



ARLINGTON
VIRGINIA

Flow Monitoring Network

Introduction

Arlington County has developed a **Flow Monitoring Network** to better understand the factors that drive flooding and to take the first steps toward reducing flood risk in Arlington's communities.

The **Flow Monitoring Network** will be used by the County to:

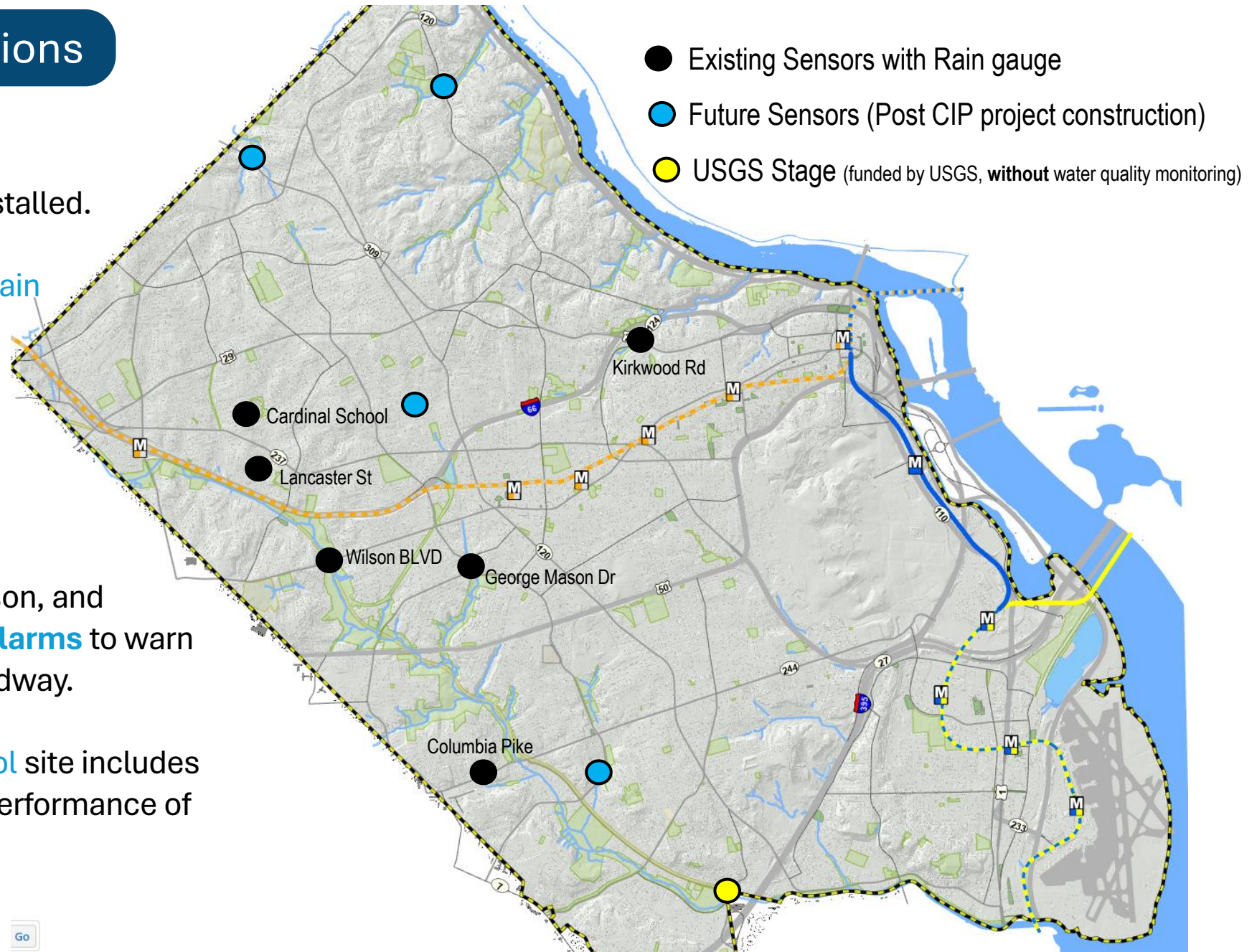
- Monitor water level and precipitation during each storm event
- Analyze storm event data to assess system performance, including:
 - Available capacity
 - Time to peak flow
 - Time to return to baseline conditions

By collecting real-time water level and rainfall data, the County will be able to:

- Identify potential flooding conditions that could adversely impact urban areas.
- Calibrate hydrologic and hydraulic models (such as SWMM) using observed field data.
- Refine local weather and rainfall characteristics, including intensity–duration–frequency (IDF) curves, since climate change is altering weather patterns in many parts of the United States.

Flow Monitoring Stations

- So far, **6 stations** have been installed.
- All stations are equipped with **rain gauges** and **water level sensors**.
- 3 stations (Columbia Pike, Wilson, and Kirkwood) have **flashing flood alarms** to warn drivers when water is on the roadway.
- The **Cardinal Elementary School** site includes several sensors to analyze the performance of the underground vault system.

