Advances in Telemetry

{ Finding out what is really going on in your system

Who am I

- Dr. David Mundie
- President of High Tide Technologies
- Involved in telemetry design for over 30 years
- Space, Air and Ground Telemetry
- Lately focused on the telemetry for utilities in the Water, Wastewater, and Natural gas industries

Telemetry is the wired or wireless transmission and reception of measured quantities for the purpose of remotely monitoring environmental conditions or equipment parameters. The term is also used in reference to the signals containing such data.

What is Telemetry?

SCADA (supervisory control and data acquisition) is a category of software application program for process control, the gathering of data in real time from remote locations in order to control equipment and conditions.

What is SCADA?

- Plants
  - Where a PLC or large SCADA program reads status and controls the treatment process
- Collections Systems
  - To get pump and overflow alarms, and system sizing and preventative maintenance information.
- Distribution Systems
  - To maintain tank levels, monitor flows and pressures and detect leaks through the system.

Where do utilities use Telemetry and SCADA?

- Alarms
  - Equipment Failures
  - Power Failures
  - Overflow avoidance
  - Leak detection
- Operations
  - Tank Level controls
  - Water usage monitoring
- Maintenance
  - Tracking pump and valve performance
  - Water loss tracking

Why Do I Need Telemetry?

- Wired
  - Usually in a plant
  - Ethernet, dial up phone lines and leased lines to remote sites
  - Landline phone dialers
- Wireless
  - In plant wireless networks like WIFI or Zigbee
  - Point to point radio networks with repeaters (licensed and unlicensed)
  - Cellular networks (ATT, Verizon , Sprint, …)
  - Satellite networks (Iridium, Inmarset, Orbcomm, …)

Types of Telemetry/SCADA

- Polled
- Report by exception
  - Monitor only ONE-WAY
  - Monitor and control/configure TWO-WAY
- Hybrid

Types of Telemetry/SCADA

- Remote Terminal Unit (RTU)
- Radio/modems
- Sensor/Transducers
- Repeaters
- Base stations
- Software
- Human Machine Interface (HMI)

Components of a SCADA Sys

- Cost
  - Initial cost
  - Maintenance cost
  - Support and communications cost
- Coverage
  - Will this technology reach all my sites?
  - Is solar power an option
- Support
  - Will the supplier be there to support and modify the system over time?
  - Is the system easy to repair?

Key Parameters When Choosing a System

Cost Factors

- Initial Cost
  - Equipment cost per site,
    - one size fits all or various models
  - Equipment cost for towers and base stations software
  - Engineering costs such as radio surveys and licenses
  - Installation cost (Is self-install an option?)
- Maintenance Cost
  - Maintenance contracts?
  - Replacement parts and service calls after the warranty runs out
  - Annual software licenses
- Support
  - Phone line costs, internet costs, cellular cost
  - Annual support fees

Coverage Factors

- Does the chosen technology reach all your sites
- With radio system remote sites may need extra repeaters
- With cellular coverage signal may be weak or non-existent at remote sites
- Phone line may be very expensive to install at remote sites
- Satellite systems generally have coverage anywhere
- Solar powered equipment could save at tank sites

- Biggest question is how will your SCADA supplier support you for the long term?

- Are they local or long distant
- Will they be able to support your system remotely and what will there be individual charges be for that.
- Is there a fee for ongoing phone support and/or changes to the system
- If they are a local distributor do they have the expertise in house to repair or make changes

Support Factors

High Tide Technologies System

{ One Example

Type of System

- Hosted Subscription System

- Purchase hardware for remote sites
- SCADA software is hosted over the internet
- Annual fee per unit that covers communications and 24x7 support.

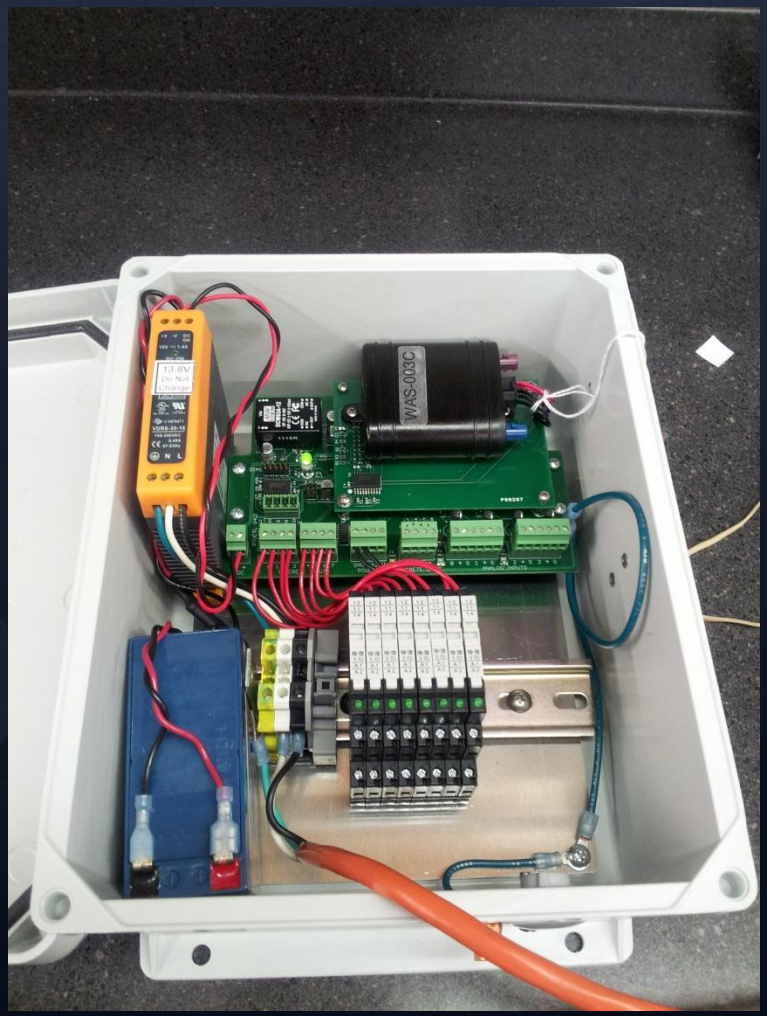
- Hardware supports multiple communications types
  - Satellite (Iridium)
  - Cellular (ATT and Verizon)
  - Direct Ethernet (usually plants)
- Communications type is transparent to the user on the SCADA interface

