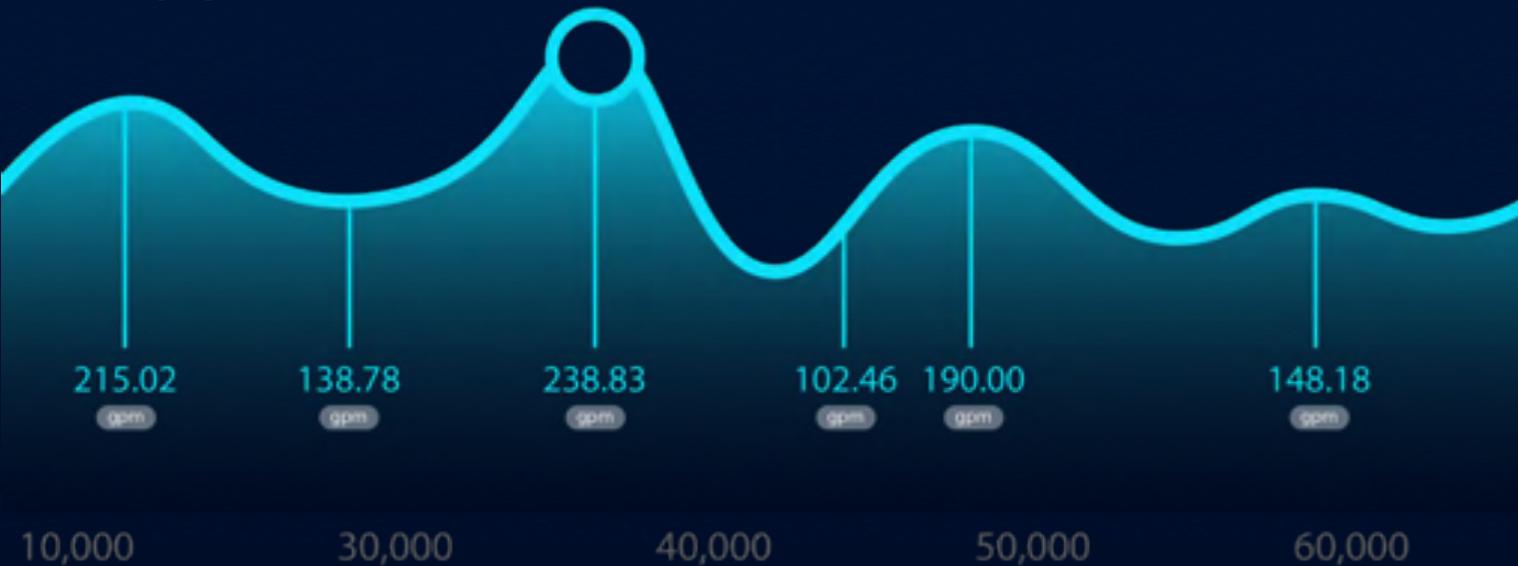


Real-time Software for Distribution System Operations

An Operator-Focused Design Approach



Introduction

MARCELO CUSACOVICH

Product Manager

Xylem's Decision Intelligence Solutions

Water Network Optimization platform



Credits and Utility Overview

Nashville MWS:

- Justin Bowling, P.E.
- Samantha White

Xylem:

- Jim Uber, Ph.D.
- Sam Hatchett
- Srini Kulkarni

Agenda

1. Nashville Metro Water Services
2. Managing a Complex Distribution System
3. Let's check it out!
4. Real Life Example: Granny White Tyne Valley – WM Breaks
5. Map Features
6. Water Age & Plant Source

01

Nashville Metro Water Services



Metro Water Services (MWS)

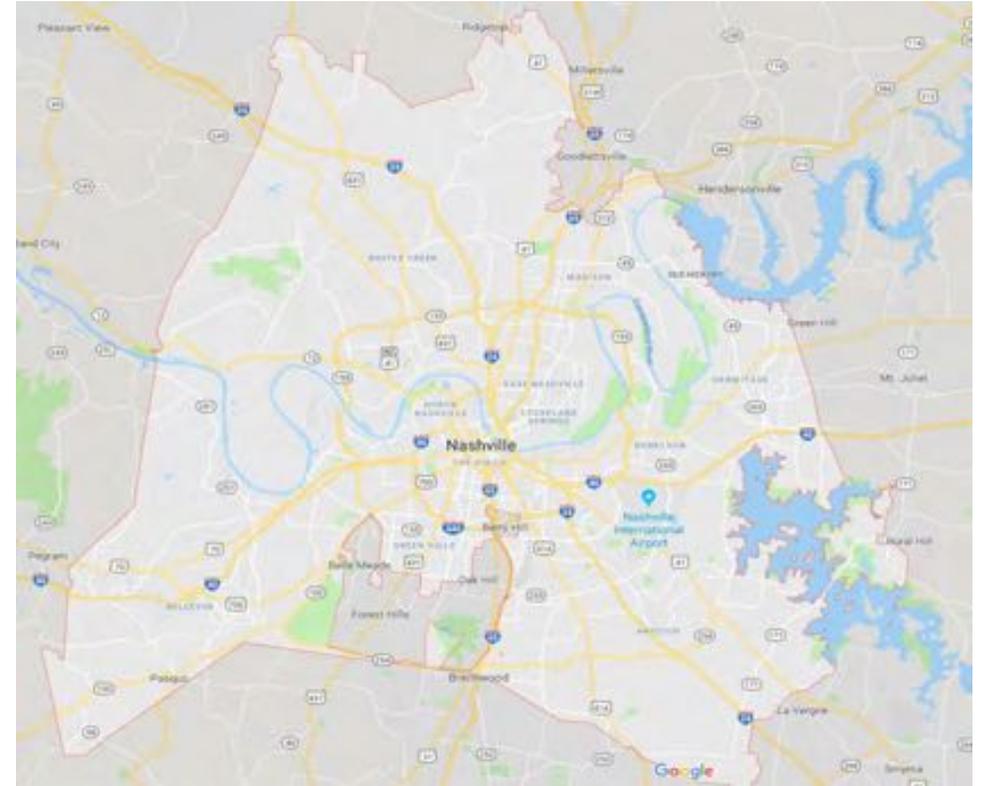
Metropolitan Government of Nashville & Davidson County

MWS

- Water
- Wastewater
- Stormwater
- Waste Services
- District Energy System (Contract Management)

