

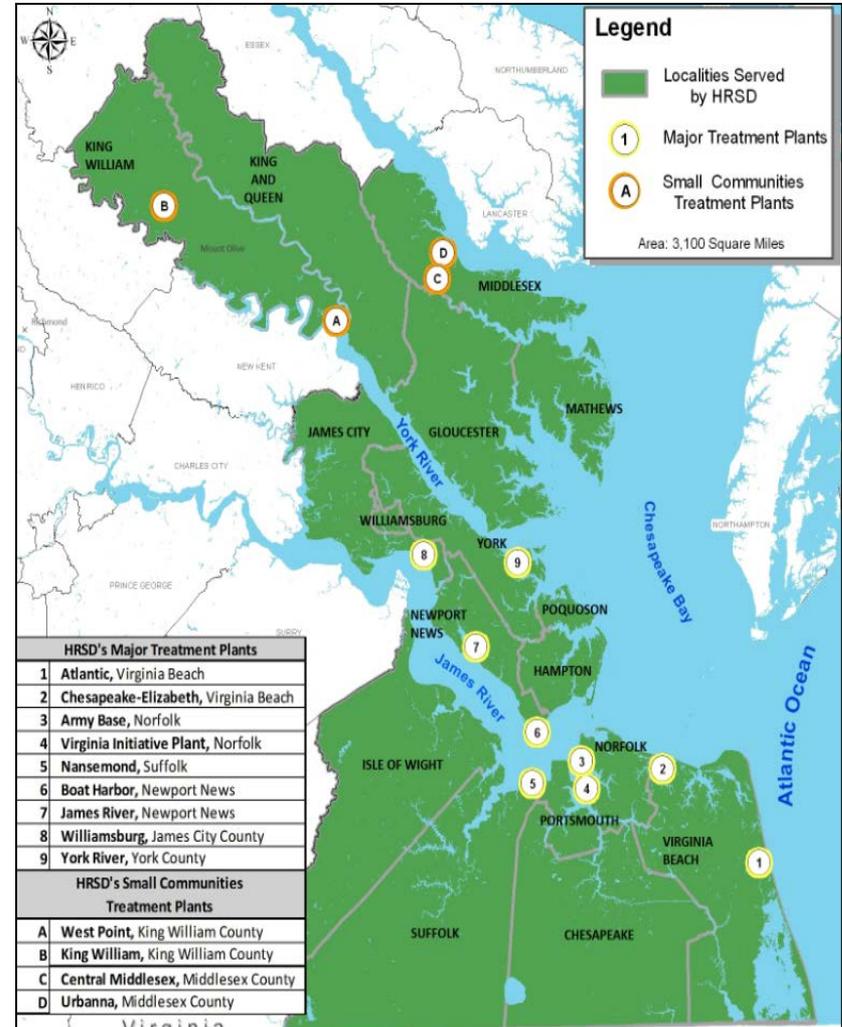


Groundwater Levels...Why Does HRSD Care?

September 20, 2016

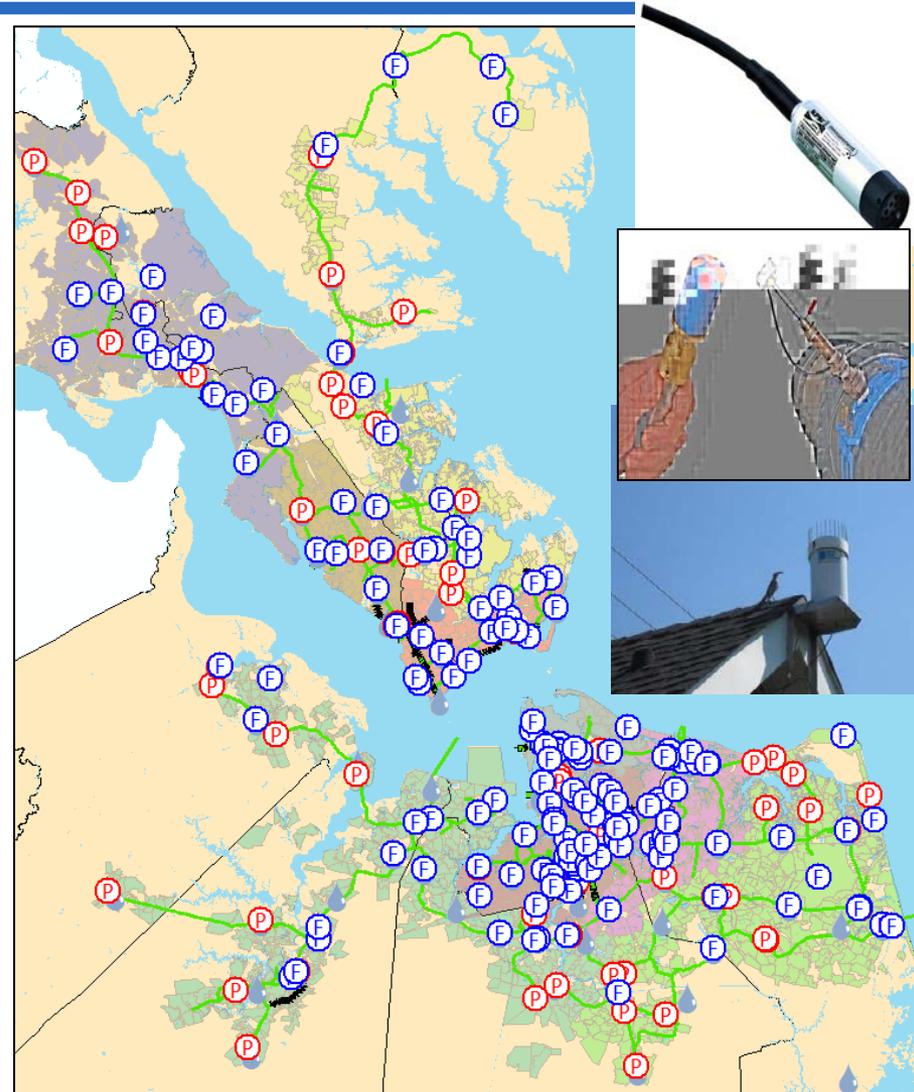
HRSD A Political Subdivision of the Commonwealth of Virginia