Type of Communication

- GPG Grinder Pump Guardian
- HTT-200 2 Alarm inputs
- HTT-900 12 Digital inputs
- HTT-1100 8 Digital inputs and 4 Analog inputs
- HTT-2100 8 Digital inputs, 4 Analog inputs, 4 relay outputs
- HTT-3100 28 Digital inputs, 6 Analog inputs, 8 relay outputs, and 2 Analog outputs
- HTT-4100 More than 3100 with options

Wide Range of RTUs

- 12 digital inputs
- 10x8 Enclosure
- Satellite or cellular
- Typical applications:
  - Sewer lift stations
  - Pulse output meters



HTT-900

Base Station

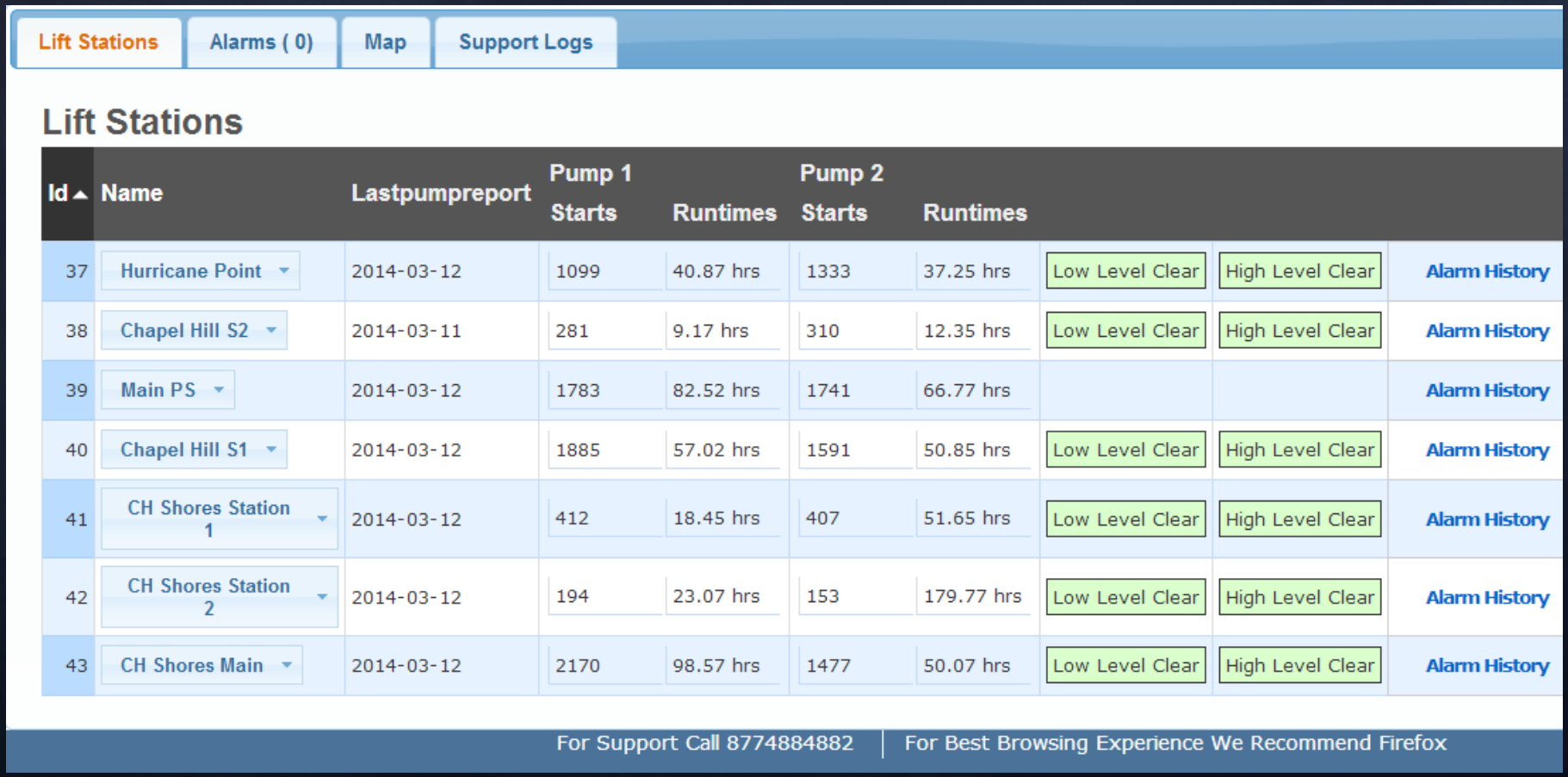
- No customer base station
- Base station function is hosted on HTT servers
- Customer uses standard internet browser to access their system
- Works on any computer, tablet, or smart phone

