Department of
Environment &
Conservation

AAPCA Best Practice: TN's Remote Monitoring of Ambient AQ Data During COVID-19

R-Shiny Web Dashboards

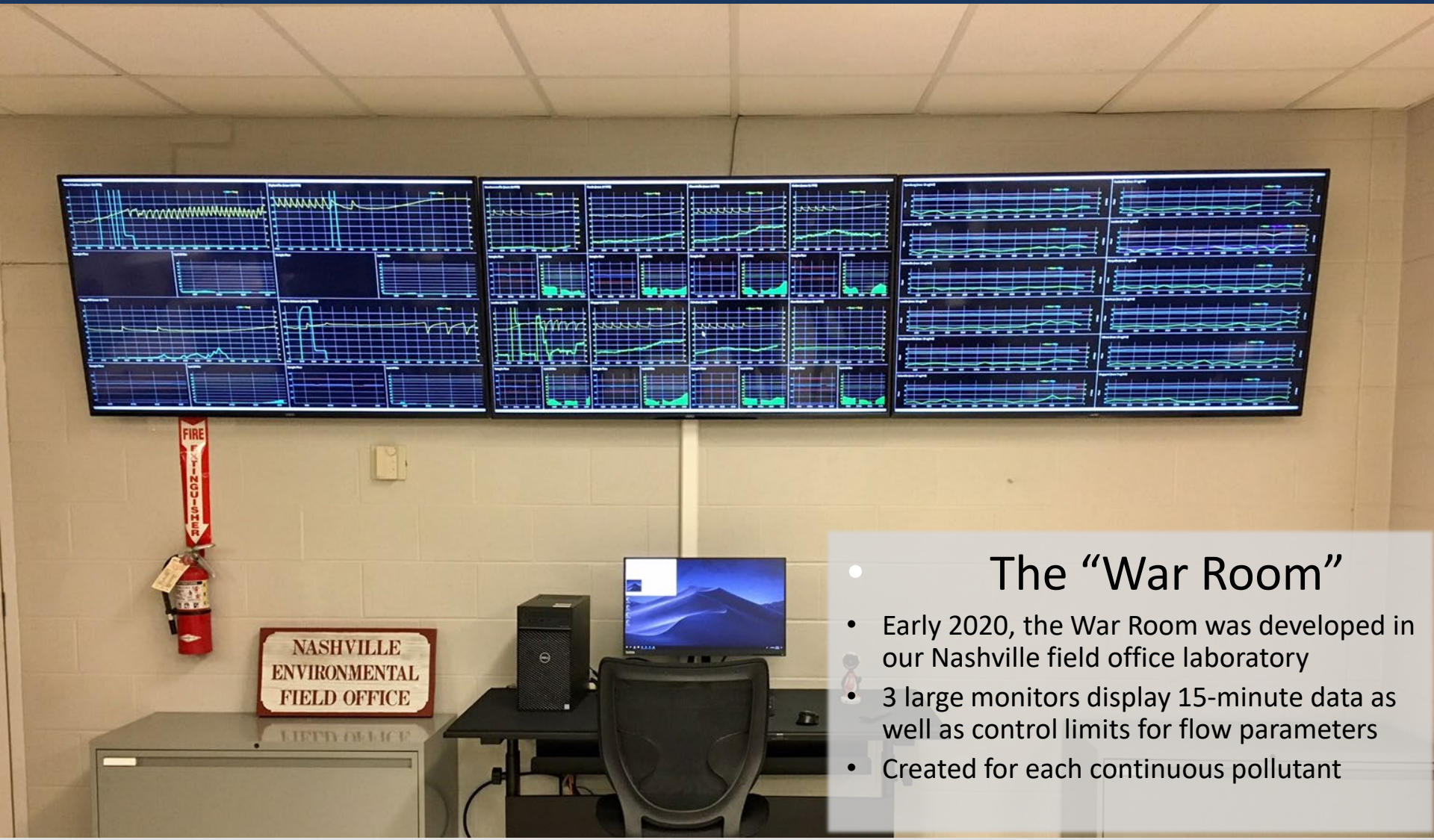
Kyle Spangle, Technical Lead, Air Monitoring Program, TDEC – Air Pollution Control

9/23/2021

Background

- 2019 TSA identified the need for better minute data review practices.
- Previously, our monitoring personnel reviewed minute data as needed during data verification and validation.
- This was accomplished by manually contacting sites or viewing data of interest long after the data was collected.
- While still beneficial, this resulted in a narrow view of network performance.
- The idea for a War Room, where staff could easily, and at-a-glance, visualize the ambient monitoring network from a central location was one solution to this problem.