- HRSD serves 17 cities and counties.
- 13 Wastewater treatment plants
- Serves 1.7 million people.
- Over 500 miles of pipe, 6 to 66 inches in diameter.
- Combined capacity of ~249 million gallons per day.



HRSD's Monitoring Network

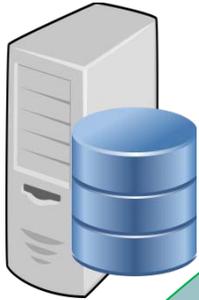
- 160 flow meters
- 156 pressure sensors
- 74 rain gauge
- 21 groundwater shallow well sensors
- NOAA Tide Data
- Multiple Weather Stations
- Collecting Pump Station data
 - RPMs, Drive Outputs, Wet Well Level



Viewing the Monitoring Network

Most data collected at 2-min intervals.

telog Web Module
A TRIMBLE COMPANY



PI Coresight

PI / Esri ArcGIS Integrator

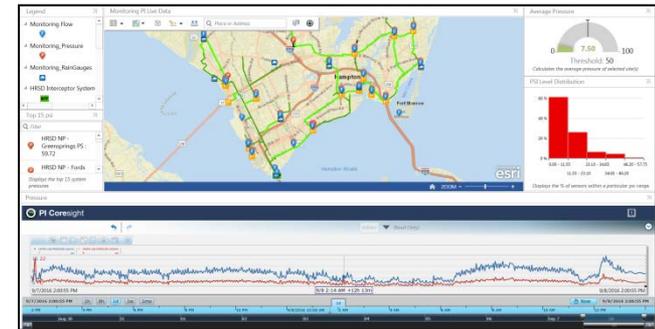
Arc GIS Online

PI Historian / Asset Framework



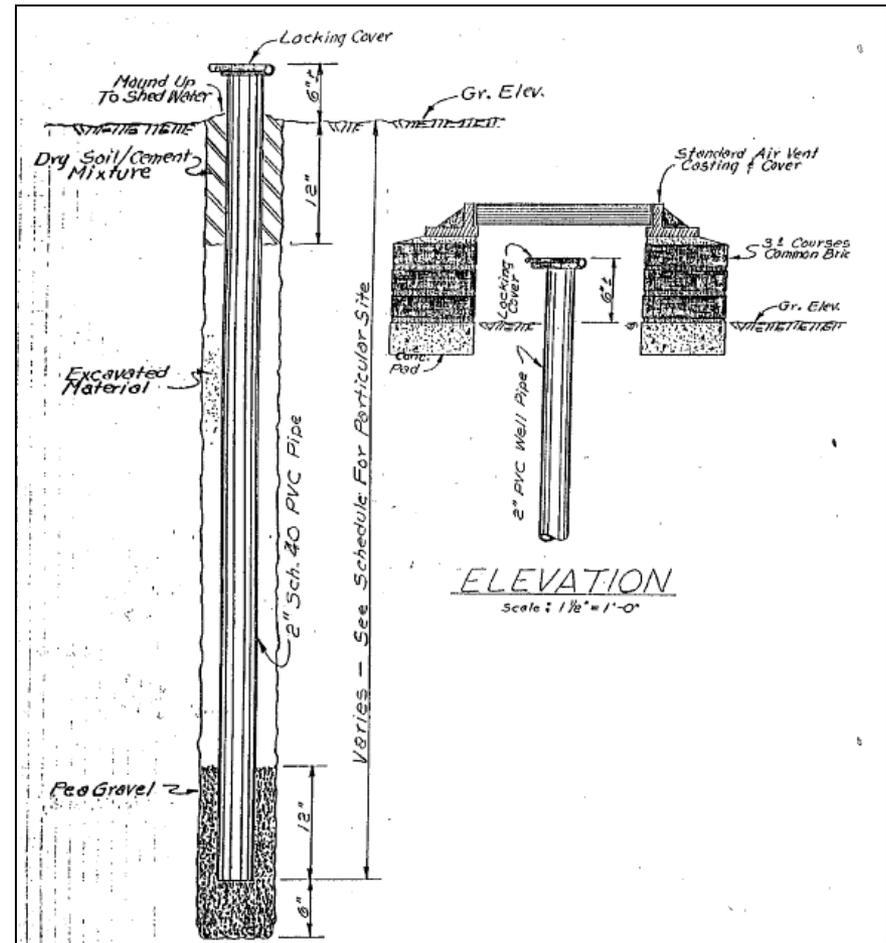
Telog Server

Telog Recorders in the Field



Shallow Wells - Where and How?