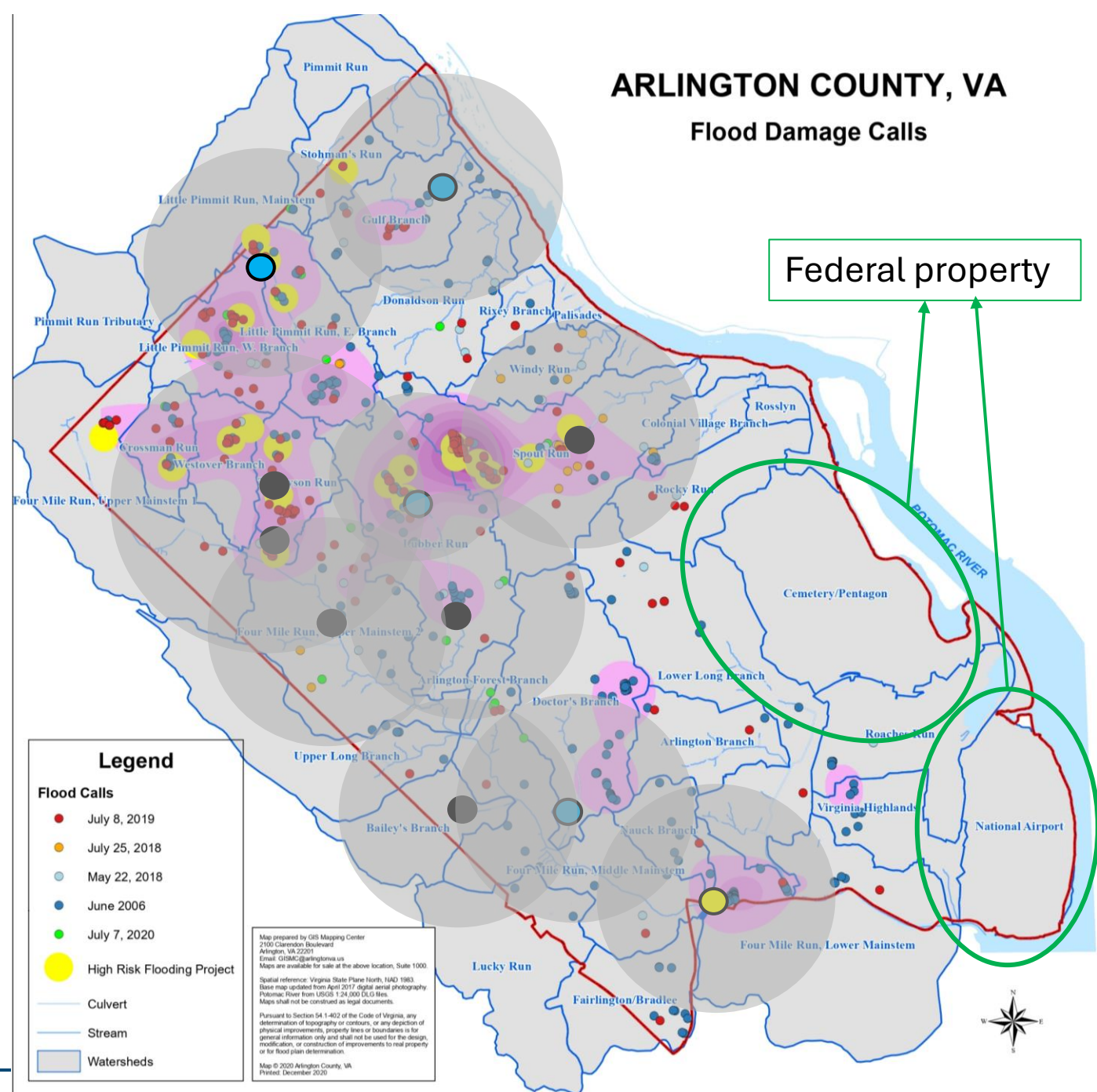


Rain Gauge Coverage

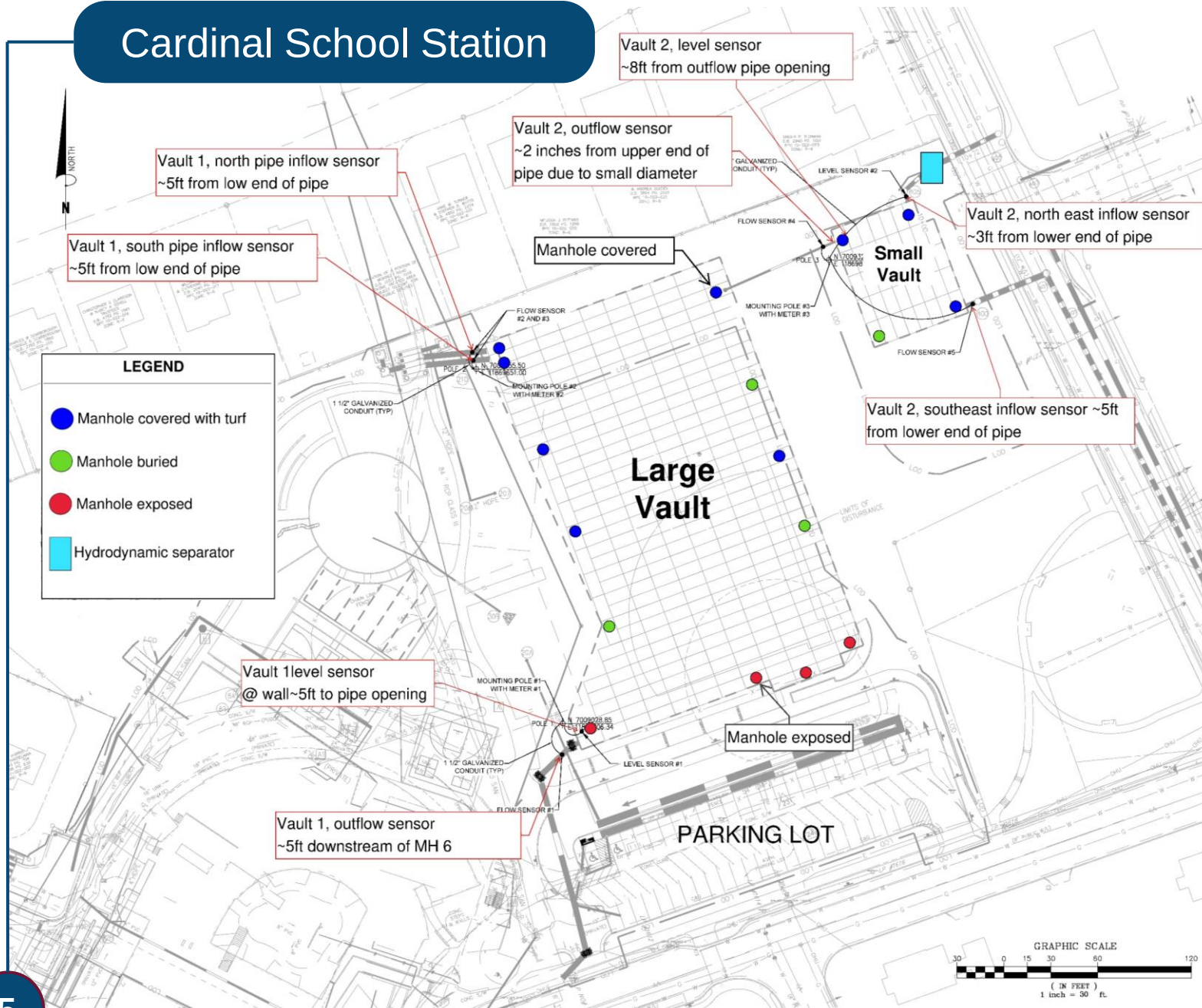
- Existing Sensors with Rain gauge
- Future Sensors (Post CIP project construction)
- USGS Stage (funded by USGS, **without** water quality monitoring)

Once the Flow Monitoring Network is fully implemented and all “Future Sensor” stations are installed, the rain gauge network will provide coverage across **much of Arlington County**, excluding federal properties (Arlington National Cemetery and Reagan National Airport).

The base map shows locations of flood damage calls from multiple storm events in Arlington. The Flow Monitoring Network has been designed to provide coverage in these high-impact areas as well.



Cardinal School Station



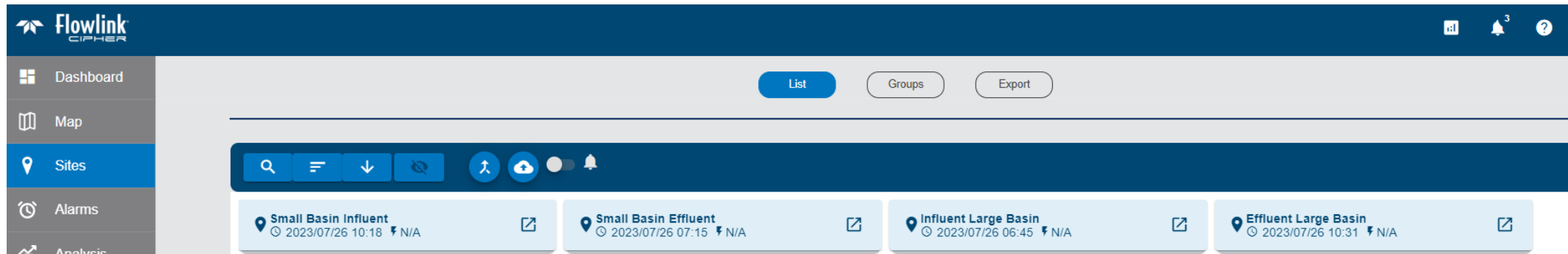
Installed equipment in vault system:

- **Six** Area Velocity sensors (flow sensors) to measure water depth and velocity and subsequently calculate flow
- **Two** Level sensors to measure depth of water
- **One** rain gauge

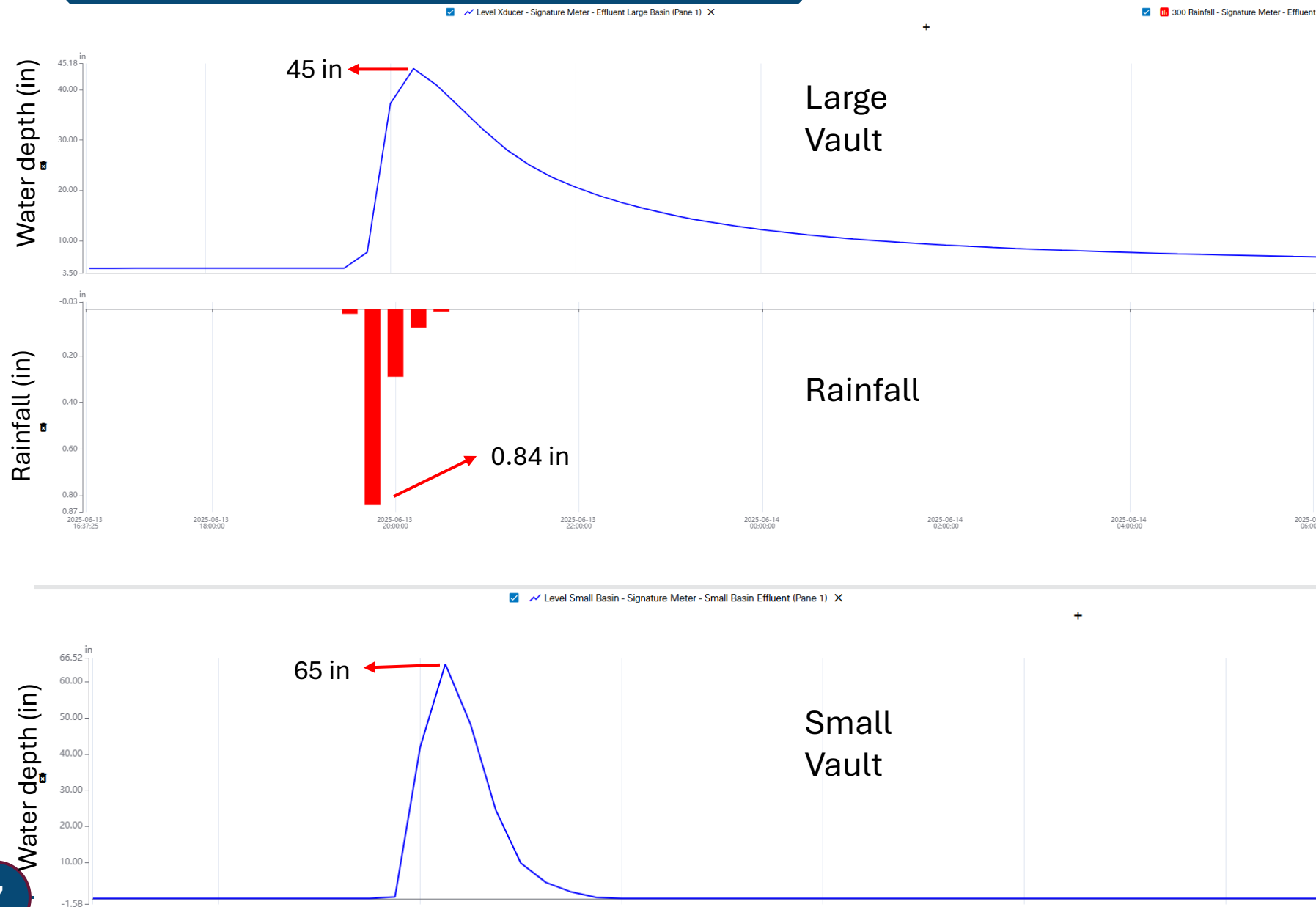
Cardinal School Website

There are four stations (sites) related to the vault system:

1. Influent of small vault
2. Effluent of small vault
3. Influent of Large vault
4. Effluent of Large vault



Example Results: Cardinal School Station



What Does This Station Monitor?

