

11/16/2022

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# Pump Optimization: San Jose Water's Application of the AVEVA PI System

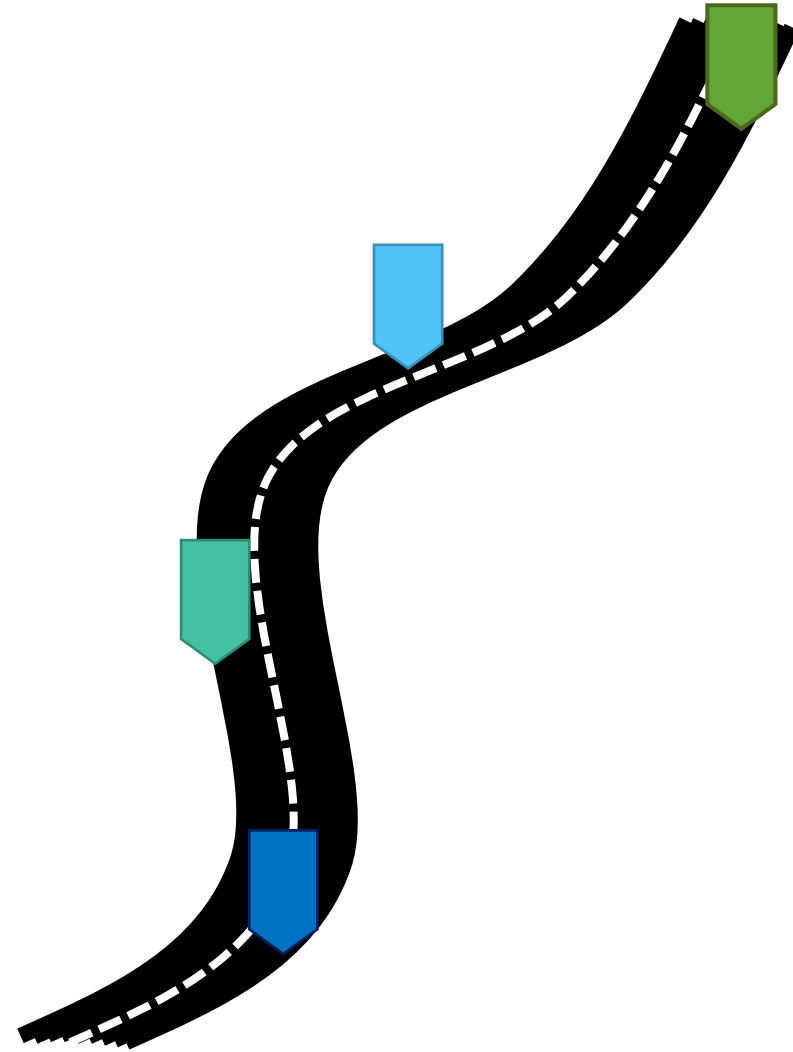
Ethan Smith

Blake Chetcuti

**AVEVA**

# Roadmap

- About SJW
- The Problem
- The Solution
  - Implementation
  - Application
- Initial/Expected Results
- Next Steps
- Live Demo
- Questions