- 21 locations around HRSD Pump Stations
- Measures the water column in the well using pressure transducers
- Conversion to NAVD88 using the elevation of the sensor
- All are “shallow” wells
 - 8 ft – 21 ft in depth



Why is Groundwater Important to HRSD?

- Infiltration of groundwater
 - Cracked pipes, leaky manholes, and sump pumps
 - Adds additional wastewater for treatment

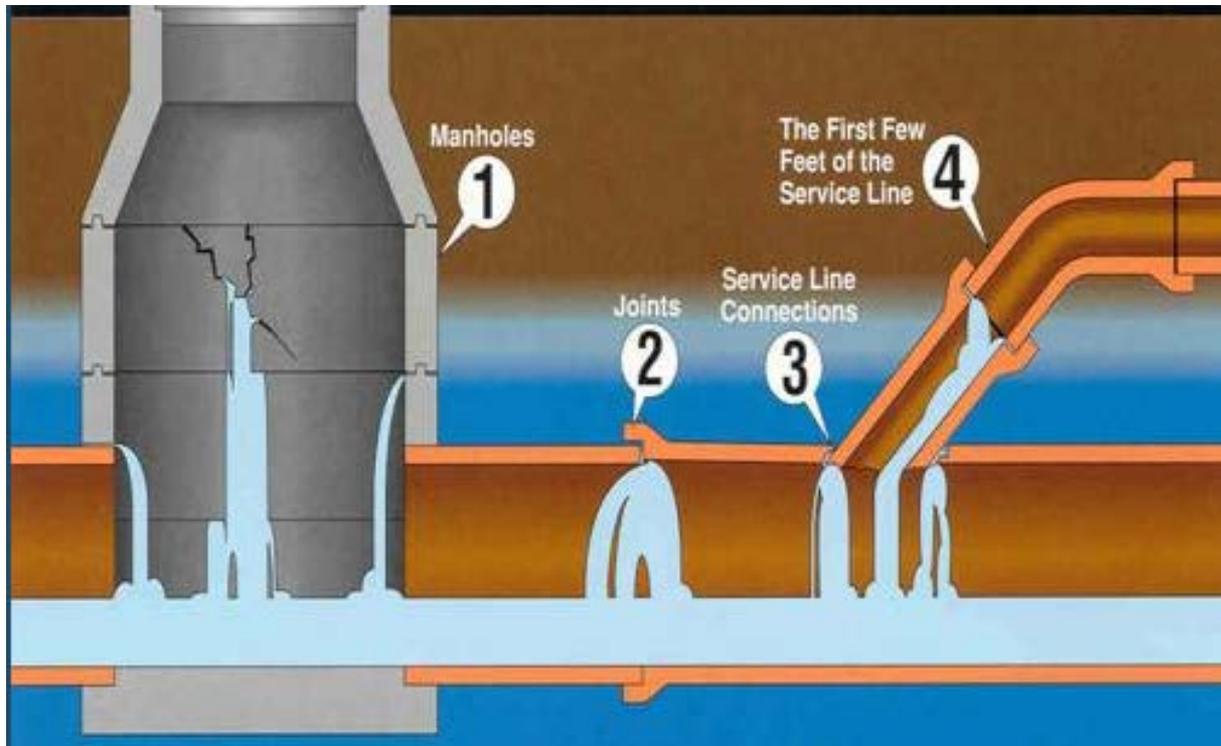


Photo courtesy of ICGA

What Does Infiltration Look Like?



But What Does it Really Look Like?



HRSD's Approach to Infiltration

- Sewer Lateral Investigation Program (SLIP)
 - Private Property Sewer Laterals
- Closed-Circuit Television Inspection (CCTV) of our collection system
 - HRSD system and Locality system
- Sanitary Sewer Evaluation Studies (SSES)
 - HRSD system and Locality system
- Capital Improvement Projects (CIP) of collection system (i.e. – pipes, manholes, etc)
 - HRSD system and Locality system

Why Are We Doing SLIP?

- Sewer Lateral Investigation Program (SLIP)
 - Laterals are a significant part of most systems
- State and Federal mandates to reduce sewage overflows
- Find the most cost-effective solution
 - Pilot projects
 - Flow monitoring
 - Engineering