During an evening storm on **June 13, 2025**, the Cardinal School station recorded about 1 inch of rain in 30 minutes, with intensities similar to a 1–2 year storm.

Water level sensors in the underground vaults measured depths of approximately 45 inches and 65 inches in the large and small vaults, respectively.

This example shows the type of rainfall and water level information the monitoring network can provide during real storm events.

Example Results

**Inflows and outflow data
related to 7/24/2023 at 3:30 AM**

Since six velocity sensors have also been installed in the vault system, this monitoring station is able to report inflow and outflow rates, as well as total inflow and outflow volumes to and from the vaults. This is another example of the results that can be obtained.

Inflows and outflow

Rain data

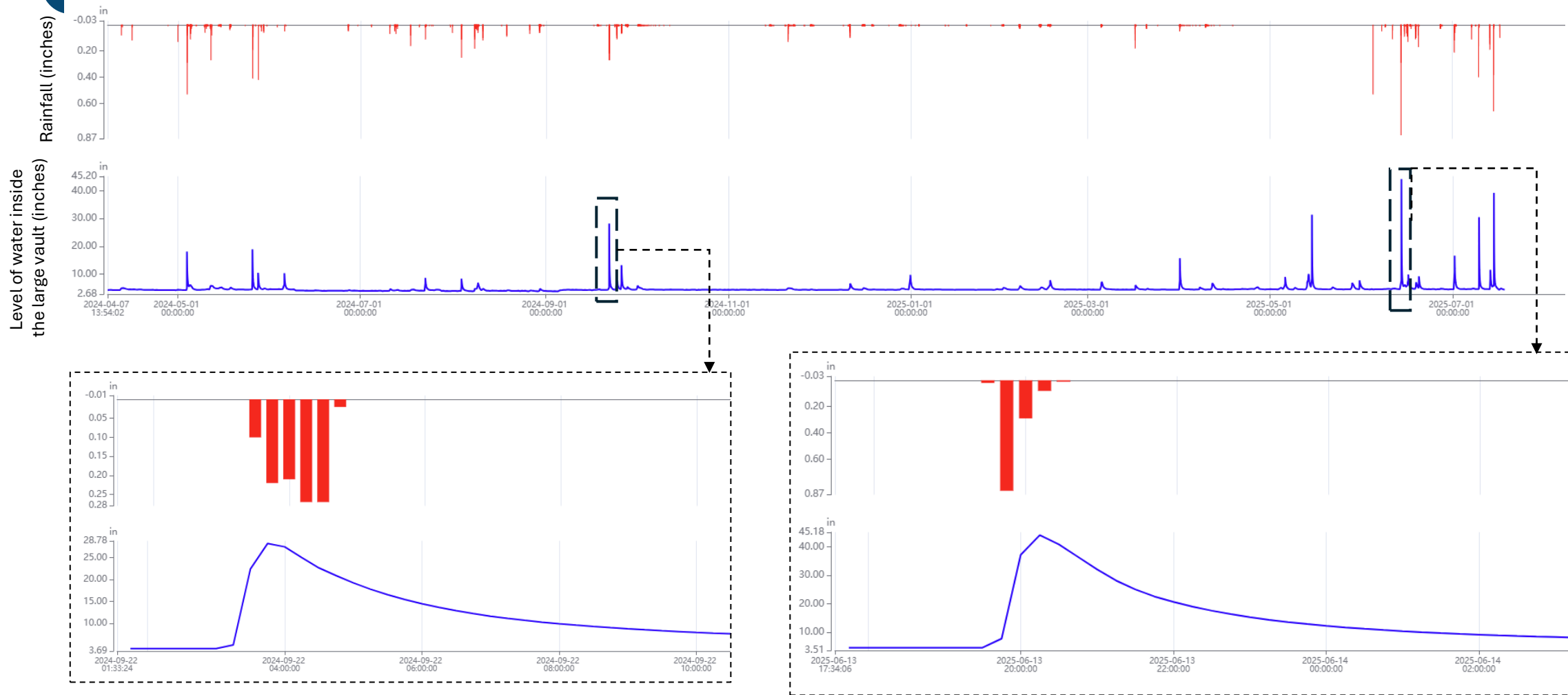
Total rain: 0.47"
Total inflow to small vault $\approx 20,000 \text{ ft}^3$
Total inflow to large vault $\approx 16,000 \text{ ft}^3$
Total outflow from large vault $\approx 28,000 \text{ ft}^3$

Start date 7/24/2023 12:58 AM		Go to Date		Scroll by Increments 1 Minute		Set Range 1 Timespan		End date 7/24/2023 7:25 AM	
Timestamp	Large Inflow - Influent Large Basin ^{ft}	Small Inflow - Small Basin Influent ^{ft}	Total Flow - Signature Meter - Effluent Large Basin ^{ft}	300 Rainfall - Signature Meter - Effluent Large Basin ^{ft}					
2023-07-24 02:30:00	200.92	76.97	62.34	0.00					
2023-07-24 02:45:00	197.26	76.95	59.45	0.00					
2023-07-24 03:00:00	200.03	76.96	57.55	0.00					
2023-07-24 03:15:00	201.79	76.93	55.48	0.00					
2023-07-24 03:30:00	198.92	76.97	59.55	0.03					
2023-07-24 03:45:00	205.79	1725.47	-177.18	0.33					
2023-07-24 04:00:00	7228.15	12624.75	381.63	0.05					
2023-07-24 04:15:00	81.21	1482.04	2405.33	0.00					
2023-07-24 04:30:00	86.14	295.15	2275.74	0.00					
2023-07-24 04:45:00	85.96	86.78	2094.84	0.00					
2023-07-24 05:00:00	86.42	70.08	1926.04	0.06					
2023-07-24 05:15:00	86.32	404.51	1743.82	0.00					
2023-07-24 05:30:00	87.06	572.48	1563.12	0.00					
Total: 16008.11 ^{ft} Average: 242.56 ^{ft}		Total: 20603.35 ^{ft} Average: 312.17 ^{ft}		Total: 27851.86 ^{ft} Average: 422.00 ^{ft}		Total: 0.47 ^{ft} Average: 0.01 ^{ft}			

Activate Windows
Go to Settings to activate Windows.

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Example Results of Vault Water Depth Response to Storm Events



This is another example of results, showing **long-term monitoring** of the vault and how it responds to different storm events between April 2024 and July 2025. These data help improve understanding of the vault system's performance during storm events.

High Water Detection Webpage

Sites

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Rain gauges

 [Rain Increment](#) (0)

 [Columbia Pike](#) (13001)

 [Rain Increment](#) (0)

 [George Mason Dr](#) (13014)

 [Rain Increment](#) (0)

 [Lancaster St](#) (13013)

 [Rain Increment](#) (0)

 [N. Kirkwood](#) (13007)

 [Rain Increment](#) (0)

 [Wilson Blvd at Four Mile Run](#) (13004)

Sites

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Water Level Sensor

 [Stage](#) (7)

 [Columbia Pike](#) (13001)

 [Stage](#) (7)

 [George Mason Dr](#) (13014)

 [Stage](#) (7)

[Stage SDI-12](#)

