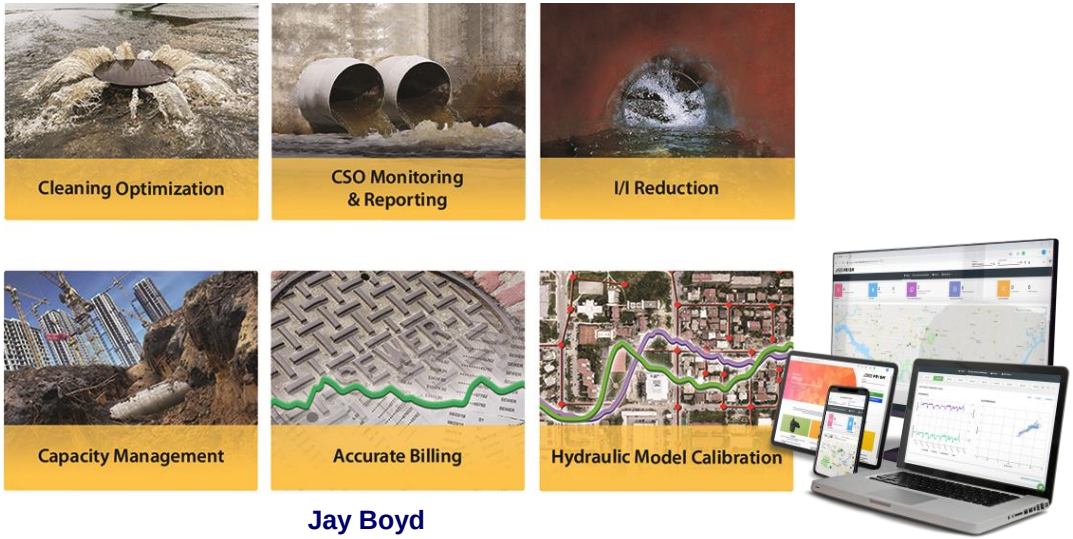
Cleaning Can be a Bitter Pill Yet Utilities Have a New Smart Tech Cure Lowering Costs & Reducing SSOs



Jay Boyd
Director of Market Development
ADS Environmental Services

Agenda

Theme:
Optimize Collection System O&M Operations by Leveraging Proven, Smart Technology

- Cleaning Practices
- Defining Cleaning Optimization
- Case Studies: Practical Examples & Results
- Technology Supporting Optimization
- Closing Thoughts and Q&A

Framing the Topic

review

1 Problem

- Sites cleaned *without knowing* site conditions: schedule driven
- Utilities are cleaning already clean pipes

2 Solution

Cleaning Optimization using Internet of Things (IoT) technology:

- Cleaning process becomes site-condition driven
- 24/7 visibility of actual site conditions
- Ongoing protection from SSOs

The CMOM

Capacity, Management Operations and Maintenance (CMOM)

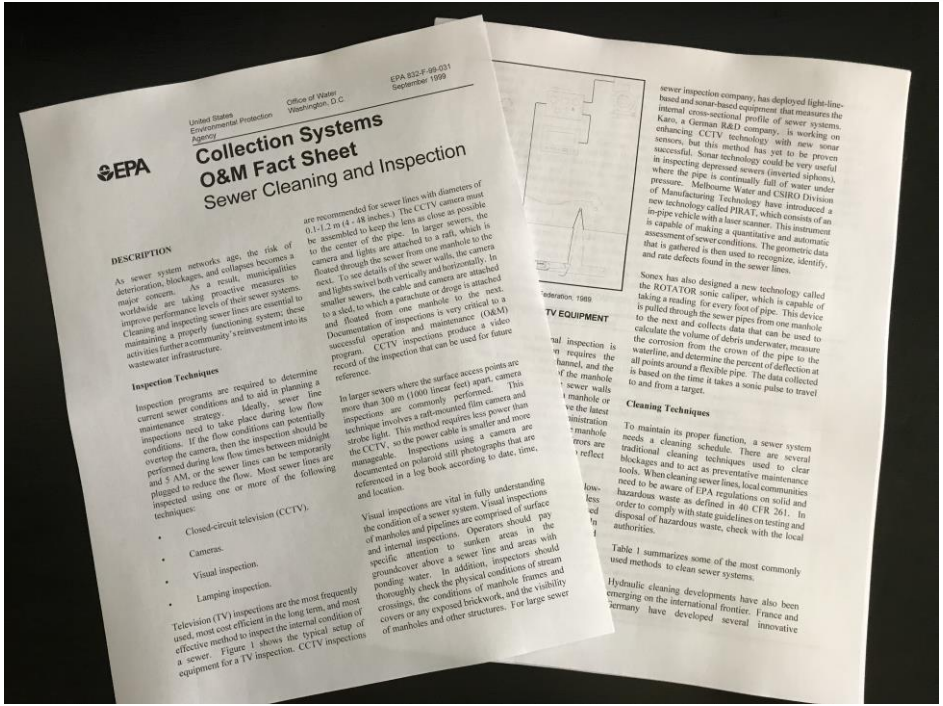
- Guidance for O&M *Best Practices*
- Two-plus decades old

Goal:

- Prevent Sanitary Sewer Overflows SSOs

Approach

- Clean!
- Regular, programmatic cleaning & inspection



EPA Guidance Document: 'Collection System O&M Fact Sheet' *Sewer Cleaning and Inspection,* September 1999

