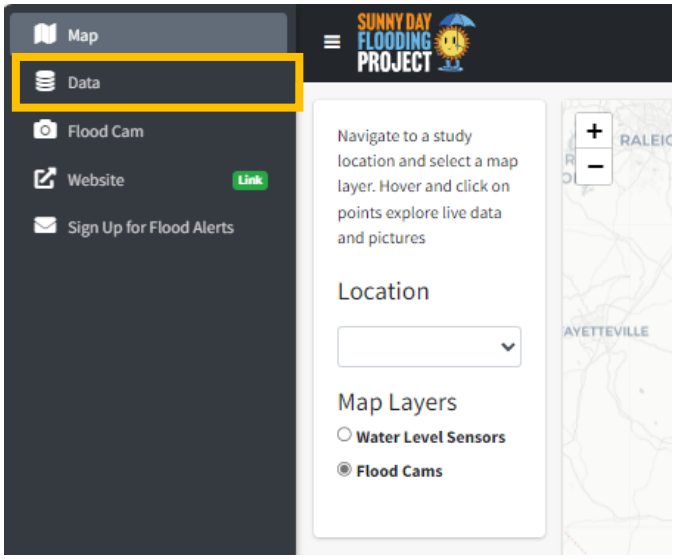
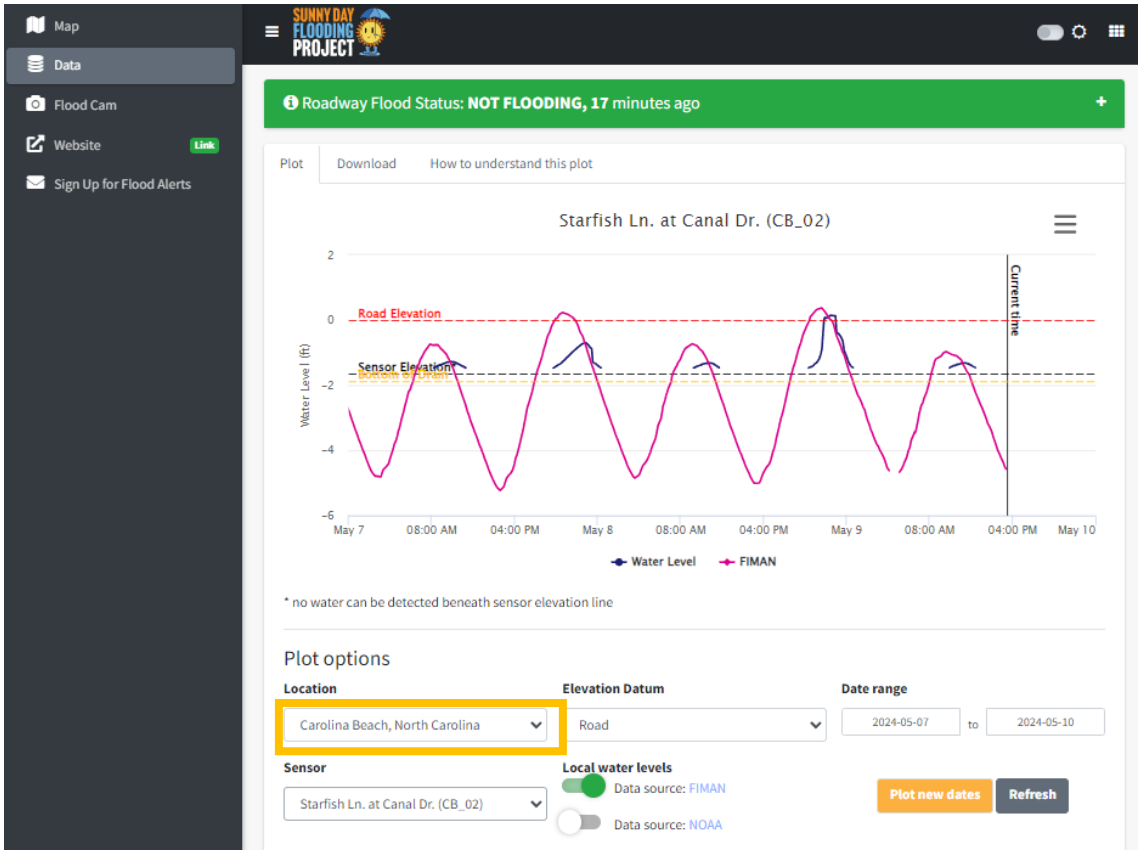
How-to-Guide: Using storm drain water level data to evaluate check valve performance in Carolina Beach