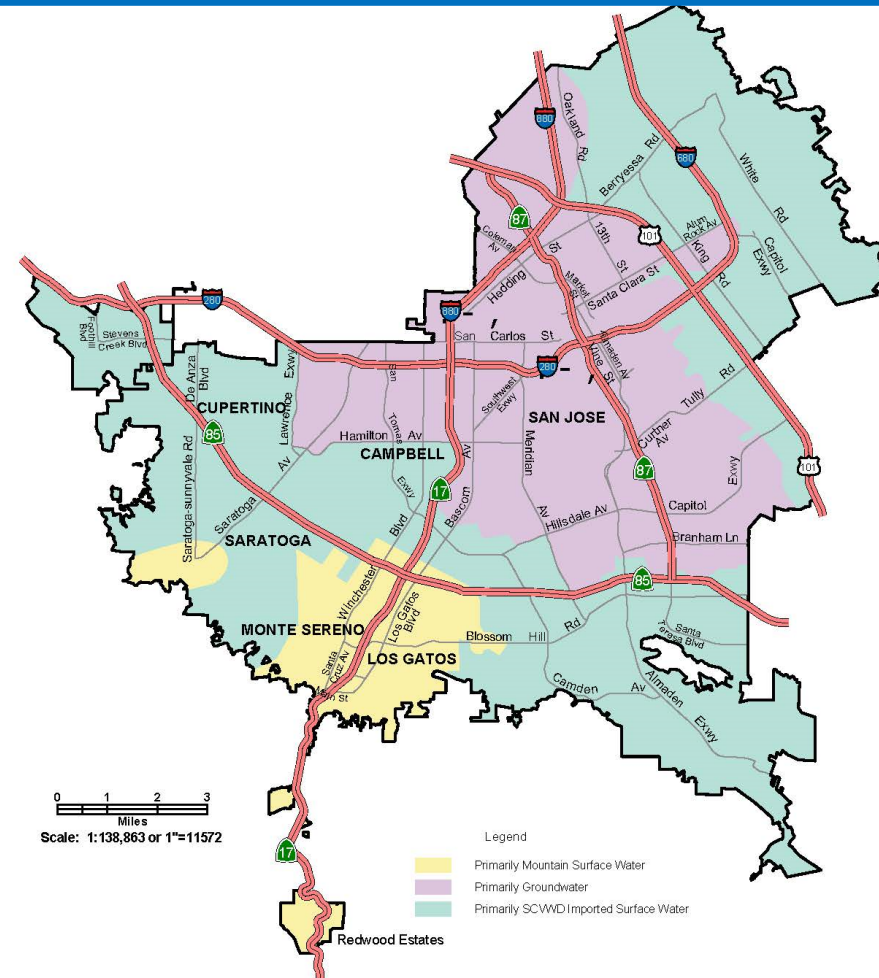
SAN JOSE WATER

# About SJW





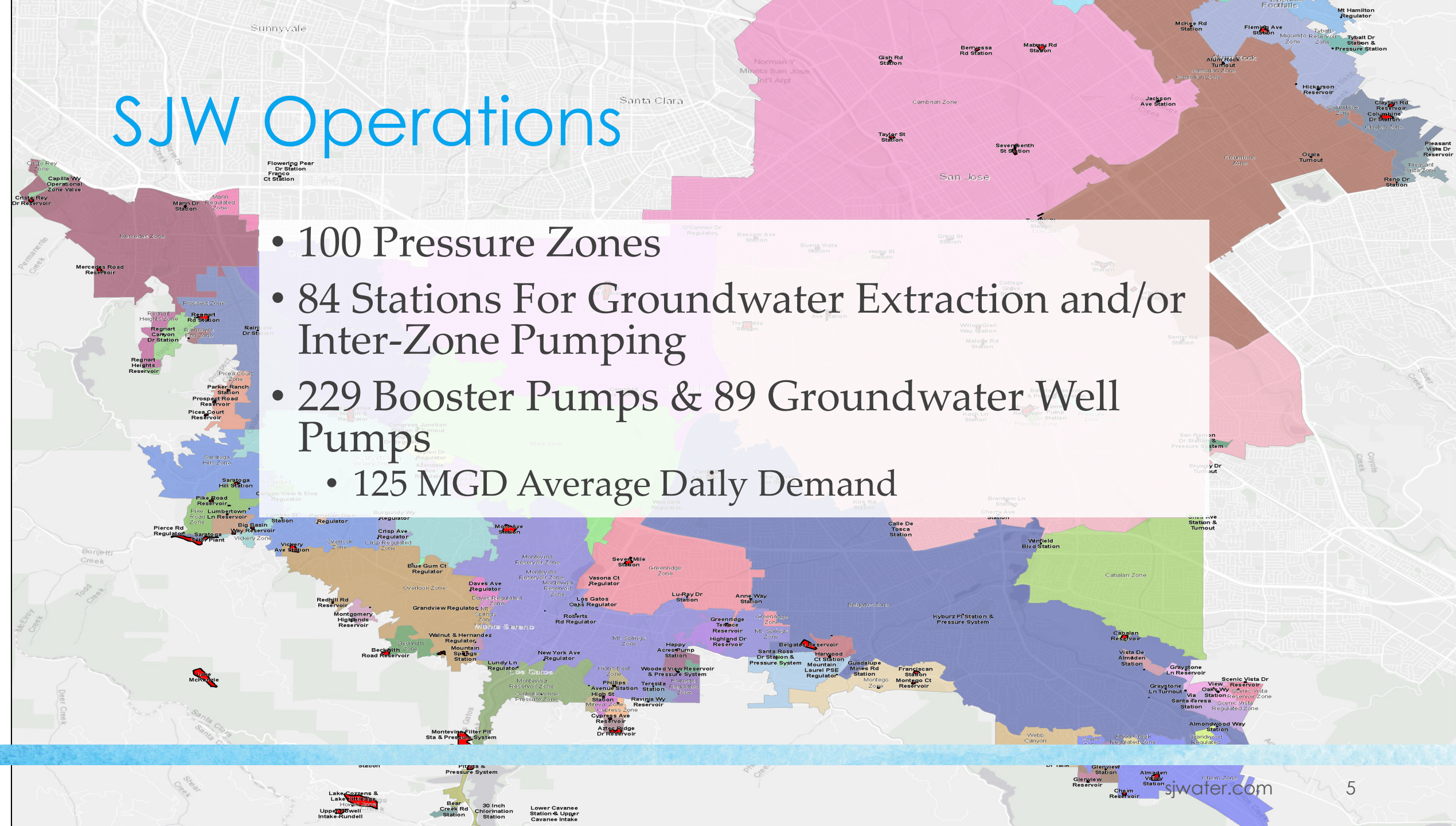
# SJW Overview





# SJW Operations

- 100 Pressure Zones
- 84 Stations For Groundwater Extraction and/or Inter-Zone Pumping
- 229 Booster Pumps & 89 Groundwater Well Pumps
- 125 MGD Average Daily Demand

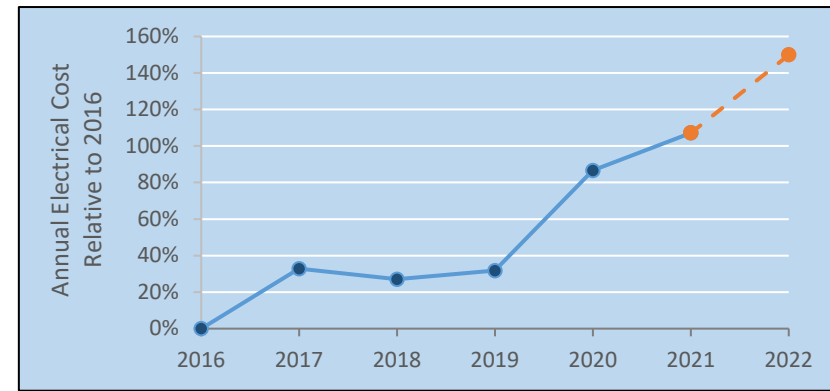




# The Problem



# Costs of Pumping



- 92% of Energy Use
  - 43,000 MWh / \$9.3 M annually
  - ESG Goal – reduce GHG 50% by 2030
- Limited Monitoring = Reactive Maintenance
  - System Strain
  - Service Interruption
  - More Costly Repair/Replacement
- Pump Prioritization Reliant on Field Efficiency Tests
  - Resource demanding
  - Infrequent
    - Data is Often 2-5 Years Old

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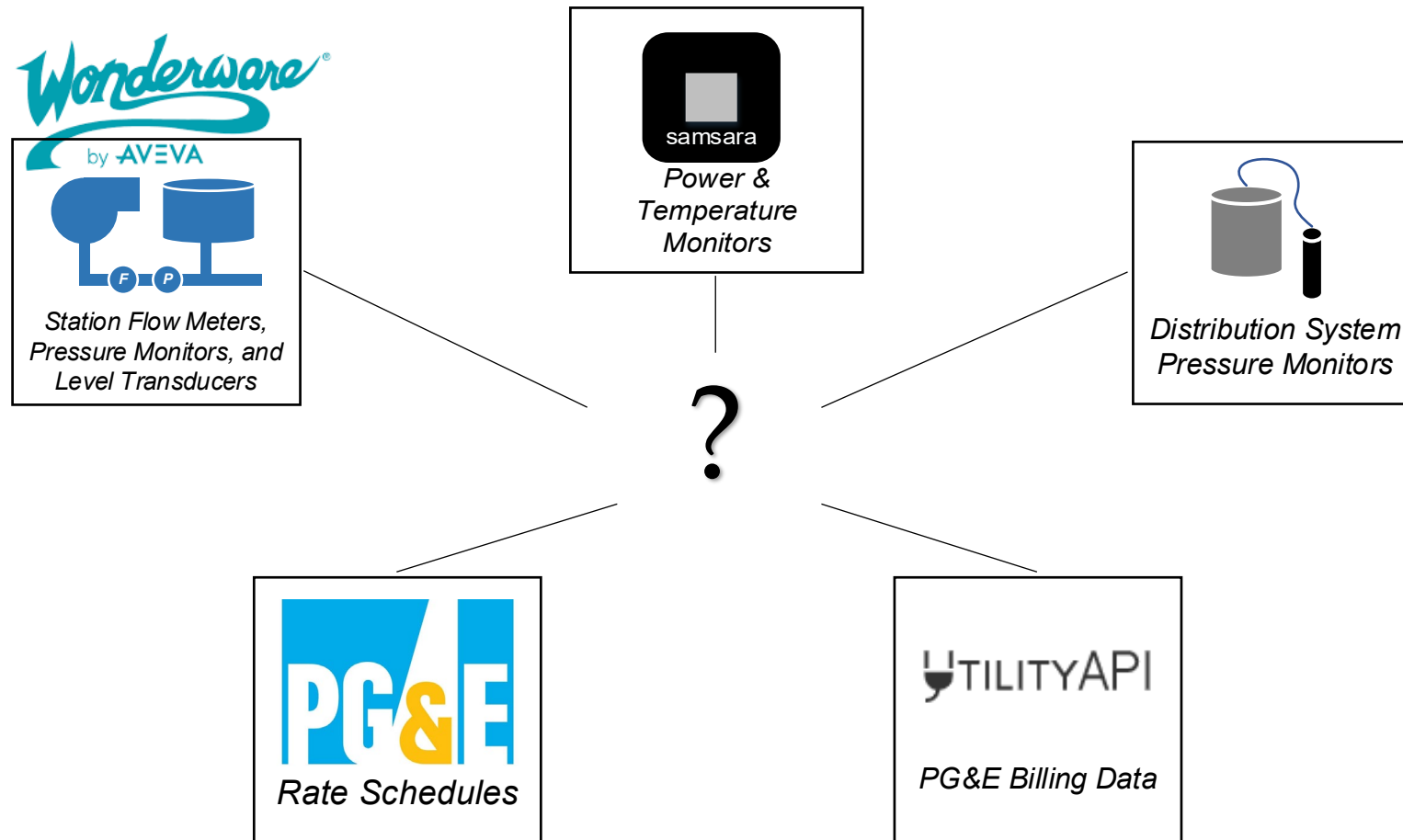