- Sewer Lift station
- Large Meters
- Water Tanks
- Water Booster stations, monitor and control
- Valve stations, monitoring and control
- Water Plants
- Sewer Plants
- Raw Water intake stations
- Natural Gas Odor injectors and regulators
- …

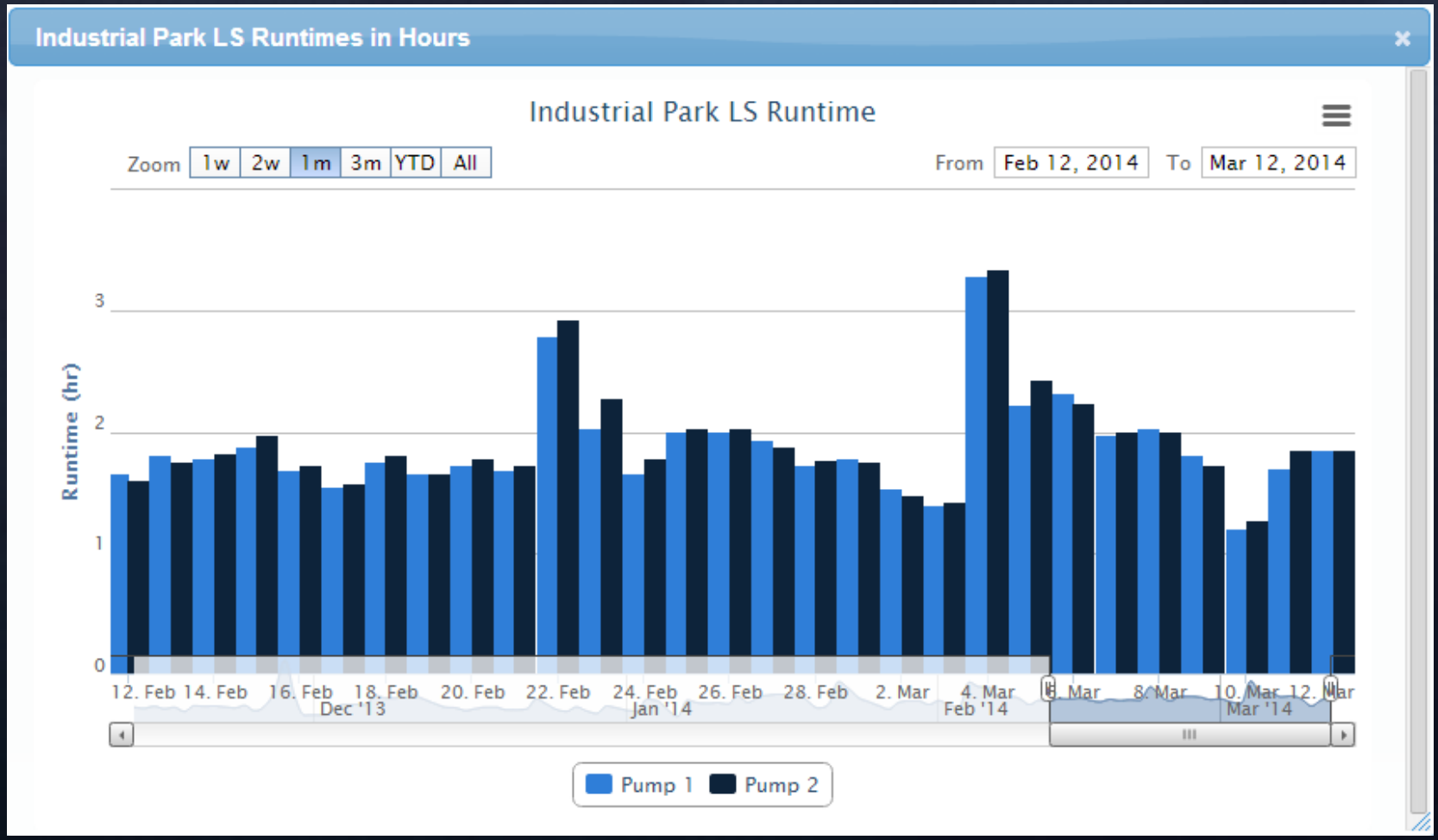
Applications

HMI Screen Shots

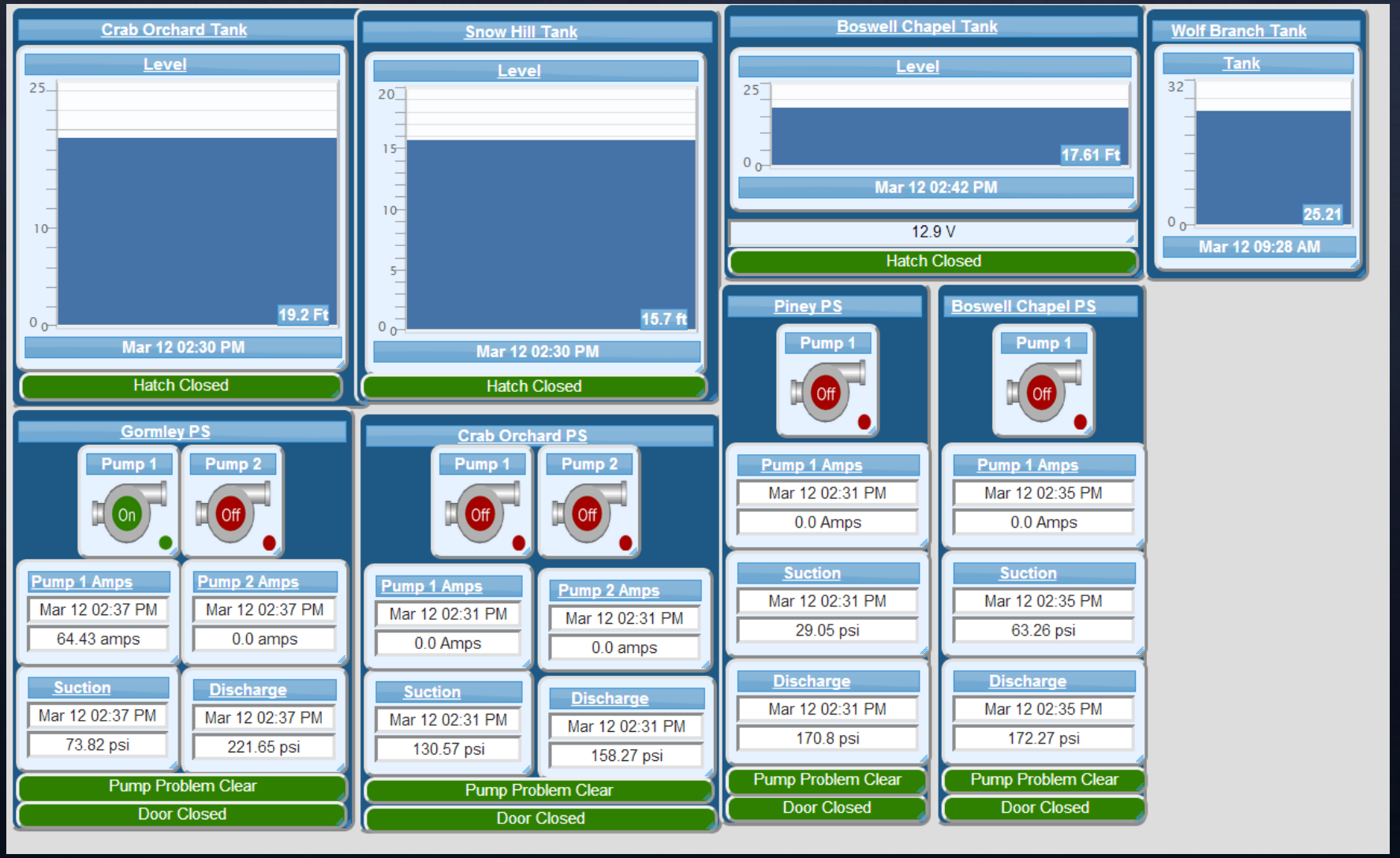
- Typical



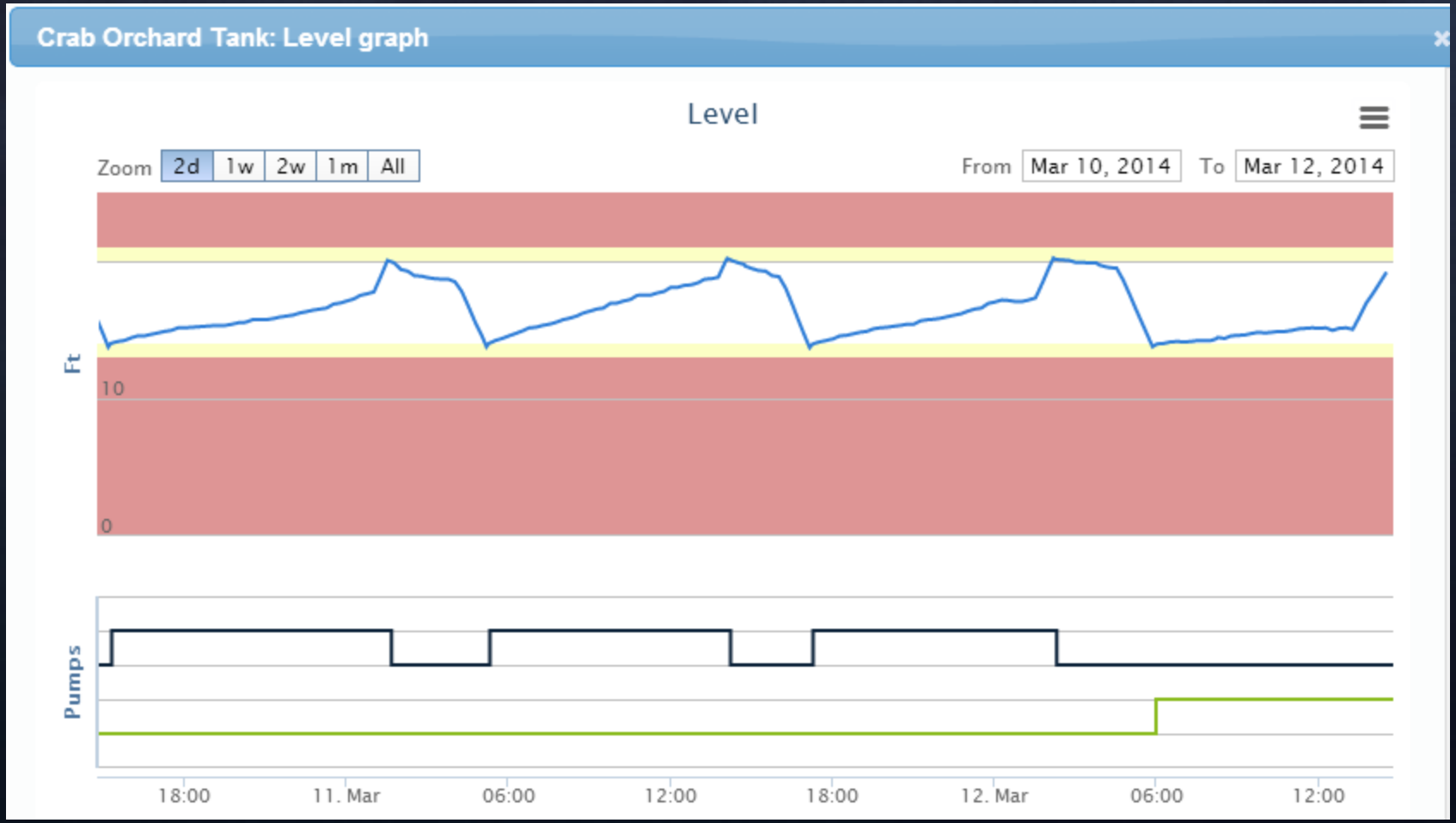