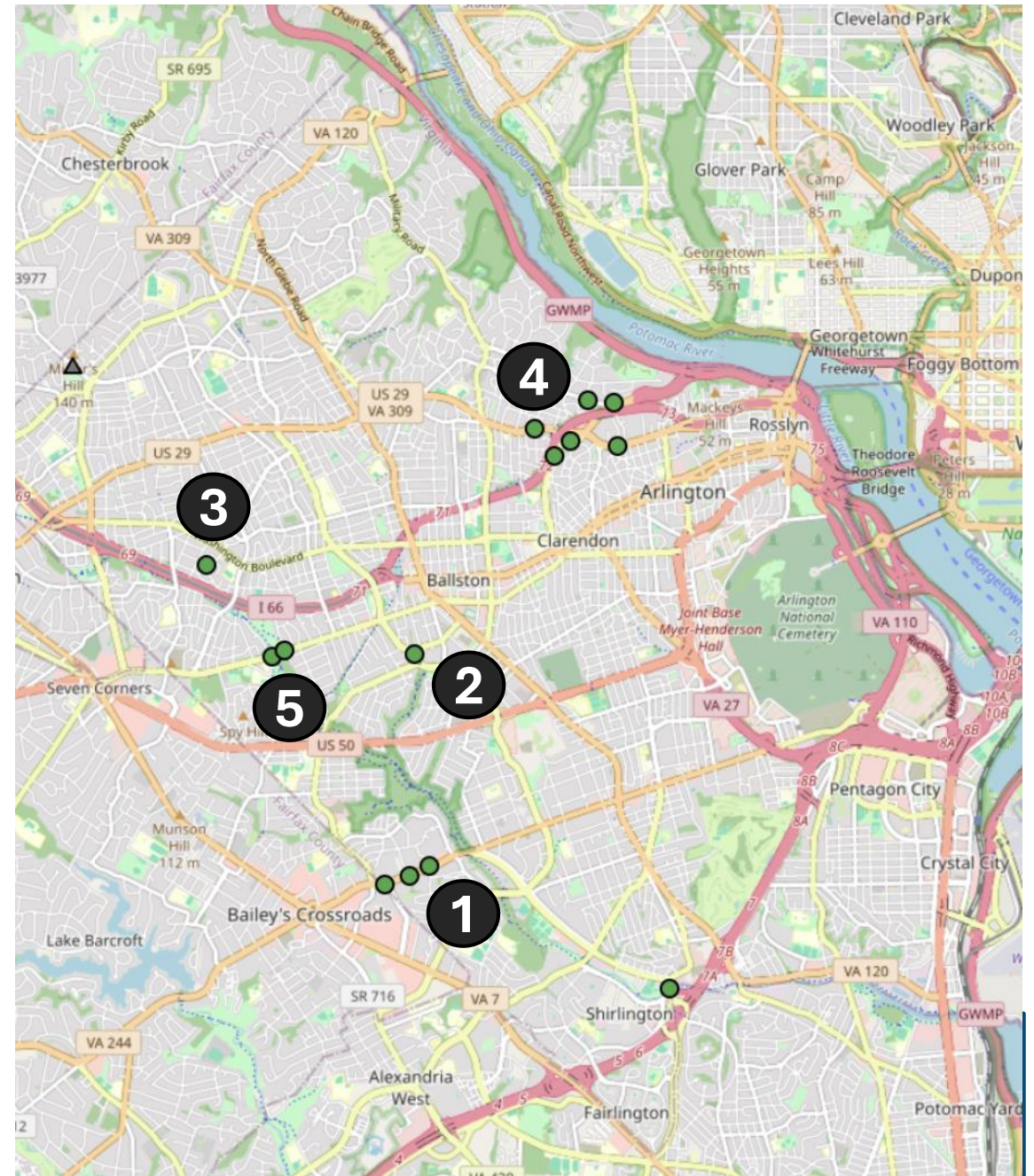
 [Lancaster St](#) (13013)

 [Stage](#) (7)

 [N. Kirkwood](#) (13007)

 [Stage](#) (7)

 [Wilson Blvd at Four Mile Run](#) (13004)

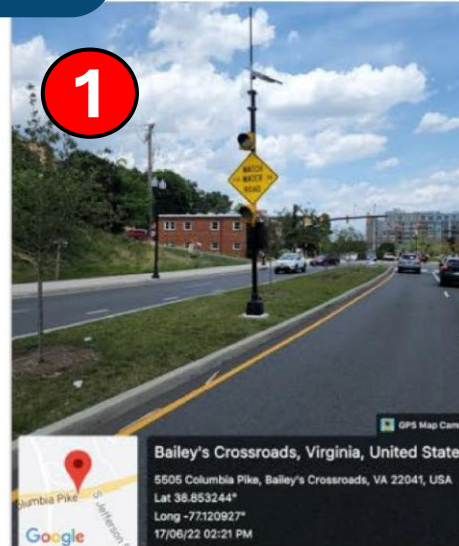


Site Photos: Sensors and Flashing Alarms

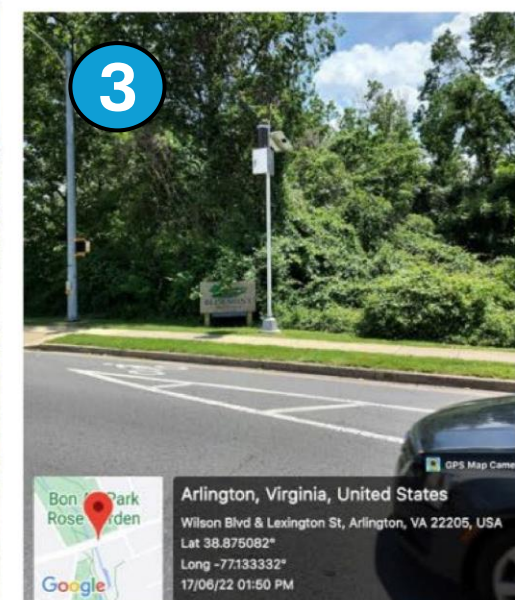
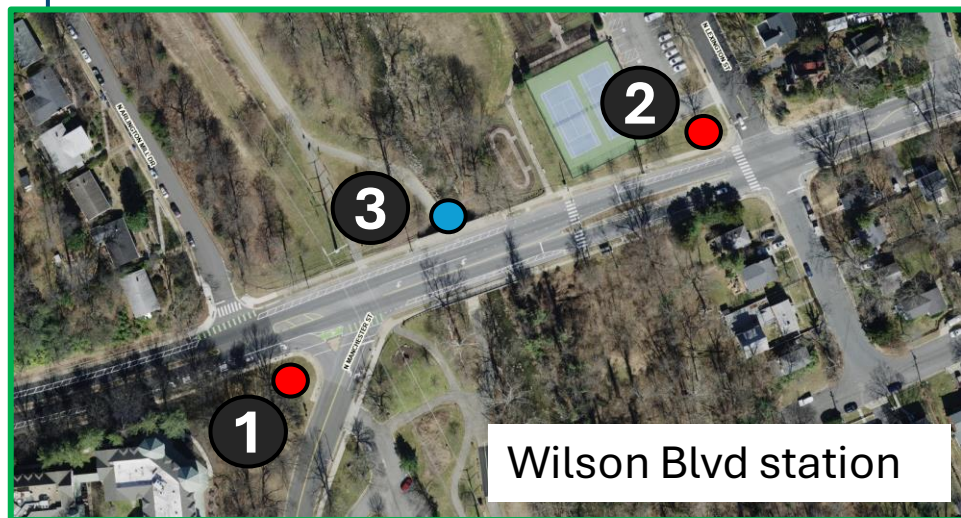
Columbia Pike station



Location #1: Columbia Pike near S Greenbrier St.