**Private
Laterals**



**Public
Sewers**

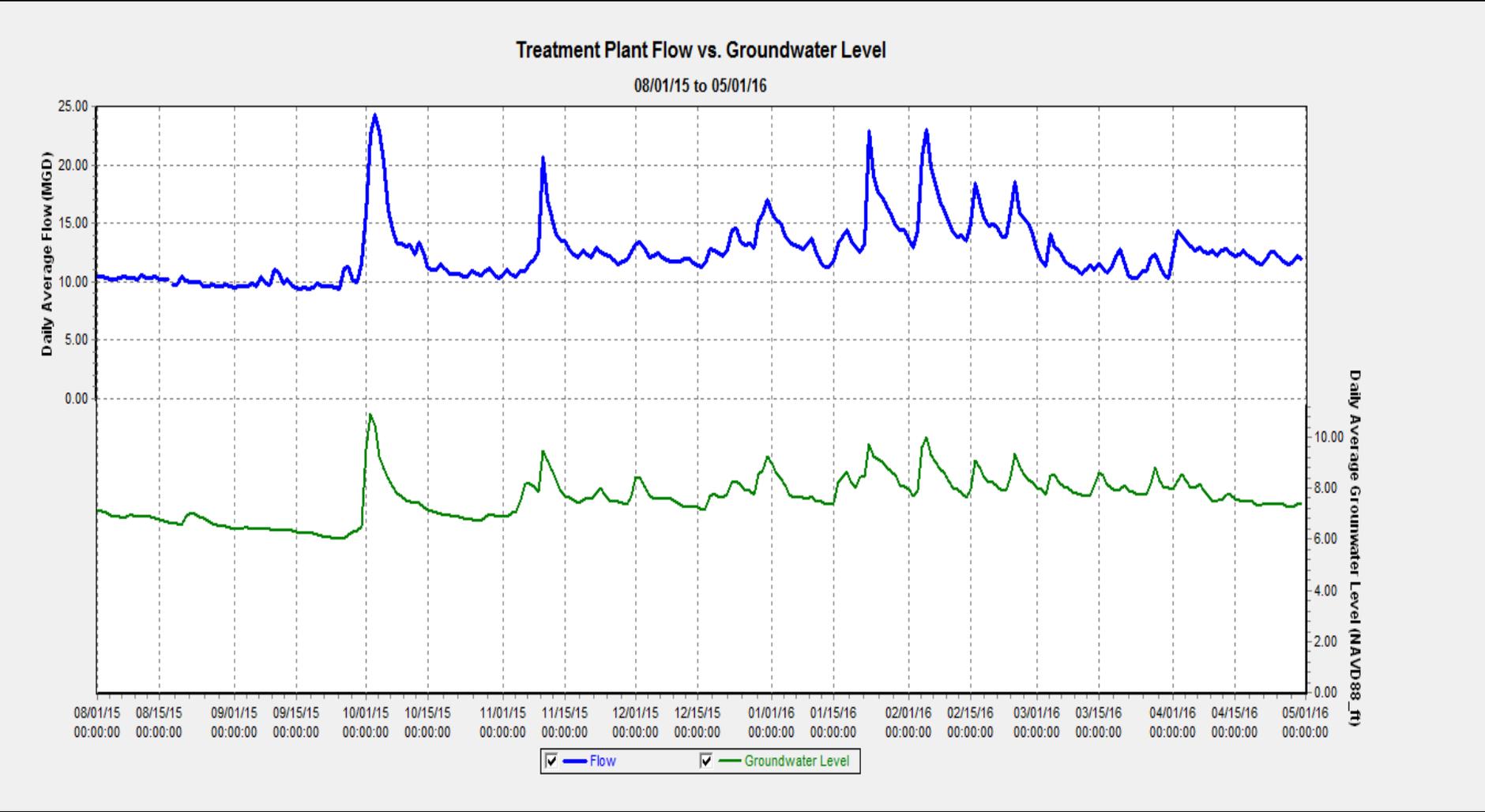


**HRSD
Sewers**



**Treatment
Plants**

Groundwater in the Wastewater System