Collection System



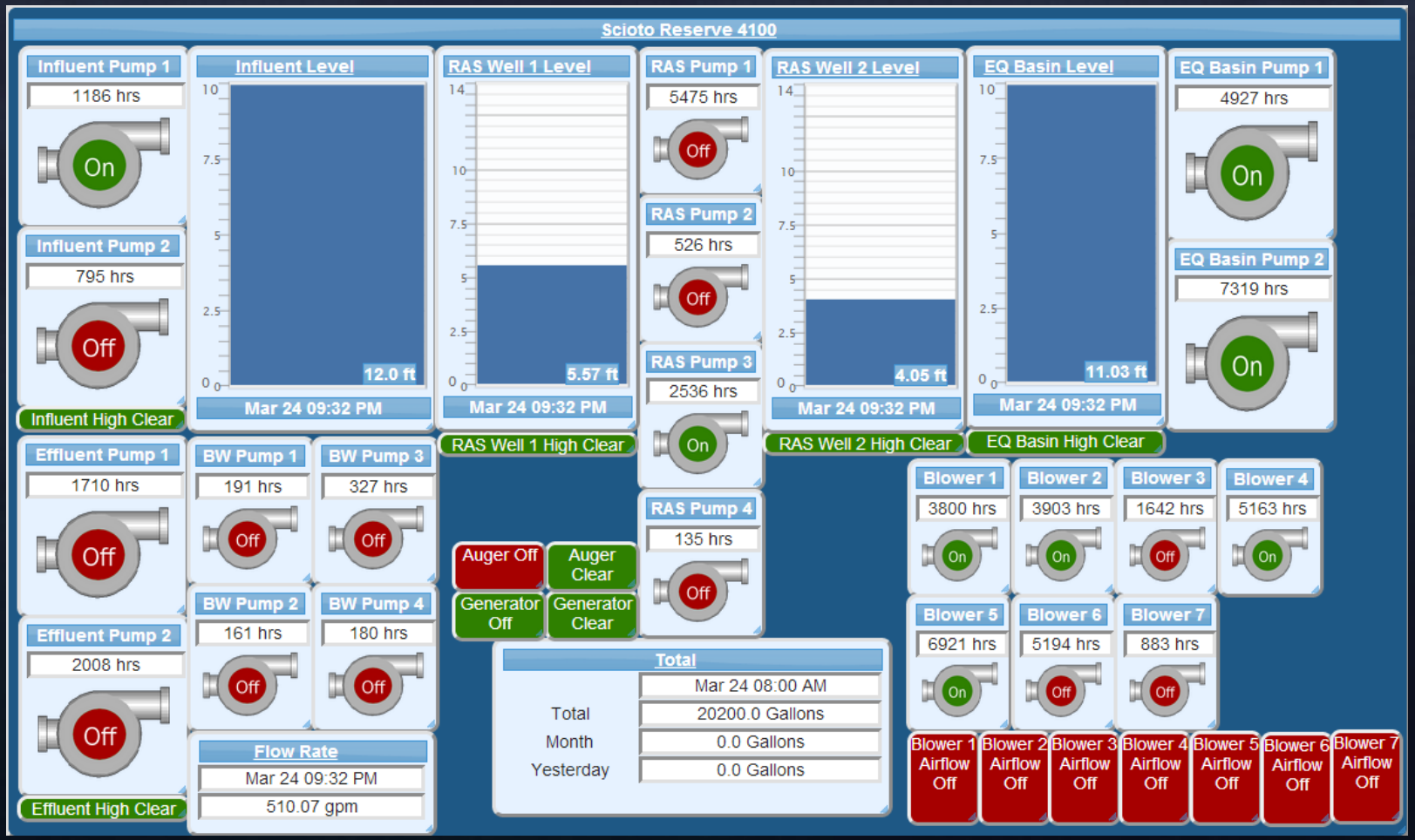
Runtime Analysis



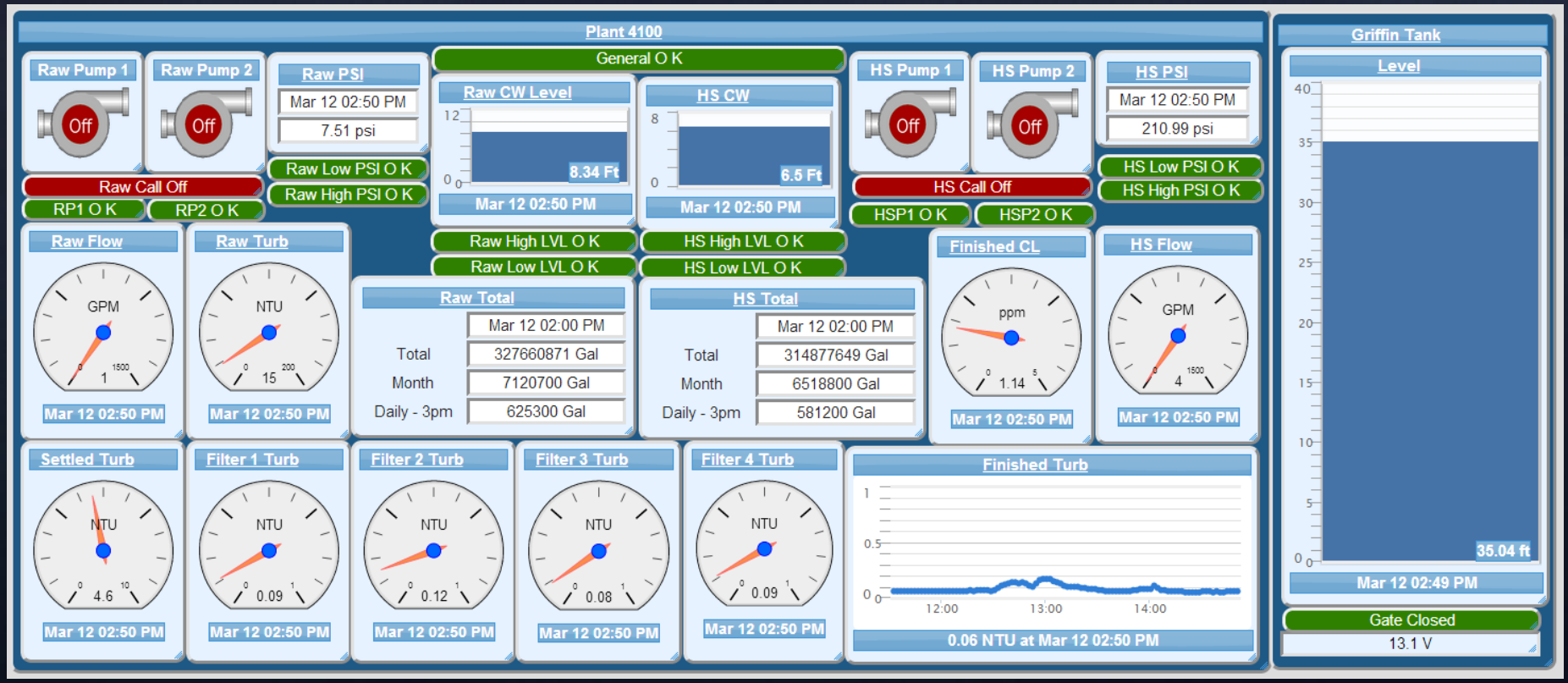
Distribution System



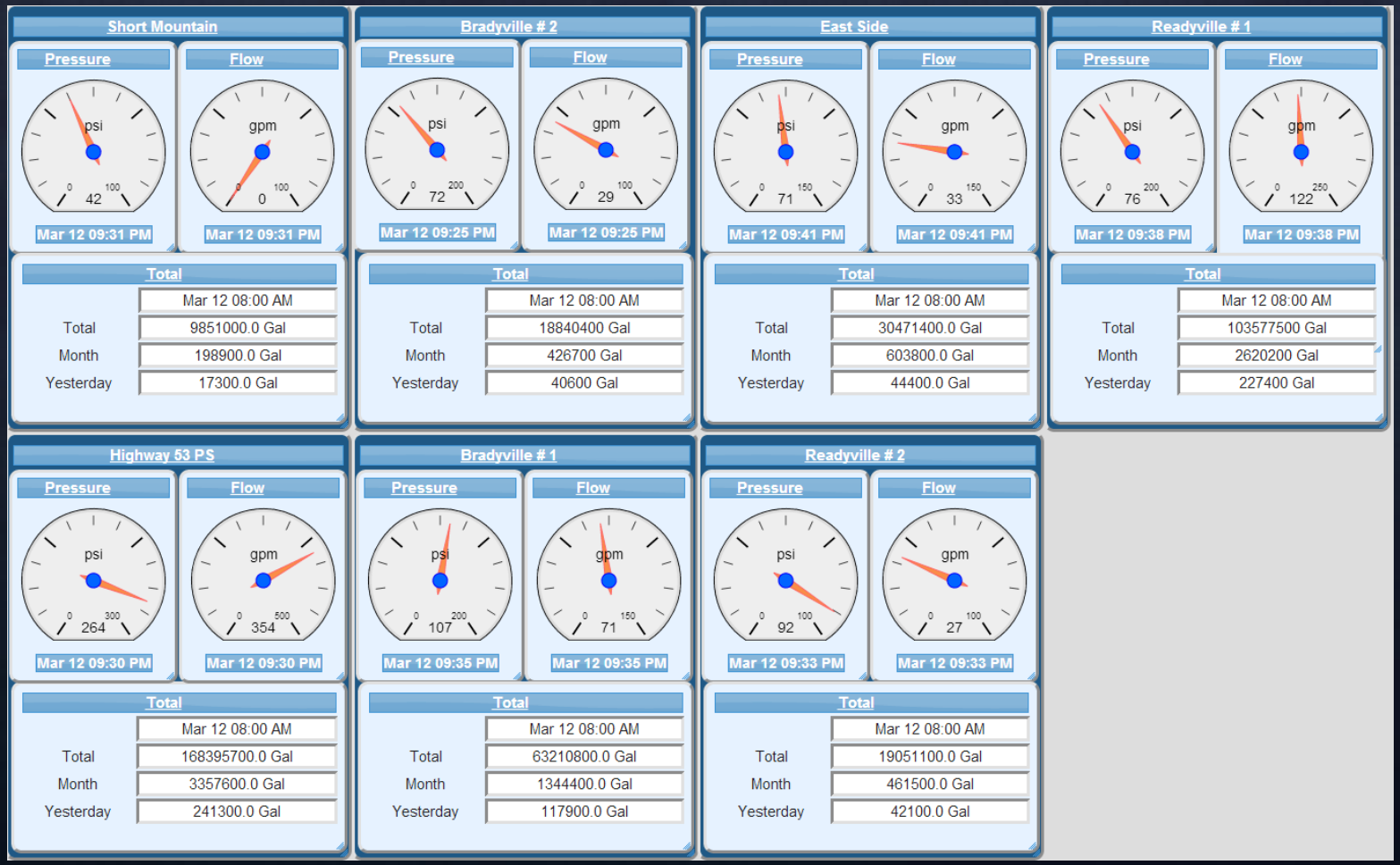
Tank/Pump Graph



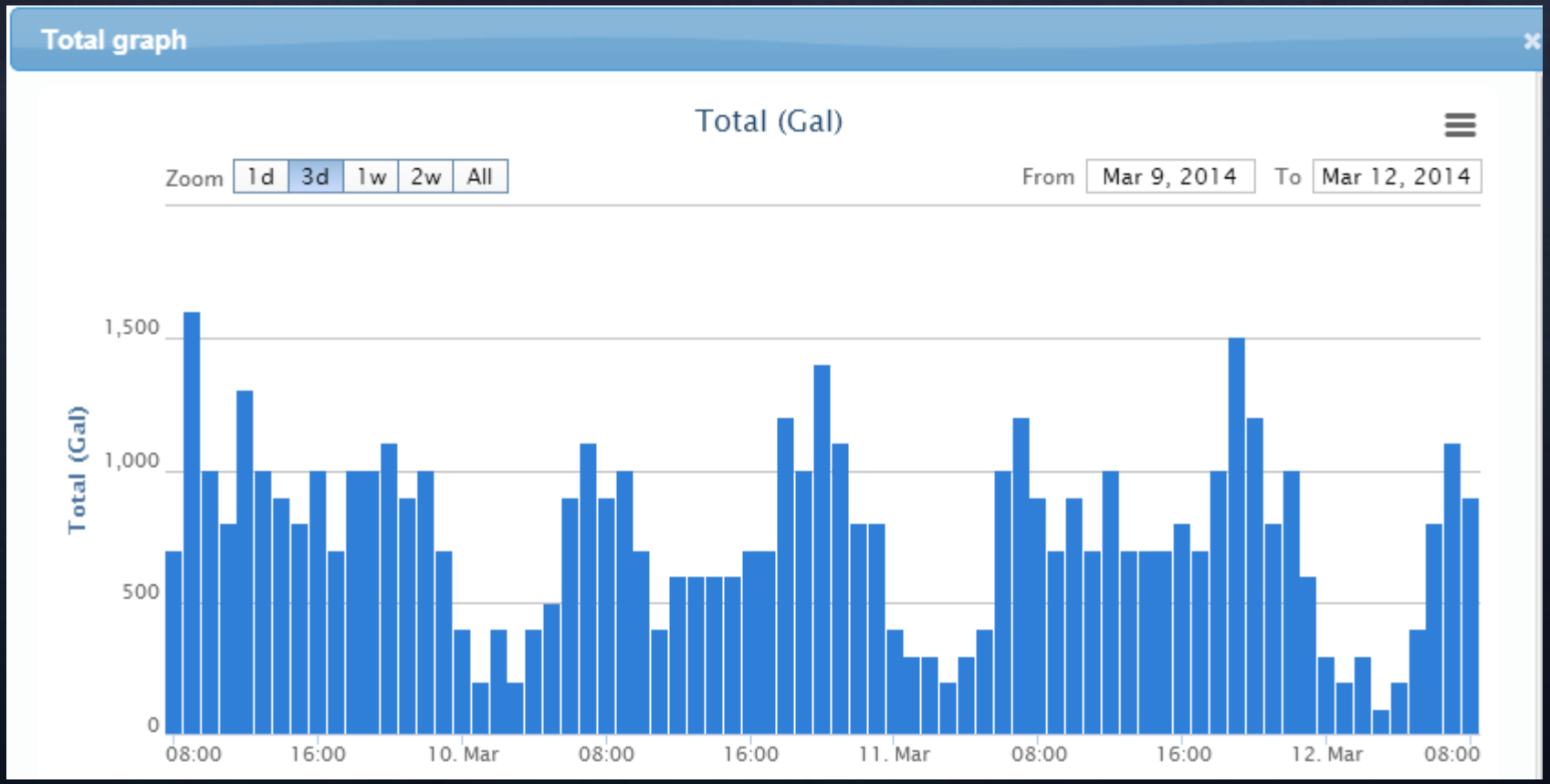
WW Treatment Plant



Water Treatment Plant


Short Mountain
Pressure
psi
42
Mar 12 09:31 PM
Flow
gpm
0
Mar 12 09:31 PM
Total
Mar 12 08:00 AM