\$





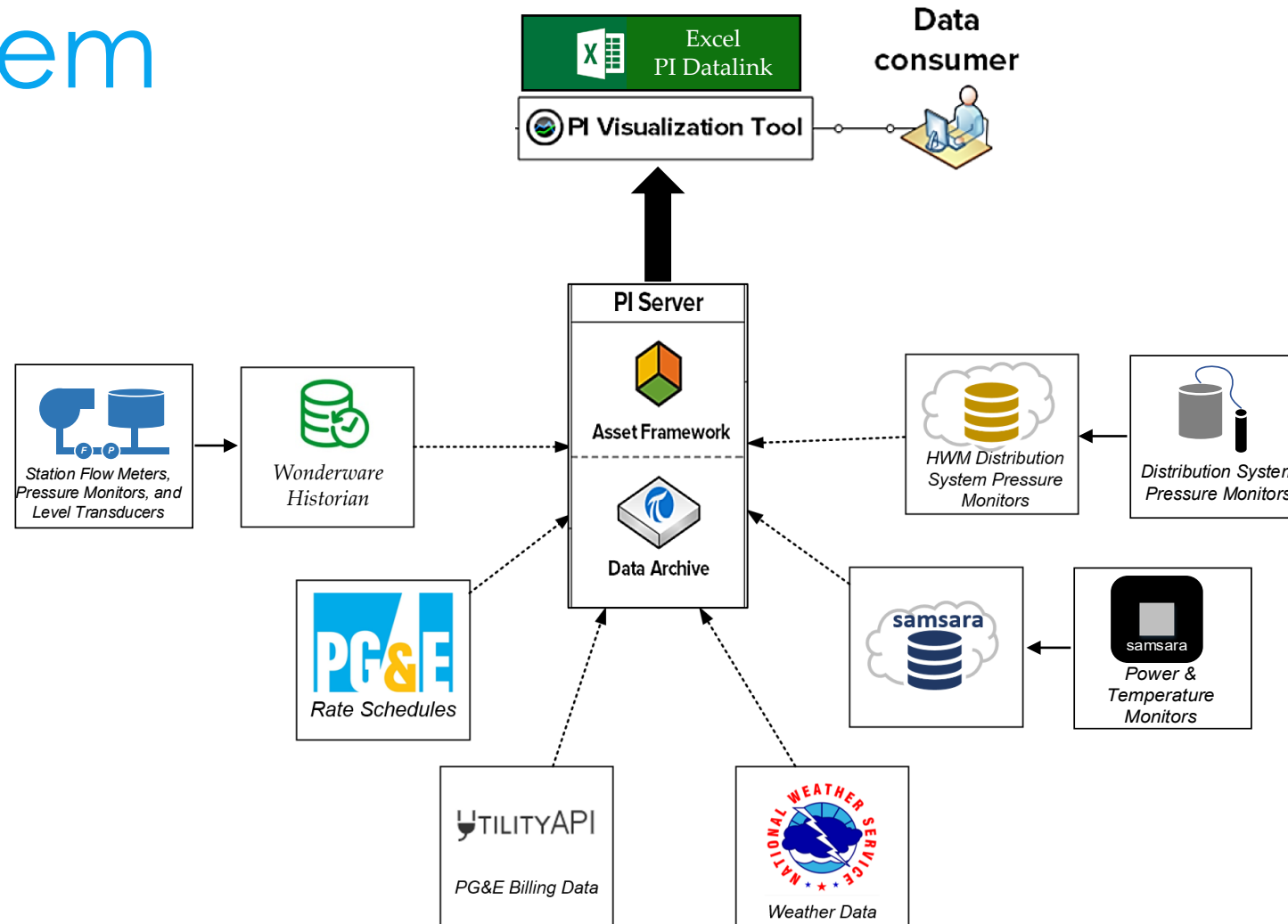
# Independent Data Sources



# The Solution

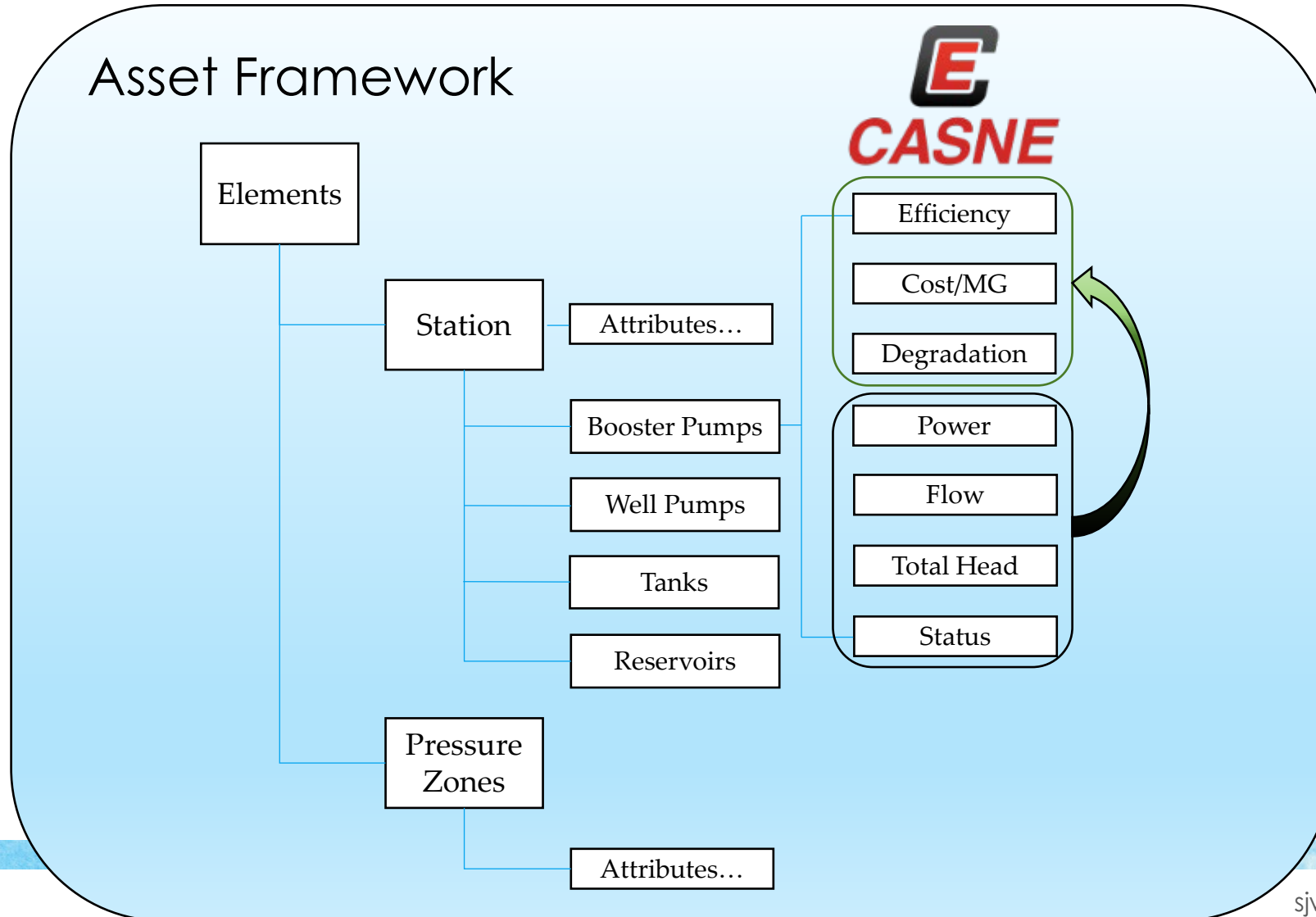


# PI System



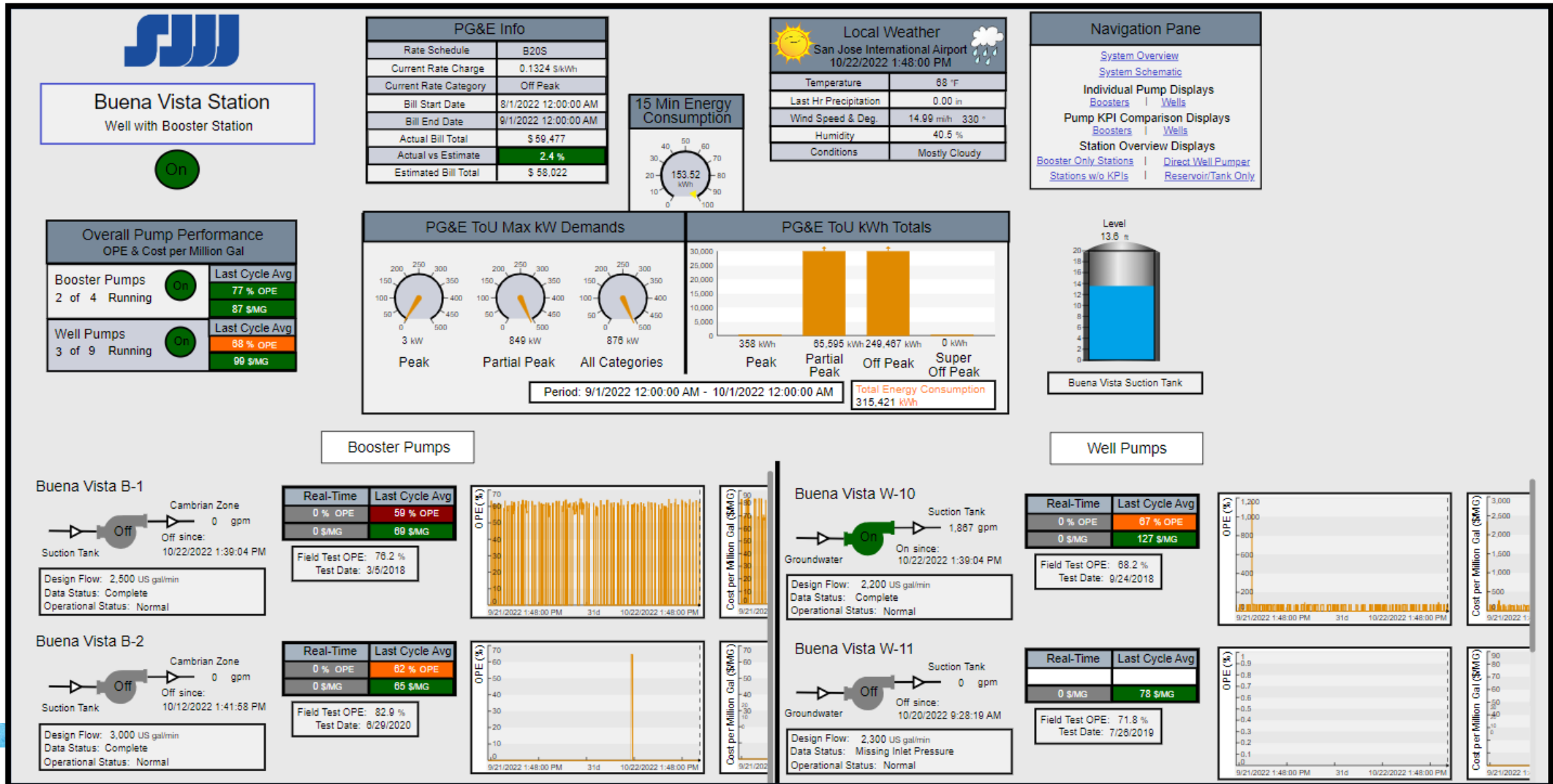


# Implementation



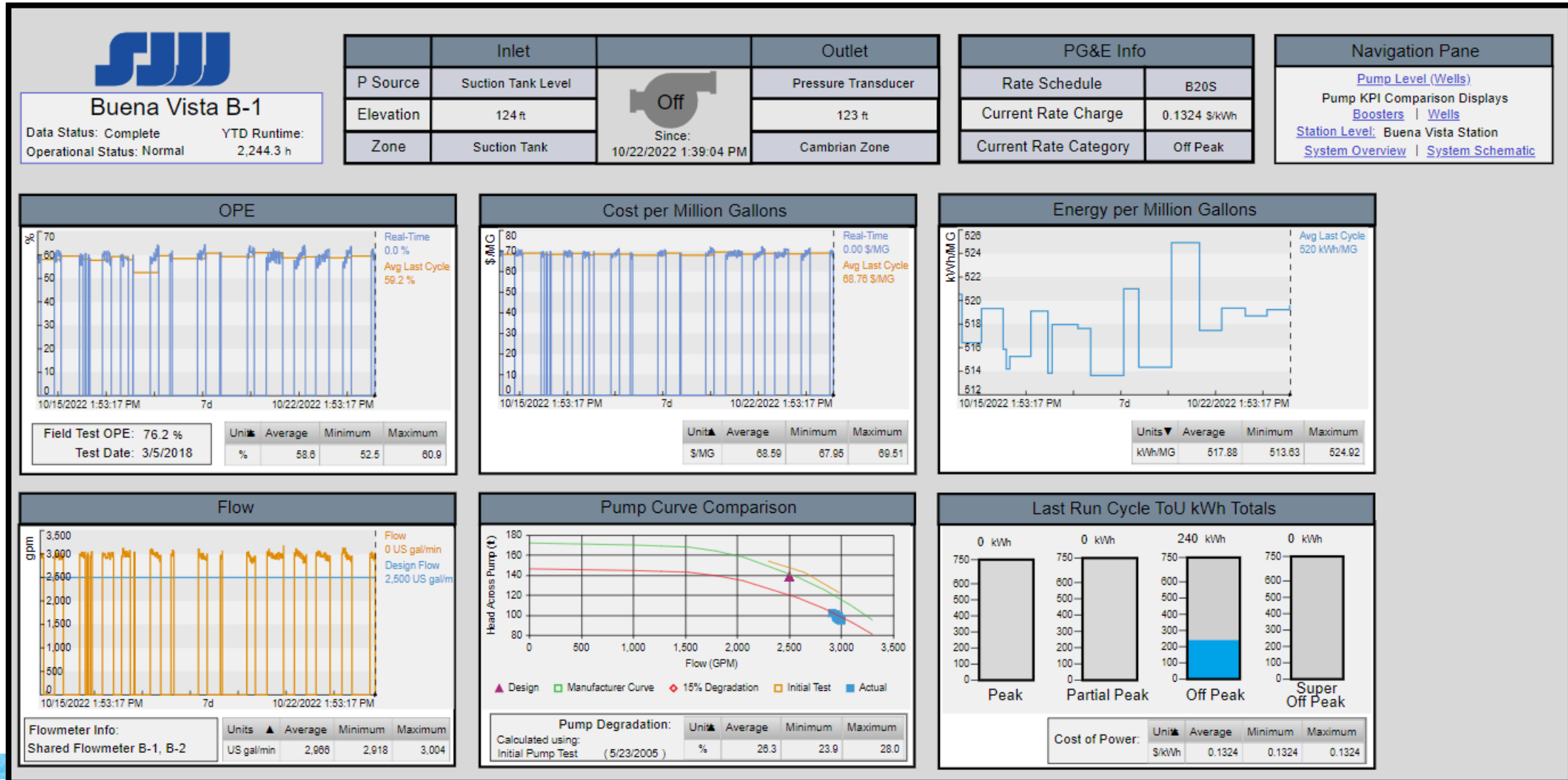
# Dashboards

AVEVA™ PI Vision™



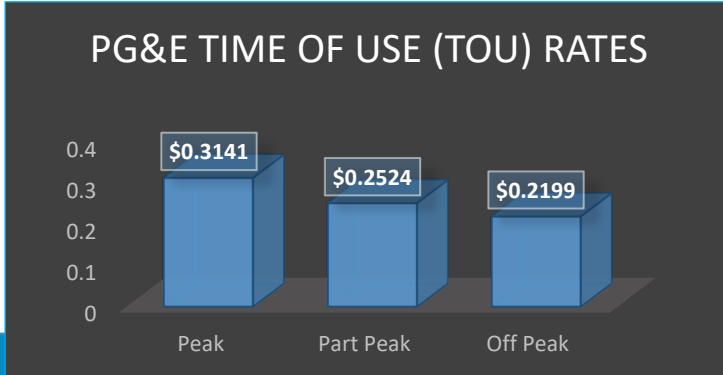
# Dashboards

AVEVA™ PI Vision™





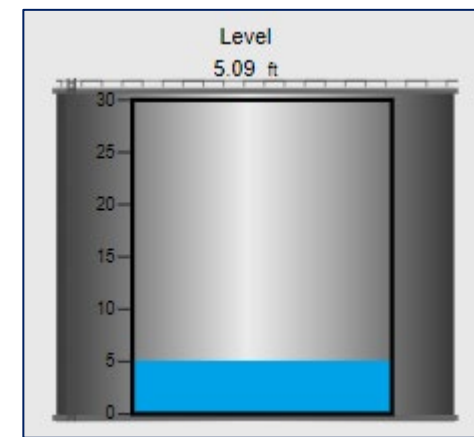
# Application: Alerts



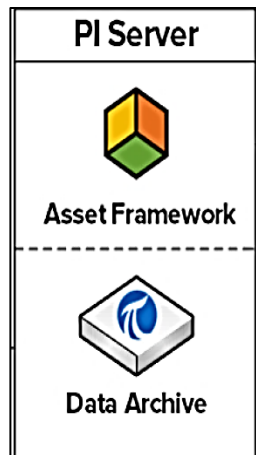
- Pump On @ Peak ToU
- Pump Degradation > 20%
- Runtime Since Last Service > Threshold
- Pct. Diff. Electric Bill vs Estimate > 5%



# Application: Automated Pump Ranking



## AVEVA InTouch HMI

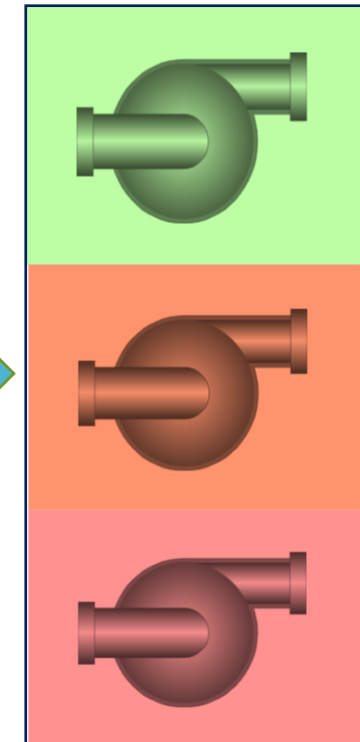


\$/MG

Extract



Prioritize



# Initial/Expected Results





# Cost Savings

**ENERGY STATEMENT**  
www.pge.com/MyEnergy

Account No: 1023456789-0  
Statement Date: mm/dd/yyyy  
Due Date: mm/dd/yyyy

**2 Service For:**  
RESIDENTIAL CUSTOMER  
1234 MAIN STREET  
ANYTOWN, CA 00000

**3 Your Account Summary**

Amount Due on Previous Statement	\$57.87
Payment(s) Received Since Last Statement	-57.87
Previous Bill Balance	\$0.00
Current Bill Charges	\$58.09
Current Bill Total	5.81
<b>Total Amount Due by XX/XX/20XX</b>	<b>\$63.90</b>

**4 Questions about your bill?**  
Monday-Friday 7 a.m.-9 p.m.  
Saturday 8 a.m.-6 p.m.  
Phone: 1-800-743-5000  
www.pge.com/MyEnergy

**5 Ways To Pay**  
www.pge.com/waystopay