The 'Best Practice' for Cleaning

Total System Cleaning

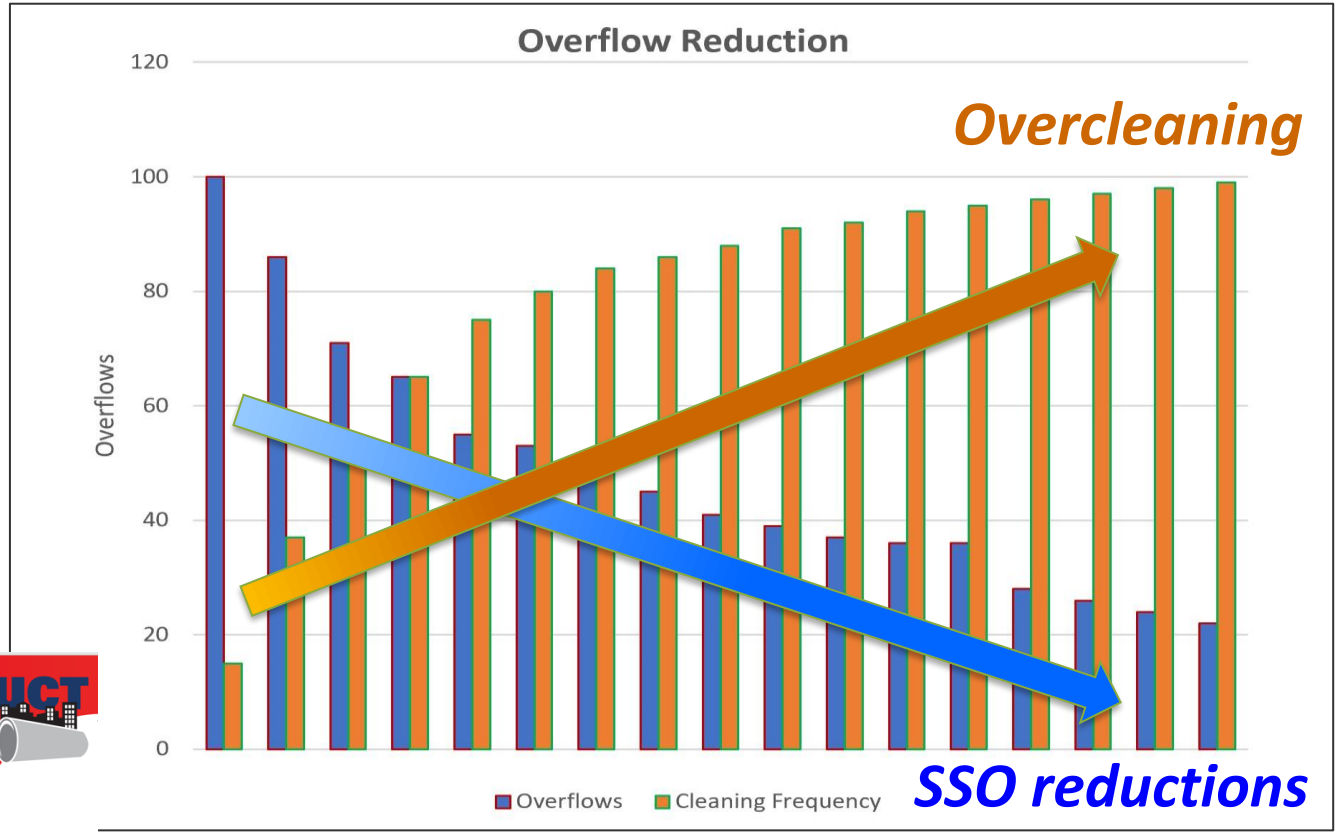
- Single to multi-year cycles
- Collection system size dependent

High Frequency Cleaning

- Based on history of risk, "hot spots"
- Frequencies: weekly, monthly, quarterly
- Principle: overclean & stay ahead of build-up

Cleaning Frequency & SSOs

High Frequency Cleaning…



Utility Challenges with High Frequency Cleaning

Keeping up with the schedule

- High frequency demands time/resources
- Projects, emergencies, resource limitations impact schedule

Aging infrastructure increases maintenance demands over time

- More to do often with no budget increase

SSO reduction has diminishing returns

- Greater investments with less returns

Truth from the Field

Cleaning when site conditions don't require it is *overcleaning*.

Revealing comments spoken by veterans…

"We're busy so who wants to clean already clean pipes?"

"The schedule says to clean but it doesn't mean it needs it."

"When you can't see what's going on, you clean to be safe."

Common Thread & Impact

Resources are being wasted

Why waste?

Site conditions not known most of the time

The core issue?

Lack remote site condition visibility

Cleaning Optimization: *The Tech-Cure*

In Crisis, Create the Future

“The most reliable way to predict the future is to create it.”

A. Lincoln

Creating Our Future:

Envision prudent and sustainable cleaning process…

Creating a Sustainable Vision in a Crisis

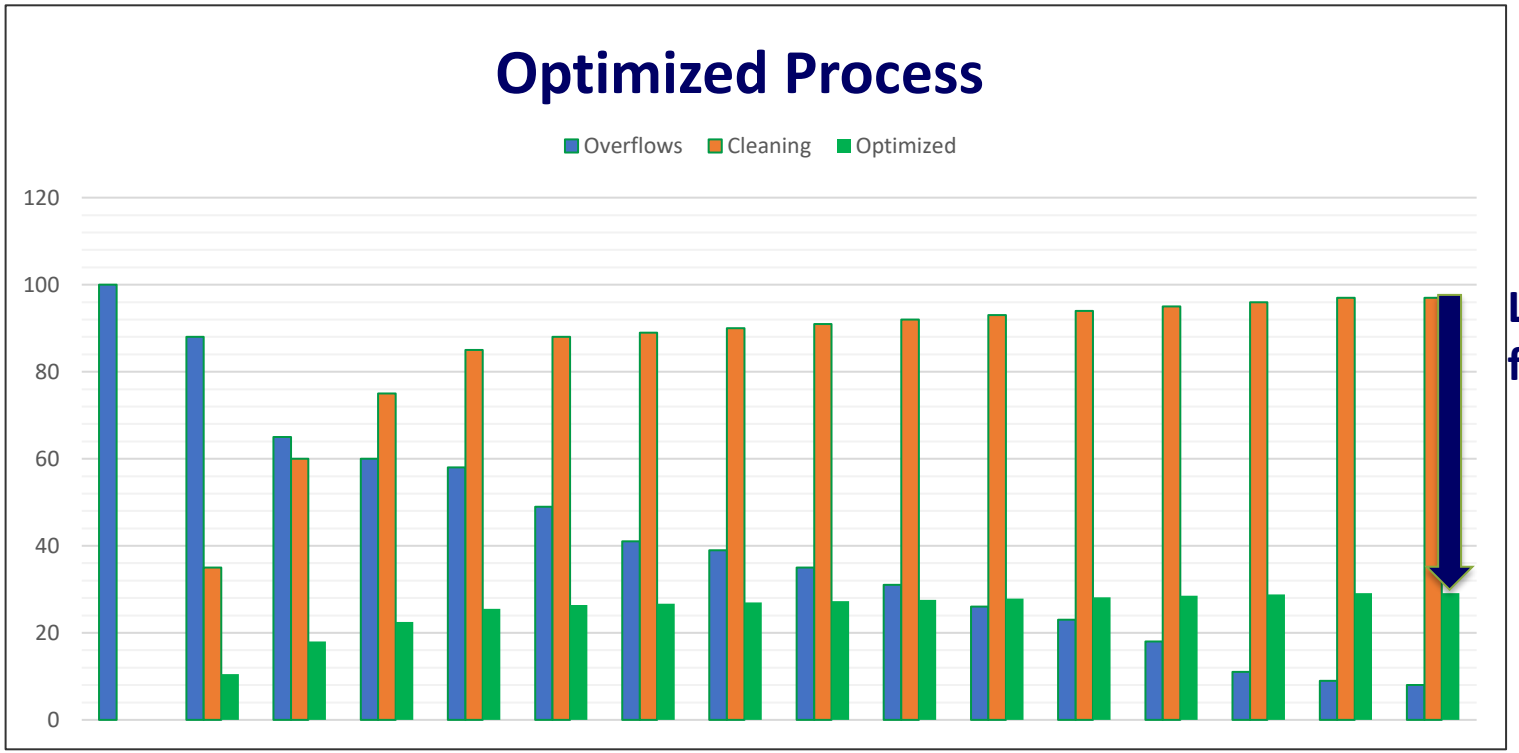
The Present	The *Future*
Schedule-driven cleaning	→ *Site condition-driven* cleaning as needed
Blind to remote site conditions	→ Site conditions *always visible & known*
Intermittent “snap-shot” view	→ *24/7 view from desktop*

New Vision: Optimized Cleaning

- Clean based on *actual by site conditions*
- Sustainable: doing *more with less*
- *Safely reduces* cleaning

What We Are Achieving with Cleaning Optimization?

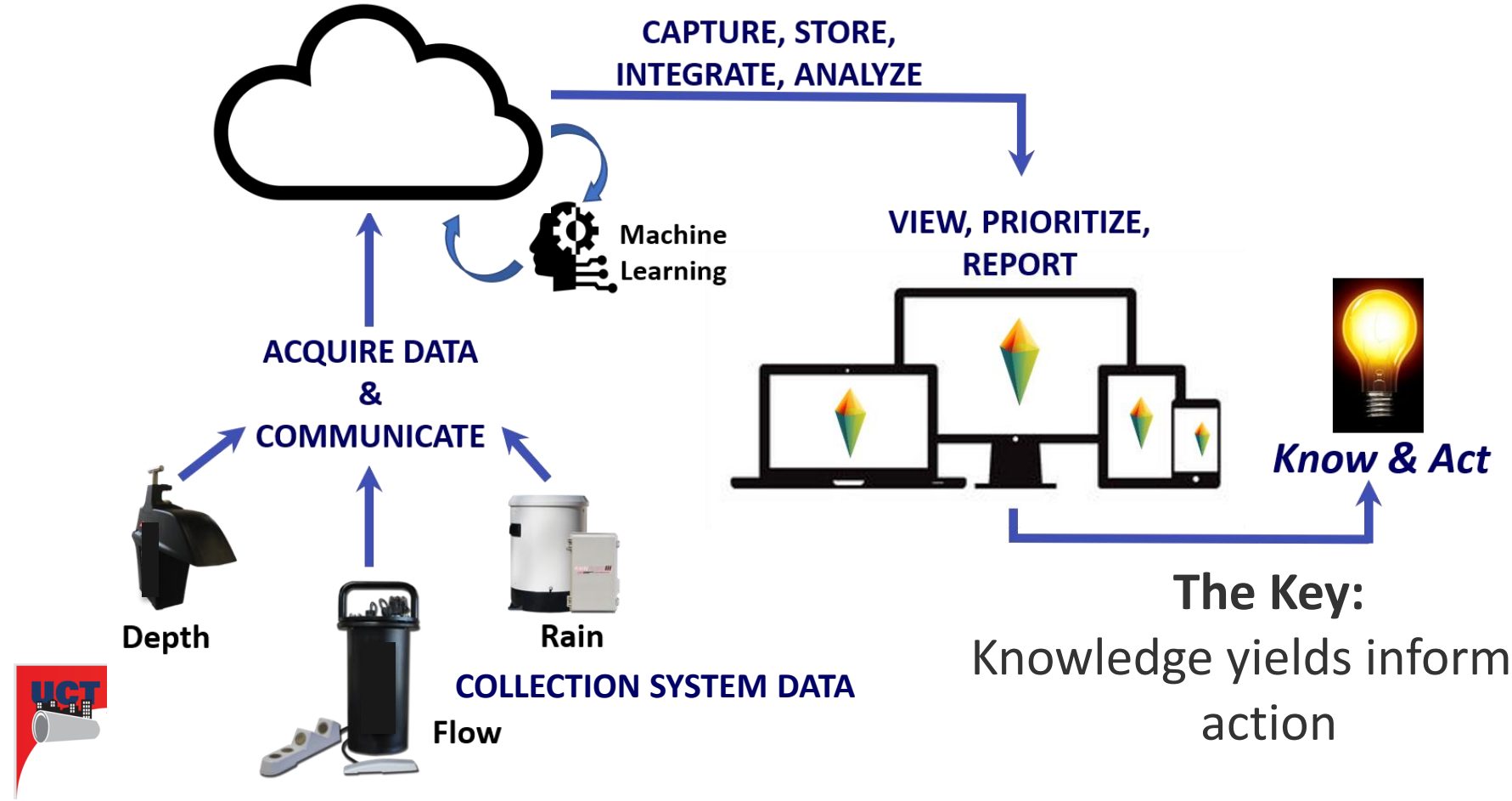
Right-sized cleaning frequency **based on remote site conditions**