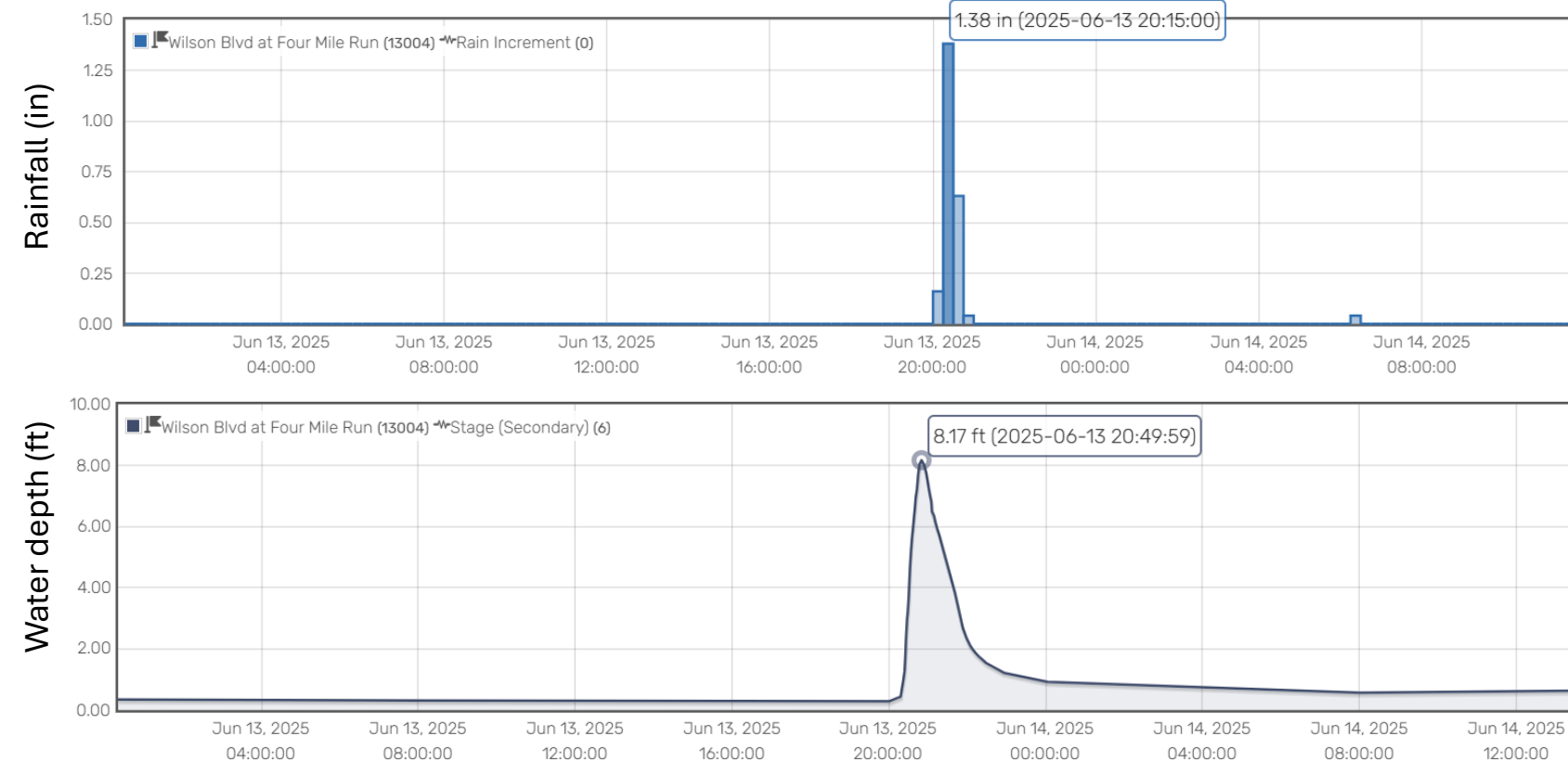


Wilson Blvd station



Location #2 Wilson Blvd. near N Lexington St. and N Manchester St.

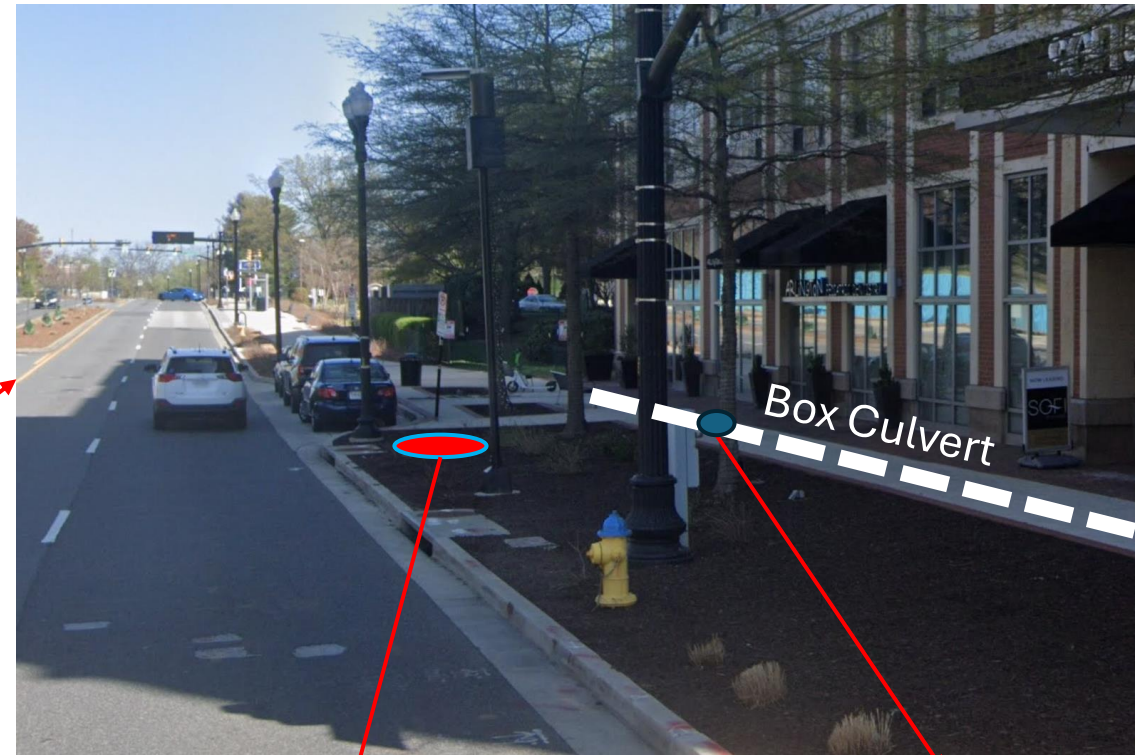
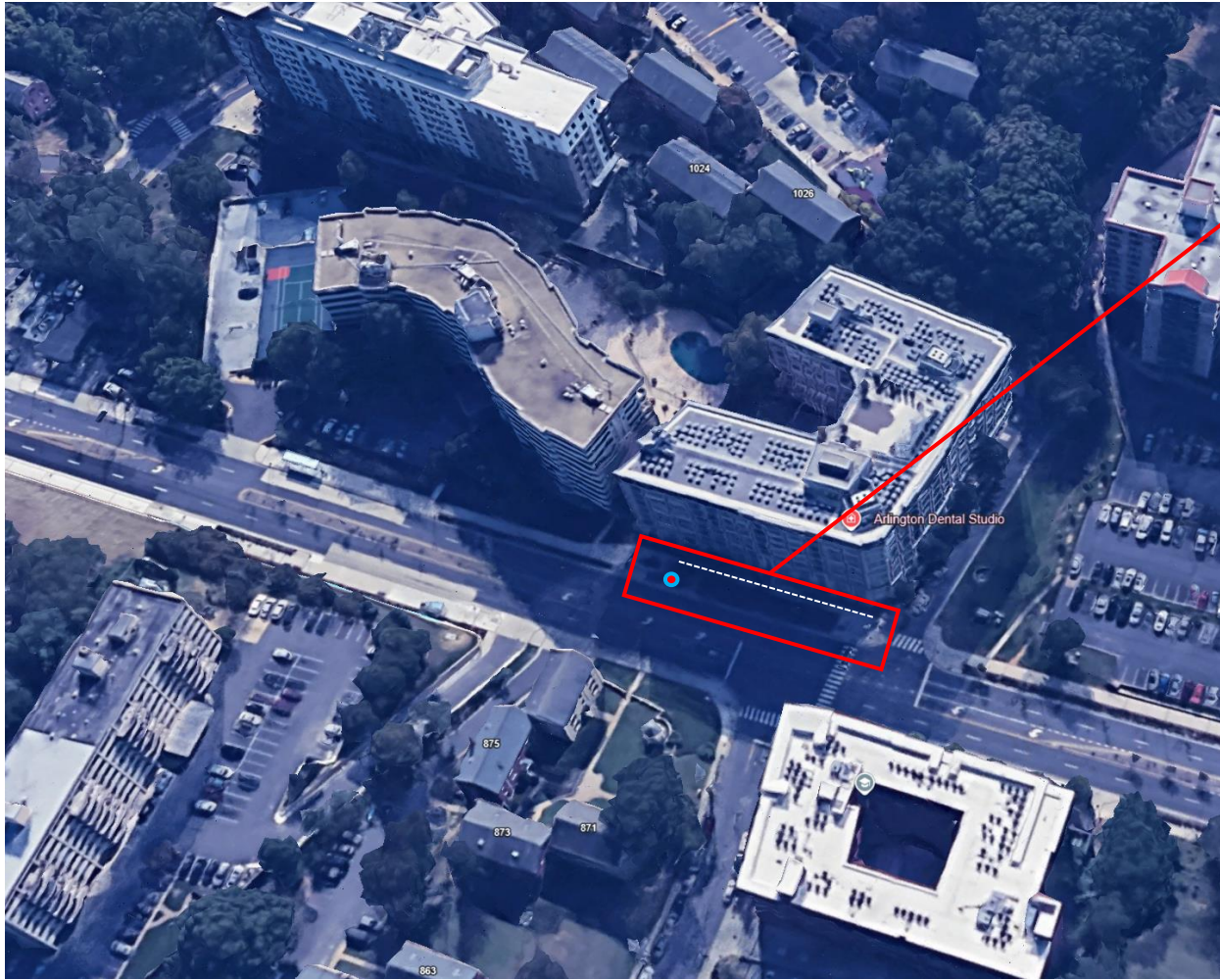
Example Results: Wilson Blvd station



At this station, a radar sensor was installed on the bridge to measure water levels in Fourmile Run. This example shows how the monitoring network can capture both rainfall and channel water levels, and how these data can be used to assess flooding conditions.