**6 Your Enrolled Programs**  
CARE Discount

**7**

**8 Monthly Billing History**

**9 Important Messages**  
Neighborhood payment centers: Did you know it's FREE to pay your PG&E bill at any of our 600 authorized neighborhood payment centers? Payments made by 5 p.m. will post to your PG&E account the same day. Locations and times of operation may be more convenient for your schedule. Call 1-888-743-6911 to find a location near you.

Please return this portion with your payment. No staples or paper clips. Do not fold. Thank you.

**10** 99901234567890100000xxxxxx000000xxxxxx

**PG&E**

Account Number: 1023456789-0	Due Date: mm/dd/yyyy	Total Amount Due: <b>\$63.90</b>	Amount Enclosed: \$
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RESIDENTIAL CUSTOMER  
1234 MAIN STREET  
ANYTOWN, CA 00000

PG&E  
BOX 997300  
SACRAMENTO, CA 95899-7300

Page 1 of 4

- PI Alert → 5% Overcharge from Electric Utility
- ~\$320,000 Past Charges
- ~\$440,000 Future Annual Savings

# Estimated Future Savings/Benefits

- Peak  Off Peak  30%  Cheaper Rate
- Prioritizing Most Efficient Pump  \$53/MG 
- \$53/MG \* 2,680 MG  **\$143,000 / Year**
- 206 Tons of 
- Pump Failure Prevention

# Summary

## Challenge

- Data Silos
- Limited Monitoring
- High Electrical Costs
- Infrequent Performance Indicators

## Solution

### AVEVA PI System

- Single Integrative Data Archive
- Process and Performance Monitoring
- Advanced Analytics