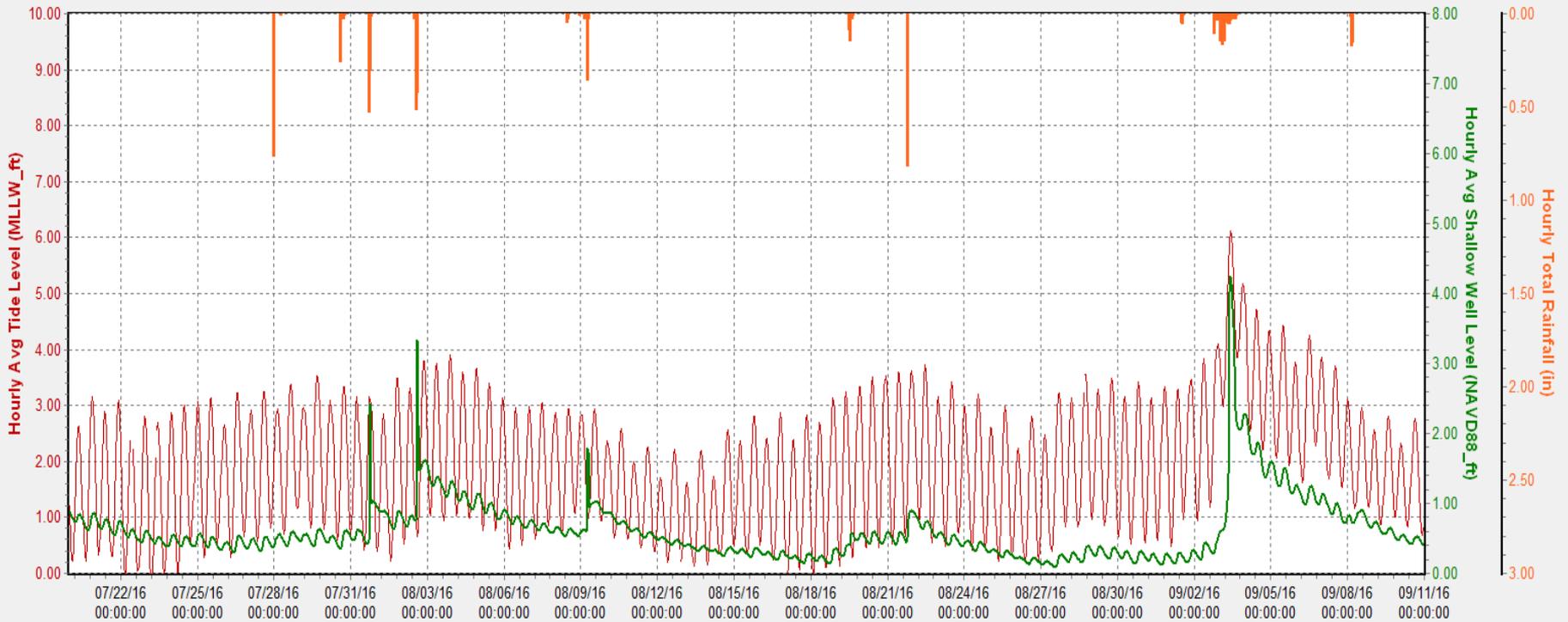


Groundwater, Tide, and Rainfall Comparison

Sewells Point Tide Gauge

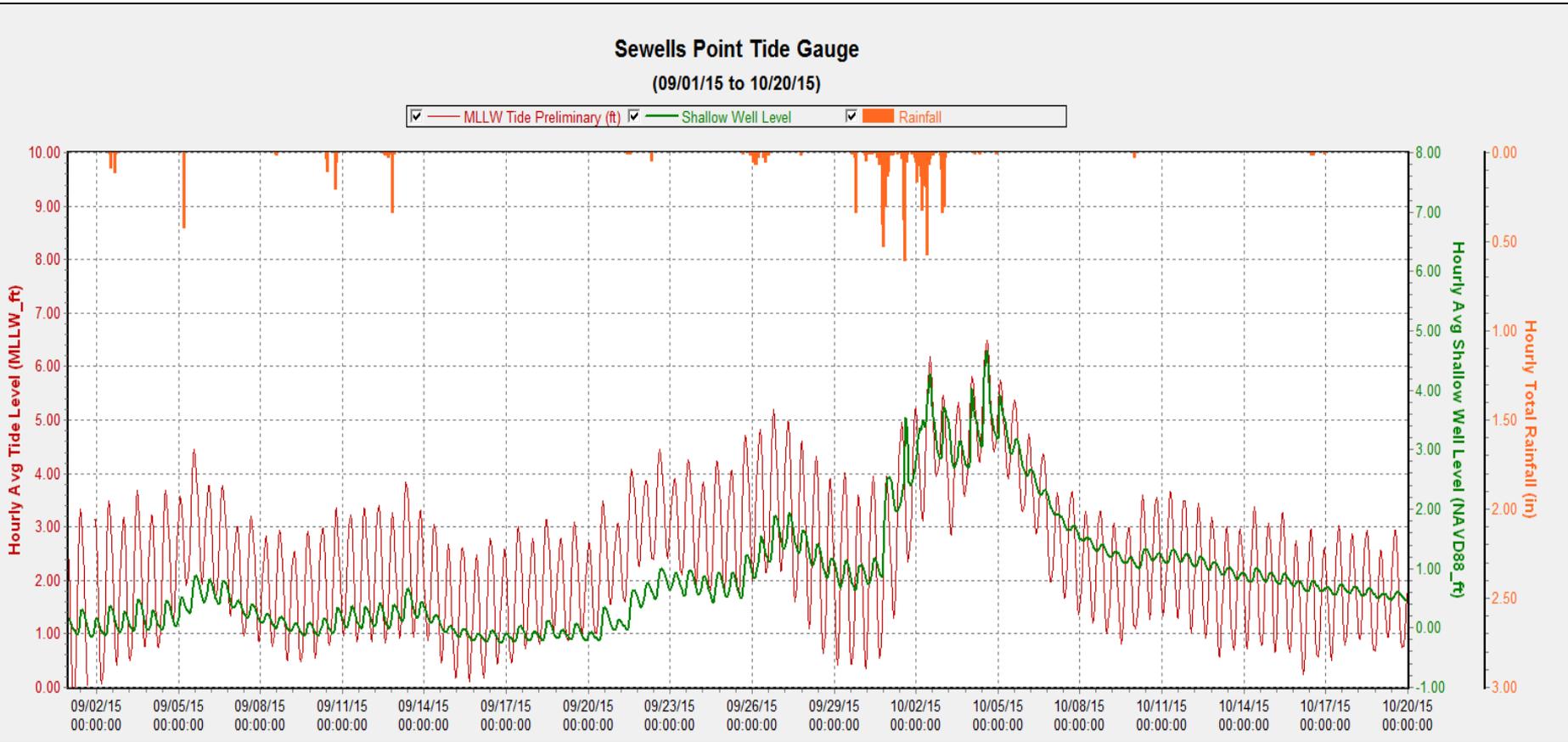
(07/20/16 to 09/11/16)