Columbia Pike Station



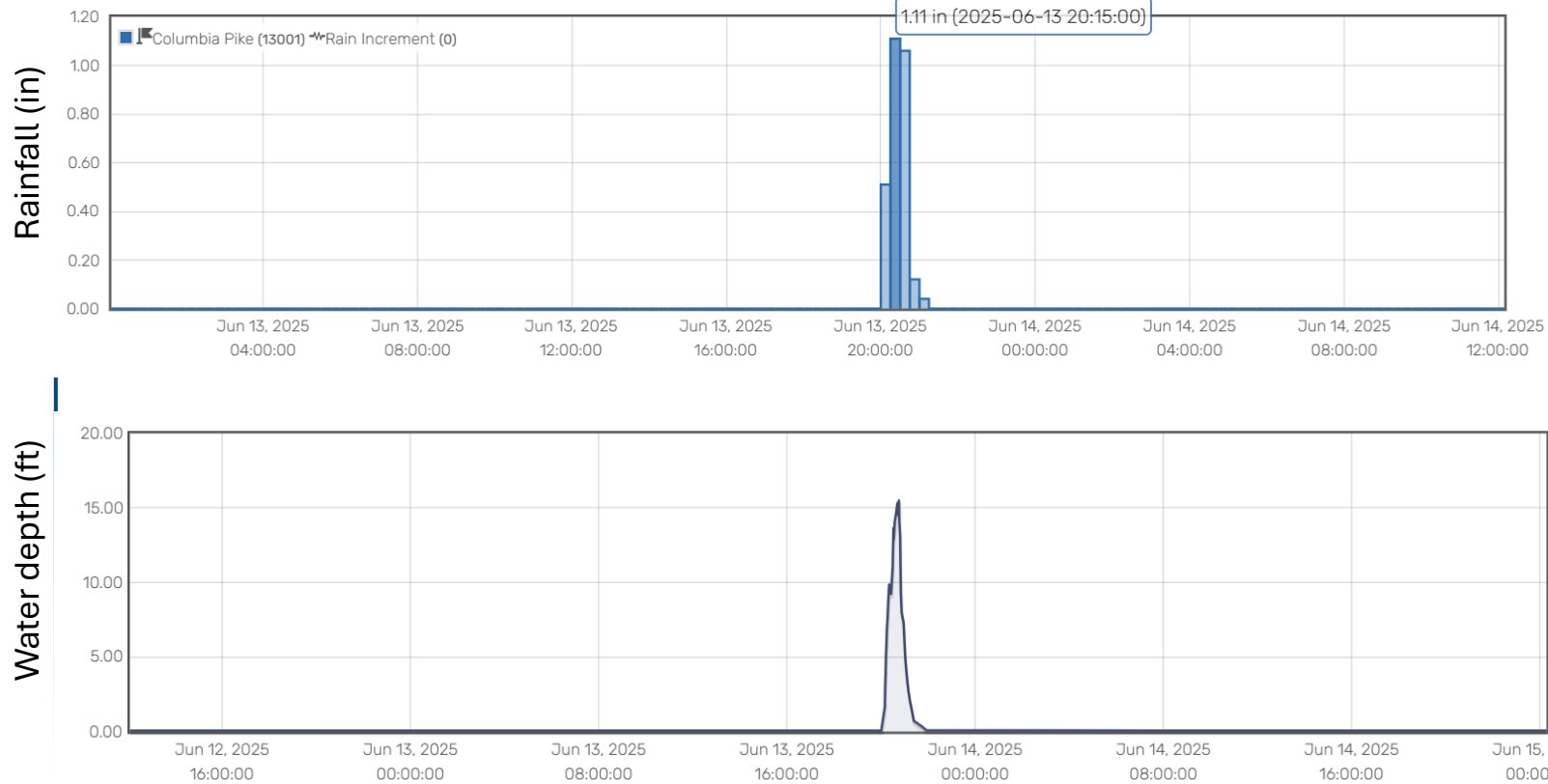
A pressure transducer was installed inside the manhole to monitor street water level. When the water level exceeds 6 inches (the height of the curb), it triggers the flashers.

A pressure transducer was installed inside the culvert to measure water level.



Pressure transducer

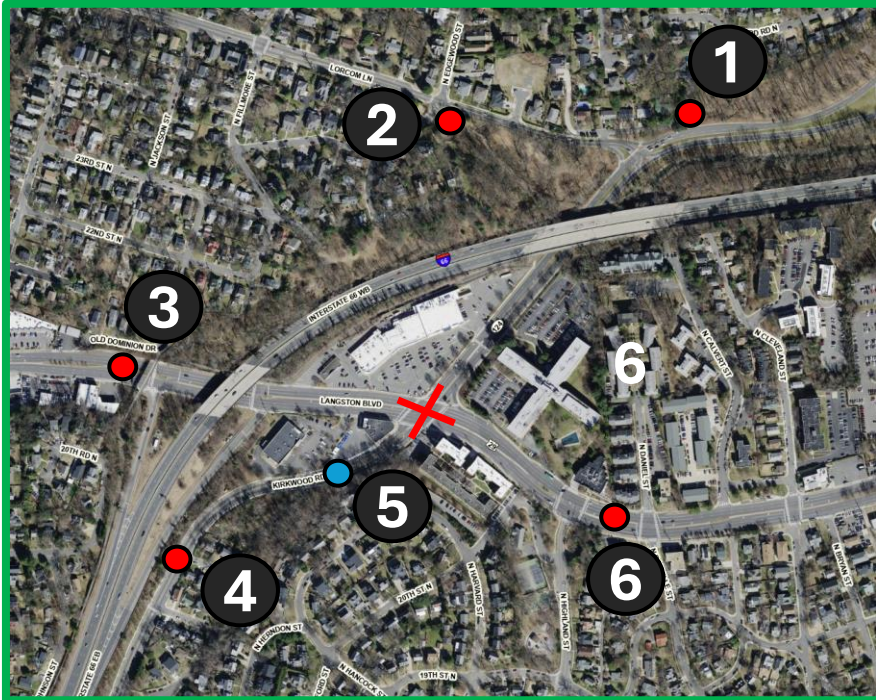
Example Results: Columbia Pike station



At this station, a pressure transducer was installed inside the box culvert to measure water levels. This example shows how the monitoring network can capture both rainfall and culvert water levels, and how these data can be used to assess flooding conditions along Columbia Pike area.



Kirkwood Station



At this station, a pressure transducer was installed inside the manhole to monitor street water levels. When the street water level exceeds 6 inches (the approximate curb height), it triggers the flashers. Five flashers have been installed around the intersection, which has experienced several flooding events in recent years.