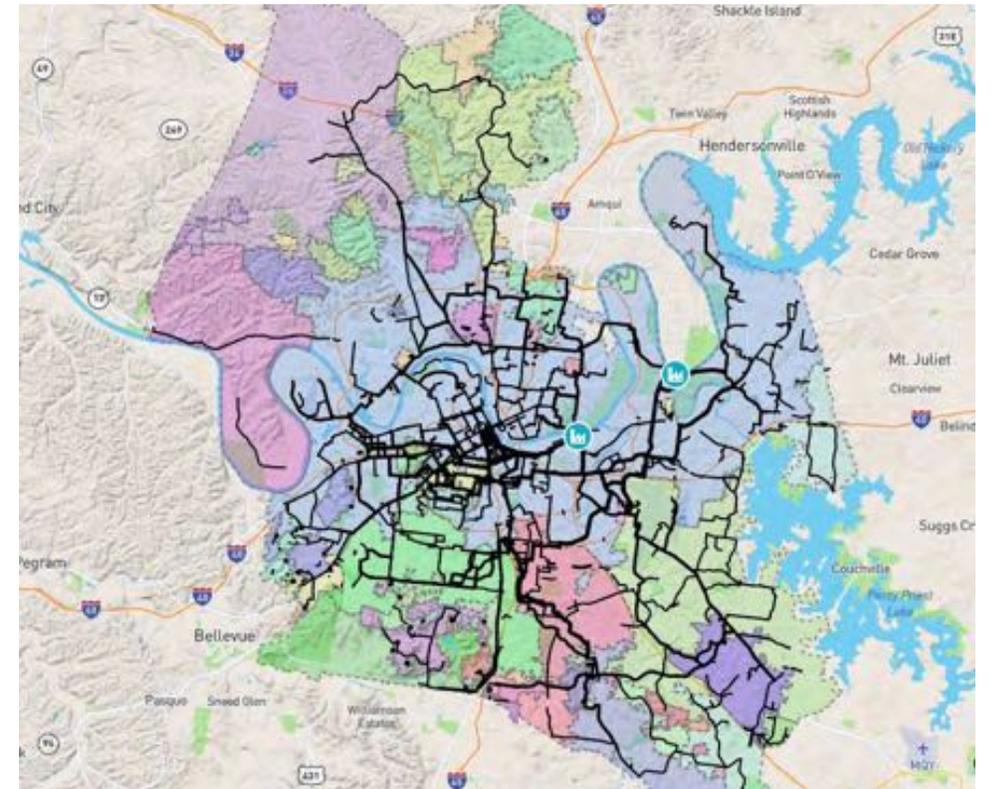
Estimated Population of over 700,000

Serve an area of over 402 square miles



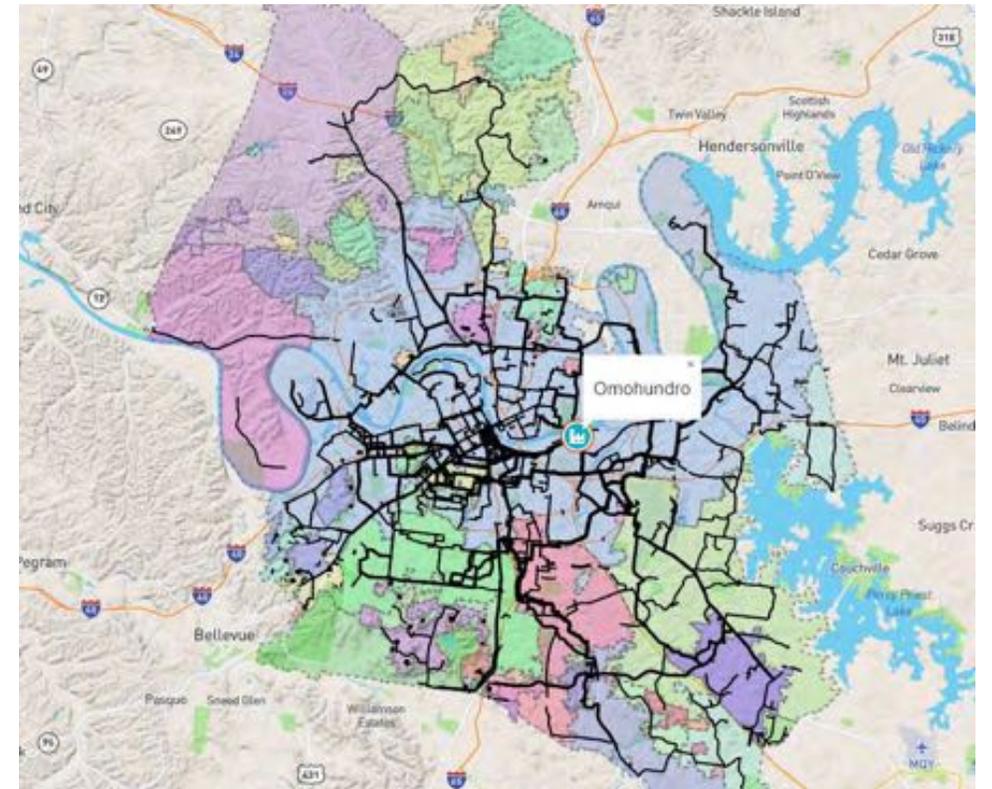
MWS Water Distribution System

Complex Water Distribution System
Over 3,000 miles of water mains



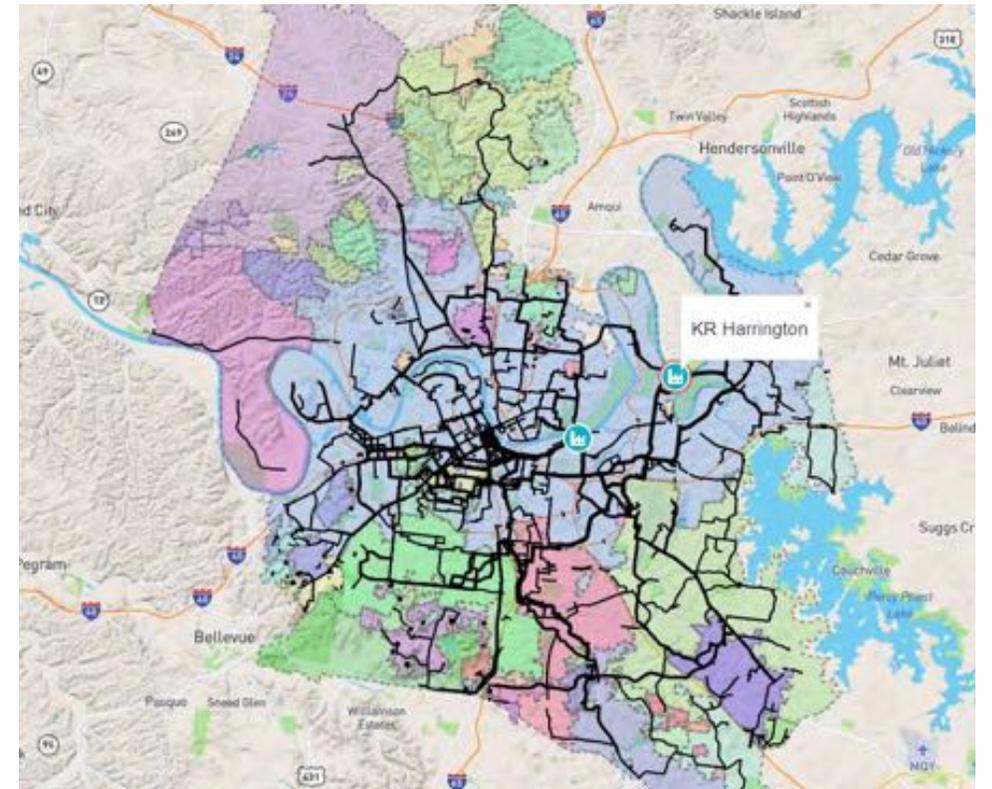
MWS Water Distribution System

2 – 90 MGD Water Treatment Plants



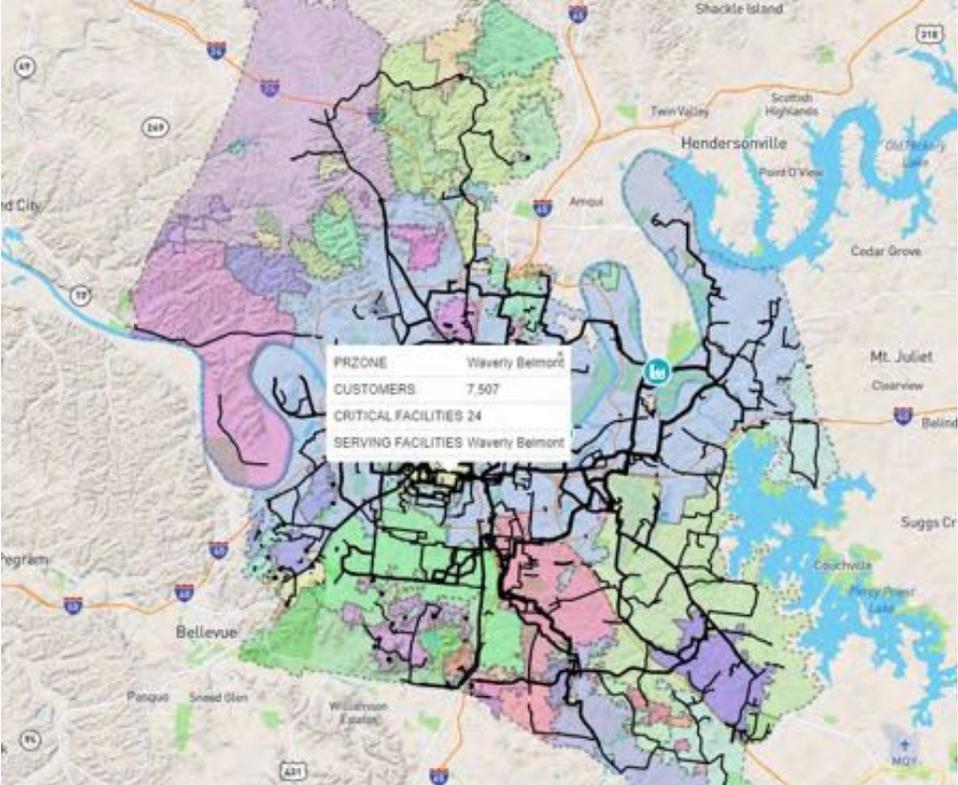
MWS Water Distribution System

2 – 90 MGD Water Treatment Plants



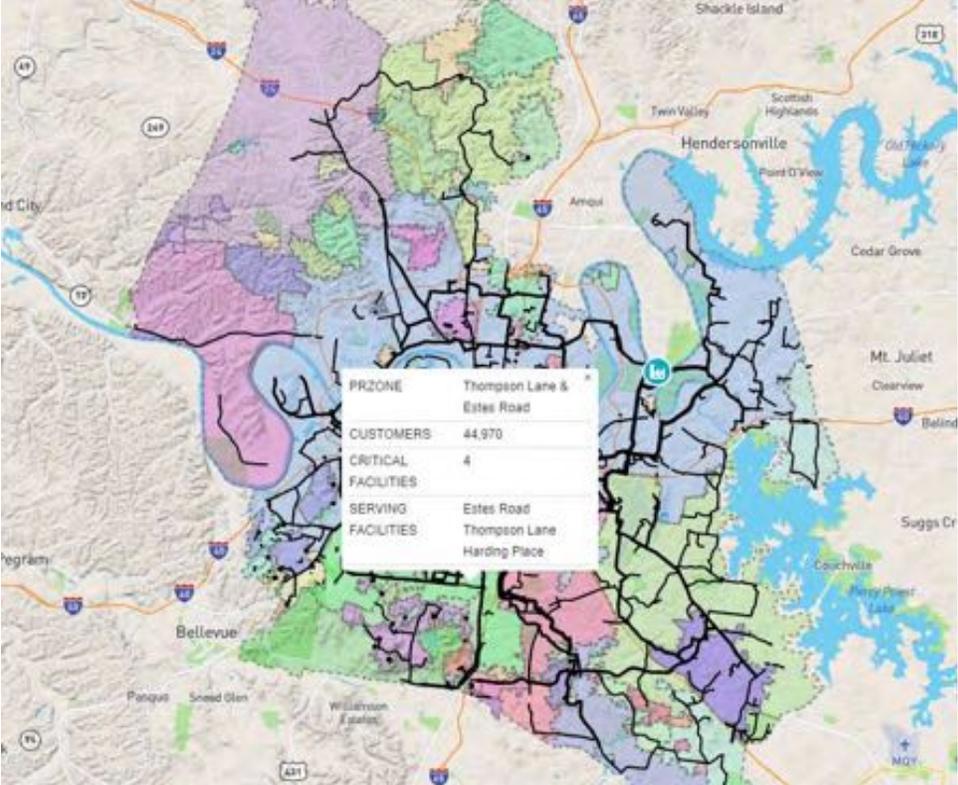
MWS Water Distribution System

90 Water Pressure Zones



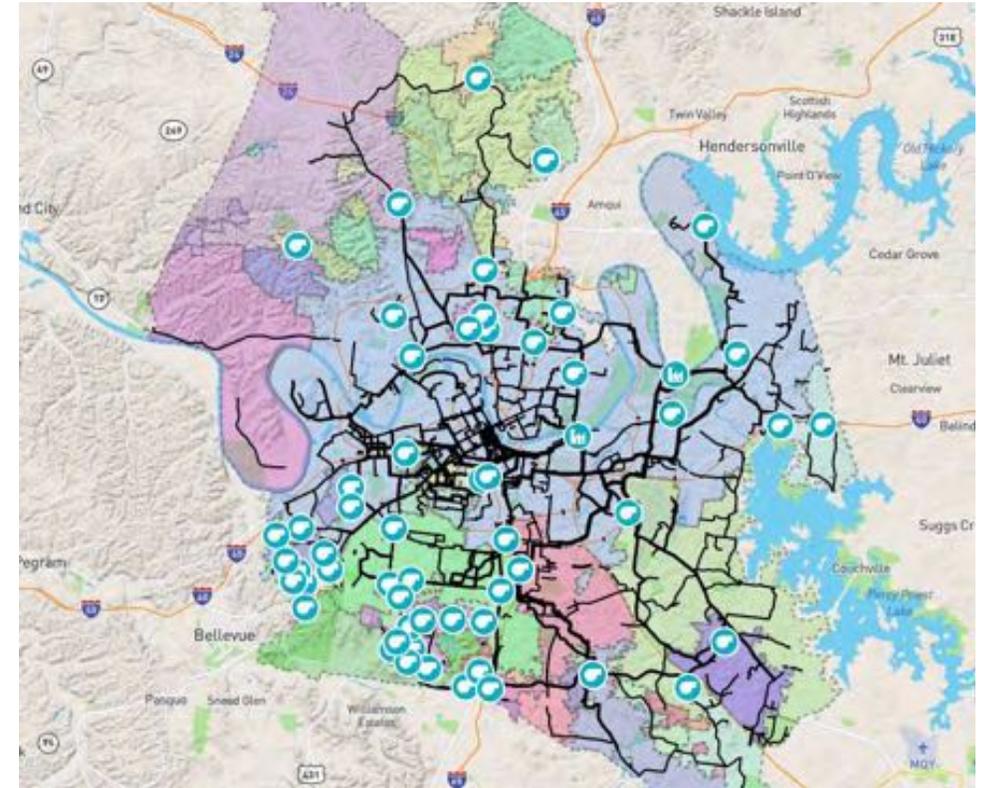
MWS Water Distribution System

90 Water Pressure Zones



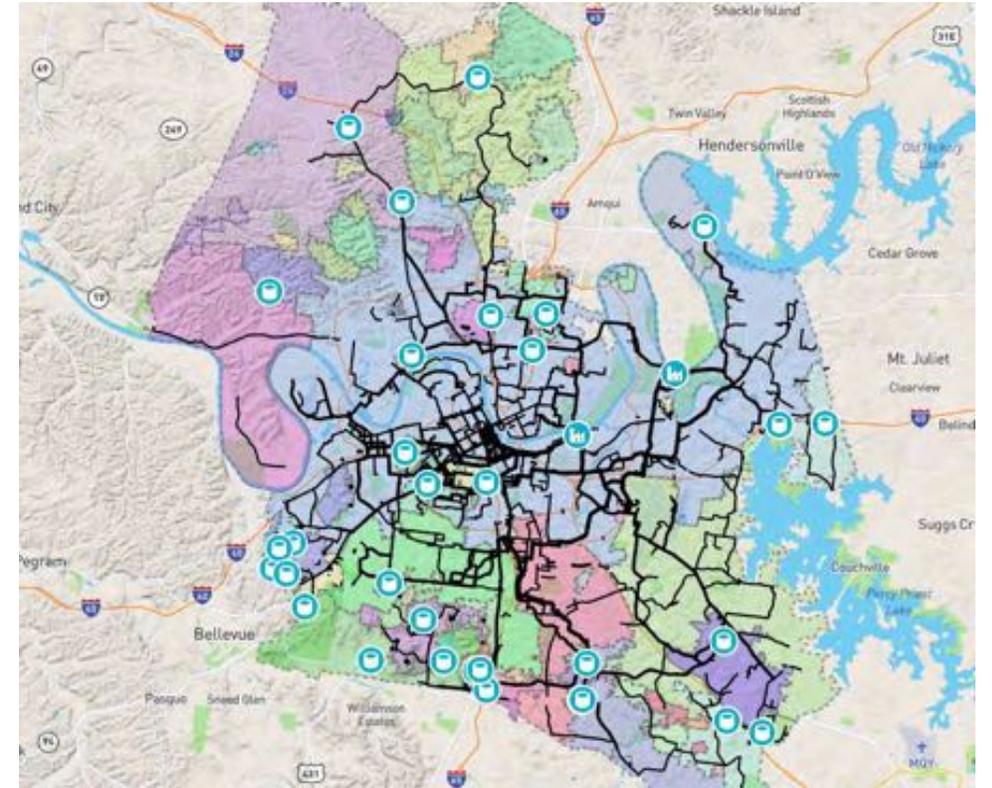
MWS Water Distribution System

56 Water Pumping Stations



MWS Water Distribution System

37 Reservoirs



02

Managing a Complex Distribution System

"We used to be throwing darts to try and solve a problem. Now we can utilize resources and implement plans with confidence, because it's all based on real-time data."

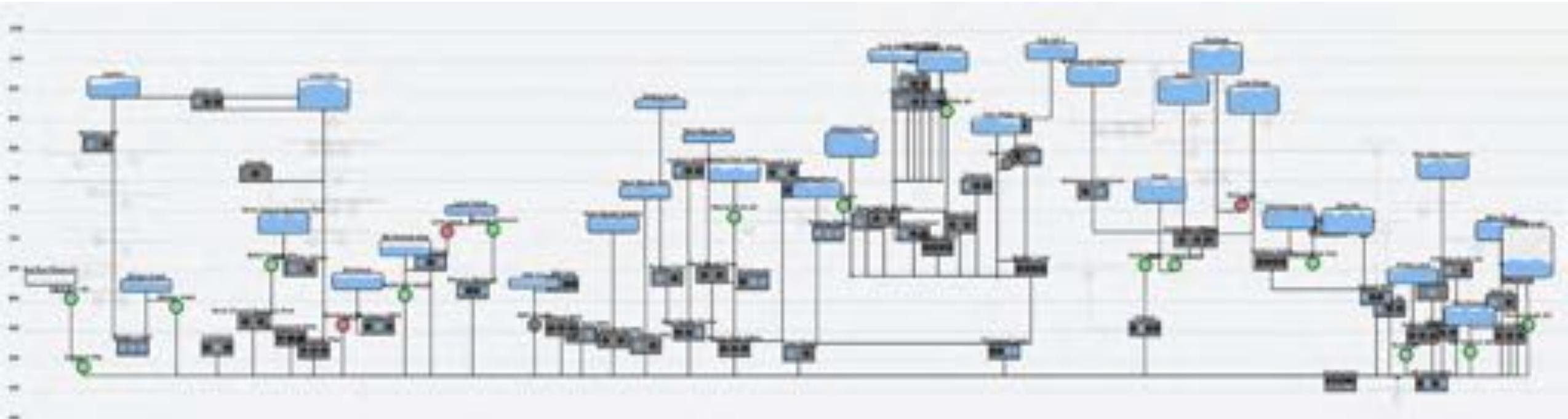
Justin Bowling

Engineer III for Metro Water Services
in Nashville, Tennessee



Managing a Complex Water Distribution System

- Water Age
- High/Low Pressure
- Reservoir Turnover
- CI Residual Management
- Low Flow
- Water Main Breaks



Managing a Complex Water Distribution System

First step: Understanding

Determining root-causes of issues is challenging

- Circumstances creating those issues are complex and fluid

Many solutions available for operating the distribution system, but the picture is incomplete

SCADA

SCADA controls the water distribution system

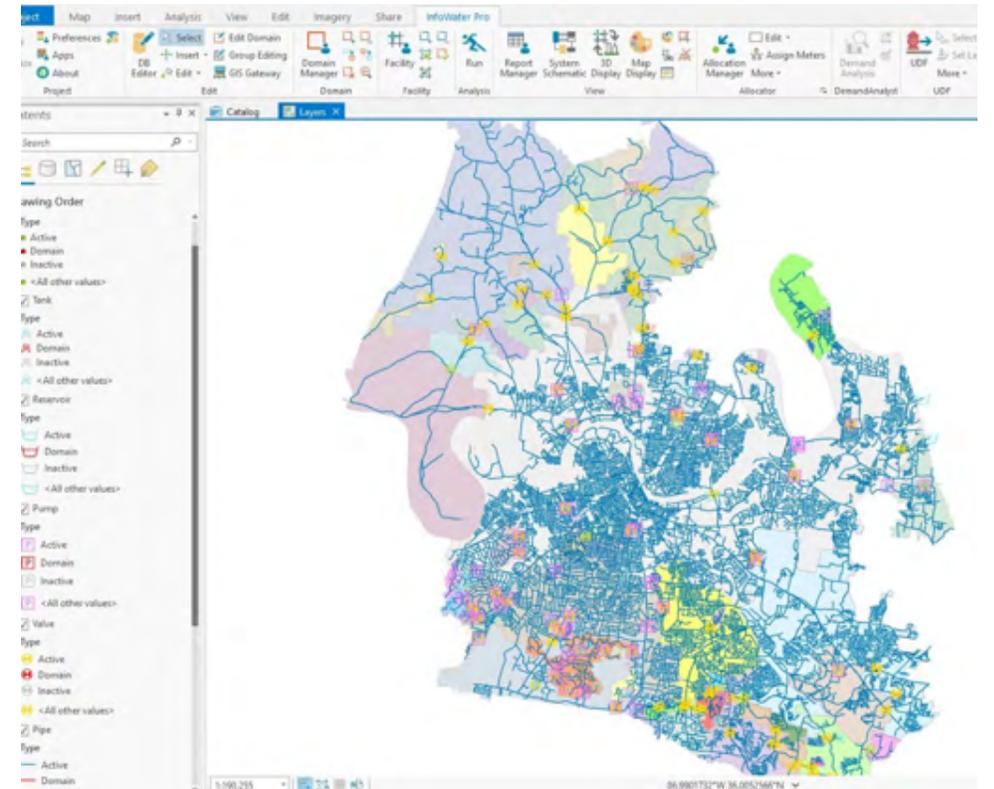
Provides real-time feedback on reservoir levels, pumps, flow, pressure and other critical parameters but just provides data, not system analysis



Water Model

Ability to diagnose issues in the system and provides system analysis

Traditional water modeling approaches rely on a static planning-level description of system operations



GIS

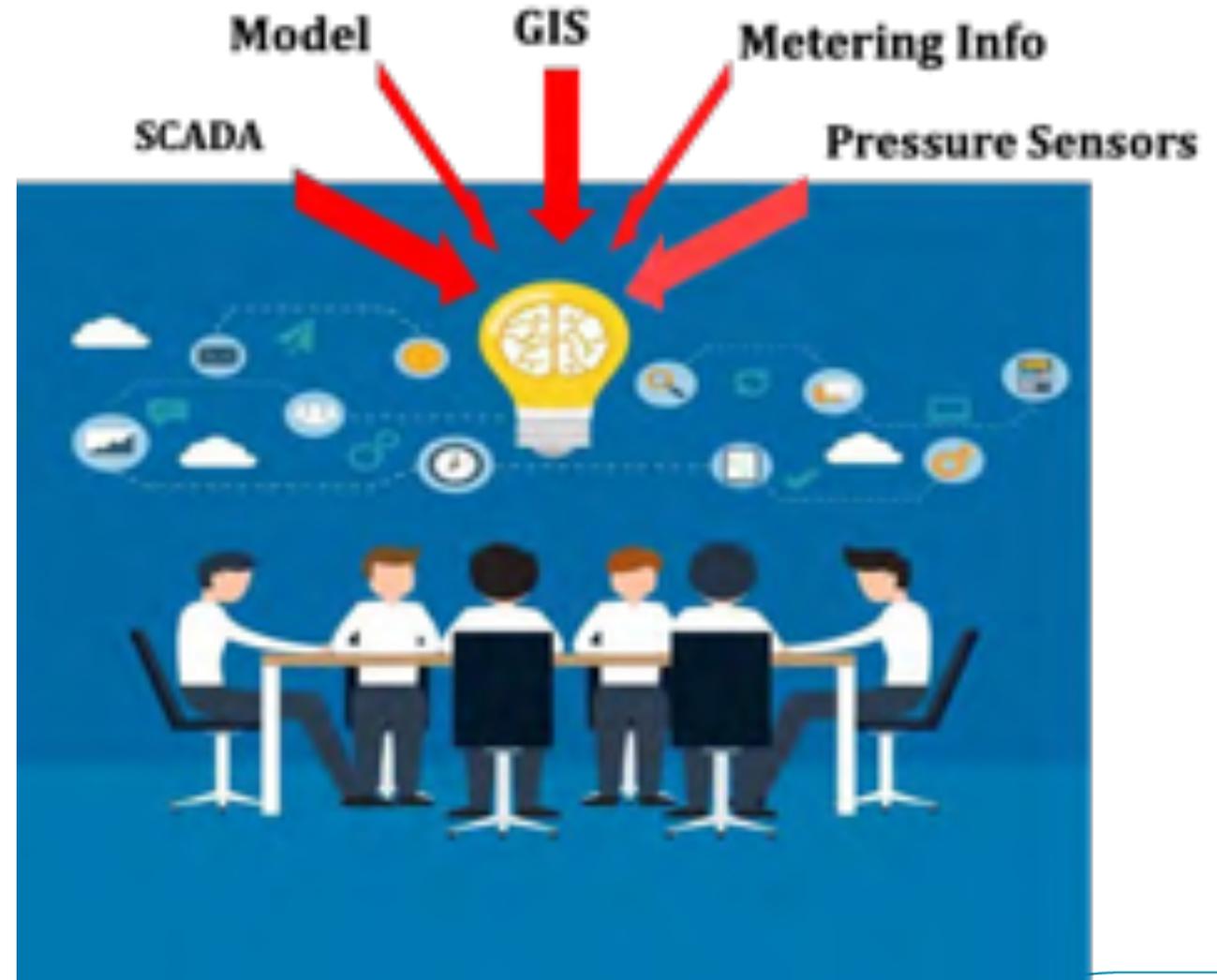
Great tool for providing maps of the system and asset history

Does not provide real-time data or system analysis



Managing a Complex Water Distribution System

How much time and staffing is dedicated within the utility just discussing what might be causing the issue prior to any attempts to solve?