War Room

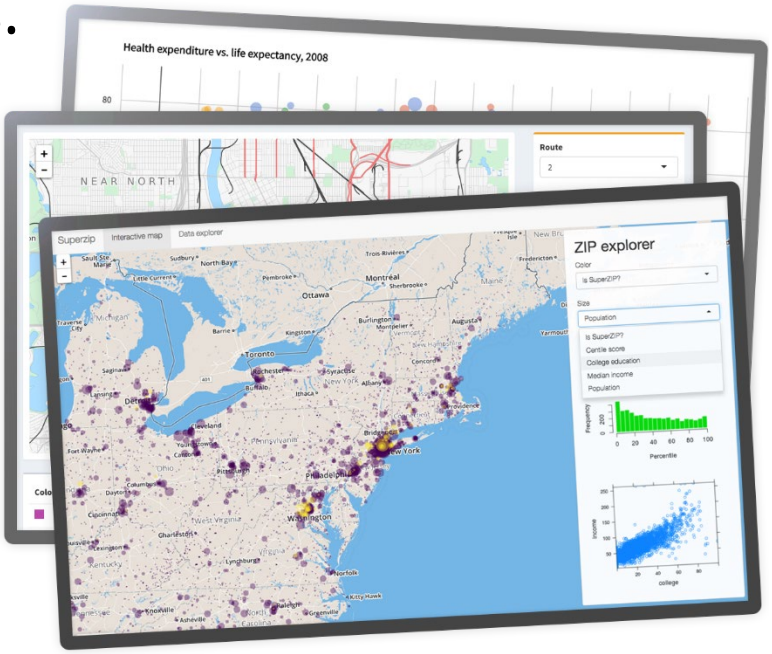


The "War Room"

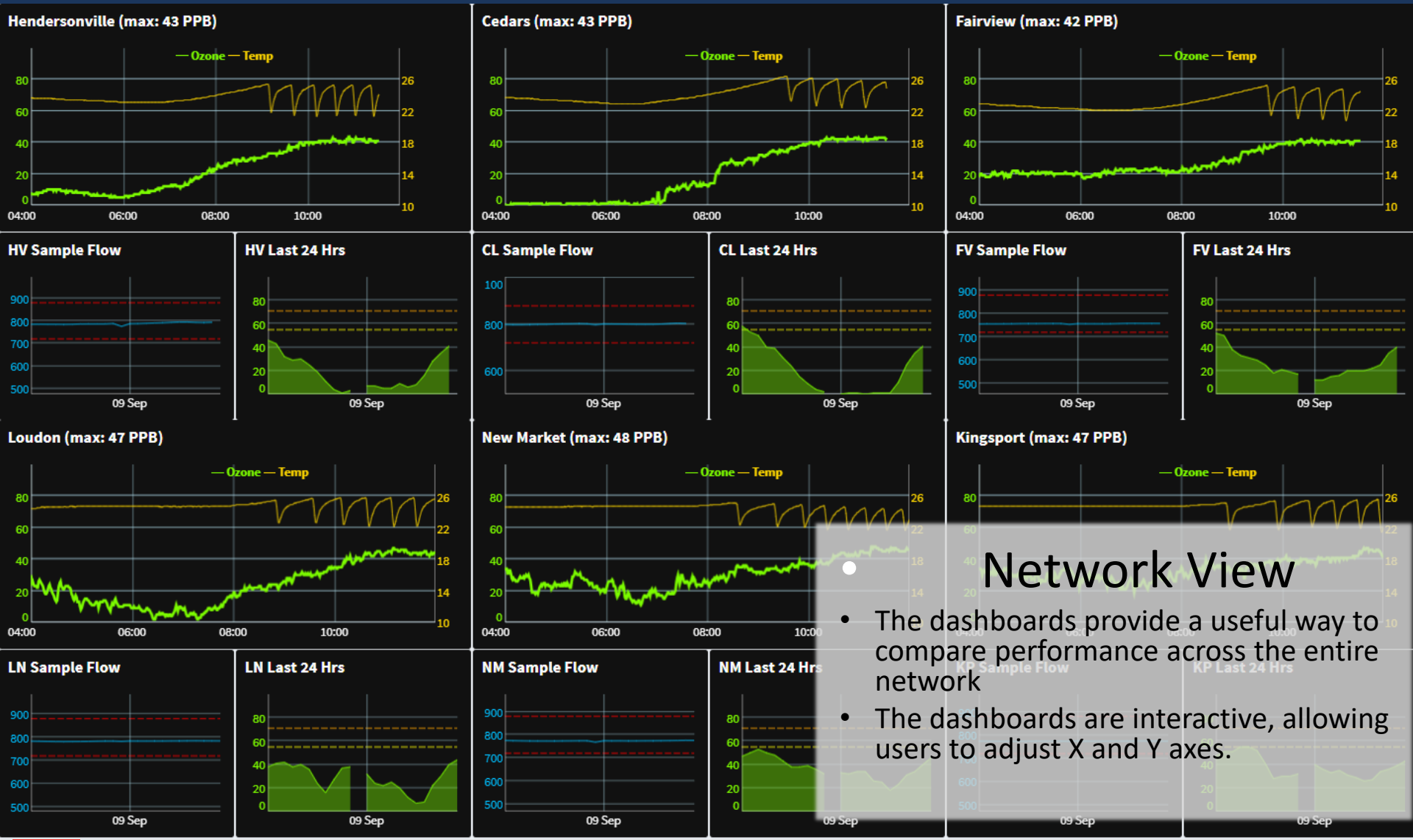
- Early 2020, the War Room was developed in our Nashville field office laboratory
- 3 large monitors display 15-minute data as well as control limits for flow parameters
- Created for each continuous pollutant