MLLW Tide Preliminary (ft) Shallow Well Level Rainfall



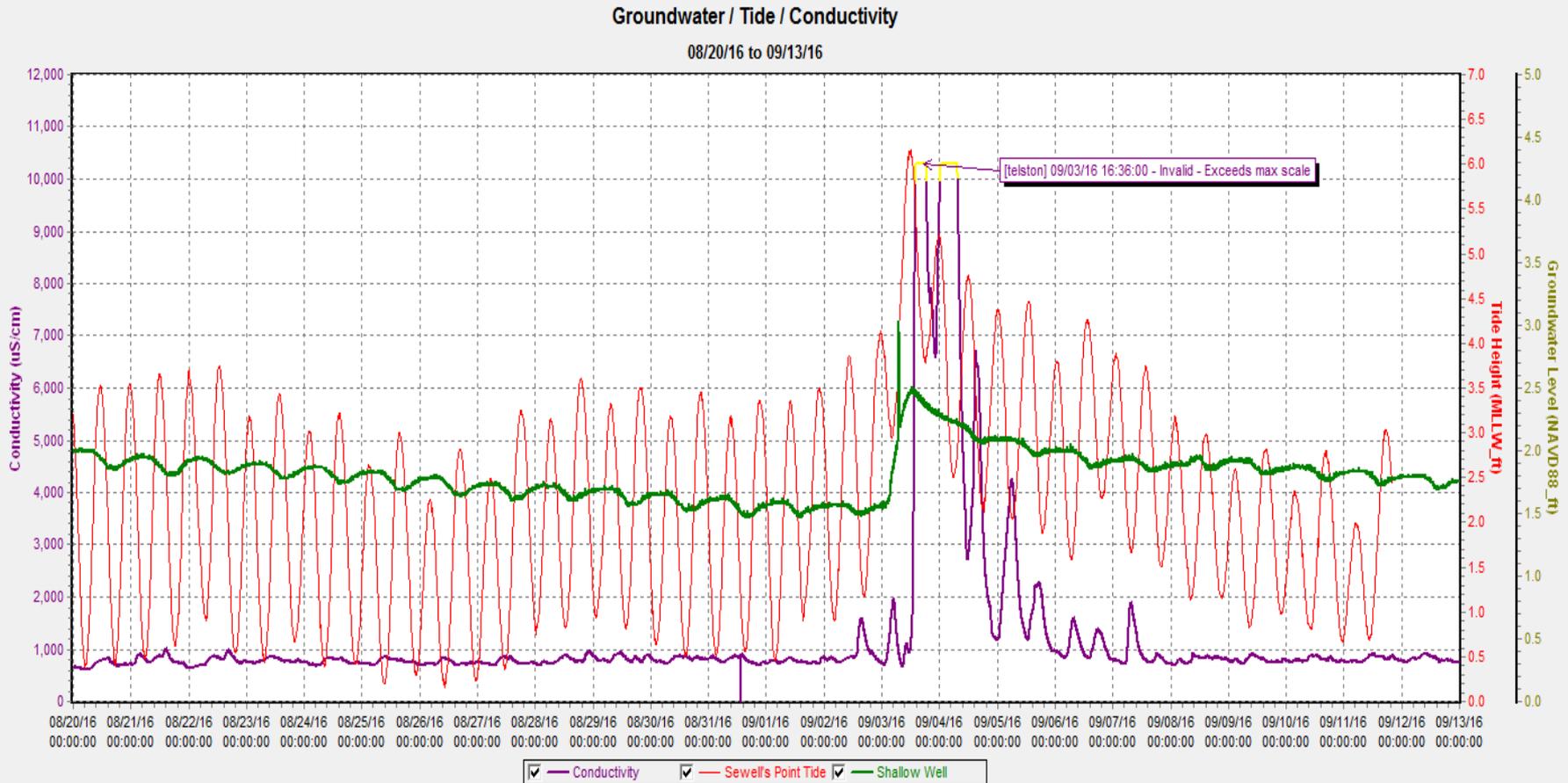
Groundwater Levels During Tidal Only Event

Groundwater levels trend with tide levels.