Lower frequency

Outcome: *lower* cleaning frequency *better* SSO prevention

Water Internet of Things: Connects Us to Remote Sites



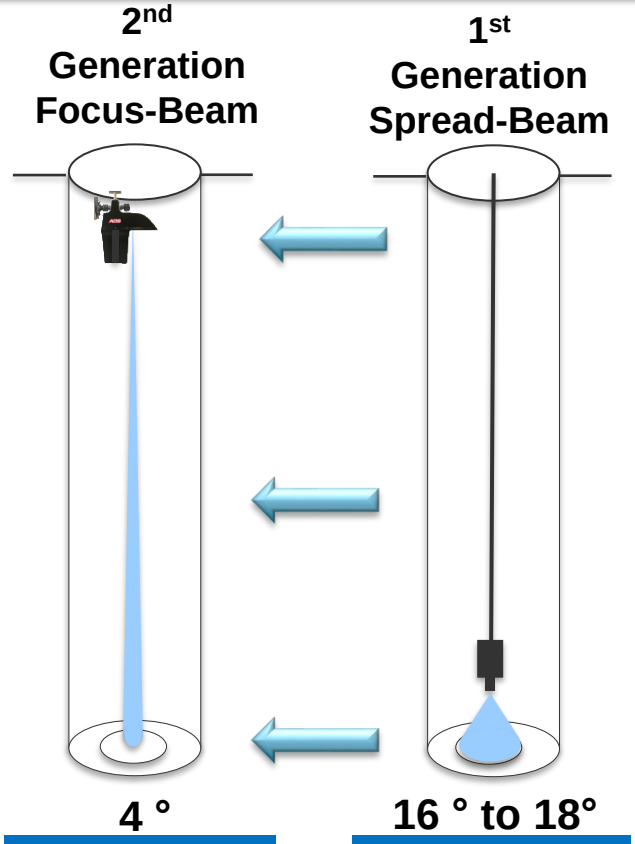
The Key:

Knowledge yields informed action

Remote Site Systems: 2-Generations of Technology

Level Monitors

Focus-Beam Ultrasonic Depth & Pressure Height Sensors in one System



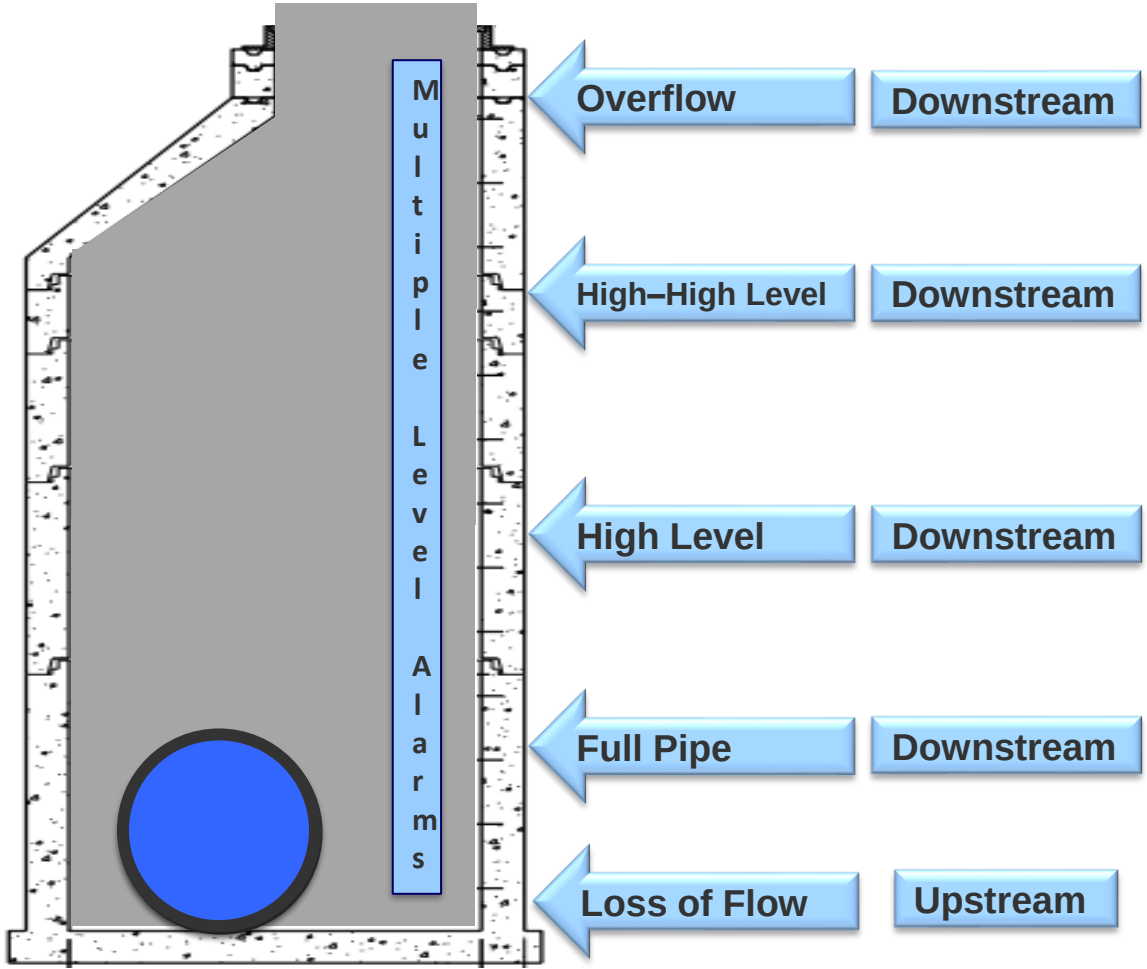
Long Range 20’ to 8” pipe

Limited Range 2’ to 8” Pipe

2nd Generation Technologies & Notifications

System Communication

- Multiple, redundant water level alarms
- Sensor alignment alarm / System status