Dashboards (R Shiny)

- Dashboards were created using the Shiny package for R.
- The Shiny package allows users to make interactive web apps, or stand-alone dashboards.
- R is relatively easy to use to visualize air monitoring data.
- Building an application that continuously updates with new data is more challenging.
- Microsoft's Power BI is another popular dashboard option.



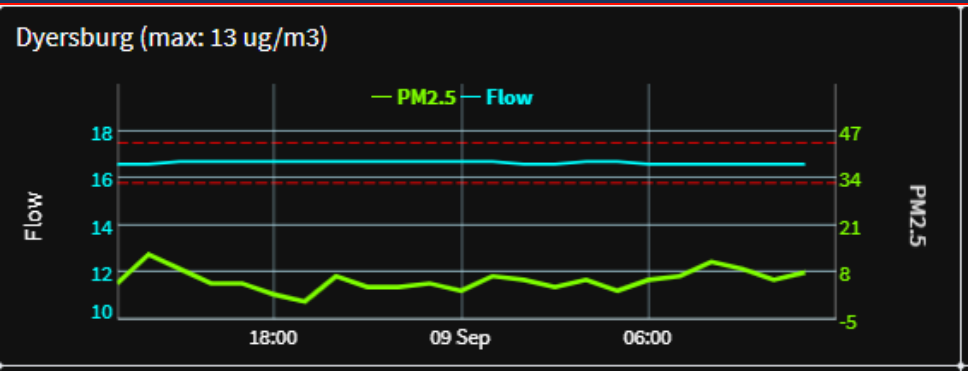
Dashboards (R Shiny)