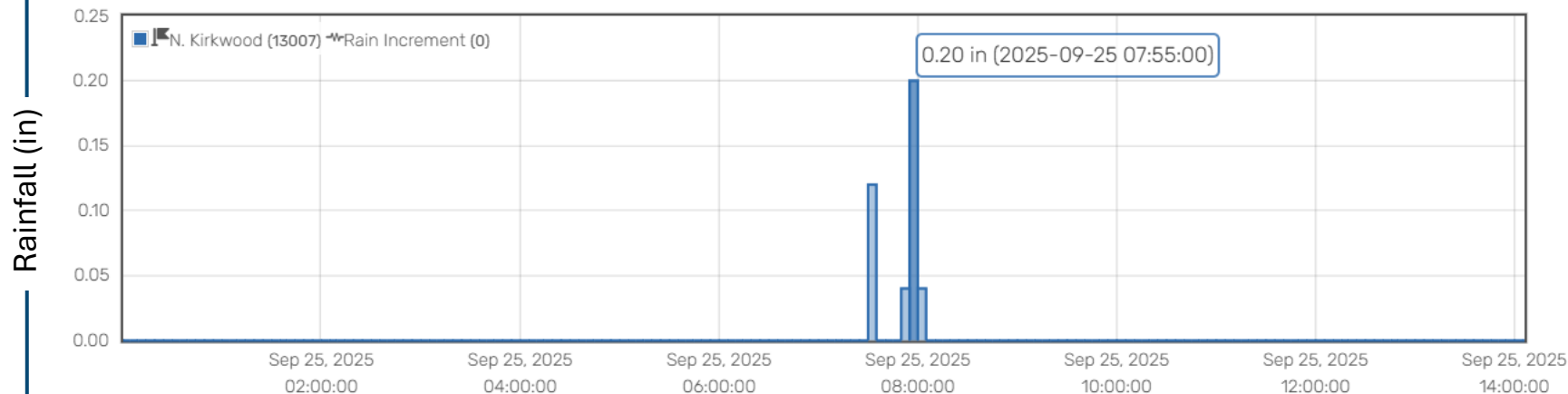
Kirkwood Station



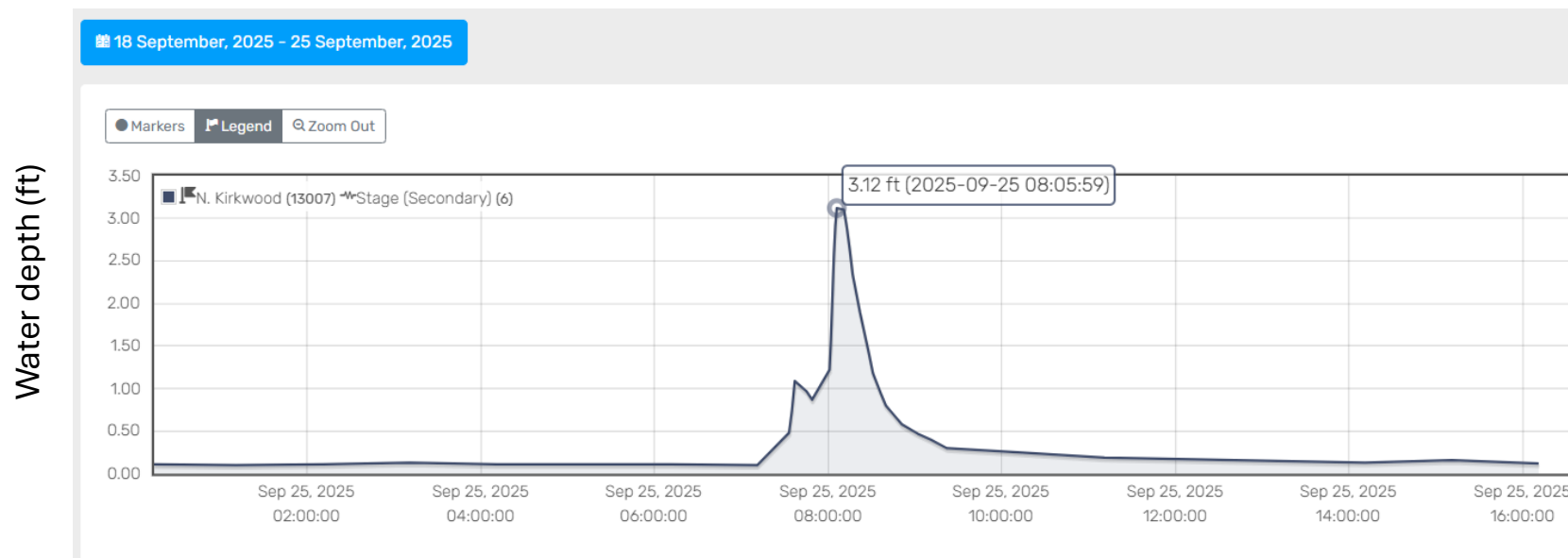
In addition, a radar sensor was installed to measure culvert water level at this station.



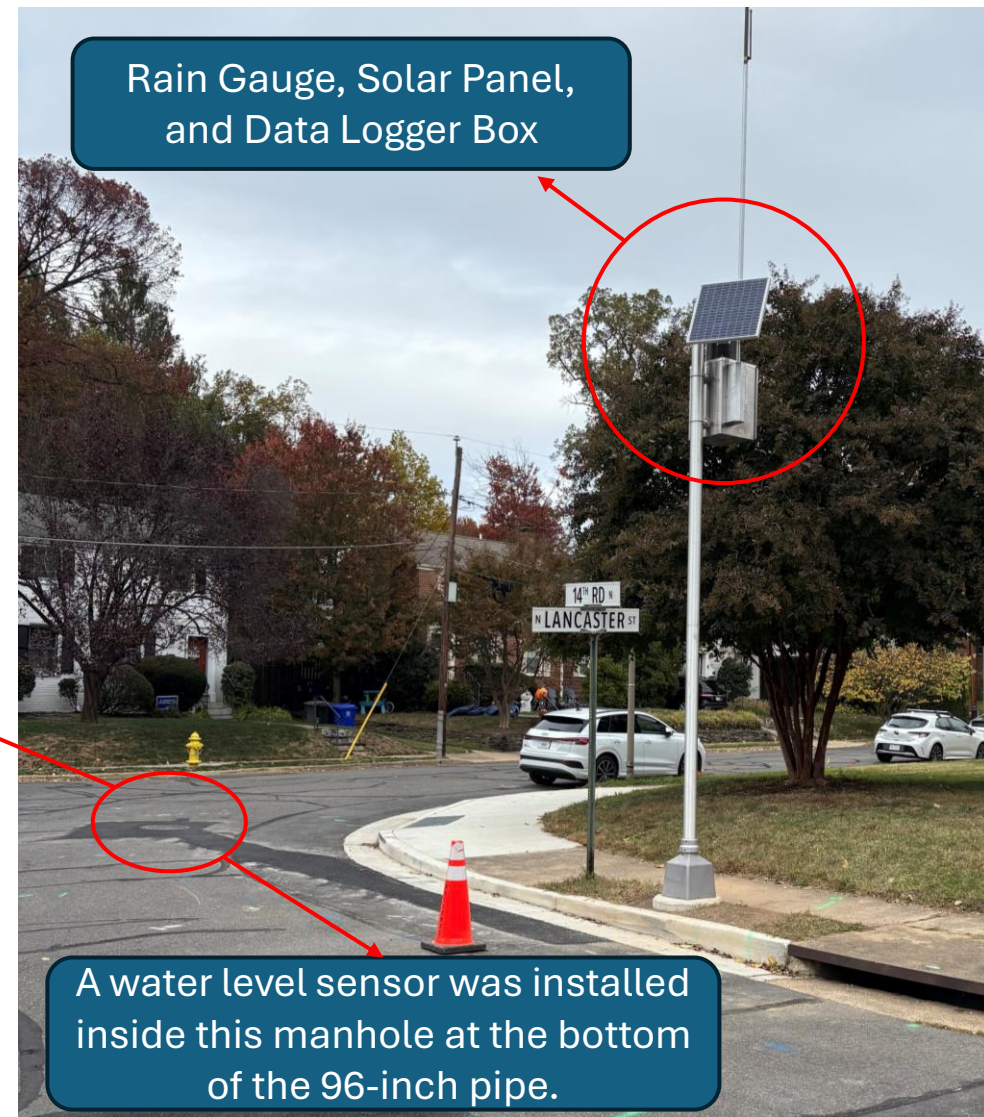
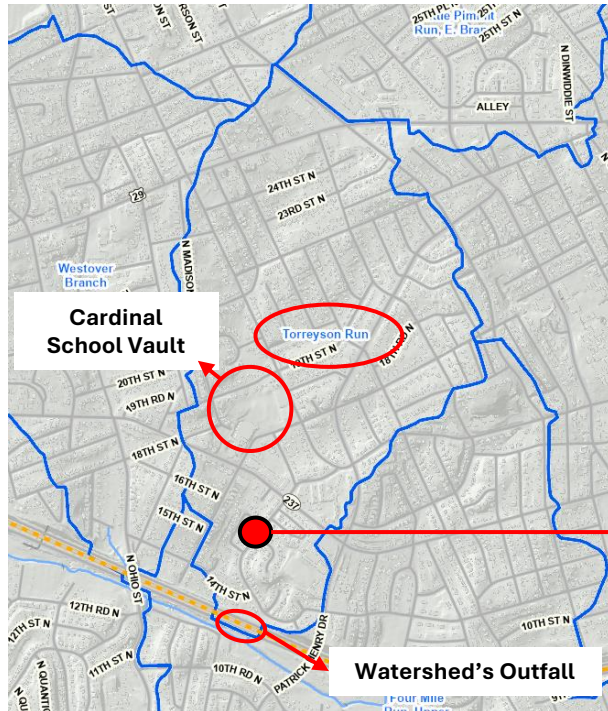
Example Results: Kirkwood station



As with other stations, this example shows how the monitoring network can capture both rainfall and channel water levels, and how these data can be used to assess flooding conditions along key roadways.