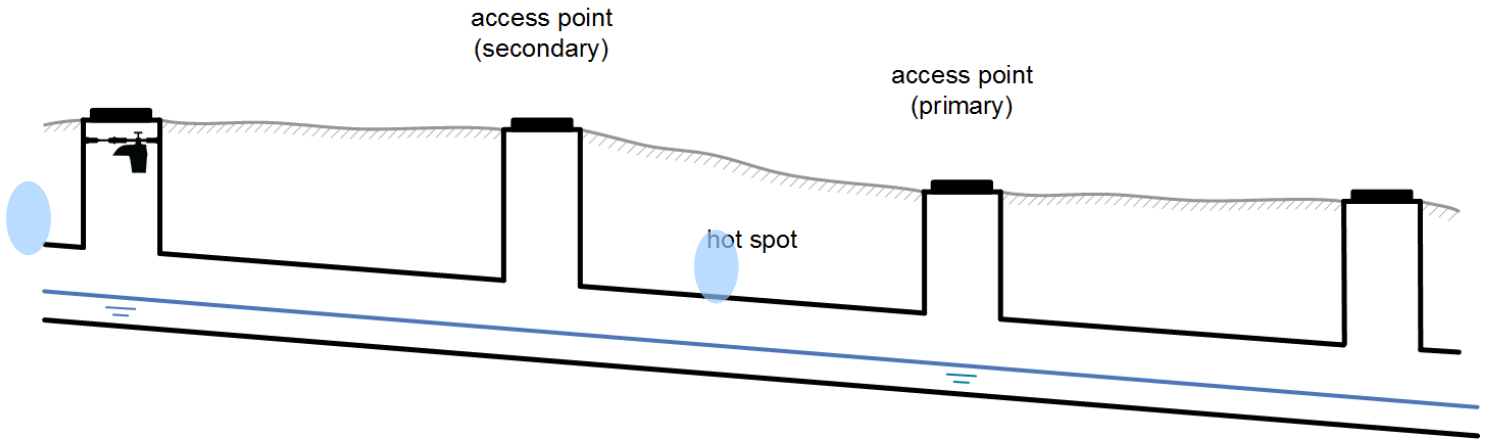


Multi-Segment Monitoring

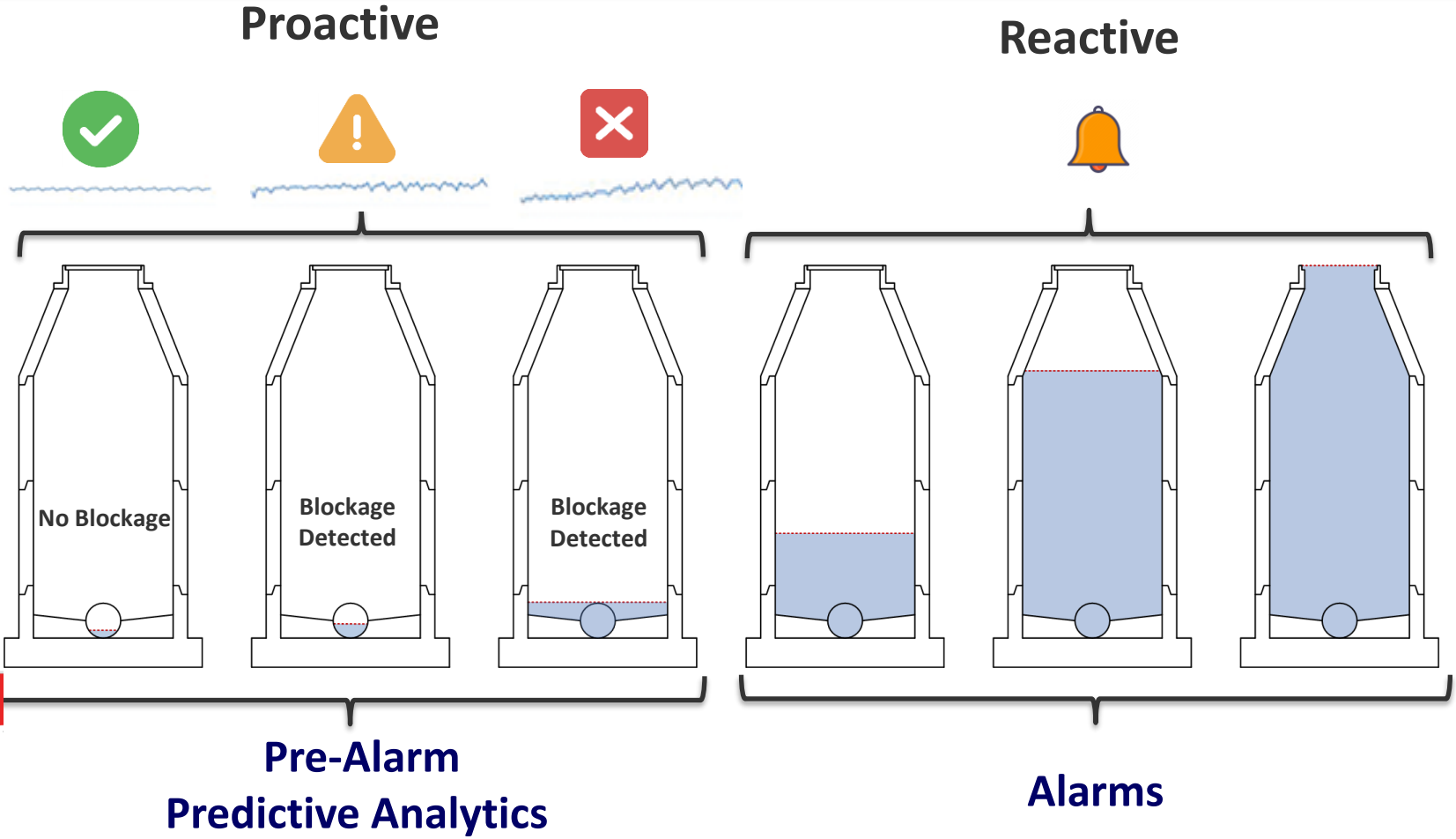
Bi-directional Monitoring:

Downstream Blockage creates backwater condition & increases level

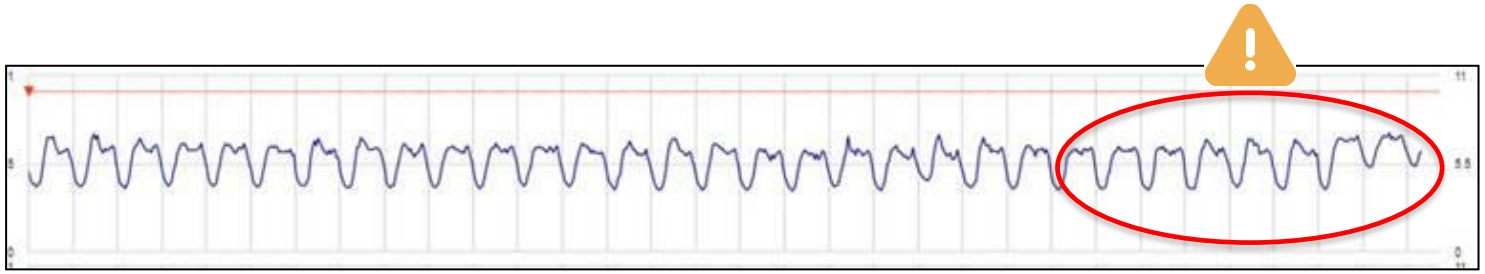
Upstream Blockage creates lower flow & decreases level