STEP 1: Display data of storm drain water levels on Canal Drive and in the Yacht Basin

1. Go to the website **go.ncsu.edu/cbflood**
2. Wait for the page to load; this can take up to 10 seconds. Then, click on the **Data** button



3. Verify that **Carolina Beach, North Carolina** is selected from the drop-down **Location** list



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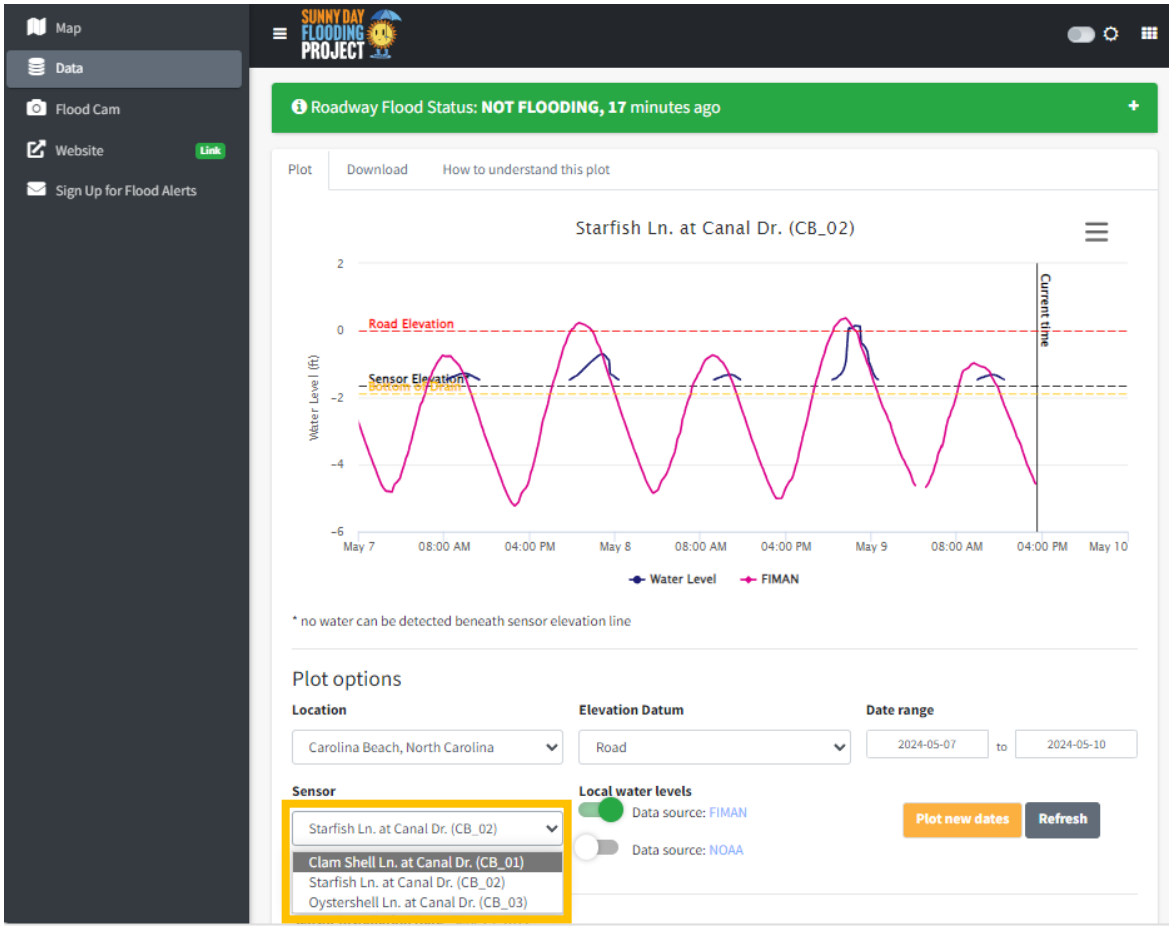
4. Use the **Sensor** drop-down list to select the Canal Drive intersection with the check valve you would like to analyze