- Powerful Visualization via PI Vision
- Customized Alerts
- Exportable Analytics Data

## Benefits

- Synthesized Data Streams
- Condition Based Maintenance
- Increased Efficiency
- Reduced Electrical Costs
- Lower Carbon Footprint
- Real-time Efficiency Driven Pump Prioritization
- Estimated ROI < 1 Yr

# Next Steps





# Integration with Asset Management



# Pressure Zone Dashboard

KPI Summary

KPI Summary

KPI Summary

KPI Summary

KPI Summary

# Live Demo





## Ethan Smith

EIT, Capital Planning

- San Jose Water
- [ethan.smith@sjwater.com](mailto:ethan.smith@sjwater.com)



## Blake Chetcuti

Operations Supervisor

- San Jose Water
- [blake.chetcuti@sjwater.com](mailto:blake.chetcuti@sjwater.com)



# Questions?

Please wait for the microphone.  
State your name and company.



# Please remember to...

Navigate to this session in the mobile app to complete the survey.




# Thank you!

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AVEVA is a global leader in industrial software, sparking ingenuity to drive responsible use of the world's resources. The company's secure industrial cloud platform and applications enable businesses to harness the power of their information and improve collaboration with customers, suppliers and partners.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. With operations around the globe, we are headquartered in Cambridge, UK and listed on the London Stock Exchange's FTSE 100.