Managing a Complex Water Distribution System

- All these solutions provide critical information on water distribution systems, but none are capable of telling the entire story
- By integrating key aspects of these systems and information into one solution, WNO, the veil can be lifted on the water distribution system

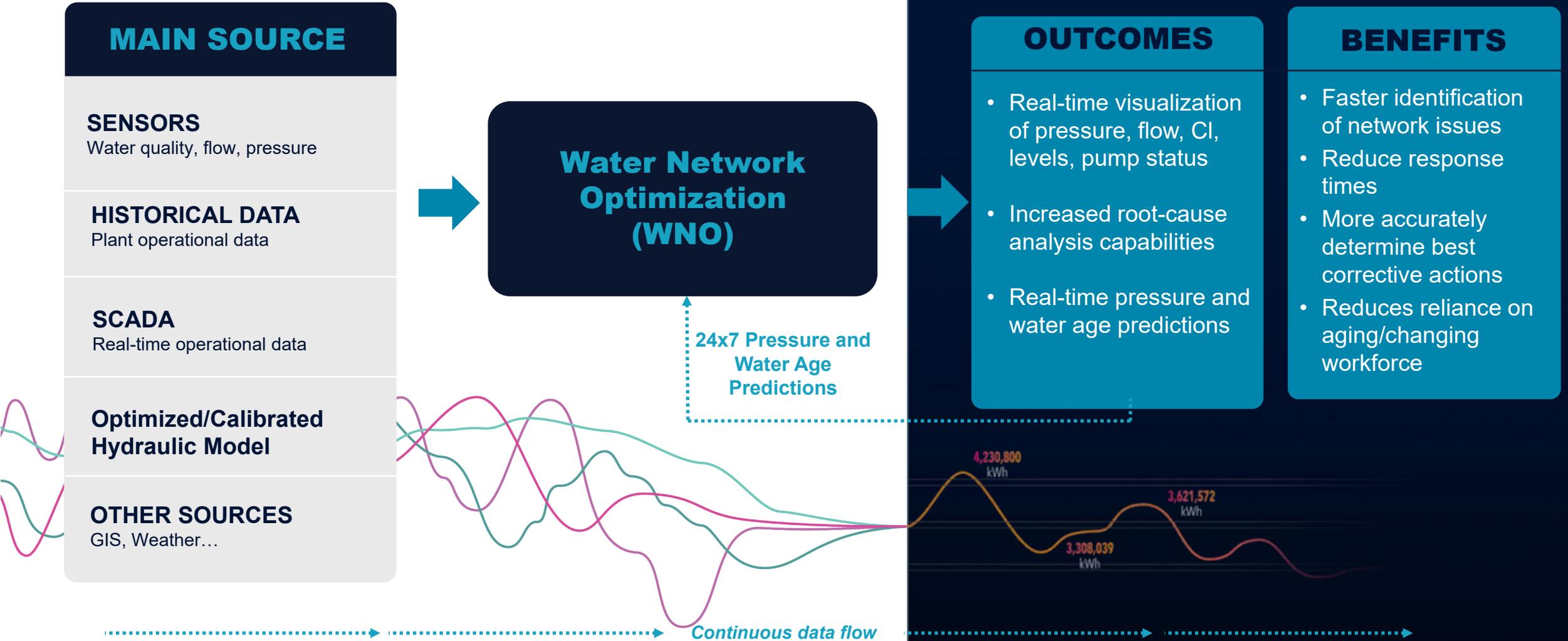
Water Network Optimization (WNO)

MWS partnered with Xylem to develop a real-time decision support tool for hydraulic and water quality distribution systems

Xylem's WNO optimizes distribution operations by providing a flexible "live" water-modeling solution, configured to MWS's infrastructure



Water Network Optimization



03

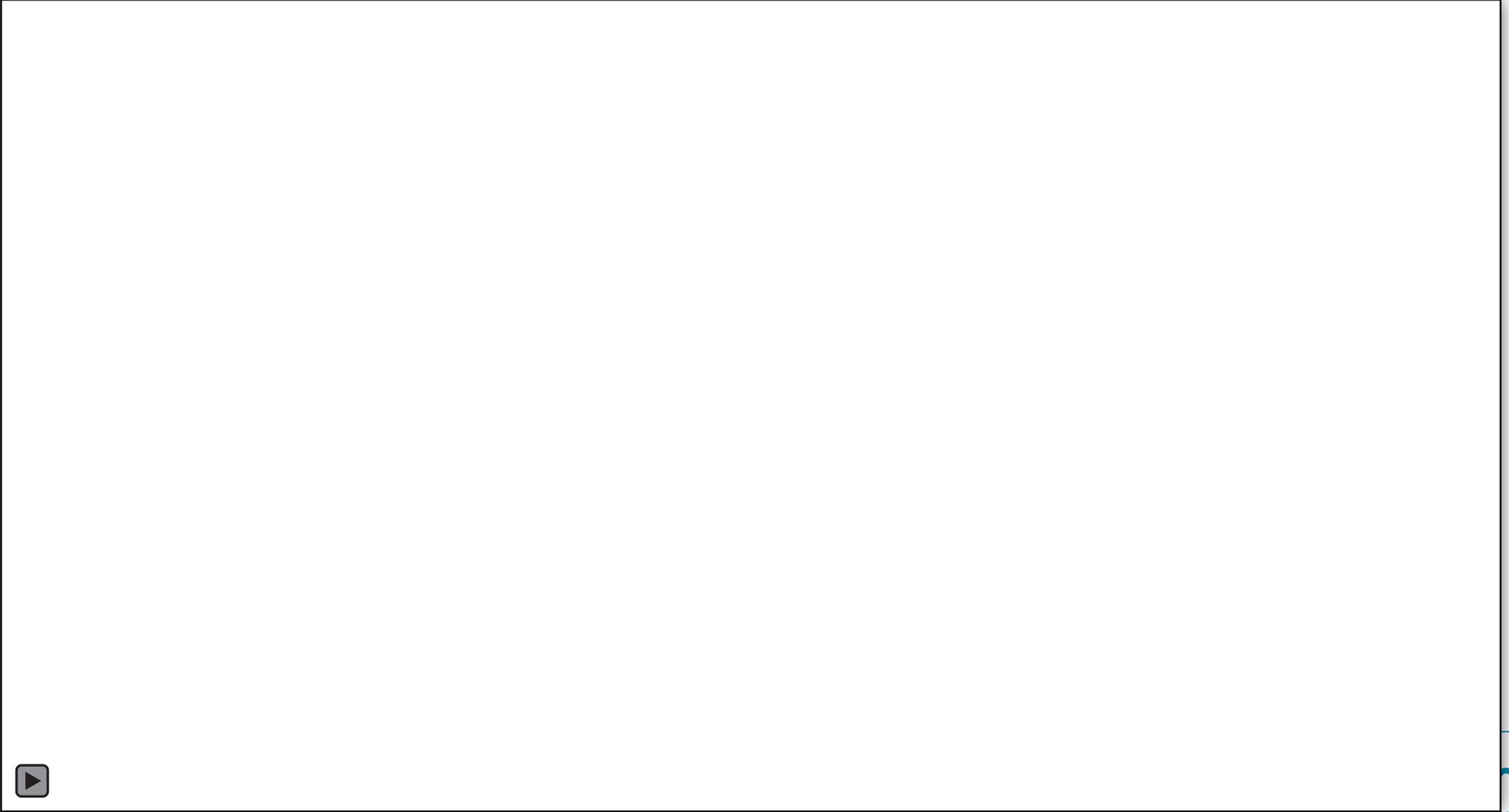
Let's check it out!



Schematic Overview – How The User Navigates



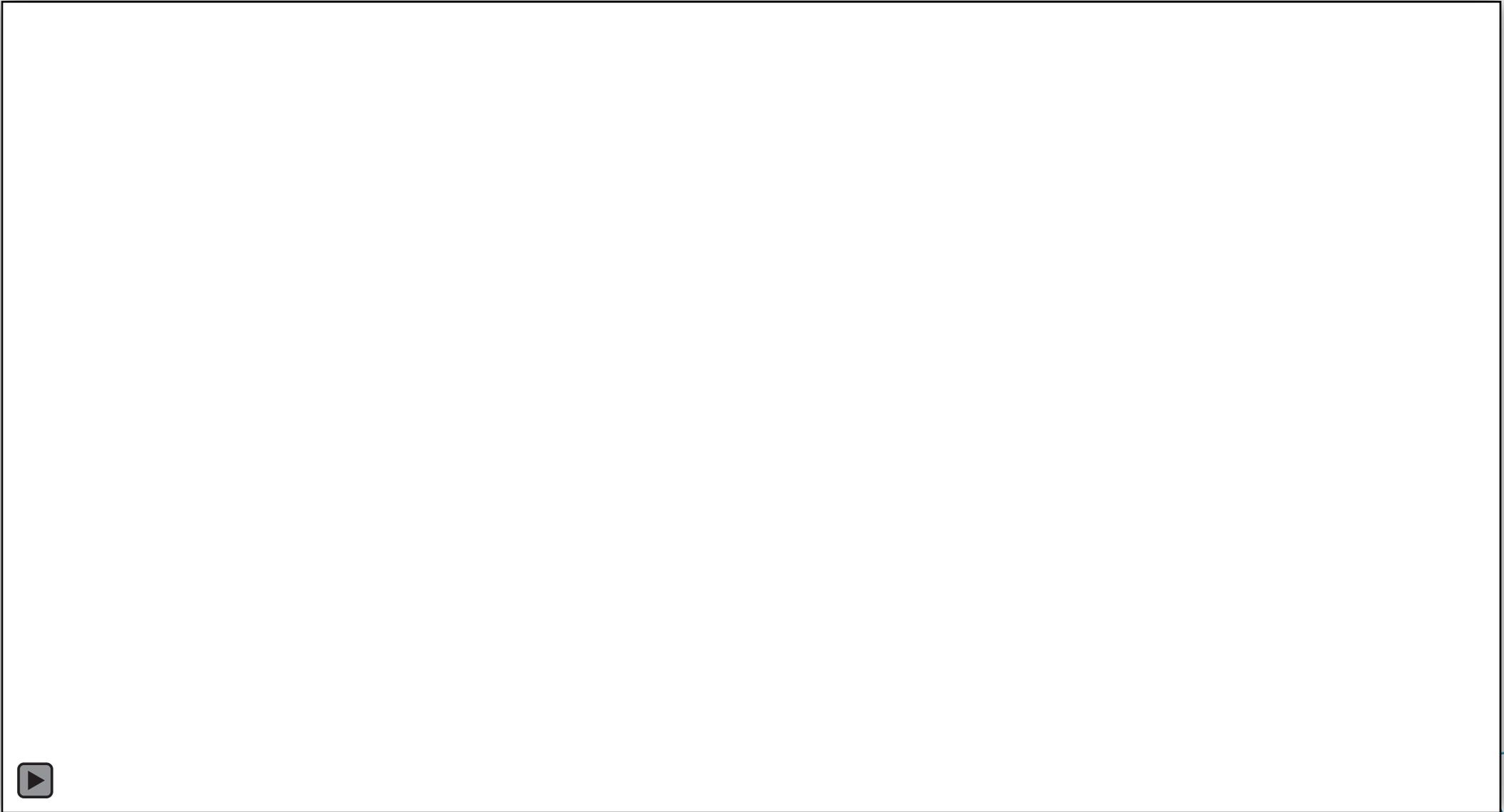
Split View



Trending Facilities in the Schematic



Layer Function



Calendar Function



Calendar Function - Benefits

- Trending date ranges in SCADA is often difficult because it's done by facility
- Trend each facility that may be involved and then attempt to overlay trends in order to diagnose issues
- This is difficult to do and time consuming
- With WNO you just select the time range
- Example – Recent breaks in the Granny White Tyne Valley Zone

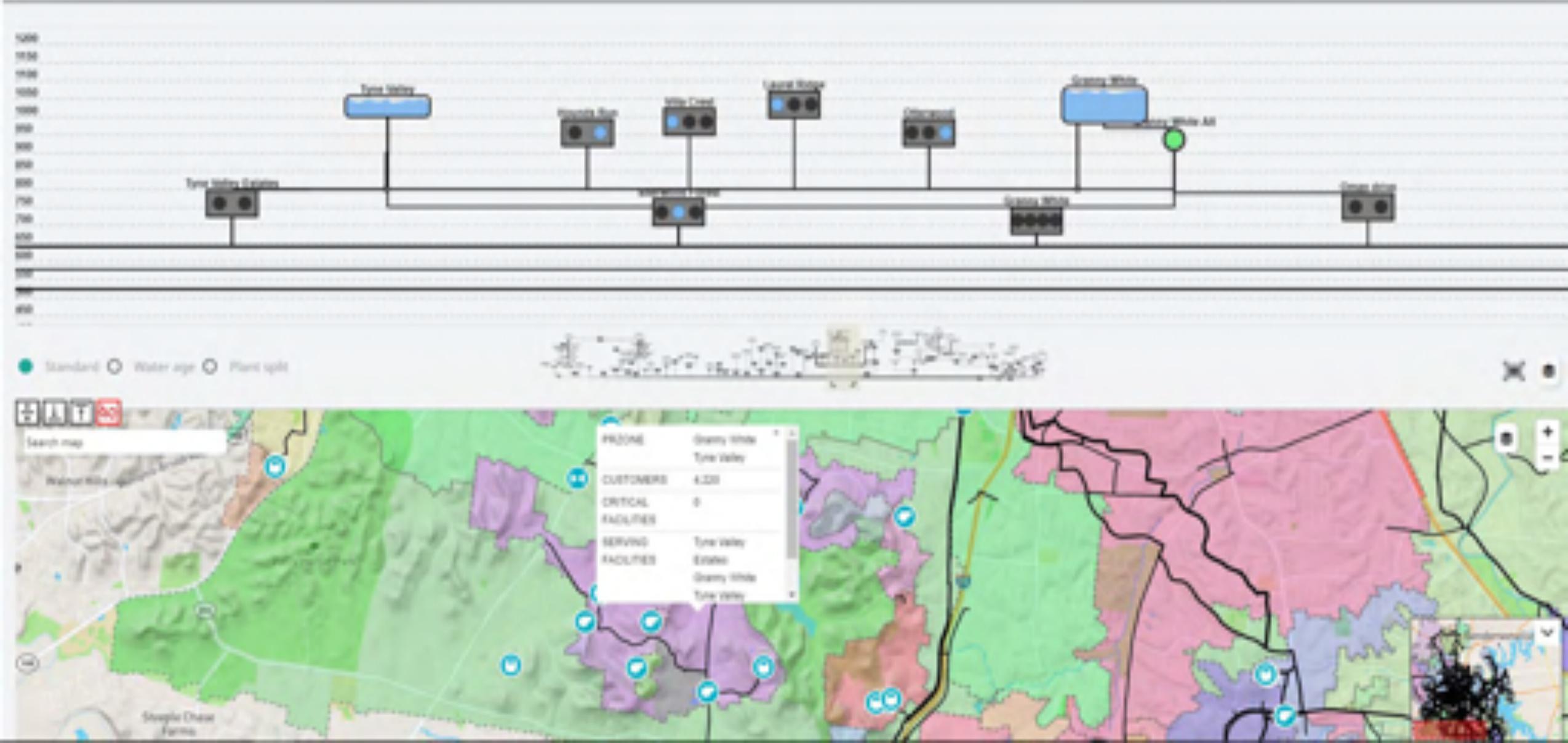
04

Real Life Example:

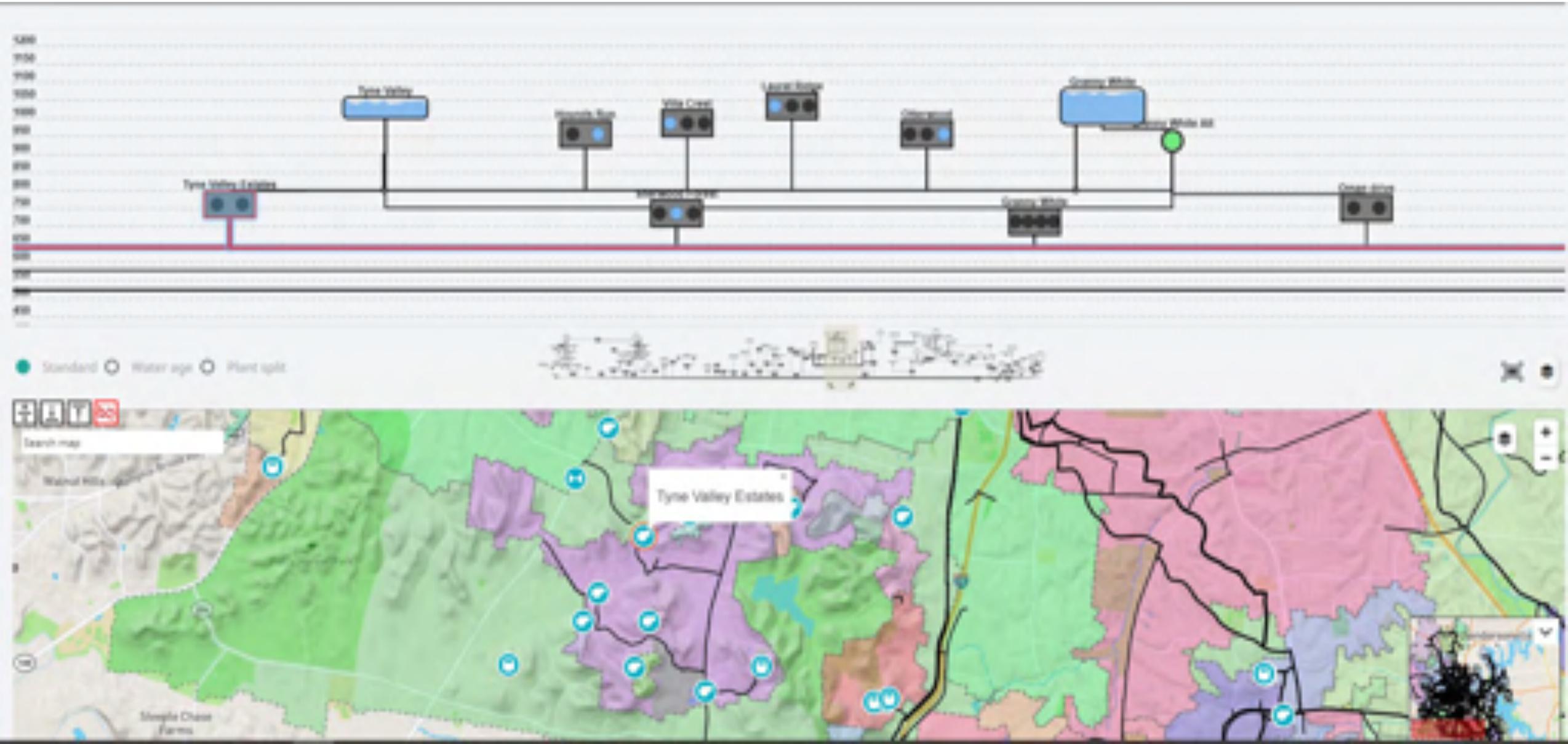
Granny Whit Tyne
Valley – WM
Breaks



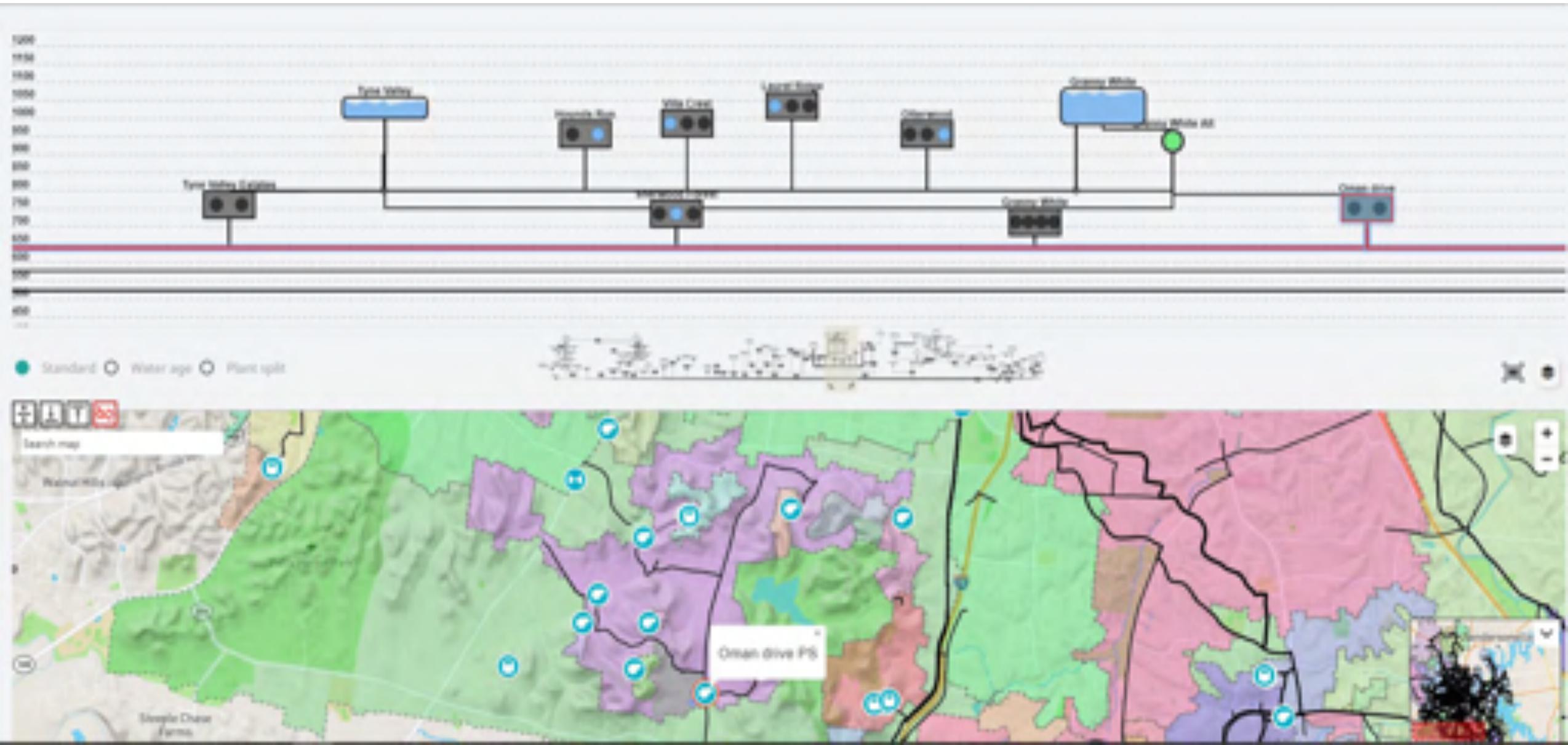
Granny White Pressure Zone – WM Break Issue



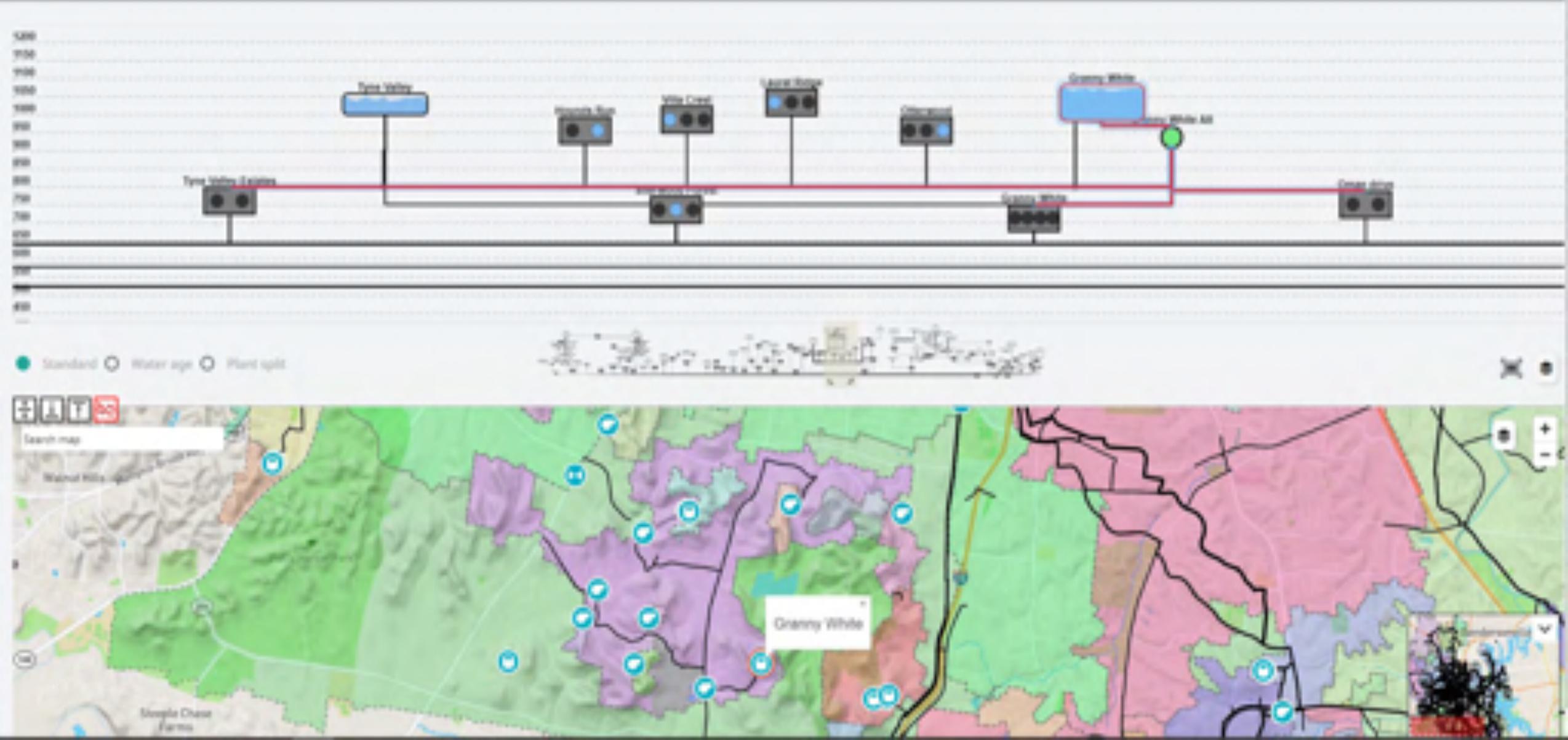
Tyne Valley PS – WM Break Issue



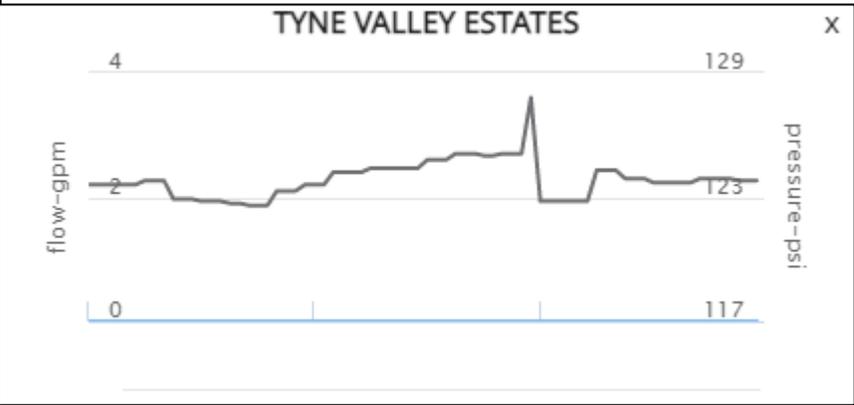
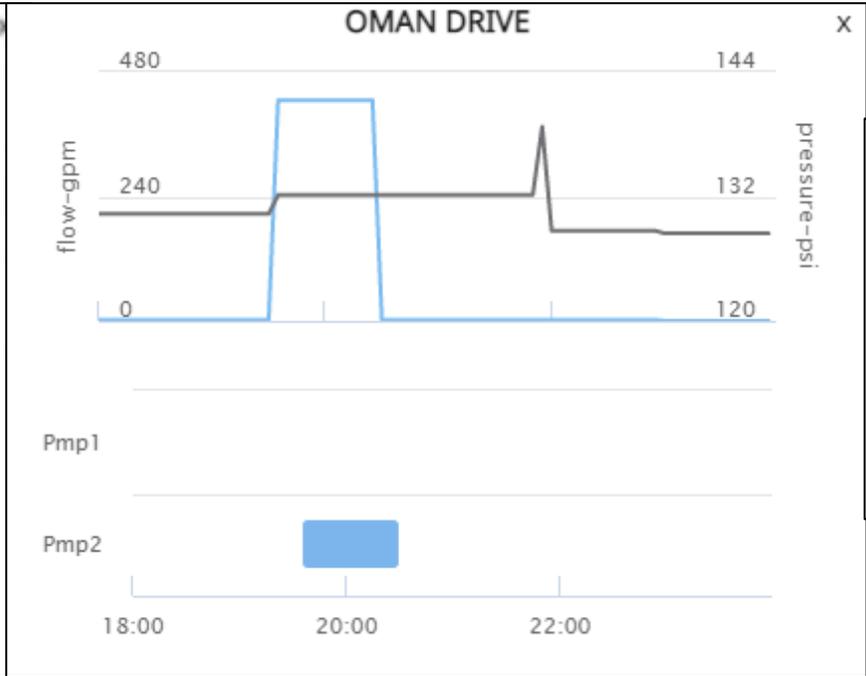
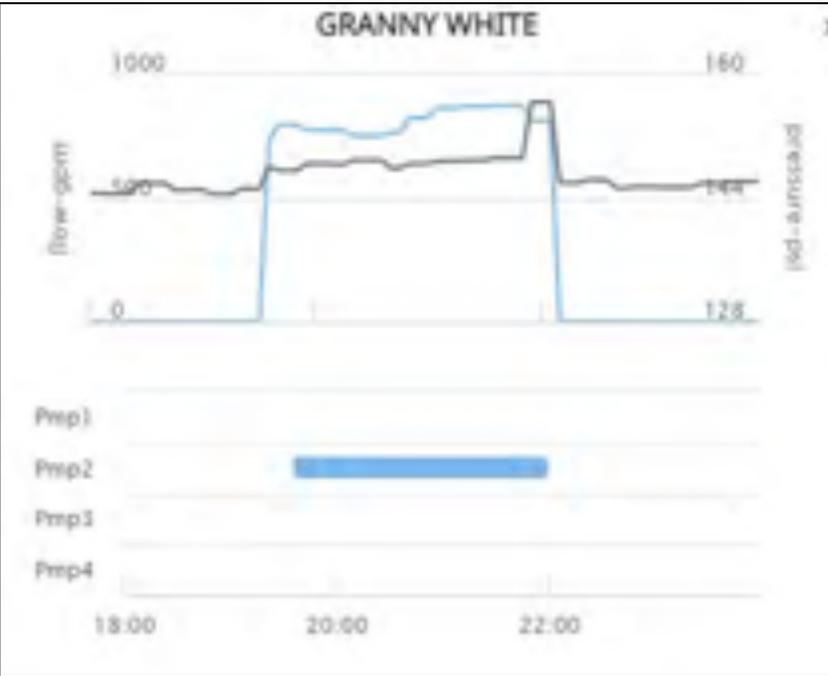
Oman Drive PS – WM Break Issue