5. Make sure the FIMAN data source is switched on (displays green under **Local water levels**)

STEP 2: Using the plot, compare the **Water Level** measured in the storm drain (*blue line*) to the measured water level from the **FIMAN** gauge in the Yacht Basin (*pink line*)

A check valve is **NOT WORKING** if the blue line is directly on top of or very close to the pink line during the rising tide. This means that the water level in the storm drain is increasing at the same rate as the water level in the Yacht Basin – so the check valve is not keeping water out of the stormwater system.

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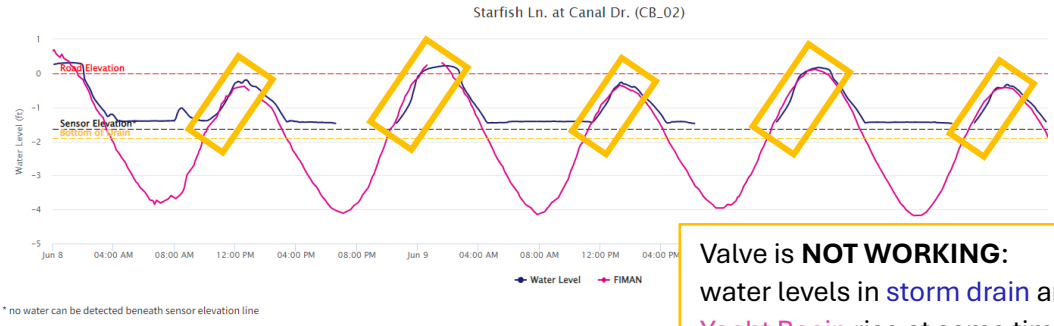
The example below shows a check valve that is not working well. Notice how the pink and blue lines stay very close together during rising tide.

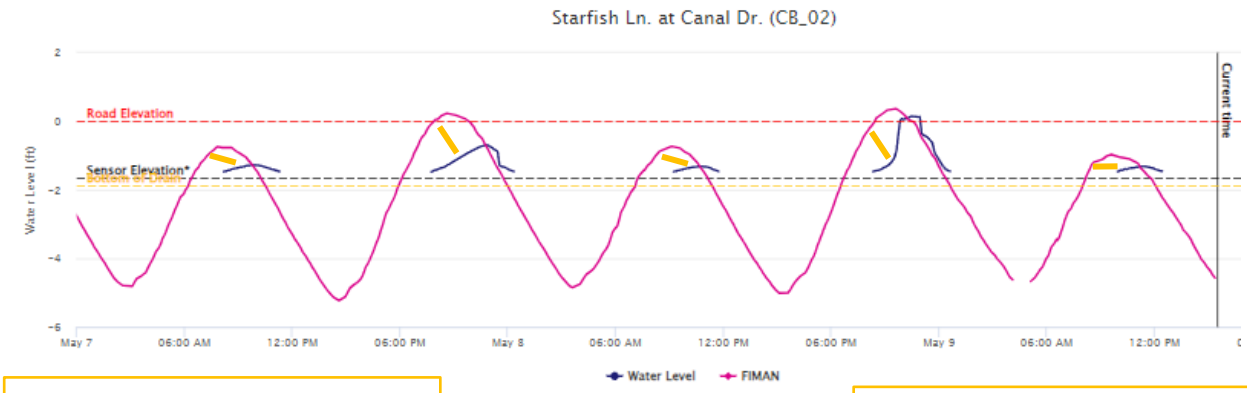


* no water can be detected beneath sensor elevation line

Valve is **NOT WORKING**: water levels in storm drain and Yacht Basin rise at same time.