Learn more at [www.aveva.com](https://www.aveva.com)





## All Pump and Storage Stations

System Overview

## Overall Pump Performance

OPE &amp; Cost per Million Gal

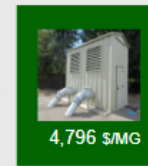
Pump Run Status		Last Cycle Avg	
Boosters	16 of 108	73 % OPE	224 \$/MG
Wells	17 of 90	75 % OPE	195 \$/MG

## Cost of Imported Water vs. Groundwater



4,953 \$/MG

&gt;



4,796 \$/MG

\*Imported water cost does not include electricity costs for booster pumps

## Navigation Pane

[System Schematic](#)[Individual Pump Displays](#)[Boosters](#) | [Wells](#)[Pump KPI Comparison Displays](#)[Boosters](#) | [Wells](#)[Station Overview Displays](#)[Booster Only](#) | [Well with Booster](#) | [Direct Well Pumper](#)[Stations w/o KPIs](#) | [Reservoir/Tank Only](#)

## Booster Only Stations

Alum Rock Station	Last Cycle Avg
Booster Pumps 0 of 2 Running	226 \$/MG

Azores Station	Last Cycle Avg
Booster Pumps 0 of 3 Running	236 \$/MG

Cambrian Avenue Station	Last Cycle Avg
Booster Pumps 0 of 4 Running	65 % OPE 197 \$/MG

Canyon View Drive Station	Last Cycle Avg
Booster Pumps 0 of 1 Running	No Data \$/MG

Columbine Drive Station	Last Cycle Avg
-------------------------	----------------

## Well with Booster Stations

Bascom Avenue Station	Last Cycle Avg
Booster Pumps 0 of 3 Running	65 % OPE 70 \$/MG
Well Pumps 0 of 4 Running	33 % OPE Calc Failed \$/MG

Breeding Avenue Station	Last Cycle Avg
Booster Pumps 1 of 2 Running	42 % OPE 170 \$/MG
Well Pumps 1 of 3 Running	374 \$/MG

Buena Vista Station	Last Cycle Avg
Booster Pumps 2 of 4 Running	77 % OPE 87 \$/MG
Well Pumps 3 of 9 Running	68 % OPE 99 \$/MG

## Direct Well Pumper Stations

Grant Street Station	Last Cycle Avg
Well Pumps 0 of 2 Running	49 % OPE 228 \$/MG

McLaughlin Road Back Station	Last Cycle Avg
Well Pumps 0 of 3 Running	690 \$/MG

McLaughlin Road Front Station	Last Cycle Avg
Well Pumps 1 of 3 Running	345 \$/MG

Needles Station	Last Cycle Avg
Well Pumps 1 of 3 Running	136 % OPE 156 \$/MG

Senter Road Station	Last Cycle Avg
---------------------	----------------

## Pump Stations w/o KPI data

Almaden Valley Station
Almondwood Way Station
Anne Way Station
Big Basin Way Station
Branham Lane Station
Canyon Creek Drive Station
Dutard Station
Franciscan Station
Gish Road Station
Graystone Heights Station
Happy Acres Station
Harwood Road Station

## Reservoir/Tank Only Stations

Aztec Ridge Drive Station
Batista Station
Bayview Drive Station
Beatrice Circle Station
Beckwith Road Station
Belgatos Station
Cahalan Station
Cheim Station
Clayton Road Station
Crothers Road Station
Dow Drive Station
Dutard Heights Reservoir Station



Station Level (Booster/Well)

Asset: Buena Vista Station ▼



## Buena Vista Station

Well with Booster Station

On

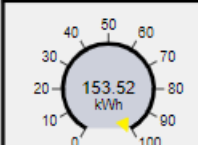
### Overall Pump Performance OPE & Cost per Million Gal

Booster Pumps		Last Cycle Avg
3 of 4 Running		77 % OPE
		87 \$/MG
Well Pumps		Last Cycle Avg
4 of 9 Running		68 % OPE
		99 \$/MG

### PG&E Info

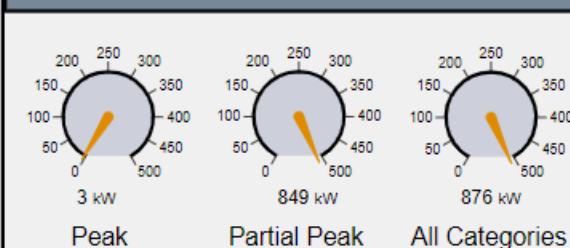
Rate Schedule	B20S
Current Rate Charge	0.1324 \$/kWh
Current Rate Category	Off Peak
Bill Start Date	8/1/2022 12:00:00 AM
Bill End Date	9/1/2022 12:00:00 AM
Actual Bill Total	\$ 59,477
Actual vs Estimate	2.4 %
Estimated Bill Total	\$ 58,022

### 15 Min Energy Consumption

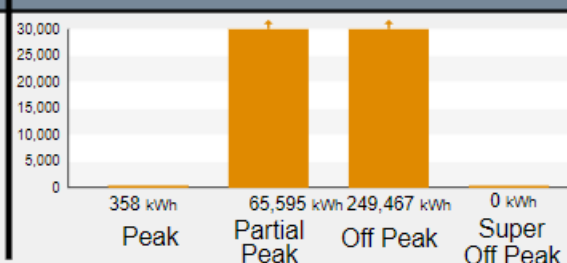


Local Weather	
San Jose International Airport 10/22/2022 1:19:15 PM	
Temperature	68 °F
Last Hr Precipitation	0.00 in
Wind Speed & Deg.	19.69 mi/h 300 °
Humidity	43.6 %
Conditions	Mostly Cloudy and Windy

### PG&E ToU Max kW Demands



### PG&E ToU kWh Totals

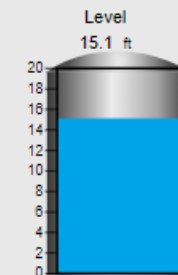


Period: 9/1/2022 12:00:00 AM - 10/1/2022 12:00:00 AM

Total Energy Consumption  
315,421 kWh

### Navigation Pane

- [System Overview](#)
- [System Schematic](#)
- Individual Pump Displays
  - [Boosters](#) | [Wells](#)
- Pump KPI Comparison Displays
  - [Boosters](#) | [Wells](#)
- Station Overview Displays
  - [Booster Only Stations](#) | [Direct Well Pumper Stations w/o KPIs](#) | [Reservoir/Tank Only](#)

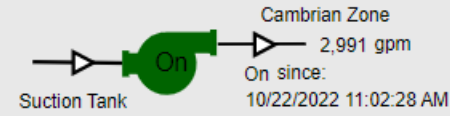


Buena Vista Suction Tank



Booster Pumps

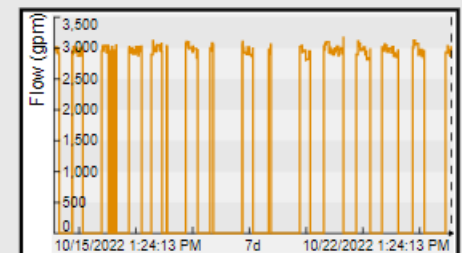
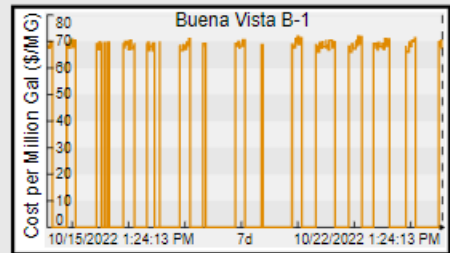
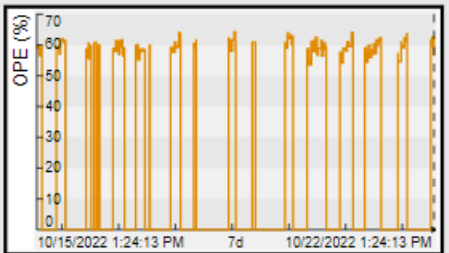
Buena Vista B-1