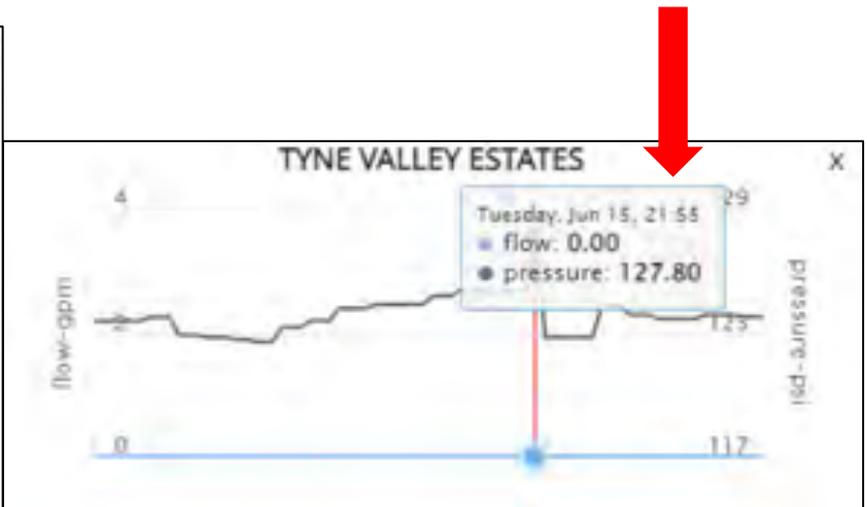
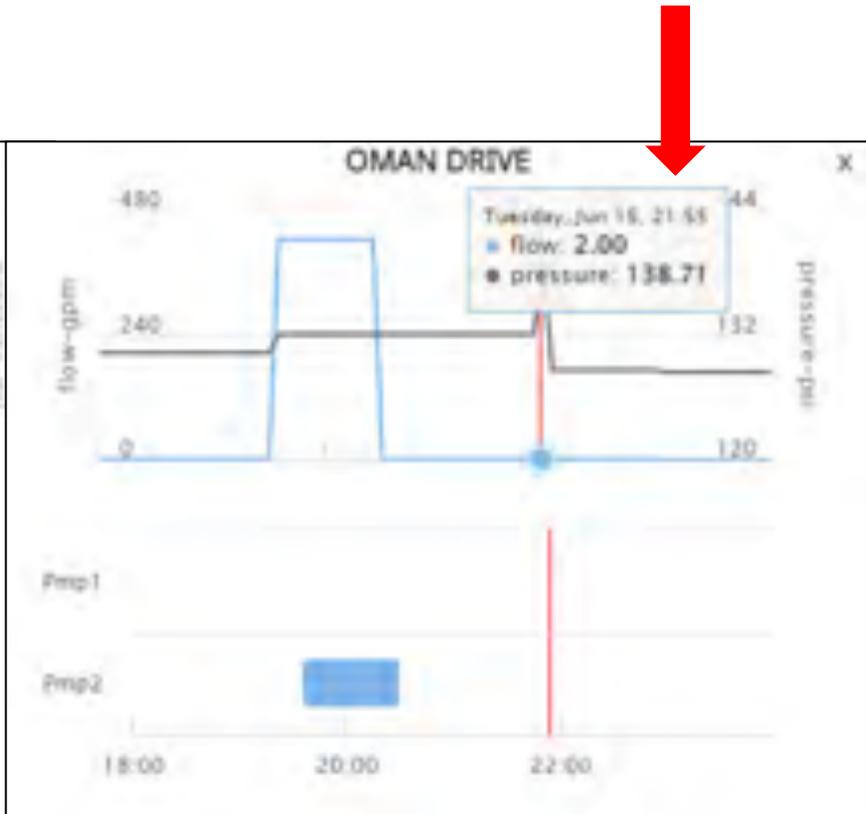
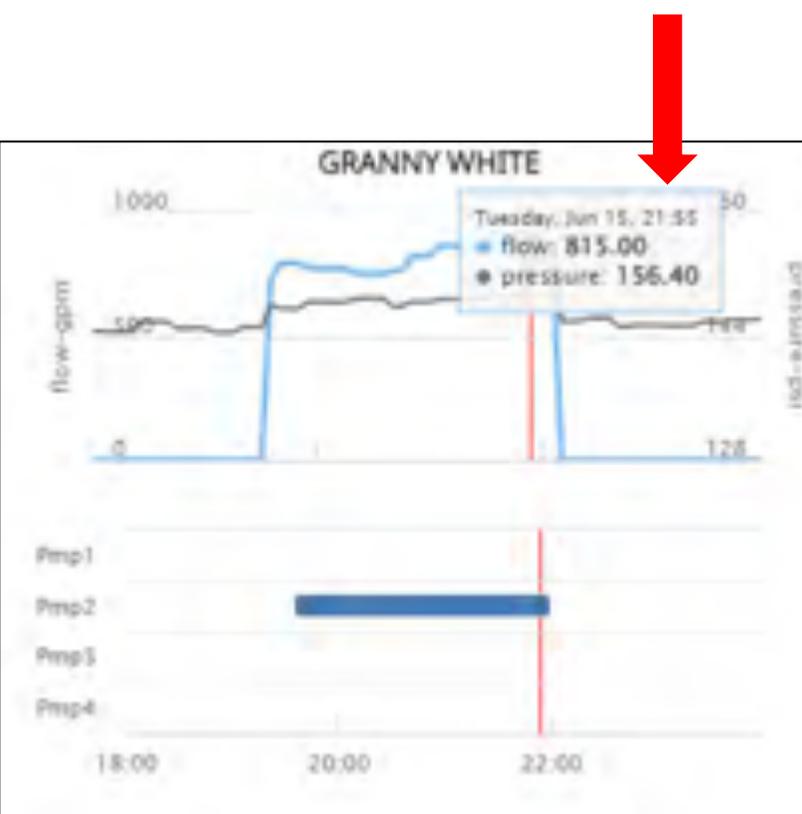
Granny White Reservoir – WM Break Issue



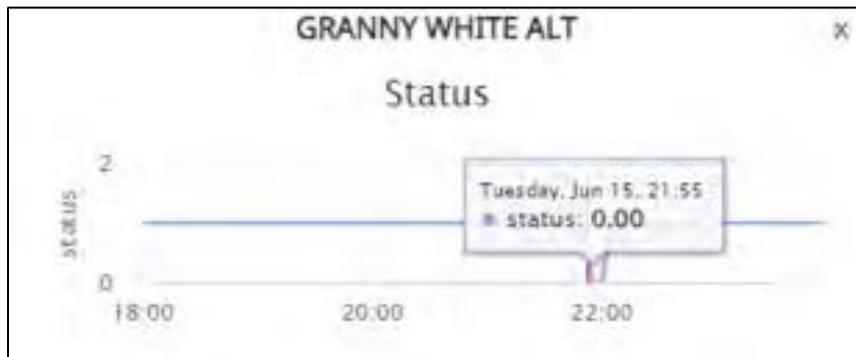
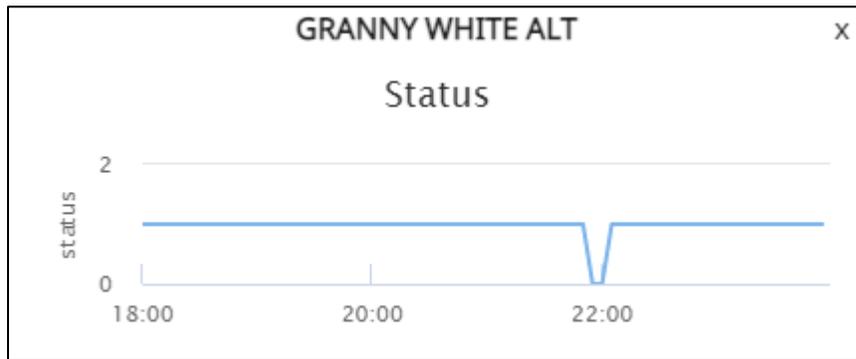
Granny White Tyne Valley – WM Break Issue



Granny White Tyne Valley – WM Break Issue



Granny White Tyne Valley – WM Break Issue



Granny White Tyne Valley – WM Break Issue

- We adjusted the pumps at Granny White to shut off when Granny White Reservoir was full, not Tyne Valley Reservoir
- Adjusted programming logic to have Tyne Valley WPS top off Tyne Valley Reservoir if needed, not Granny White WPS
- Granny White Altitude Valve stays open, and we eliminated the pressure surge
- The WNO calendar function makes it much easier to trend facilities and diagnose system issues

05

Map Features



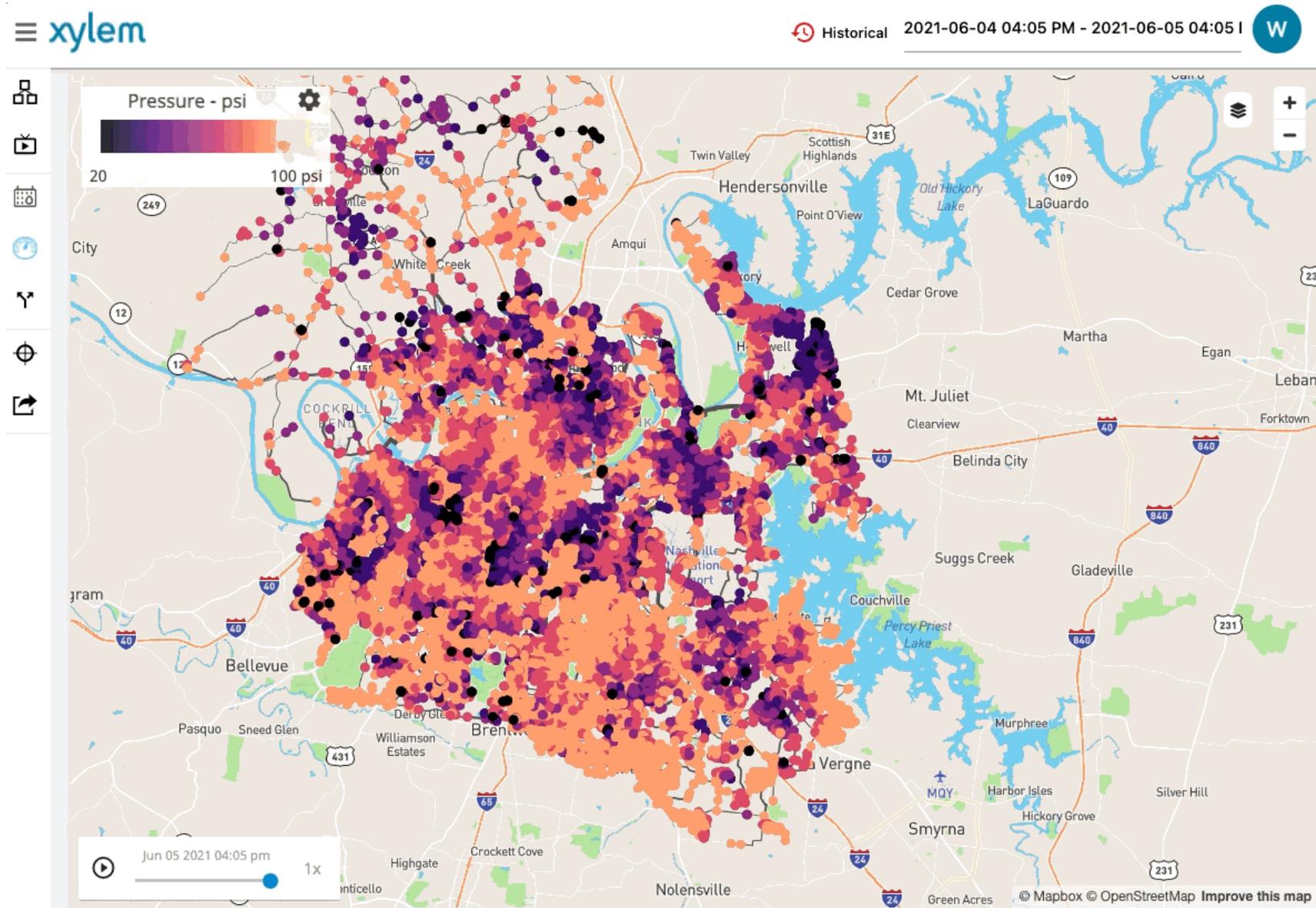
Map Features



Water Age



Water Pressure



Plant Split



06

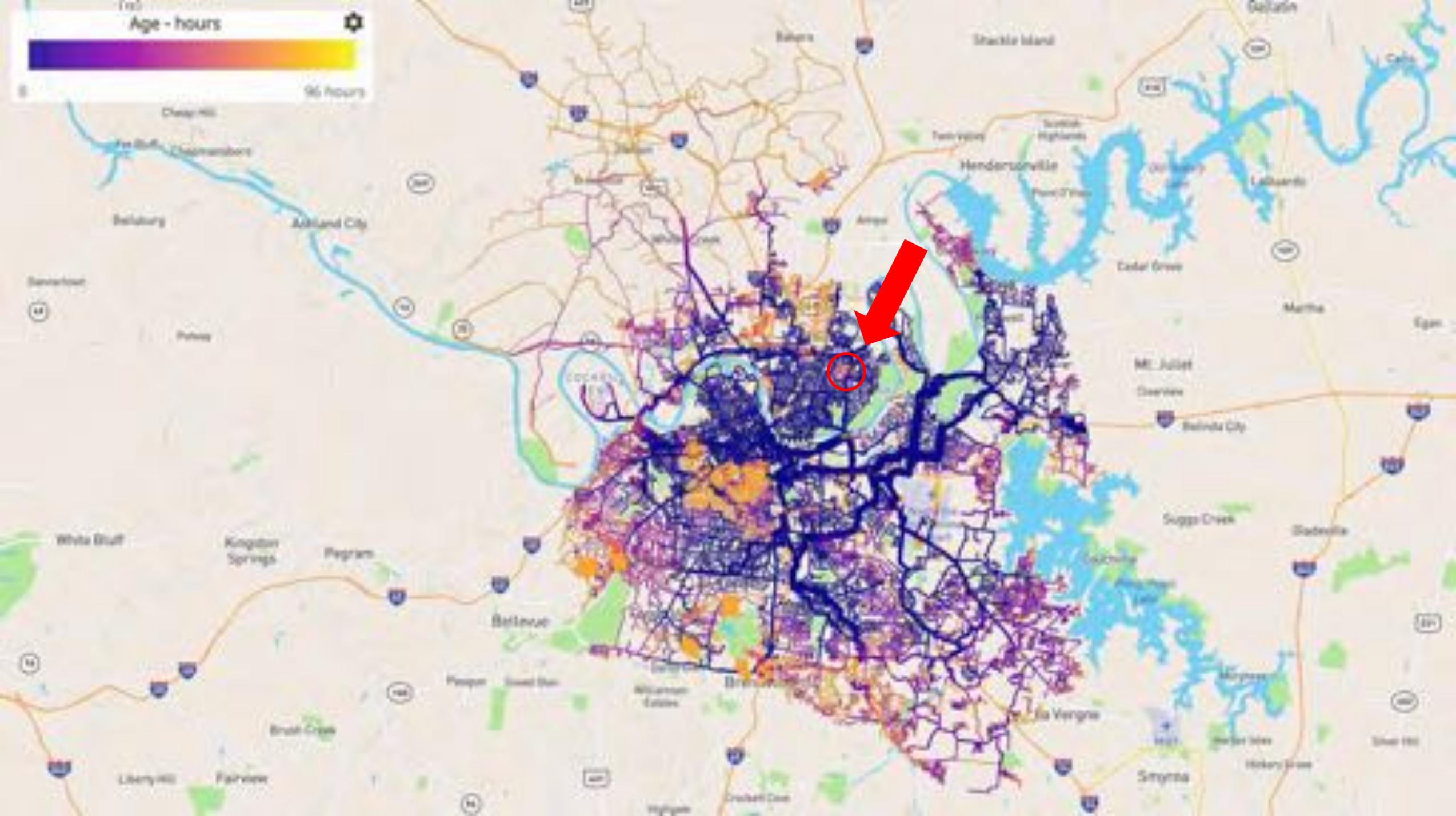
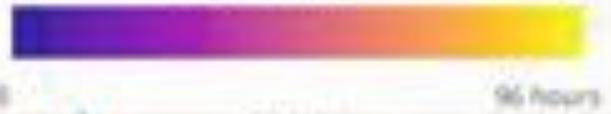
Water Age & Plant Source



Water Age & Plant Source

- Why is this important?
- What are you going to do with this information?
- How will this change how you respond to water quality issues?