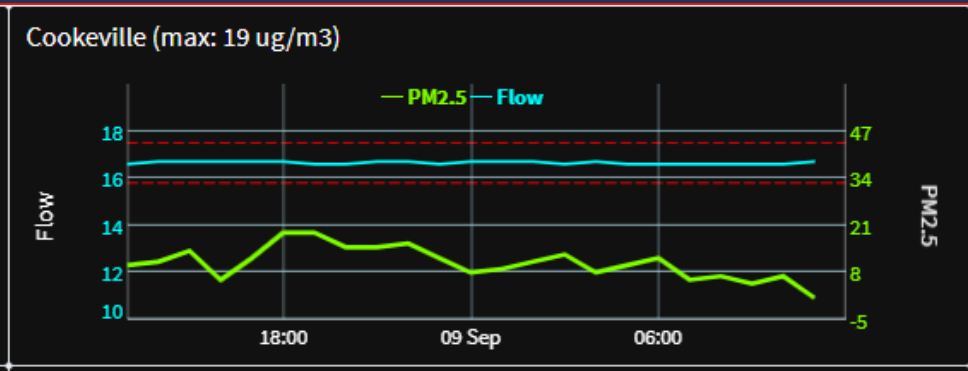


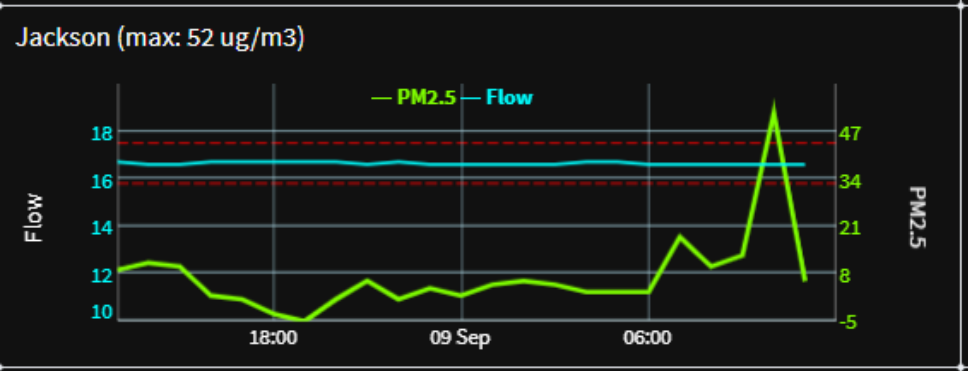
Network View

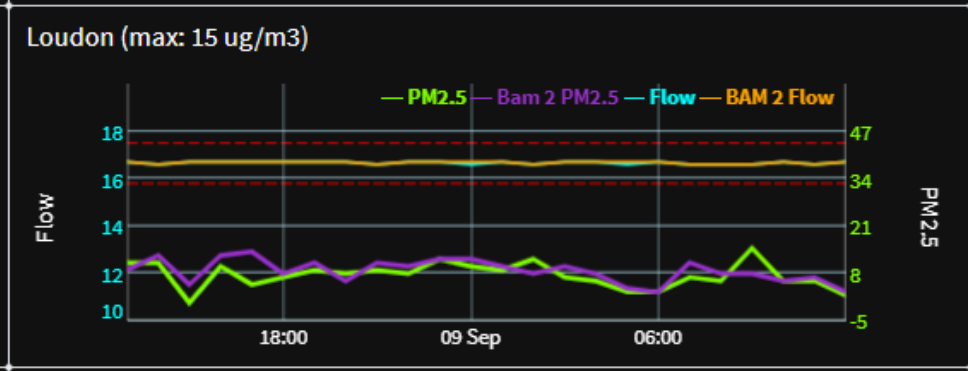
- The dashboards provide a useful way to compare performance across the entire network
- The dashboards are interactive, allowing users to adjust X and Y axes.

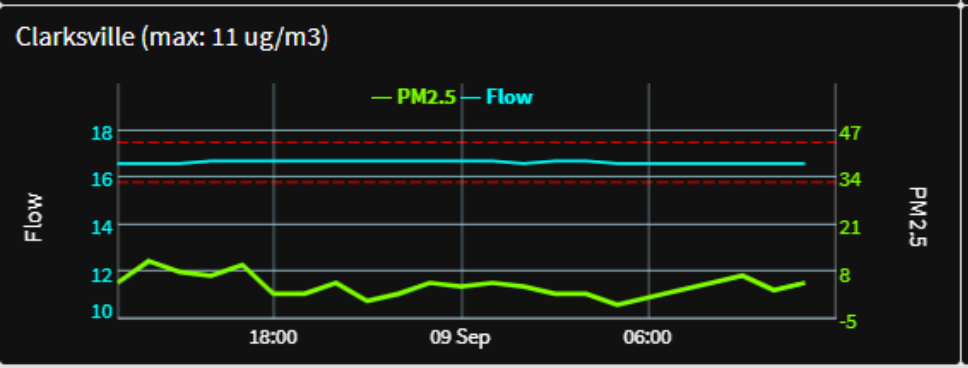
Dashboards (R Shiny)