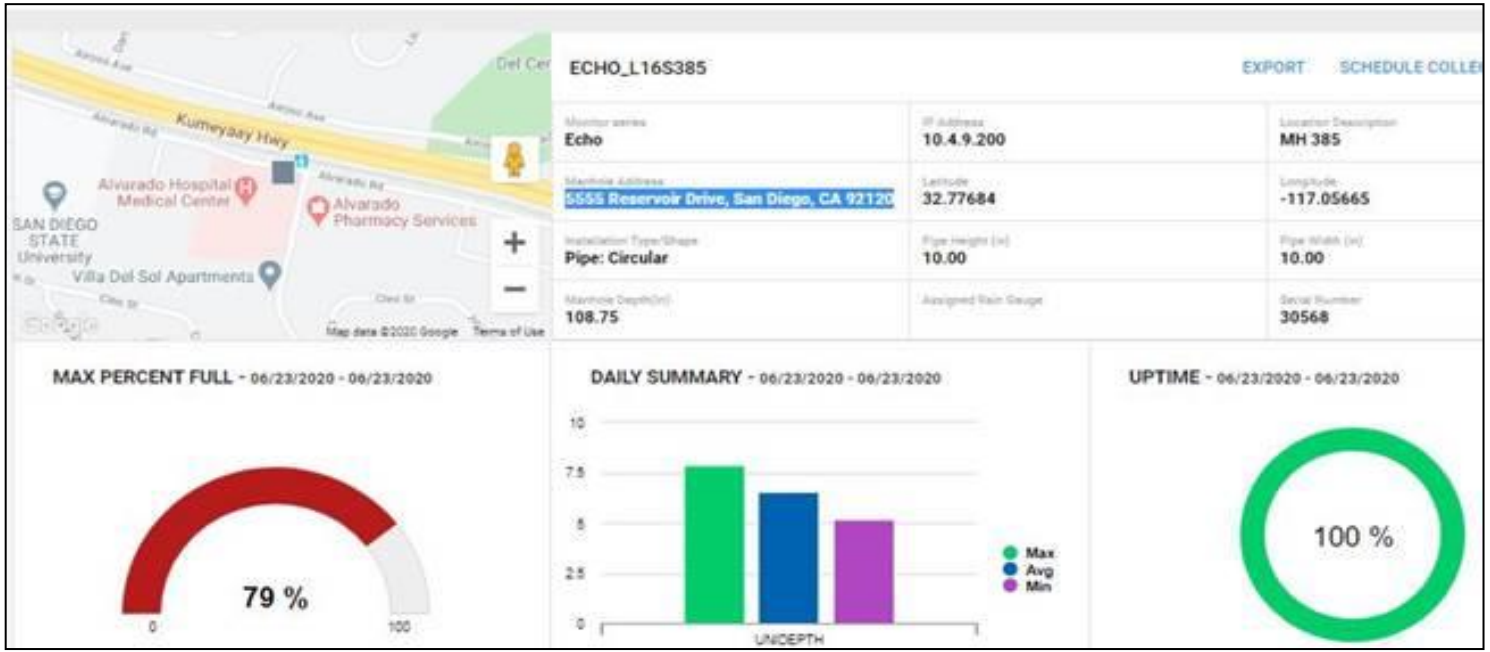


The Blockage Protection Continuum



Site Details Show Detection of Pattern Change



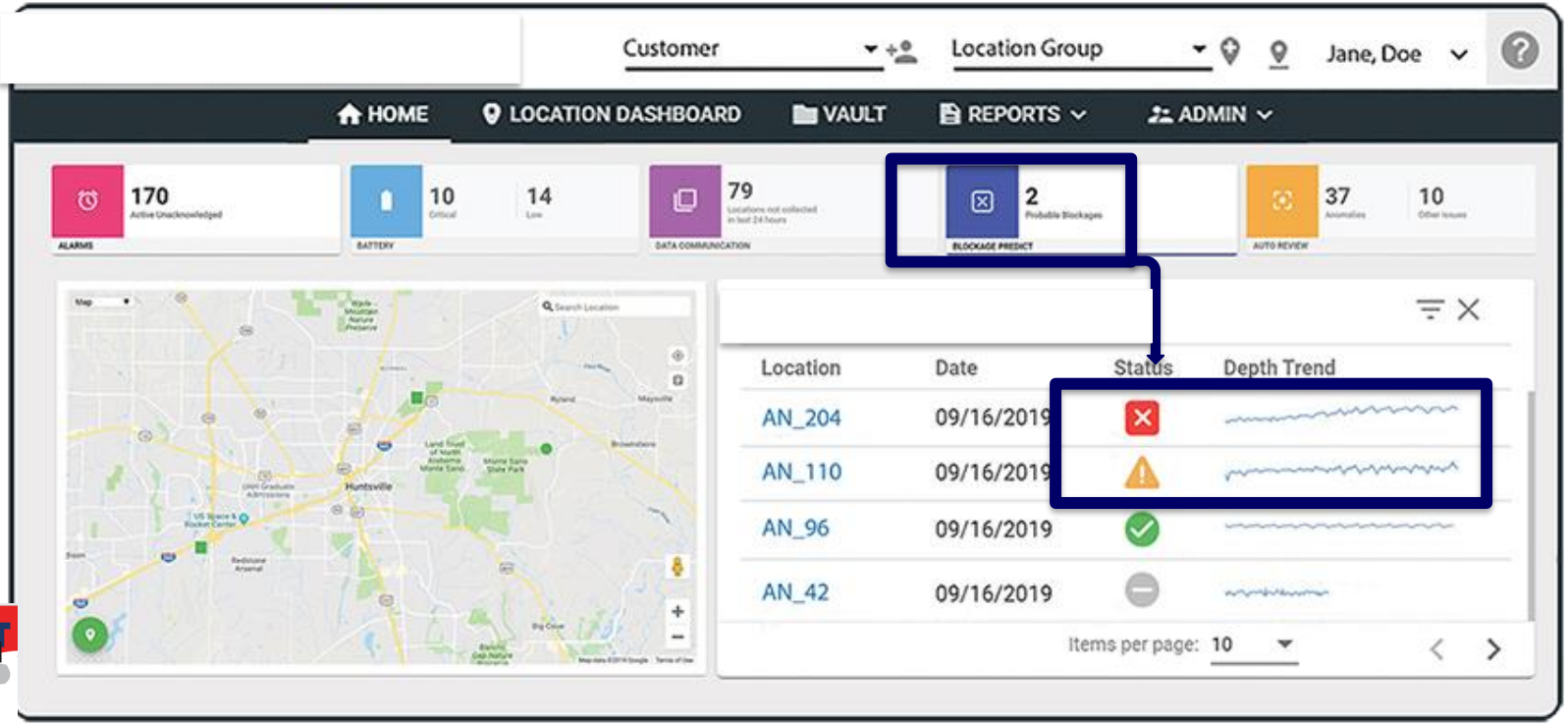


Change in hydrograph *pattern* is detected and communicated

Machine Learning Predicting Blockages

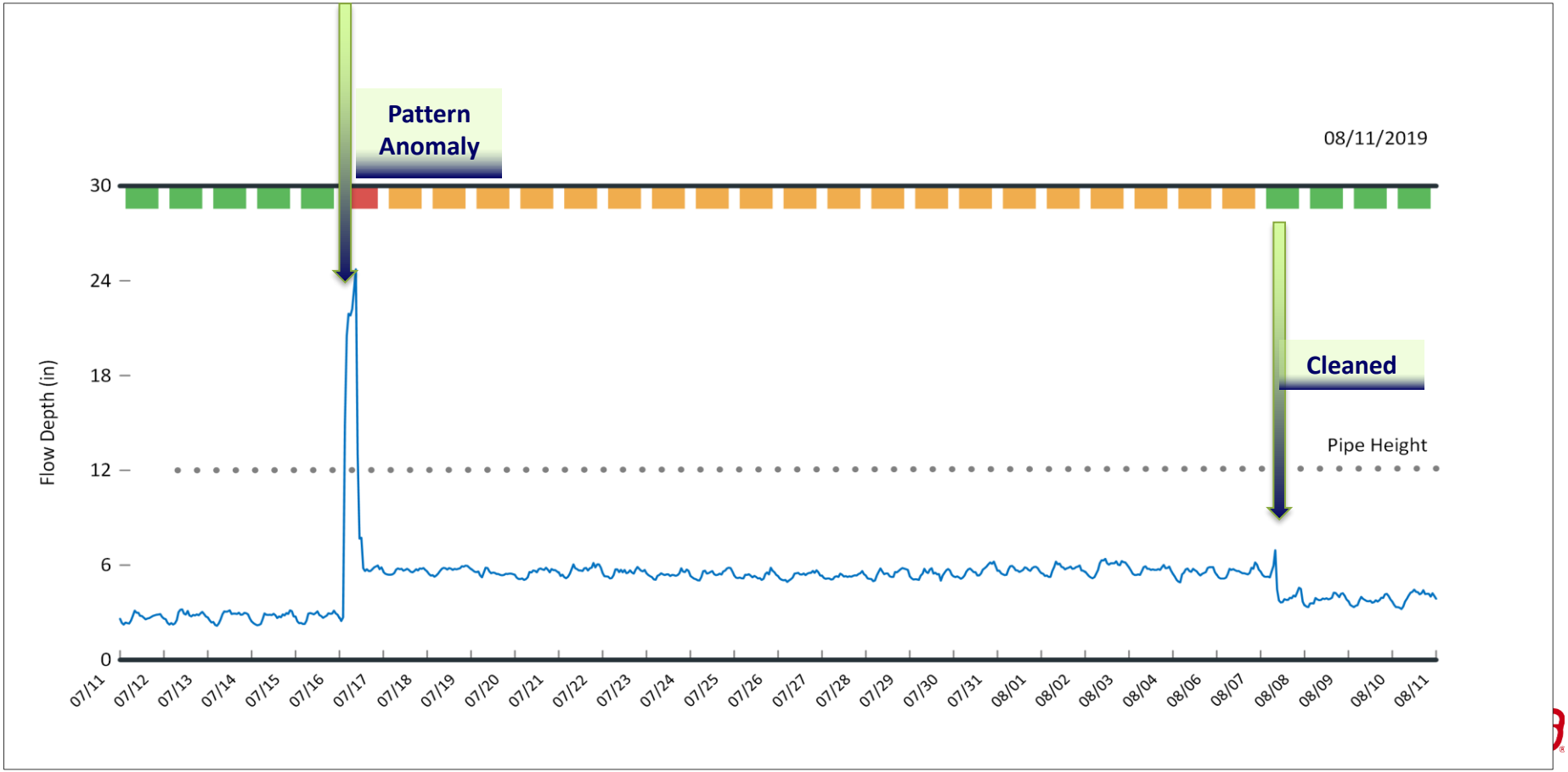
Key to Optimization: Prediction

- Advanced notice (days or weeks)
- Prioritization direct resources



How Machine Learning Detection Works: Example 1

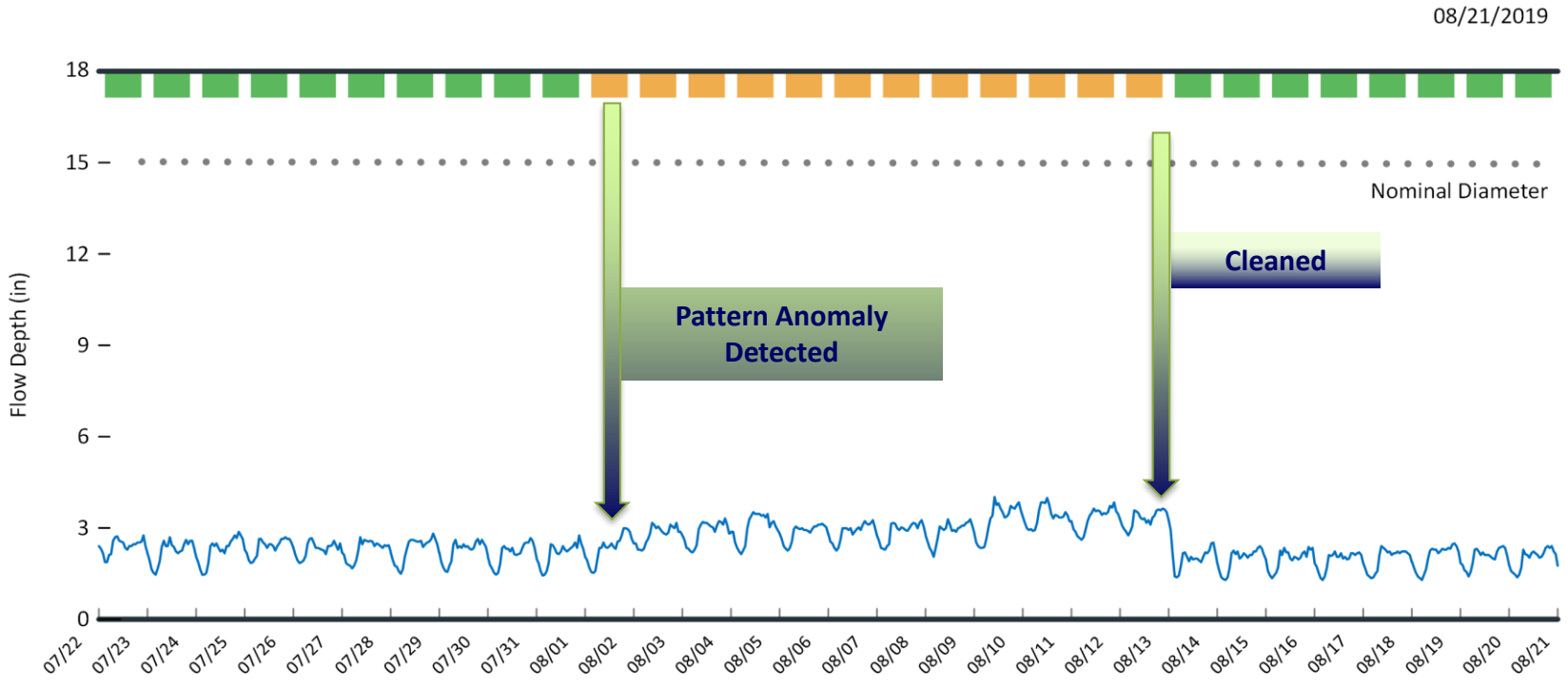
Software “machine learning” uses 1 million days of reviewed data to recognize anomalies



Example 1 Site Findings

Gravel and Rocks Observed in Manhole Channel
Cleaning pushed debris to next segment