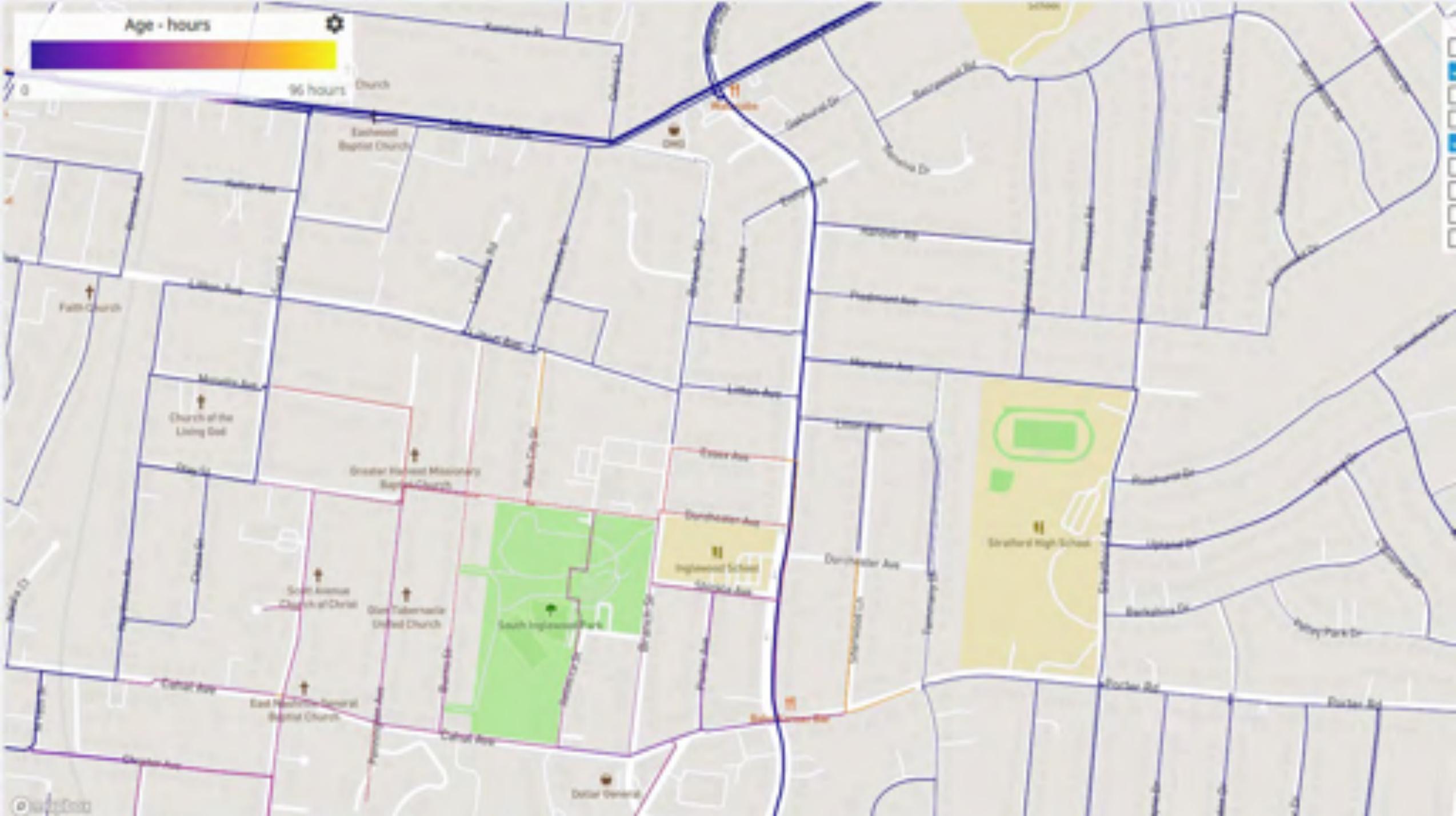
Age - hours



Age - hours



96 hours



Age - hours



95 hours

Select date range

Last 1 day

(C-0406-119)



Age - hours

96 hours

Select date range

Last 1 day

(C-0506-2666)



Omohundro-Split - %



100 %

Select date range

Last 1 day

(C-0406-119)

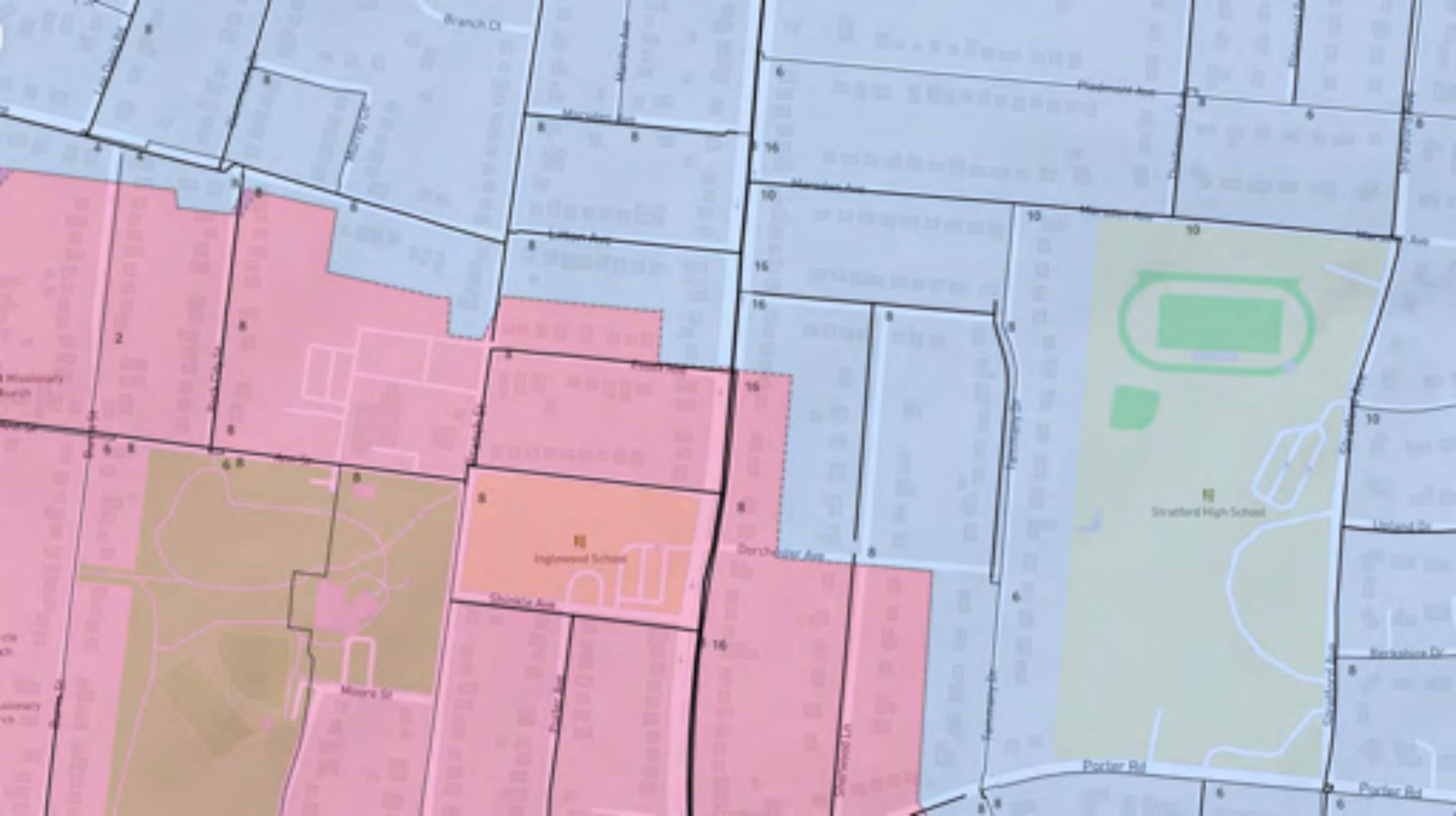


Omohundro-Split - %



100 %





Branch Ct

Main St

2

4

Moore St

Church St

Inglewood School

Derchester Ave

16

15

10

16

16

10

10

Stratford High School

10

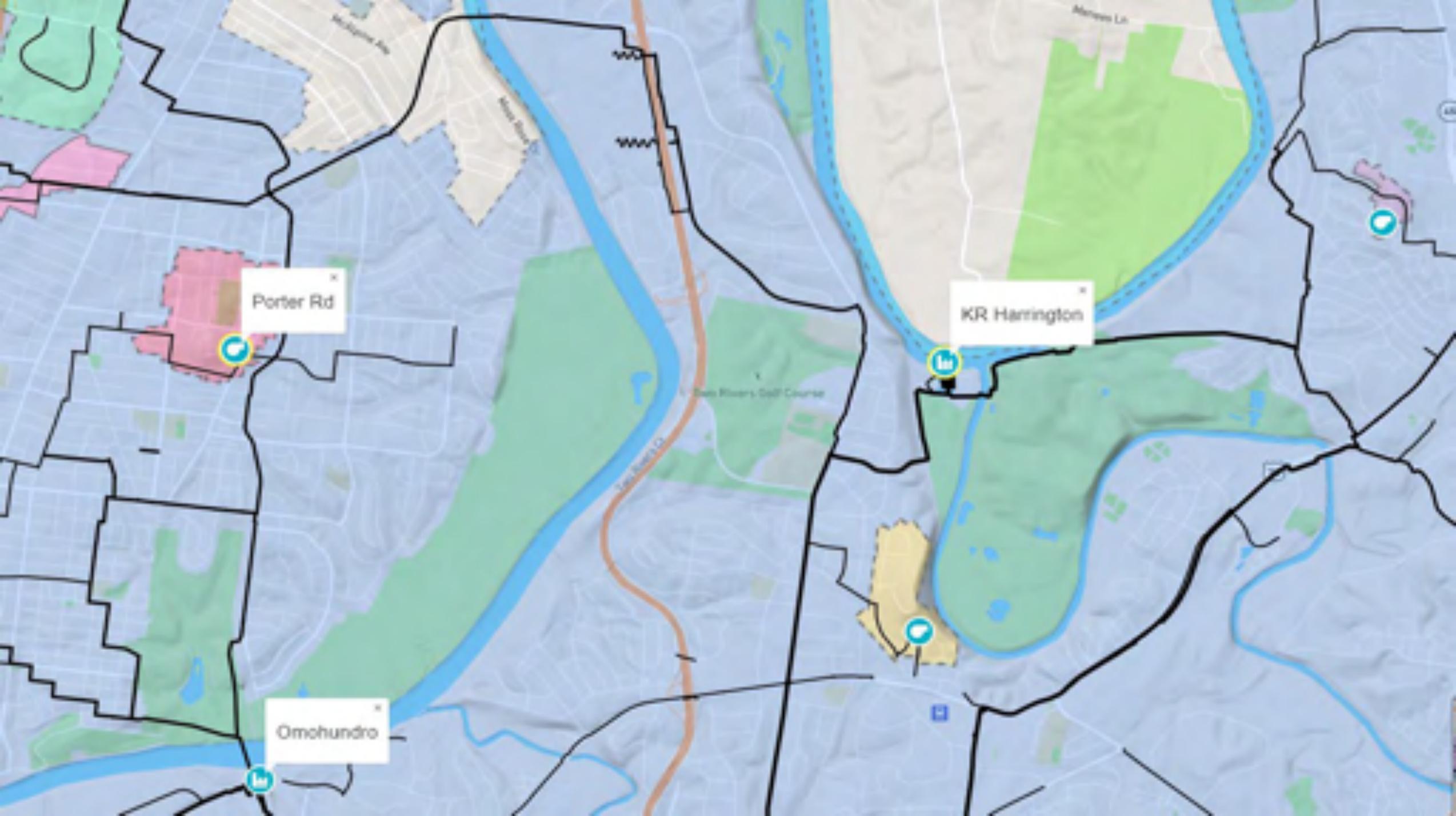
Porter Rd

Porter Rd

The map displays various service zones in different colors: light blue, pink, and green. A callout for 'City Law' is positioned over a light blue area, and another for 'Porter Road' is over a pink area. The map also shows streets like Branch Ct, Moore St, and Porter Rd, and facilities like Stratford High School.

PRZONE	City Law
CUSTOMERS	313,875
CRITICAL FACILITIES	56
SERVING FACILITIES	KR Harrington Omahunde Whites Creek Bordeaux 30th Ave

PRZONE	Porter Road
CUSTOMERS	2,709
CRITICAL FACILITIES	0
SERVING FACILITIES	Porter Rd