A check valve is **WORKING** if there is a time lag between the pink line and the blue line as the tide rises (shown on the plot below as a yellow line), or if the blue line does not appear on the plot at all. If the blue line starts rising later than the pink line, or it stays lower than the pink line, water levels in the drain lag water levels in the Yacht Basin because the check valve is slowing backflow into the storm drain. If the blue line does not appear on the plot or only appears during some tidal cycles, the check valve has kept water levels in the storm drain below the sensor.

Check valves perform differently along Canal Drive, but below are examples of check valves working well from all three of the storm drains with sensors. Notice how the pink line always rises before the blue line, with the space between the lines (i.e., the time lag) highlighted yellow.



Valve is **WORKING**: water levels in storm drain rise after water levels in the Yacht Basin.

Separation between the pink and blue lines show the valve slows flow from the Yacht Basin to the drain.

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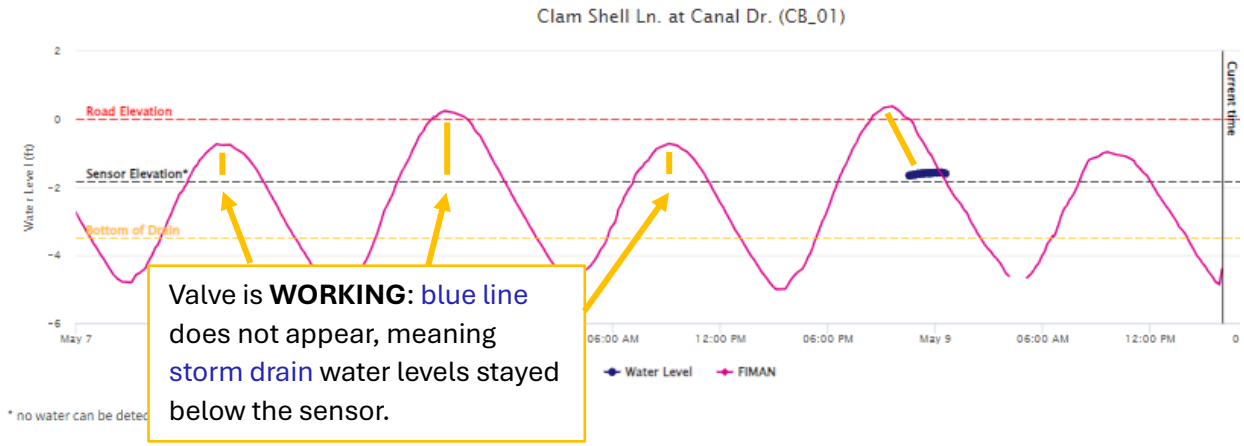
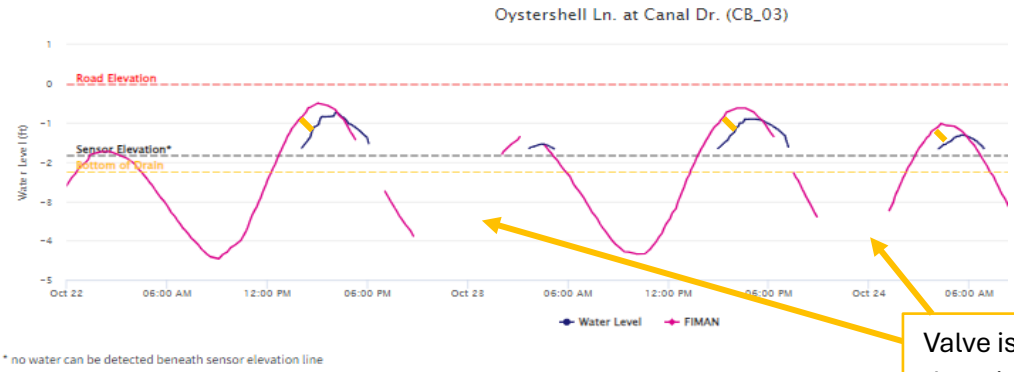


Valve is **WORKING**: blue line does not appear, meaning storm drain water levels stayed below the sensor.