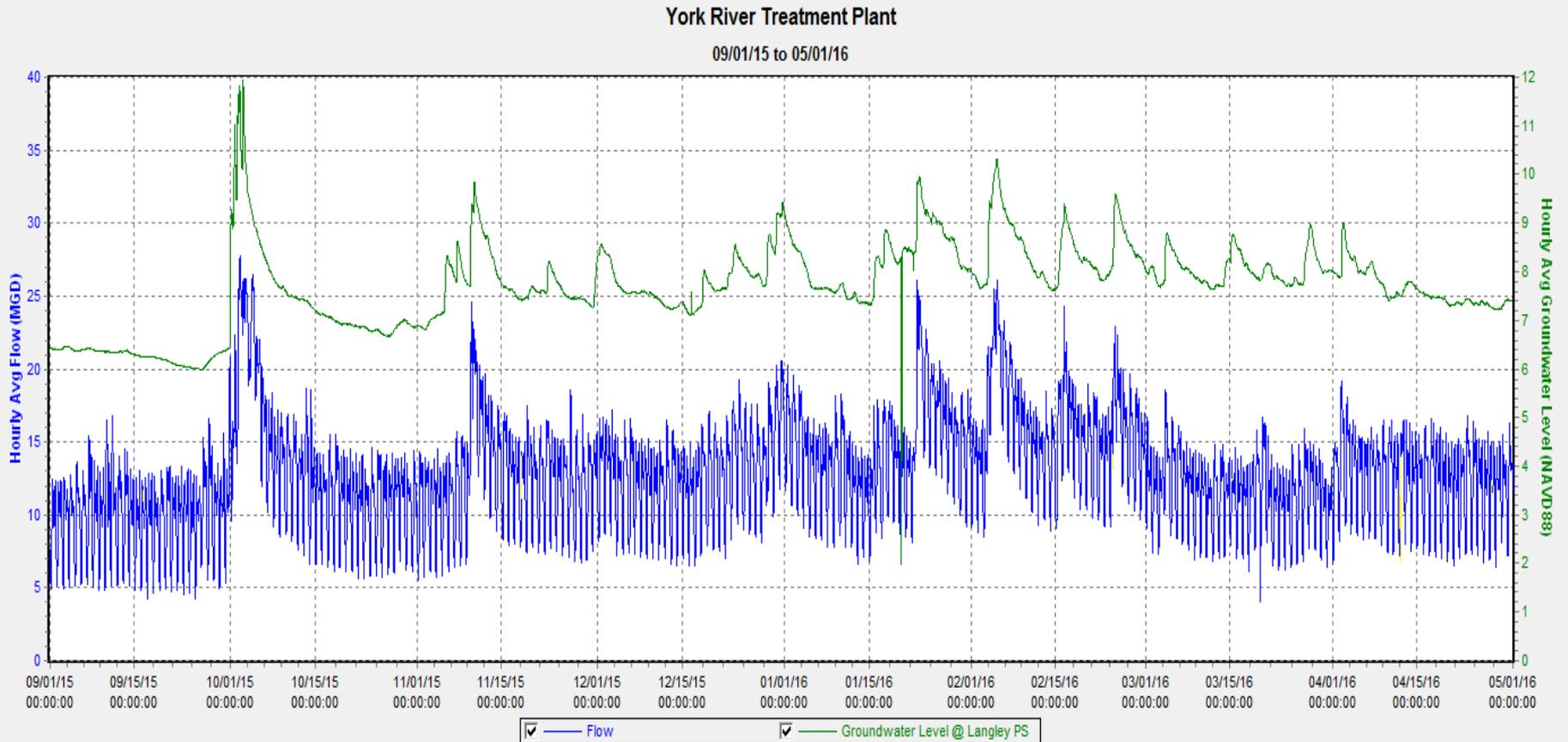
Conductivity in Wastewater

Conductivity levels in our sewer system increase with tides.



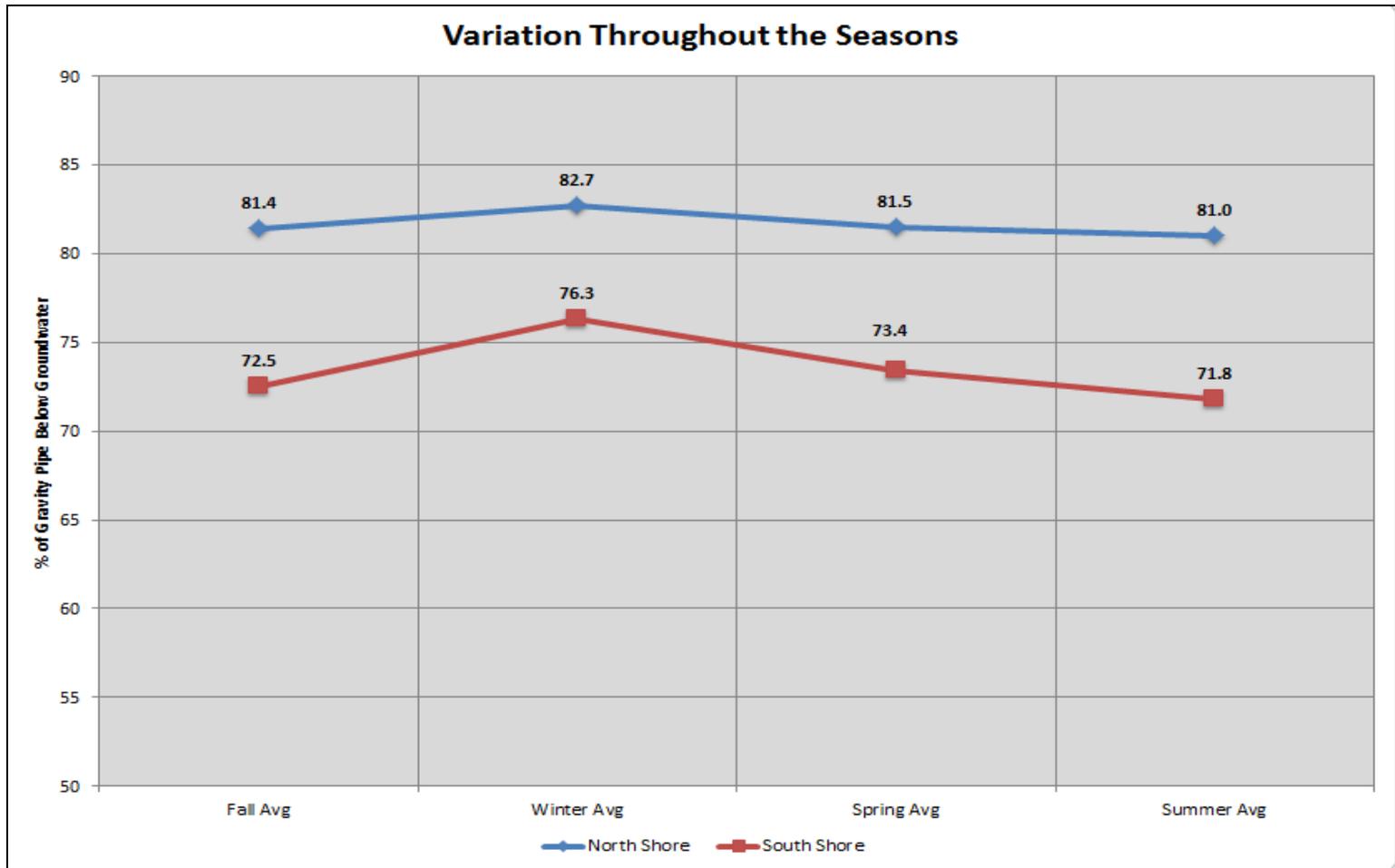
Long-Term Effects of Elevated Groundwater

Groundwater stays elevated...wastewater flows stay elevated...