Porter Rd

KR Harrington

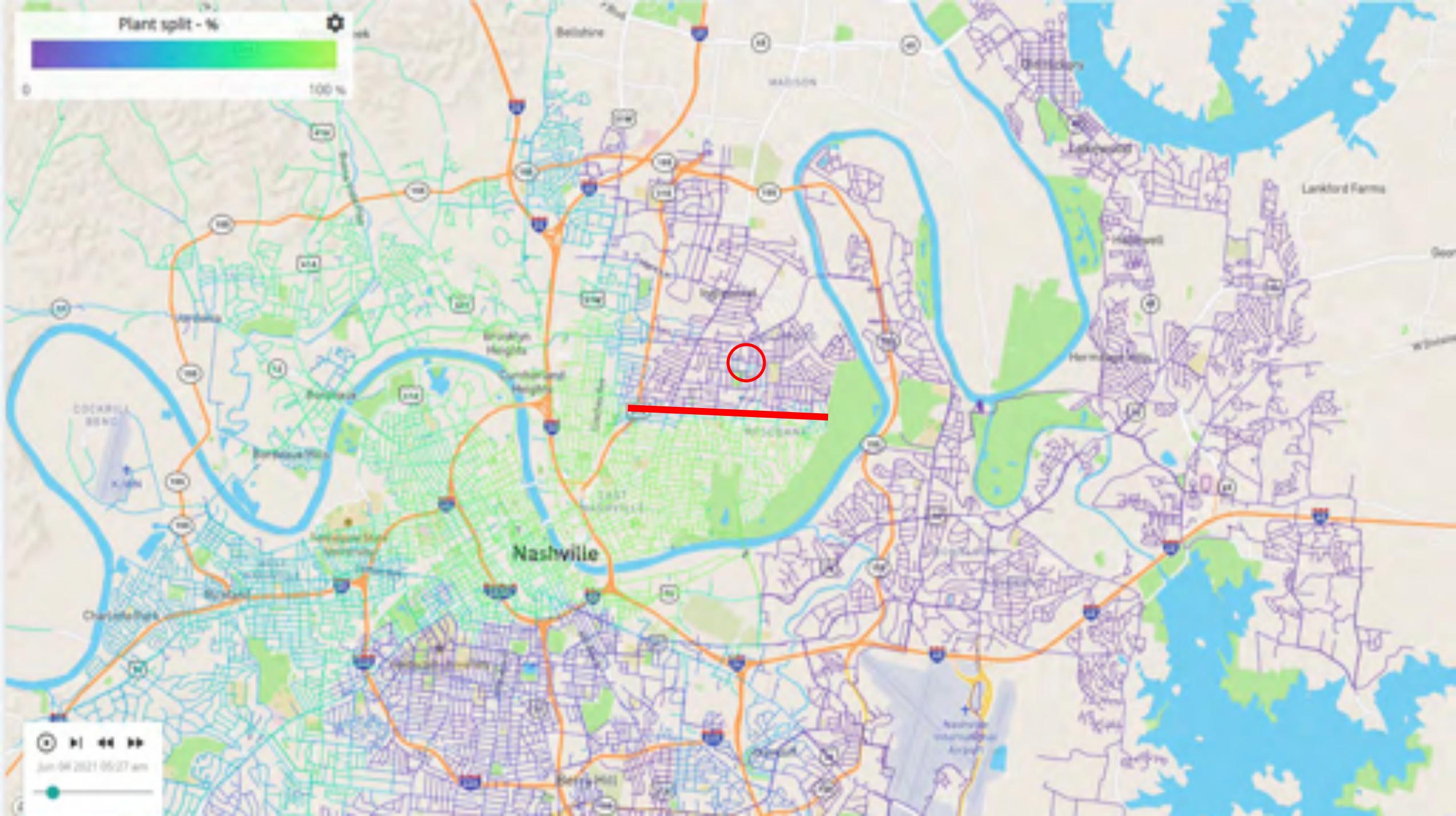
Omohundro

Swan River Golf Course

Plant split - %



100 %



Nashville



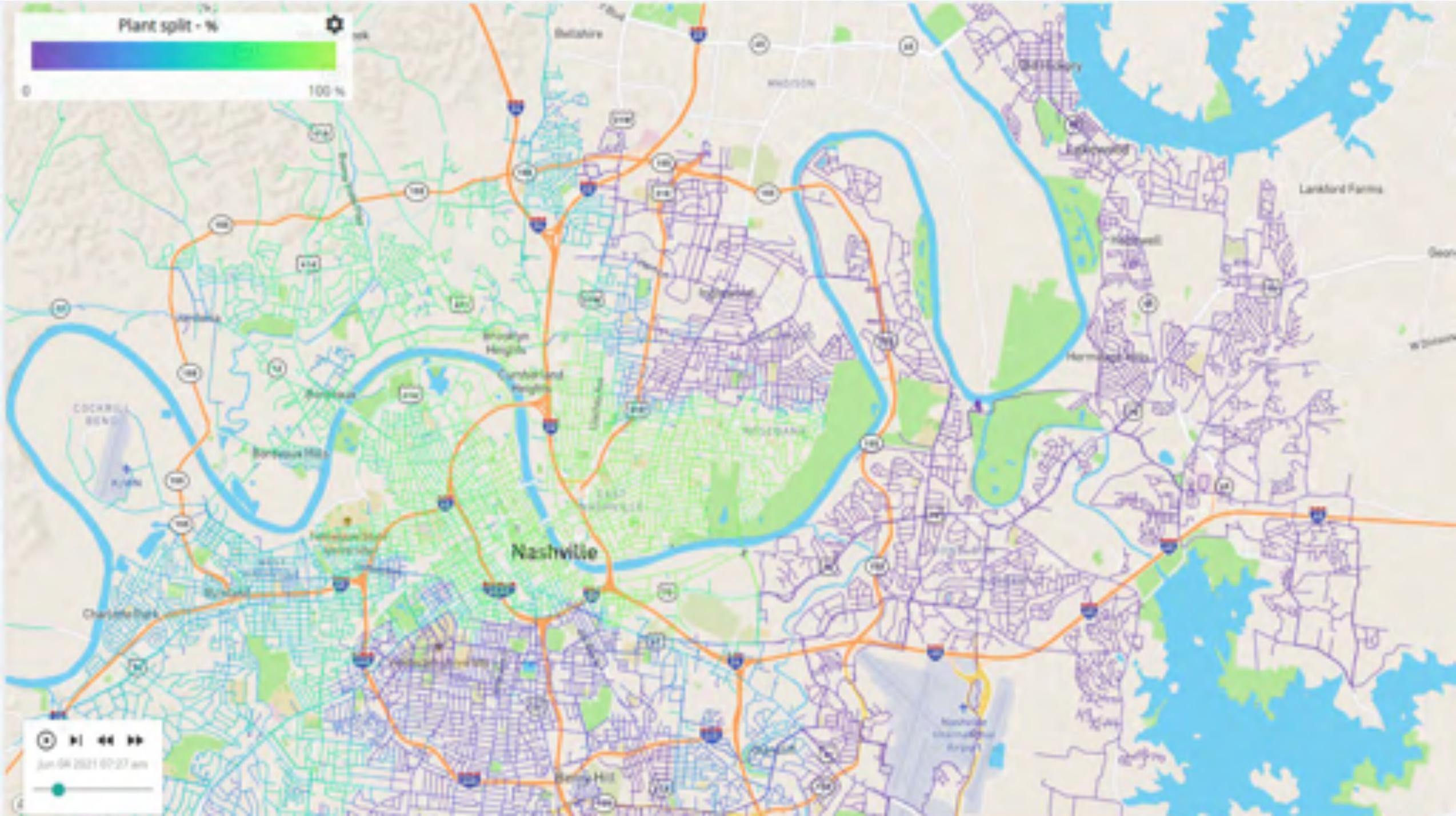
Jun-04 2021 05:27 am



Plant split - %



100 %

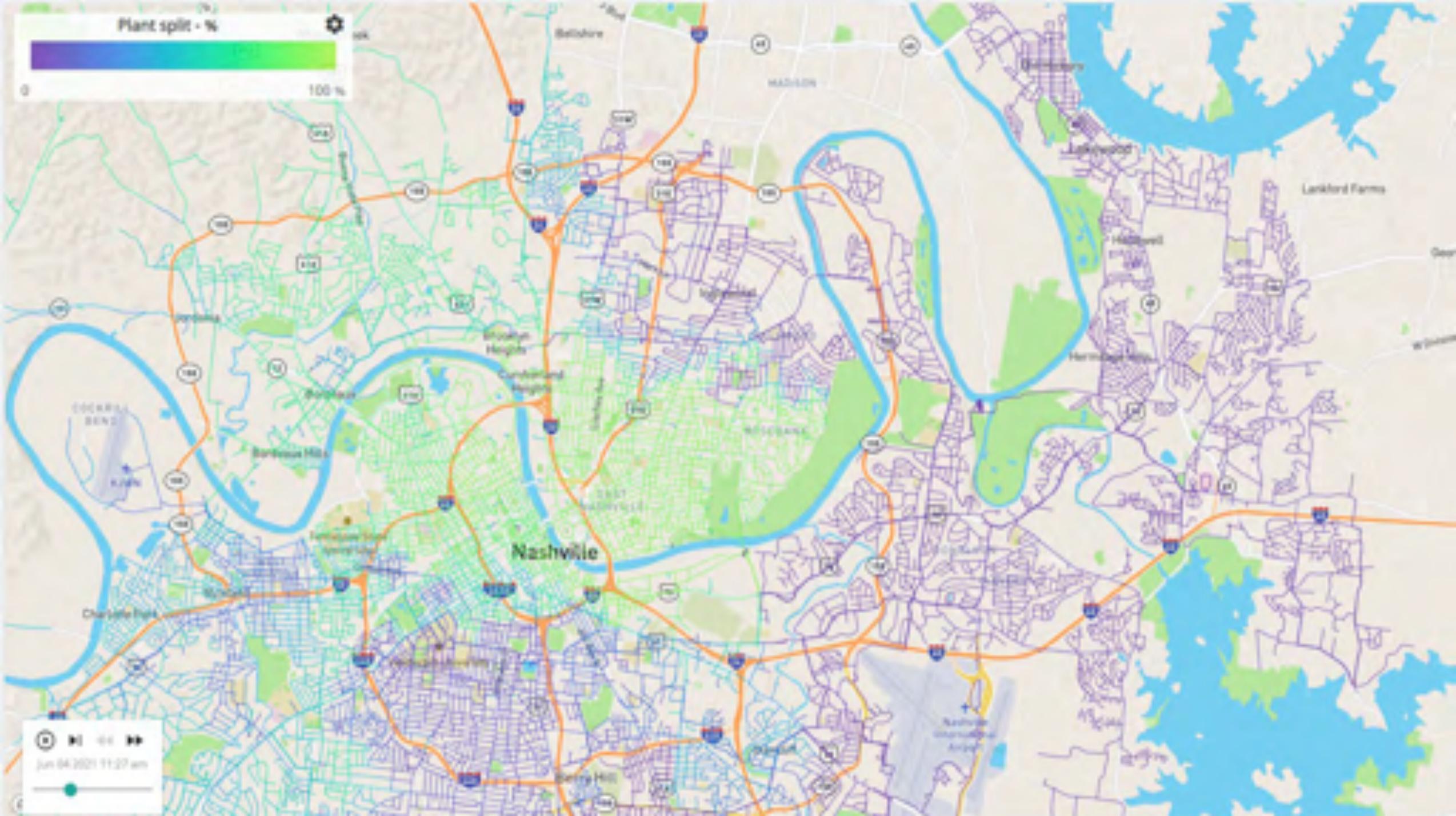


Jun 04 2021 07:27 am

Plant split - %

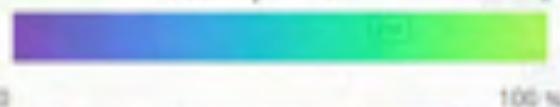


100 %

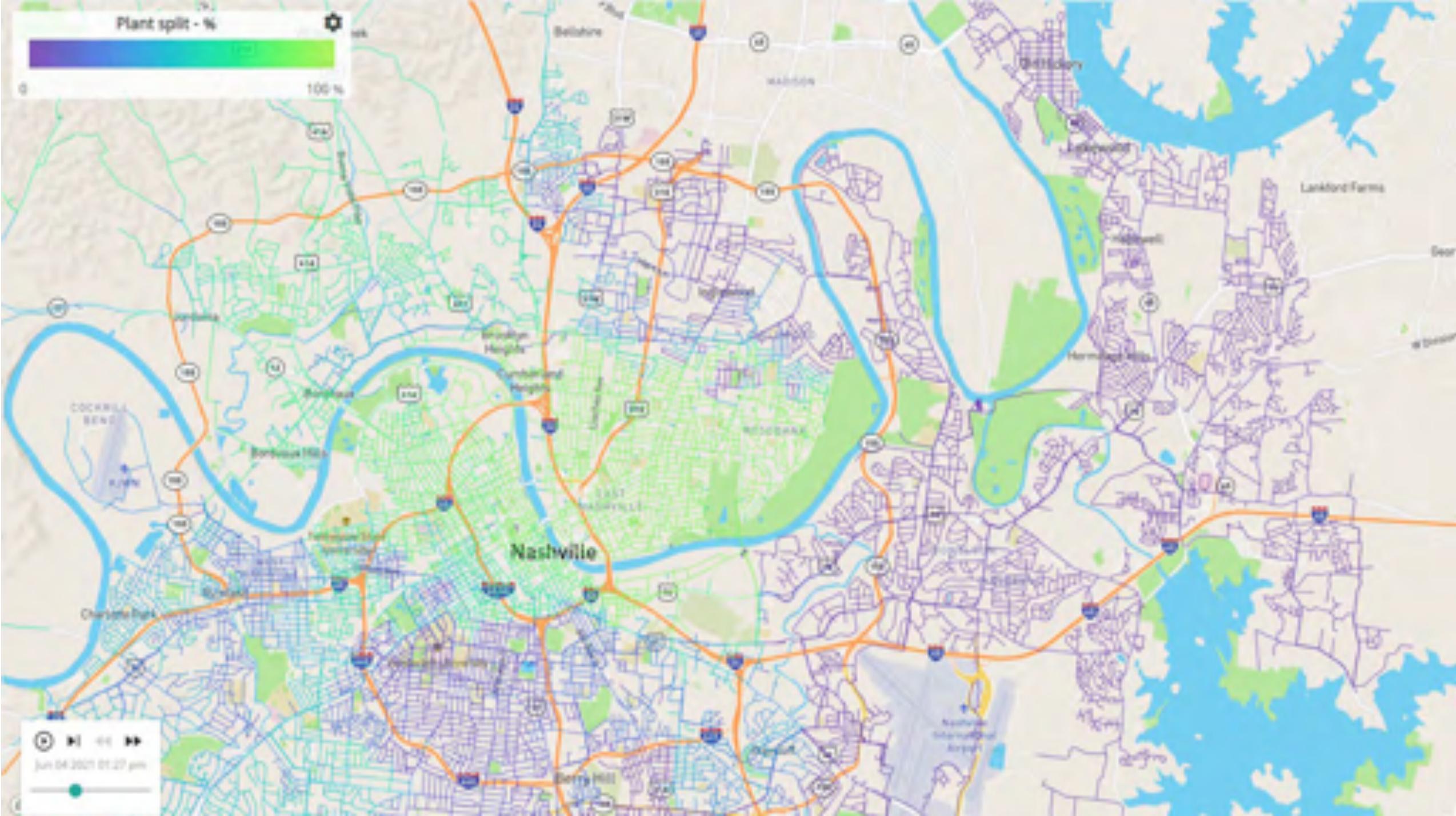


Jun 04, 2021 11:27 am

Plant split - %



100 %

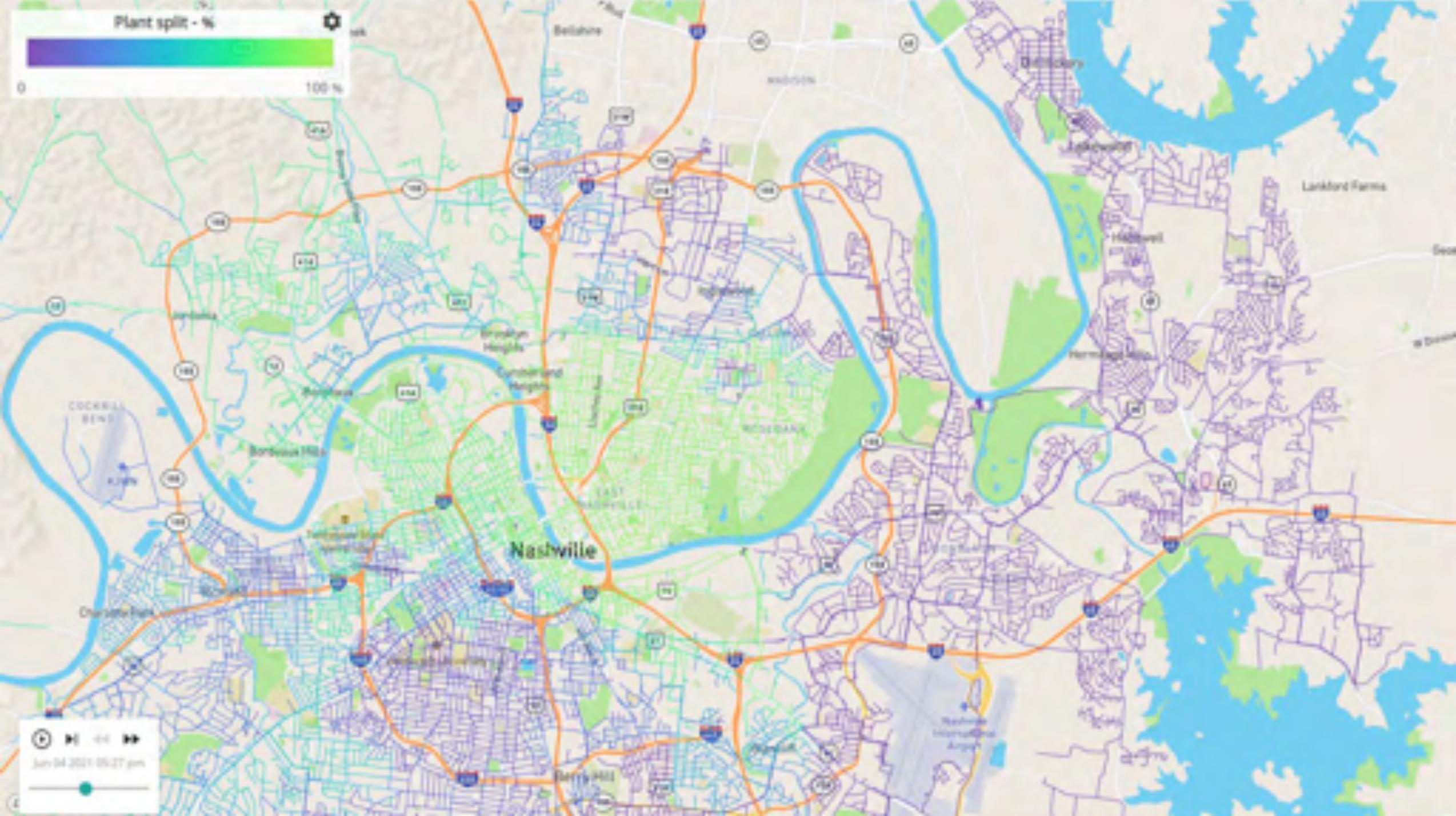


Navigation controls including a play button, a stop button, and a refresh button. Below the buttons is the text "Jun 04, 2021 01:27 pm".

Plant split - %



100 %



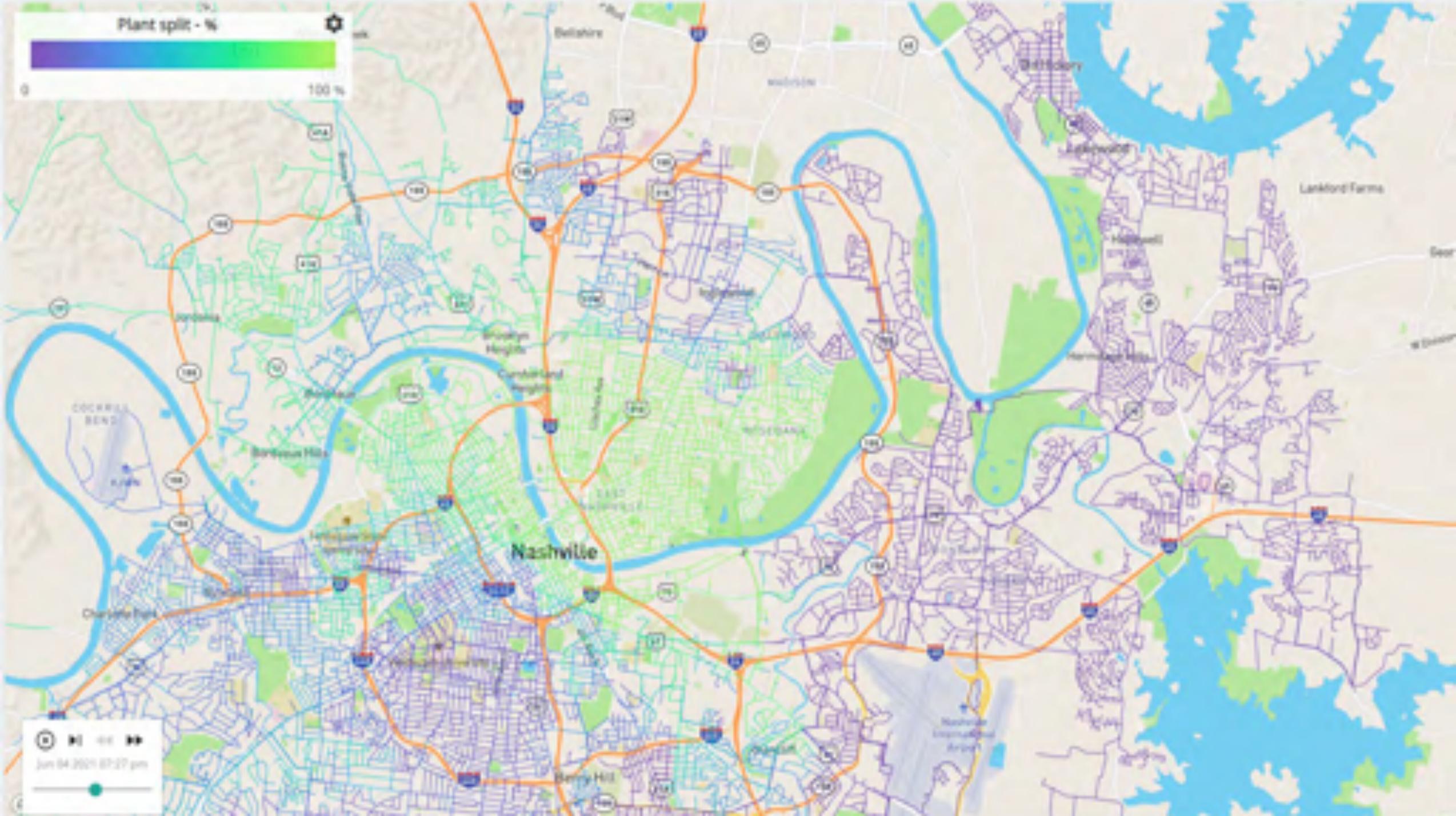
Nashville

Map navigation controls including a compass, zoom in (+) and zoom out (-) buttons, a play/pause button, and a date/time stamp: Jun 04 2021 05:27 pm.