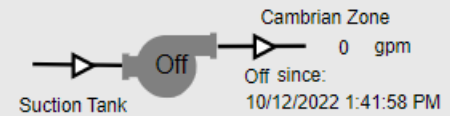
Design Flow: 2,500 US gal/min  
Data Status: Complete  
Operational Status: Normal

Real-Time	Last Cycle Avg
57 % OPE	59 % OPE
68 \$/MG	69 \$/MG

Field Test OPE: 76.2 %  
Test Date: 3/5/2018



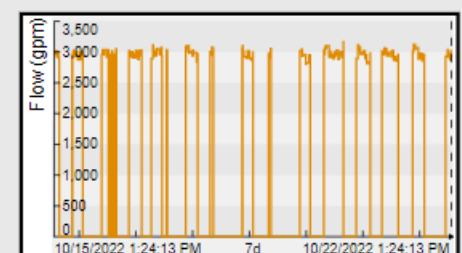
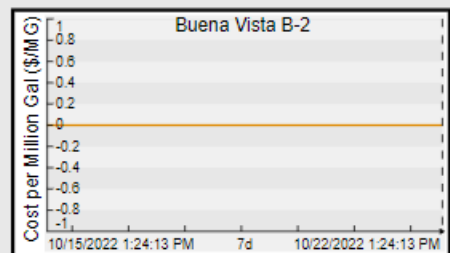
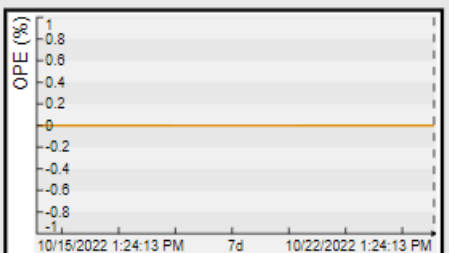
Buena Vista B-2



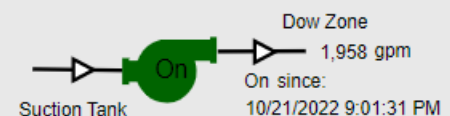
Design Flow: 3,000 US gal/min  
Data Status: Complete  
Operational Status: Normal

Real-Time	Last Cycle Avg
0 % OPE	62 % OPE
0 \$/MG	65 \$/MG

Field Test OPE: 82.9 %  
Test Date: 6/29/2020



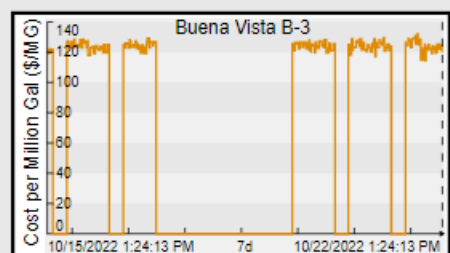
Buena Vista B-3



Design Flow: 2,150 US gal/min  
Data Status: Complete  
Operational Status: Normal

Real-Time	Last Cycle Avg
79 % OPE	78 % OPE
121 \$/MG	124 \$/MG

Field Test OPE: 84.1 %  
Test Date: 11/2/2020

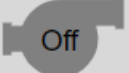






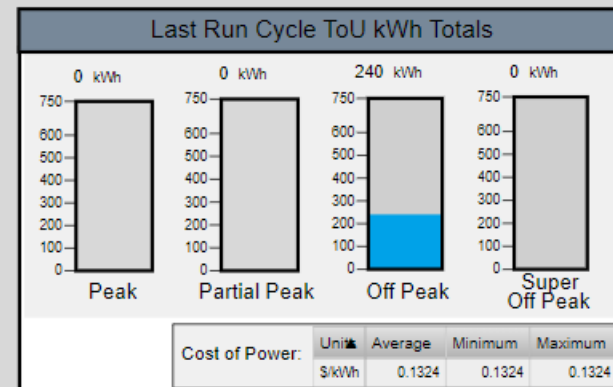
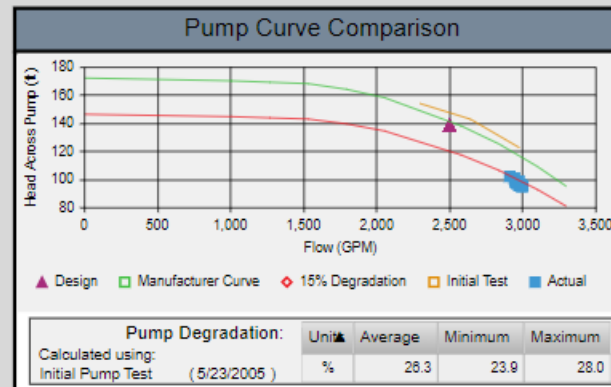
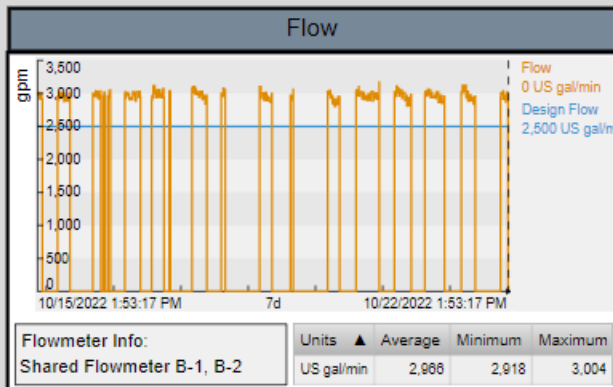
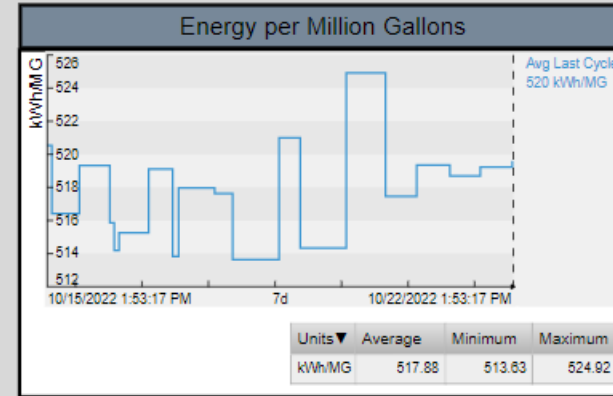
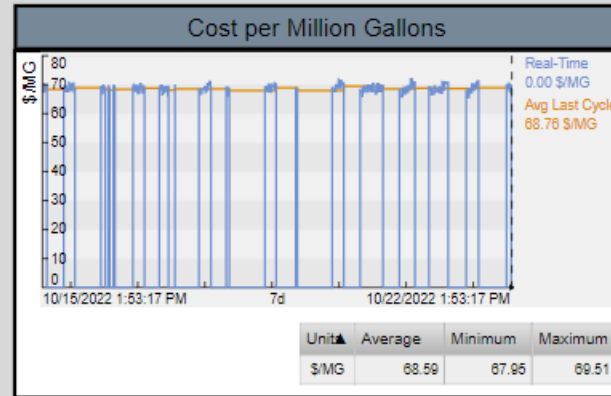
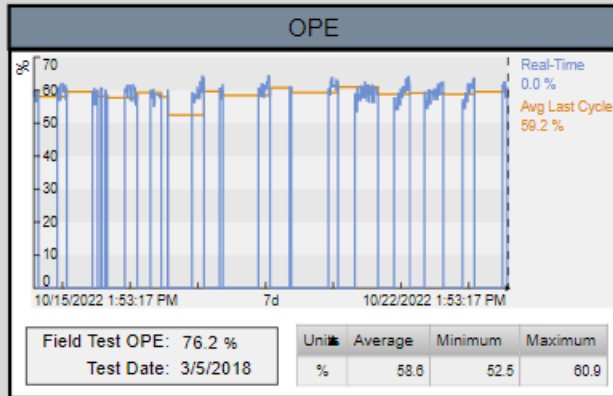
## Buena Vista B-1