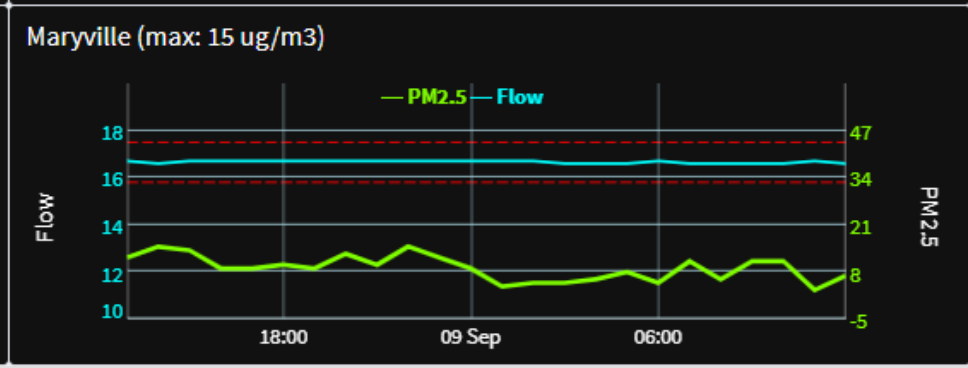






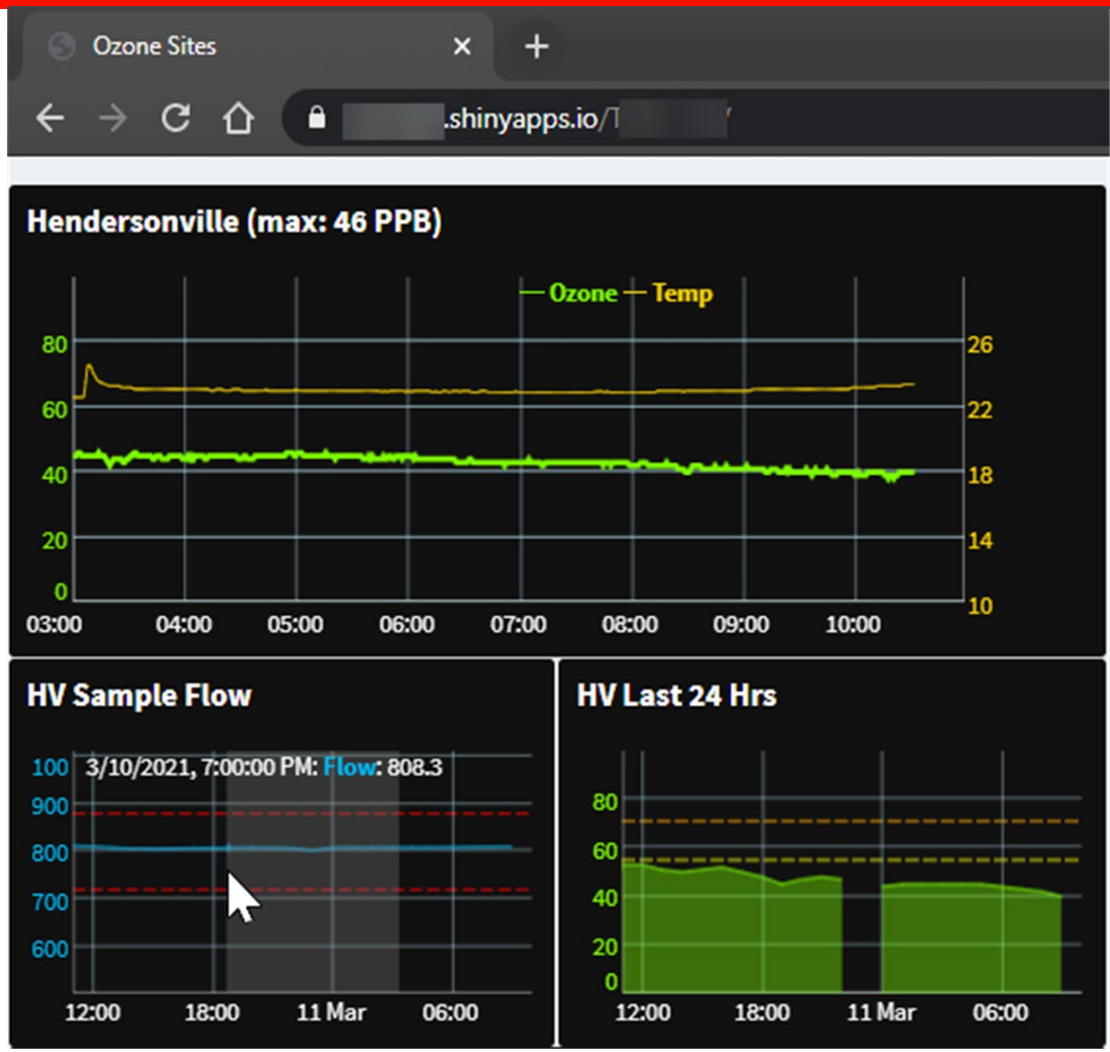






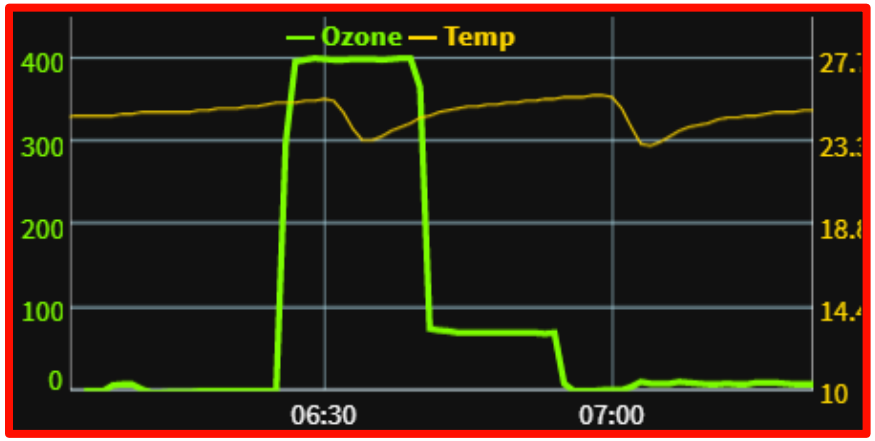
COVID-19 Impacts

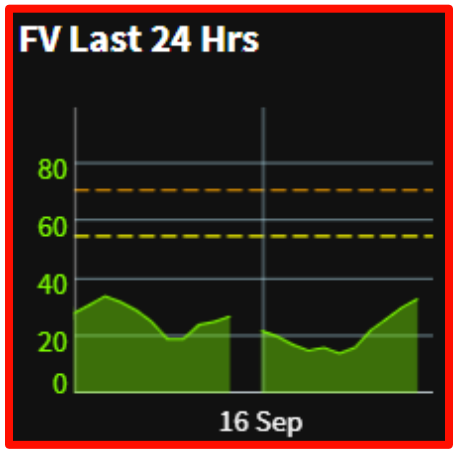
- March of 2020, staff were ordered to work from home due to the COVID-19 pandemic.
- The dashboards were published to the web, creating a virtual ‘War Room’ that could be viewed from a web browser at home.
- Since Shiny apps are a web-based technology, publishing them to the web was simple.



Benefits

- The virtual dashboards have benefited TN's monitoring program in several ways:
  - Better overall situational awareness
  - Equipment downtime reduced from days to hours
  - Trend/anomaly identification
  - Useful tool for Air Quality Forecasters





Cost

- Funding for the project came from a special TN State grant for ambient network modernization.
  - The War Room's material costs were $5,300.
  - To maintain the websites, we pay $9 per month.
- The War Room was designed and setup by 4-5 staff members and took around 4 months to complete.
- Due to the low cost and low maintenance required, TDEC plans to continue publishing the dashboards as long as possible.

Transferability

- A basic requirement for this type of project is having a streamlined data acquisition system.
- Online tutorials, training, and access to a large community of R Shiny users is freely available.
- The web application code can be transferred from TN to other agencies, with minimal changes depending on similarities in the data acquisition software used.

Kyle Spangle
TN Dept. of Environment & Conservation
Division of Air Pollution Control

Kyle.Spangle@tn.gov
615-532-0602

Contact Information