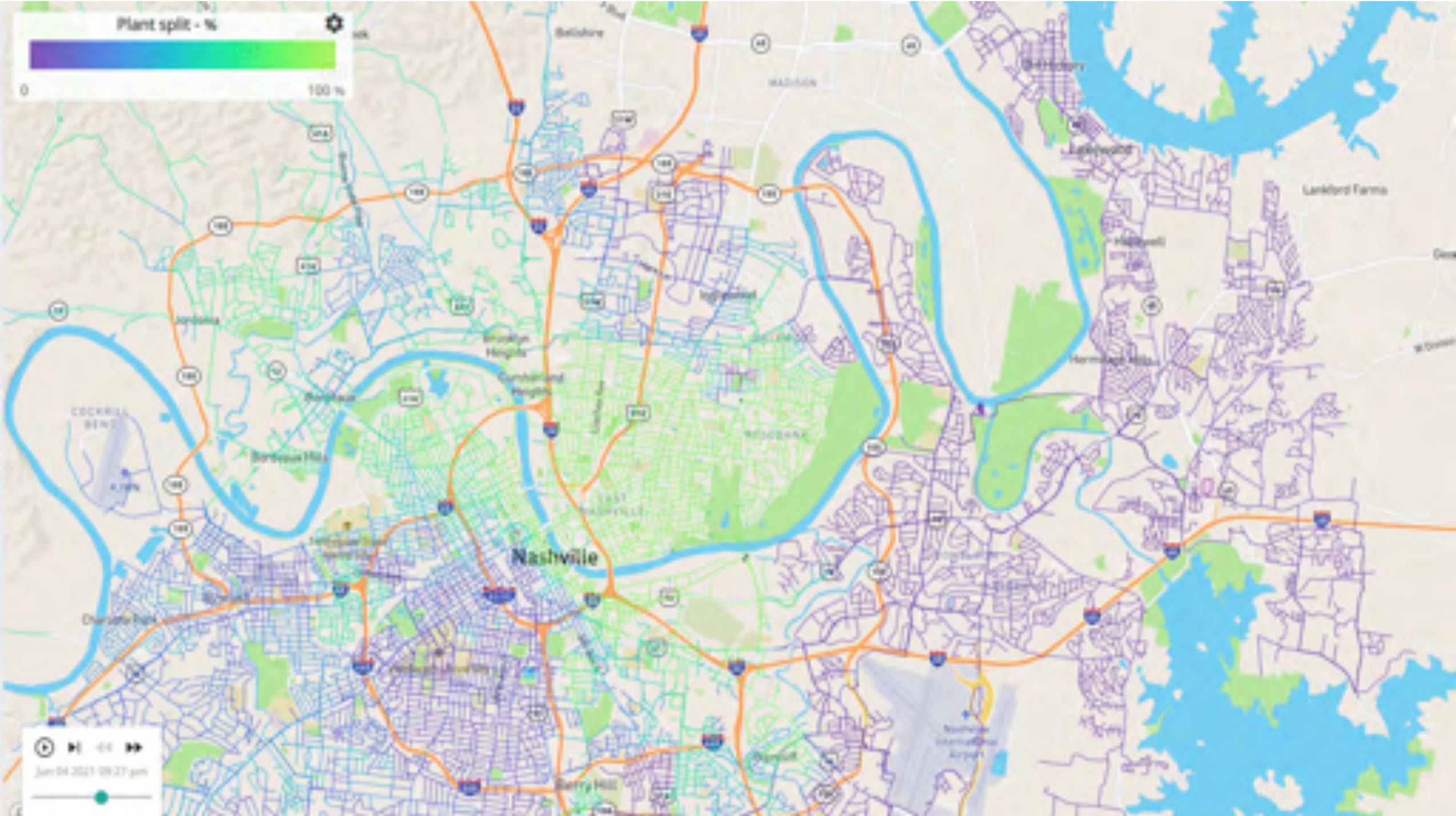
Plant split - %



100 %



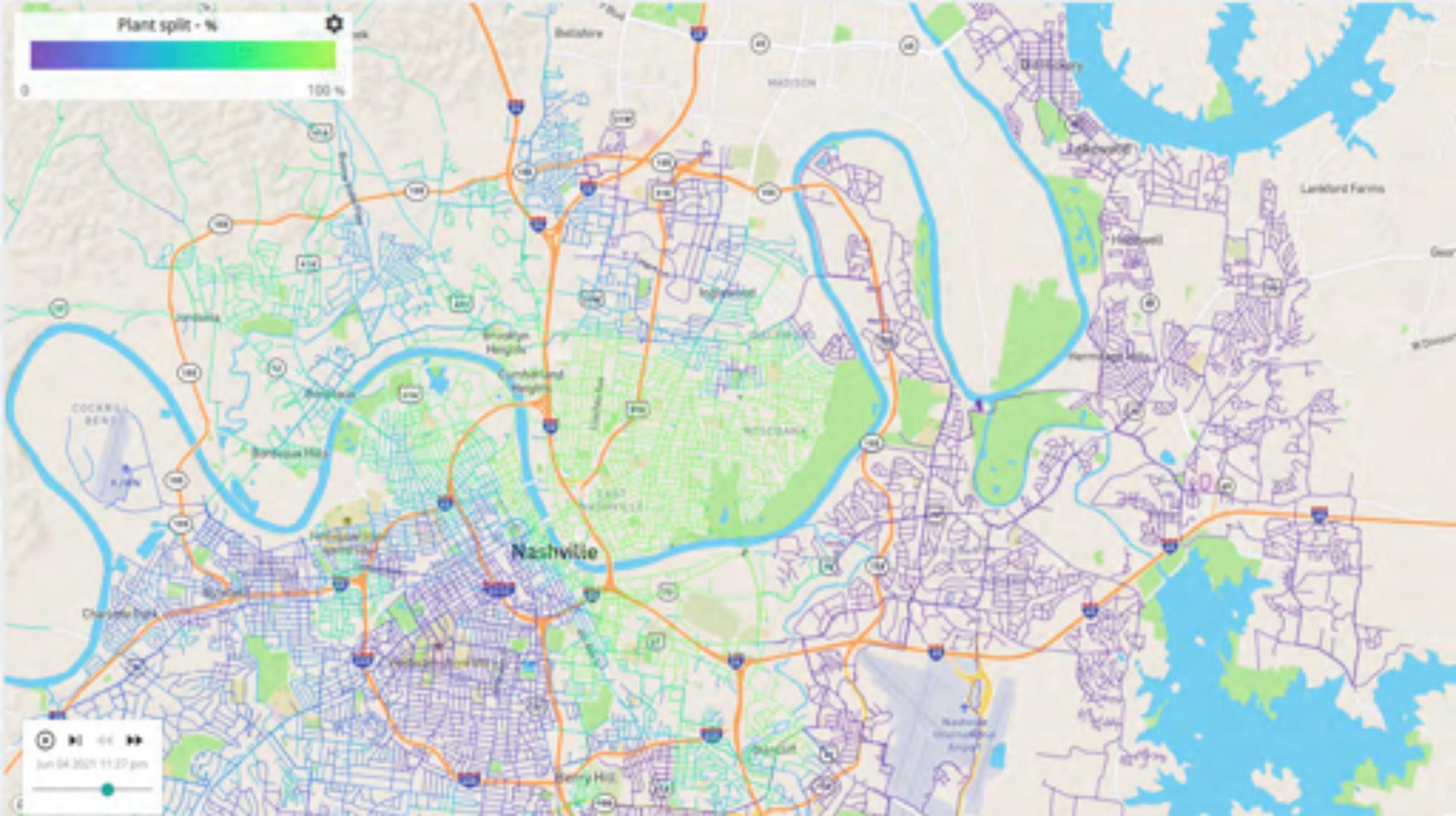
Jun 04, 2021 07:27 pm



Plant split - %



100 %

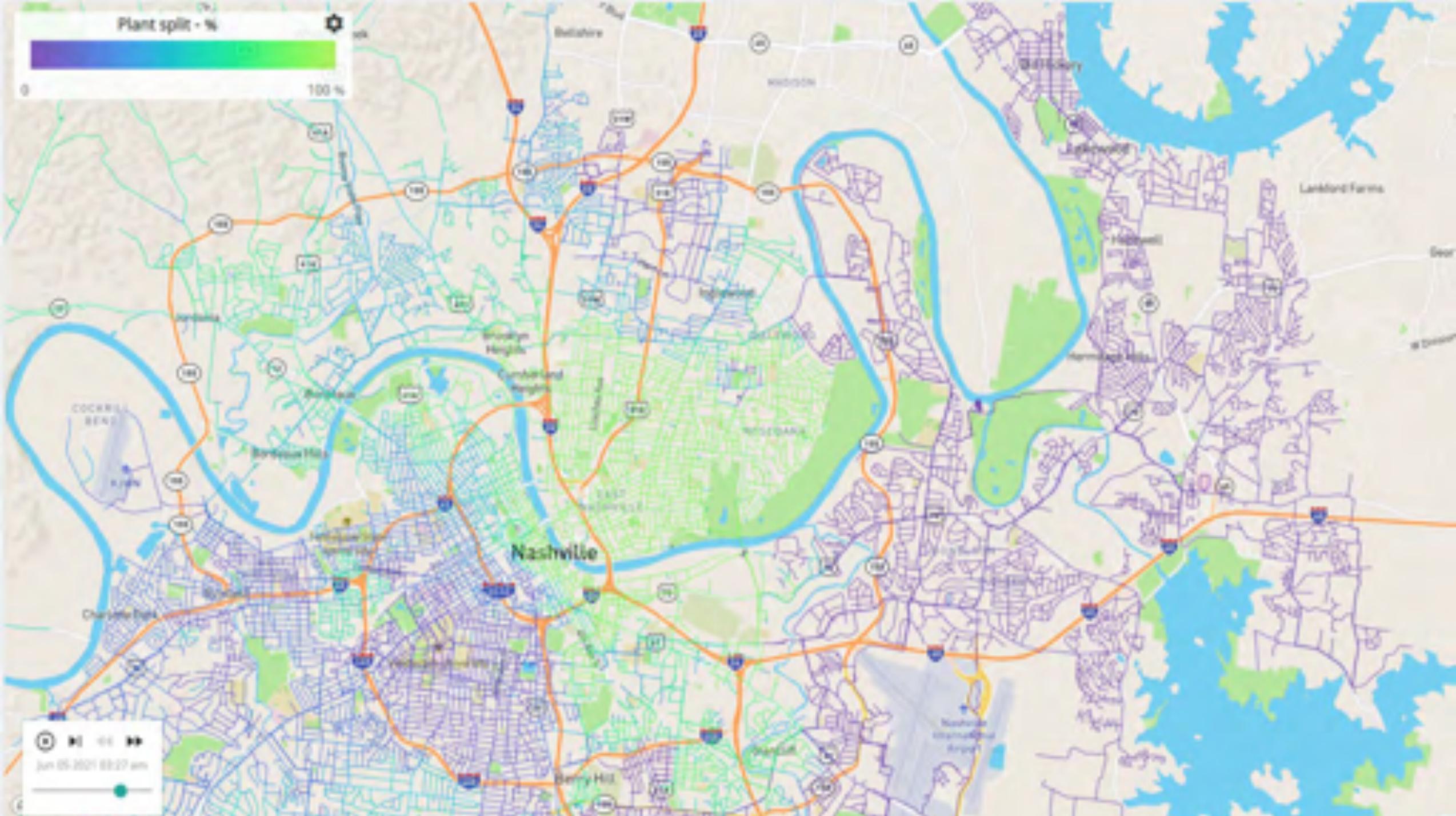


Jun 04 2021 11:27 pm

Plant split - %

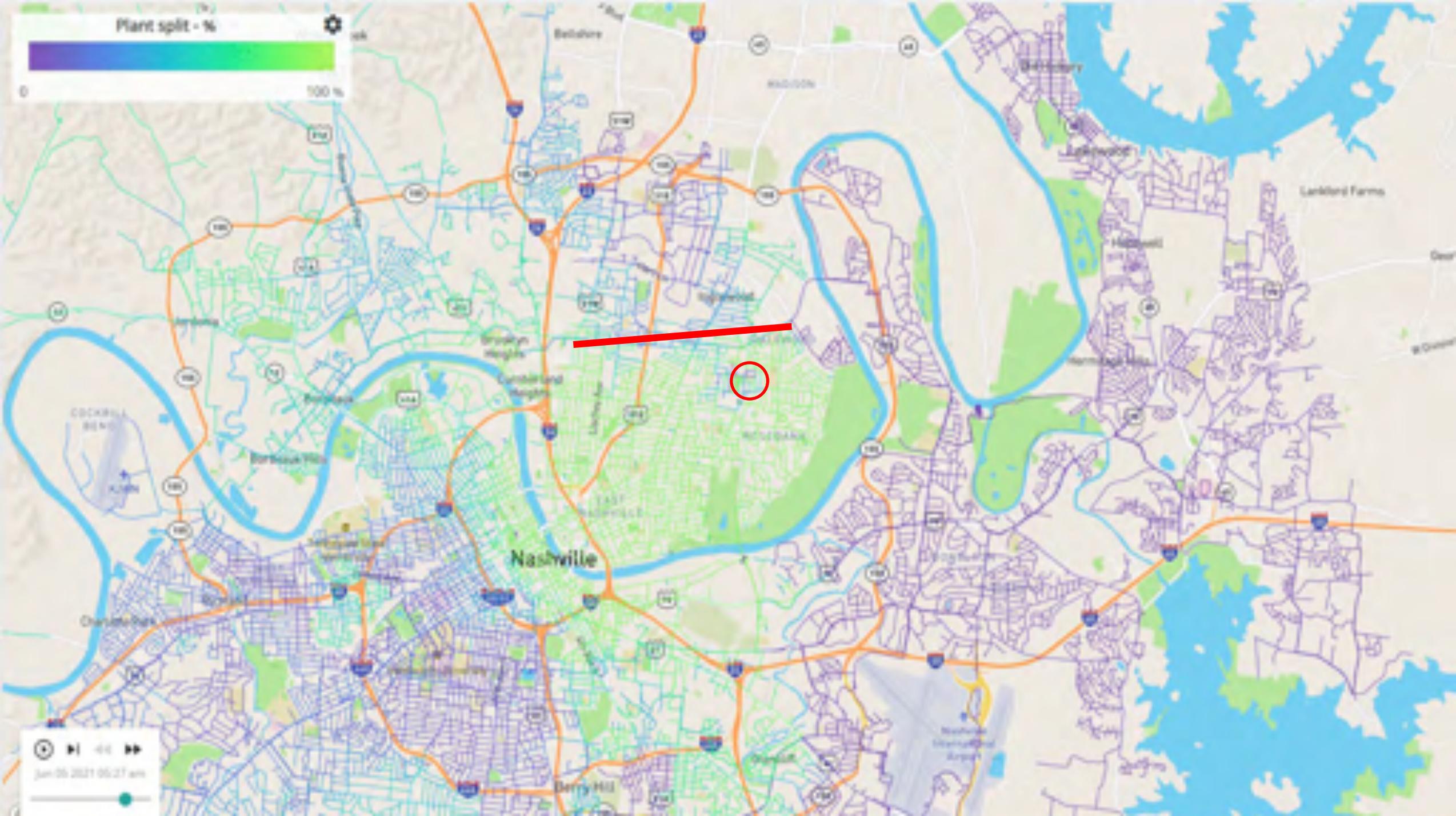


100 %



Jun 05 2021 09:27 am

Plant split - %



Nashville

Map navigation controls including a play button, a double left arrow, and a double right arrow. Below the arrows is the text "Jun-06 2021 06:27 am".

Water Age & Plant Source - Benefits

Why is this important?

What are you going to do with this information?

How will this change how you respond to water quality issues?

- Water quality complaint on Litton Avenue
- Water quality complaint on Essex Avenue

Water Age & Plant Source - Benefits

MWS feeds Powder Activated Carbon (PAC) for taste and odor

Old

- Taste and odor complaint on Litton
 - Increase PAC at both plants
- Taste and odor complaint on Essex
 - Increase PAC at both plants

New

- Taste and odor complaint on Litton
 - Increase PAC at Omohundro
- Taste and odor complaint on Essex
 - Flushing exercise

You cannot properly respond to water quality complaints if you don't know the source and age of the water

Water Network Optimization Solution

Future operations of water distribution systems will be through the integration of SCADA, the water model, and other key data

The future is now!



<https://www.xylem.com/en-us/brands/xylem-vue/>

Thank You!