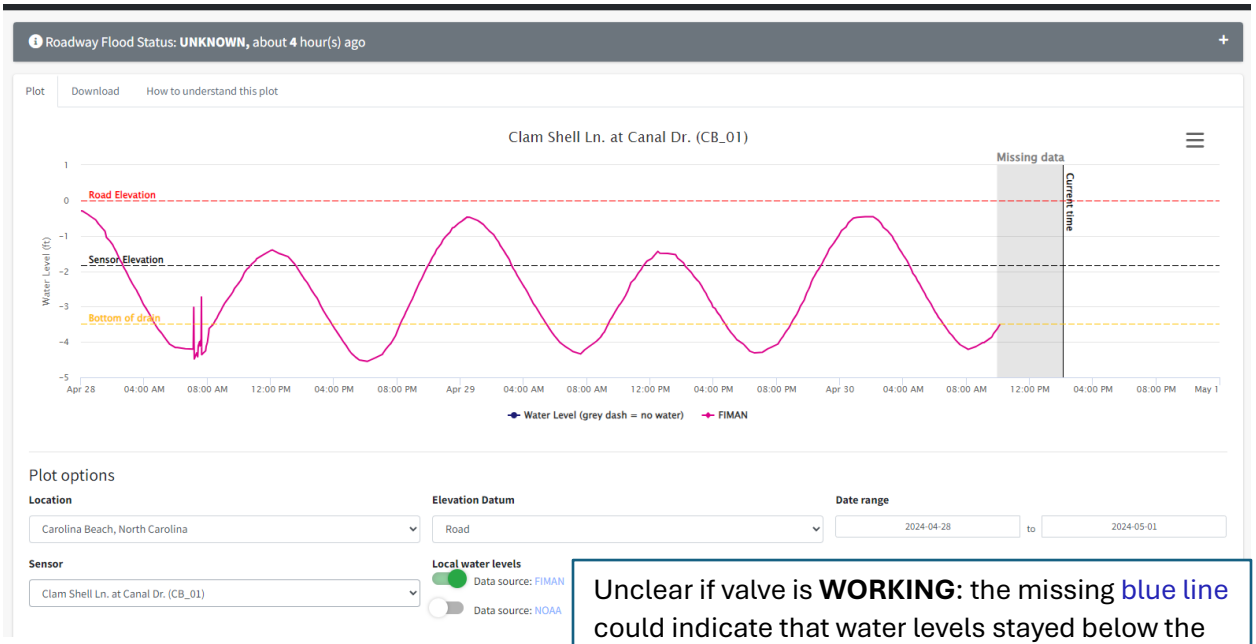


Valve is **WORKING**: but there is missing data from the **FIMAN** gauge in the Yacht Basin (pink line).

Footnotes:

- If it **rained** during the tidal cycle you are checking, none of the guidance above applies. The water levels in the storm drain and the Yacht Basin may stay close together or diverge significantly during rainstorms, and that does not indicate anything about check valve performance. You can only evaluate check valve performance during dry periods, and non-flood conditions (i.e., when you are certain water is not entering the storm drain from the road).
- Sensors break from time to time. If there are periods with missing sensor data (example: missing data from the Yacht Basin in the plot above), check the nearest time with uninterrupted pink and blue lines for a full rising tide. If a storm drain water level sensor is not currently reporting water levels, this period with missing data will be shown with gray shading (like in the plot below). This missing data notification is only present for active (real-time) data gaps. Once the data stream from the sensor is restored, the gray shading goes away.

How-to-Guide: Using storm drain water level data to evaluate check valve performance in Carolina Beach



Unclear if valve is **WORKING**: the missing blue line could indicate that water levels stayed below the sensor, or that storm drain data from this time period is missing. The active storm drain data gap is shown with gray shading, but there could be periods with prior to the gray shading where data is missing as well. Choose a different time period or check the web-app later.