Data Status: Complete YTD Runtime: 2,244.3 h  
Operational Status: Normal

	Inlet		Outlet
P Source	Suction Tank Level	 Since: 10/22/2022 1:39:04 PM	Pressure Transducer
Elevation	124 ft		123 ft
Zone	Suction Tank		Cambrian Zone

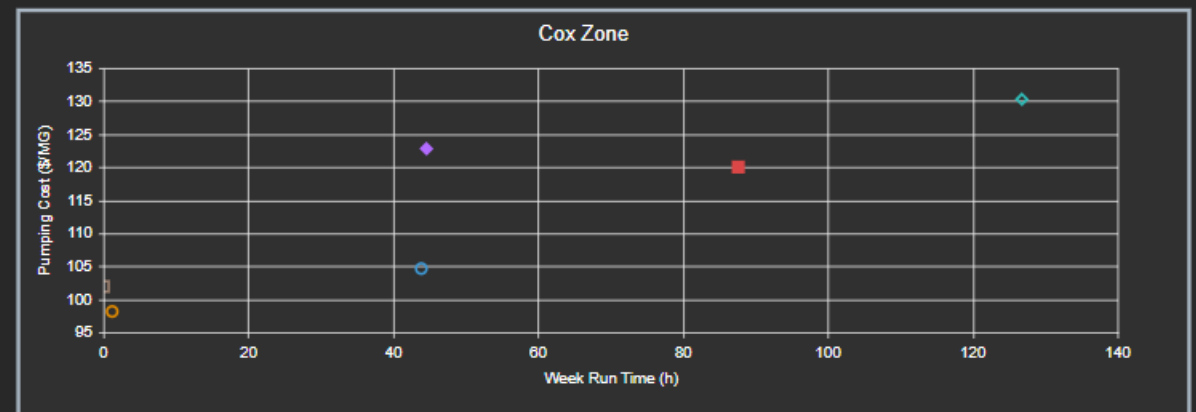
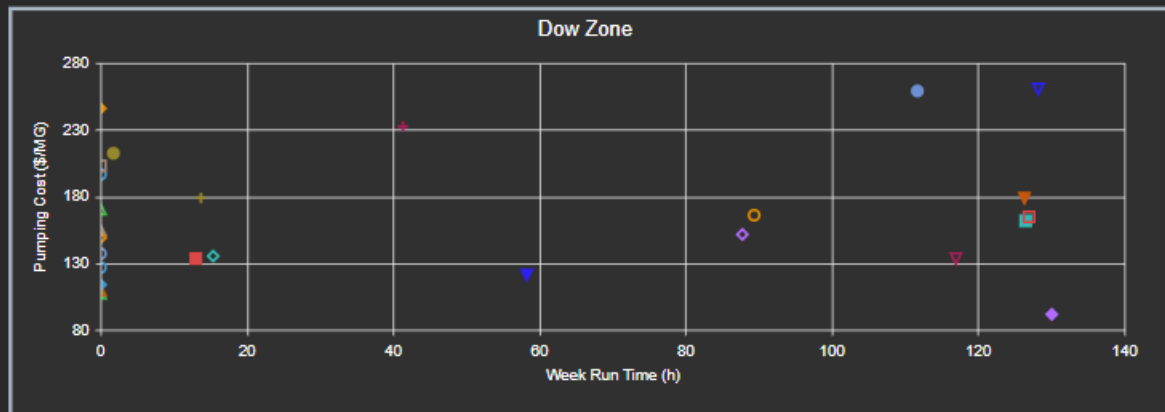
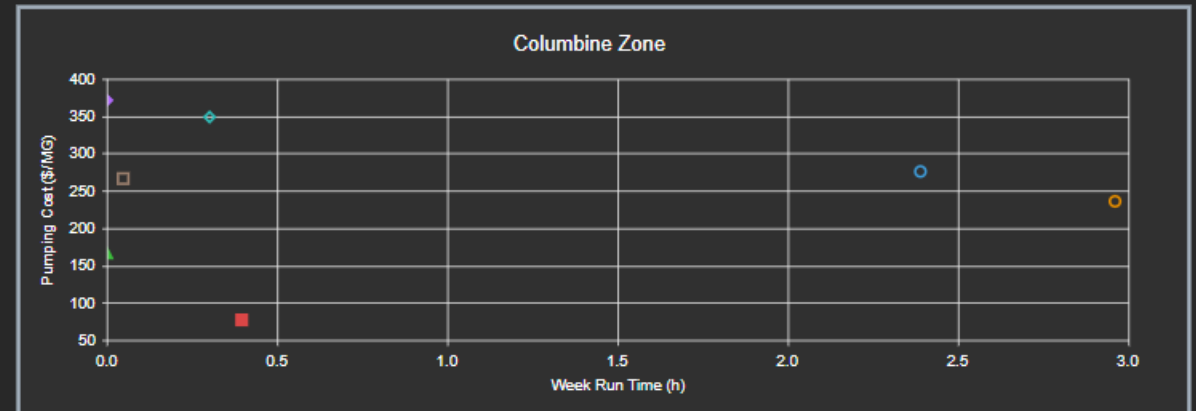
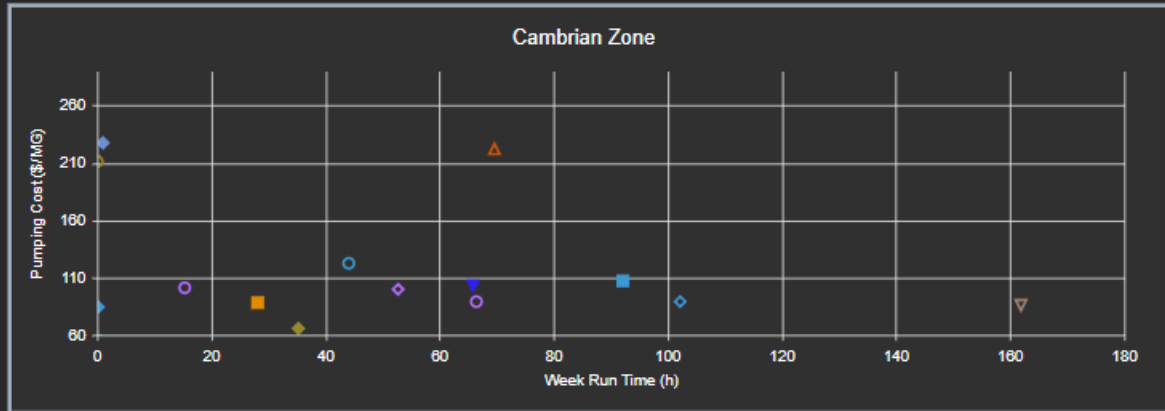
PG&E Info	
Rate Schedule	B20S
Current Rate Charge	0.1324 \$/kWh
Current Rate Category	Off Peak


Navigation Pane
<a href="#">Pump Level (Wells)</a> Pump KPI Comparison Displays <a href="#">Boosters</a>   <a href="#">Wells</a> <a href="#">Station Level:</a> Buena Vista Station <a href="#">System Overview</a>   <a href="#">System Schematic</a>



## Groundwater Zones

### Run Time vs Pumping Cost



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 [@avevagroup](https://twitter.com/avevagroup)

#### ABOUT AVEVA

AVEVA is a global leader in industrial software, sparking ingenuity to drive responsible use of the world's resources. The company's secure industrial cloud platform and applications enable businesses to harness the power of their information and improve collaboration with customers, suppliers and partners.

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