Lancaster St Station

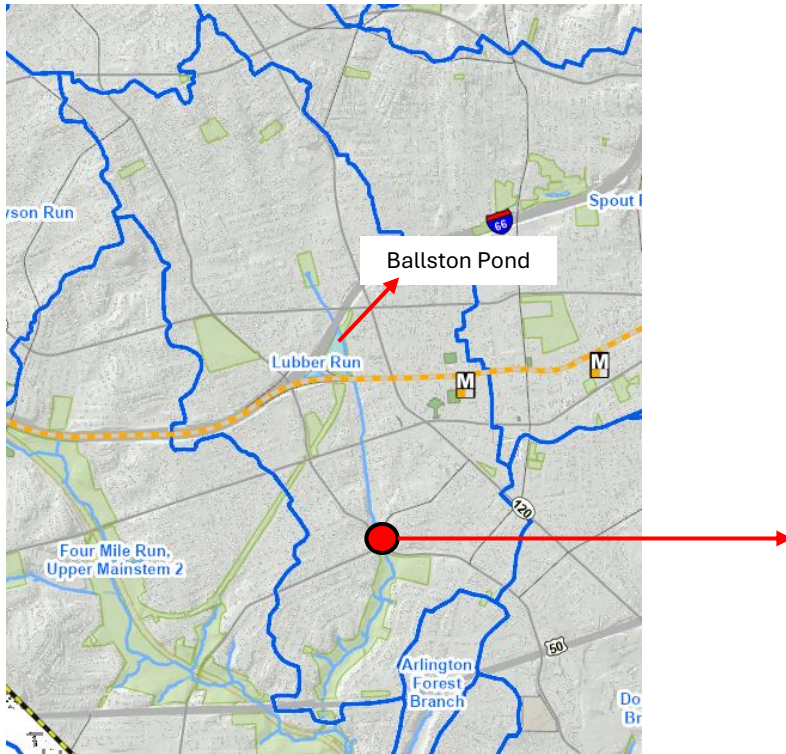


This station is located near the outfall of the Torreyson Run watershed and downstream of the Cardinal School vault. Using its data, the County will:

- Observe the impact of the Cardinal School vault on flooding during heavy storm events.
- Calibrate the hydrologic and hydraulic (H/H) model for this watershed.

This sensor was installed in mid-October 2025. No significant rain events have occurred since installation, so example data are not yet available.

George Mason Dr Station



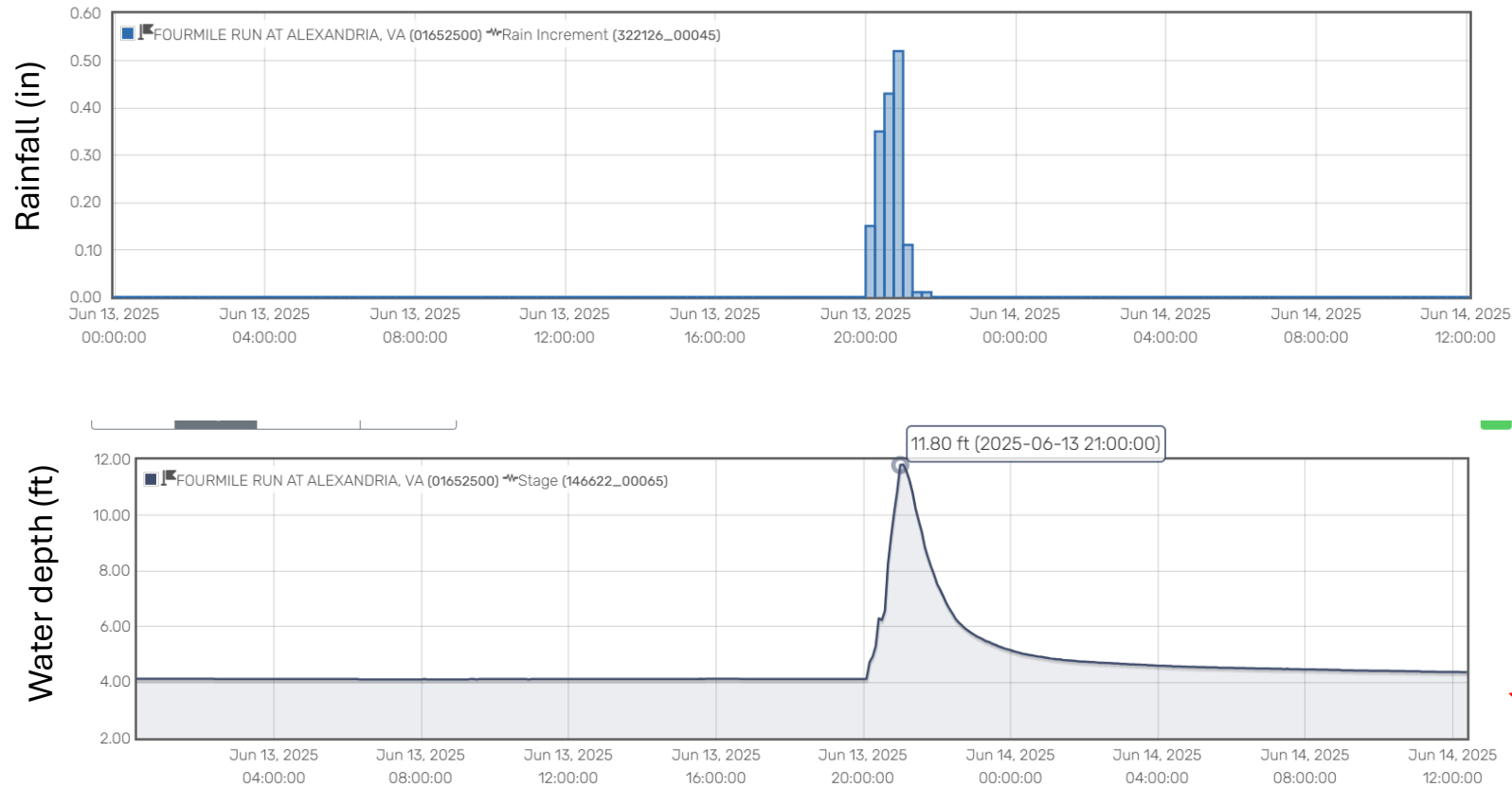
This station is located near the outfall of the Lubber Run watershed and downstream of Ballston Pond. Using its data, the County will:

- Observe the impact of Ballston Pond in reducing flooding during heavy storm events
- Calibrate and validate the hydrologic/hydraulic (H/H) model for the Lubber Run watershed

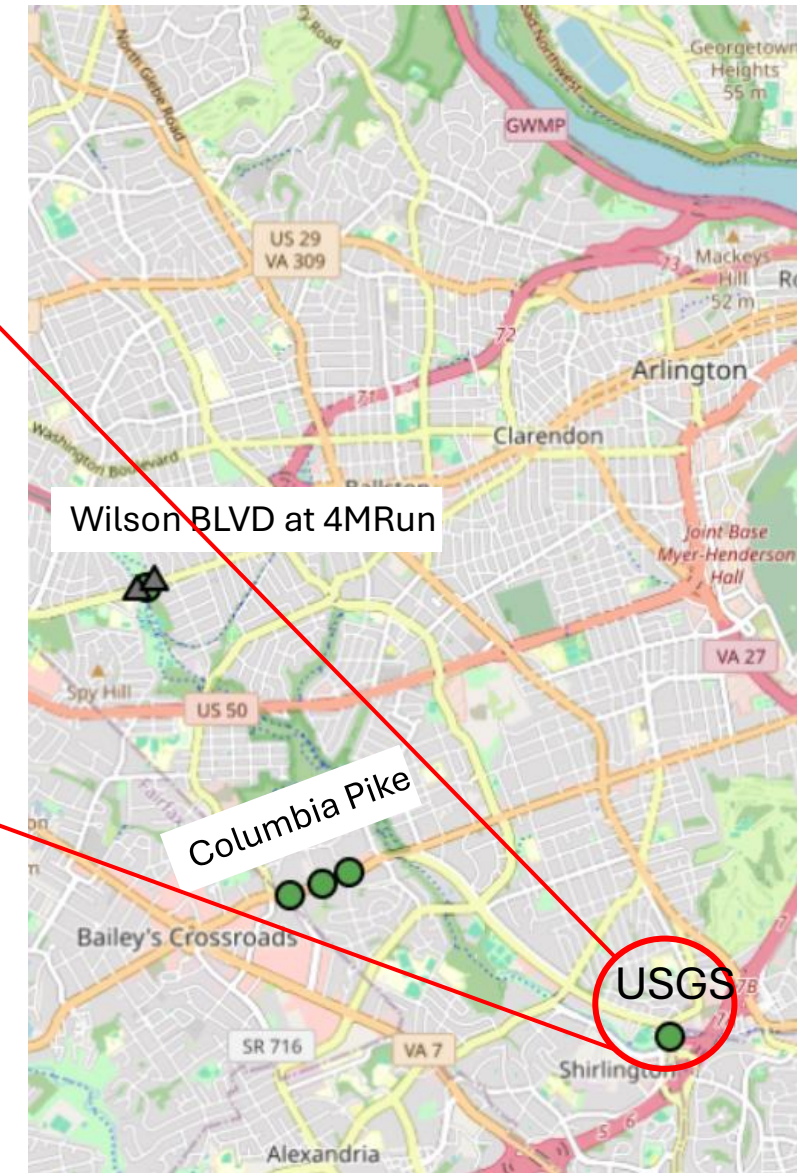


This sensor was installed in mid-October 2025. No significant rain events have occurred since installation, so example data are not yet available.

Example Results: USGS



This is an example of results from a USGS station located in southern Arlington. The County uses its data for analysis and for verifying monitoring results from upstream stations. This station measures flow and water levels but does not monitor water quality.



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