Total 9851000.0 Gal
Month 198900.0 Gal
Yesterday 17300.0 Gal
Bradyville # 2
Pressure
psi
72
Mar 12 09:25 PM
Flow
gpm
29
Mar 12 09:25 PM
Total
Mar 12 08:00 AM
Total 18840400 Gal
Month 426700 Gal
Yesterday 40600 Gal
East Side
Pressure
psi
71
Mar 12 09:41 PM
Flow
gpm
33
Mar 12 09:41 PM
Total
Mar 12 08:00 AM
Total 30471400.0 Gal
Month 603800.0 Gal
Yesterday 44400.0 Gal
Readyville # 1
Pressure
psi
76
Mar 12 09:38 PM
Flow
gpm
122
Mar 12 09:38 PM
Total
Mar 12 08:00 AM
Total 103577500 Gal
Month 2620200 Gal
Yesterday 227400 Gal
Highway 53 PS
Pressure
psi
264
Mar 12 09:30 PM
Flow
gpm
354
Mar 12 09:30 PM
Total
Mar 12 08:00 AM
Total 168395700.0 Gal
Month 3357600.0 Gal
Yesterday 241300.0 Gal
Bradyville # 1
Pressure
psi
107
Mar 12 09:35 PM
Flow
gpm
71
Mar 12 09:35 PM
Total
Mar 12 08:00 AM
Total 63210800.0 Gal
Month 1344400.0 Gal
Yesterday 117900.0 Gal
Readyville # 2
Pressure
psi
92
Mar 12 09:33 PM
Flow
gpm
27
Mar 12 09:33 PM
Total
Mar 12 08:00 AM
Total 19051100.0 Gal
Month 461500.0 Gal
Yesterday 42100.0 Gal

Zone Meters



Meter History Graph

- Telemetry is very useful for monitoring and maintaining your system
- Often pays for itself with preventative maintenance cost savings
- Many different types of telemetry systems
- Many types of wireless technology to choose from
- New technology lets you monitor your system from anywhere
- Good cost analysis should include maintenance and recurring support costs
- It is much more efficient than driving around looking at tank targets and lift station alarm lights

Summary

Contact Information

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That's all Folks!