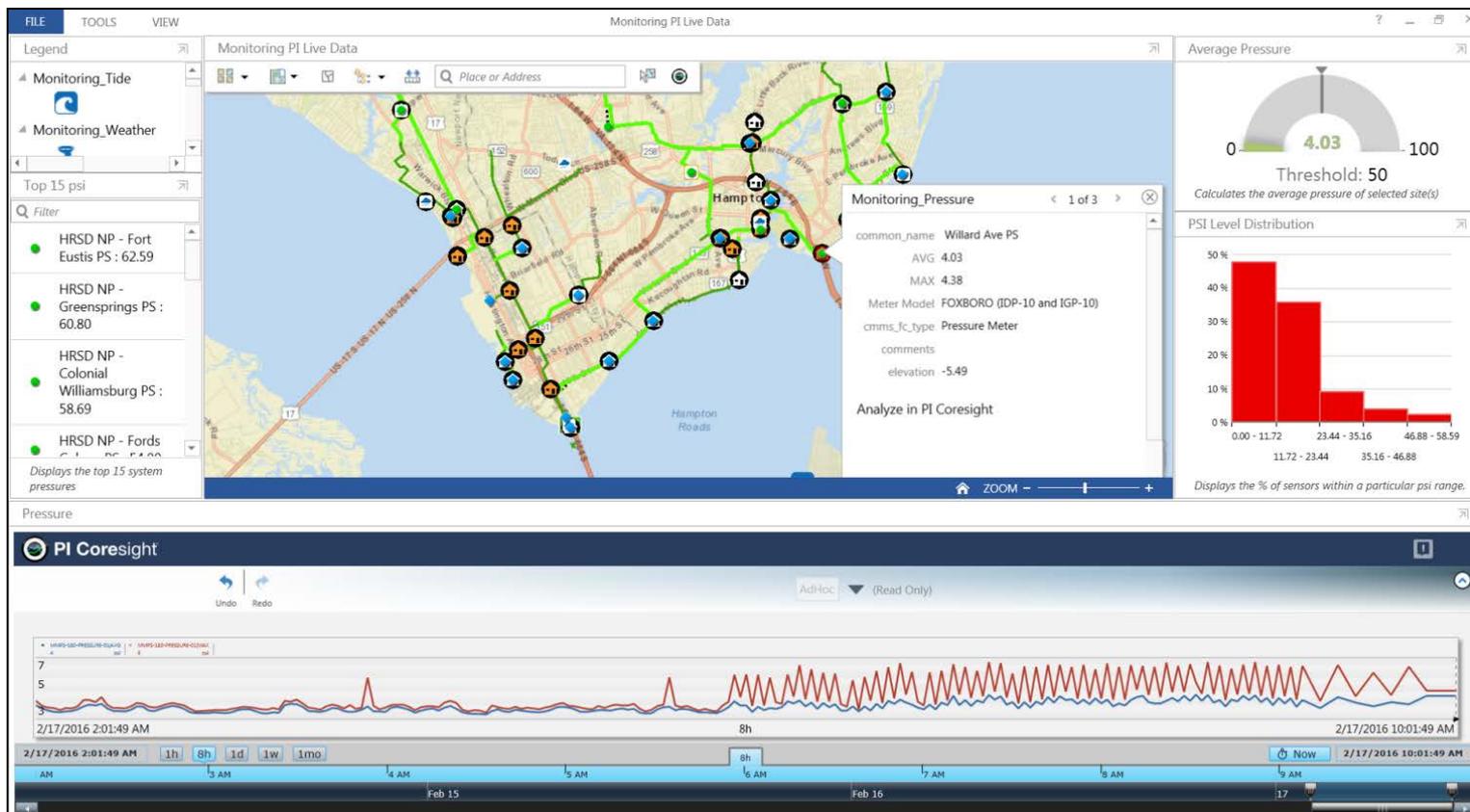


Infrastructure vs. Seasonal Groundwater Levels

- What percent of the gravity system is “potentially” below the groundwater?



- Calculate the level of groundwater compared to our infrastructure
- Add to PI/Esri ArcGIS for instantaneous visuals.



- Test conductivity in HRSD shallow wells during a “normal” tides and during high tide events
- Increase CCTV inspections on those sections of pipe that are under water
- Selection of pipe may be different during construction projects
- Move up projects in CIP schedule
- Known dewatering issues during construction and PMs

- Groundwater can infiltrate wastewater collection system
- Increased cost to HRSD to transport and treat wastewater
- High conductivity causes settling issues at wastewater treatment plant.



Questions / Comments??