Machine Learning Detection: Site Example 2



Example 2 Site Findings

Stick catching debris
Small items can cause bigger problems

Case Studies

La Mesa, CA Case Study

Situation

System 153 miles sewer, 53 miles storm

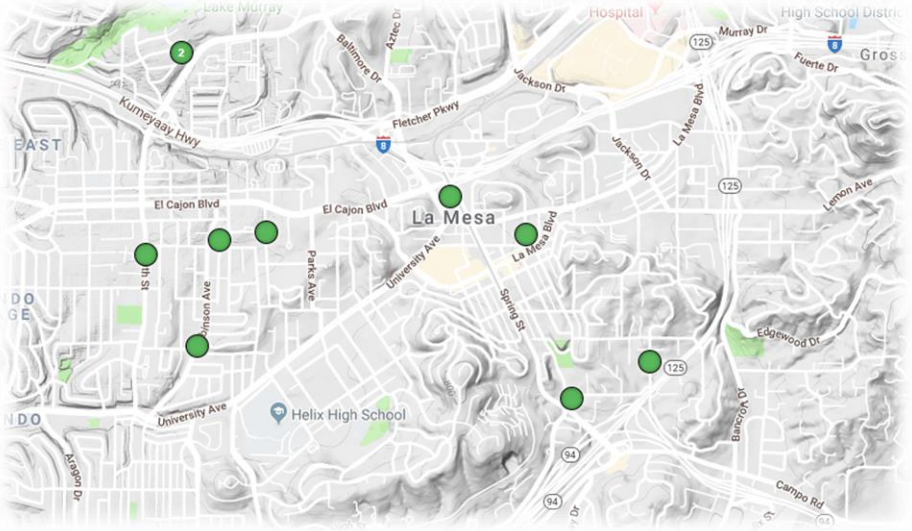
Process Annually- Clean Total System
High frequency- Clean 100 monthly/quarterly segments

Challenges **80% maintenance time spent cleaning**

La Mesa, CA – Optimized Cleaning Process Action Plan

Scope

- Ten (10) monthly cleaning segments monitored
- Study duration: 6-months
- *Site conditions* communicated, software alerts & prioritizes
- Cleaning instances recorded and viewable via cloud-based software

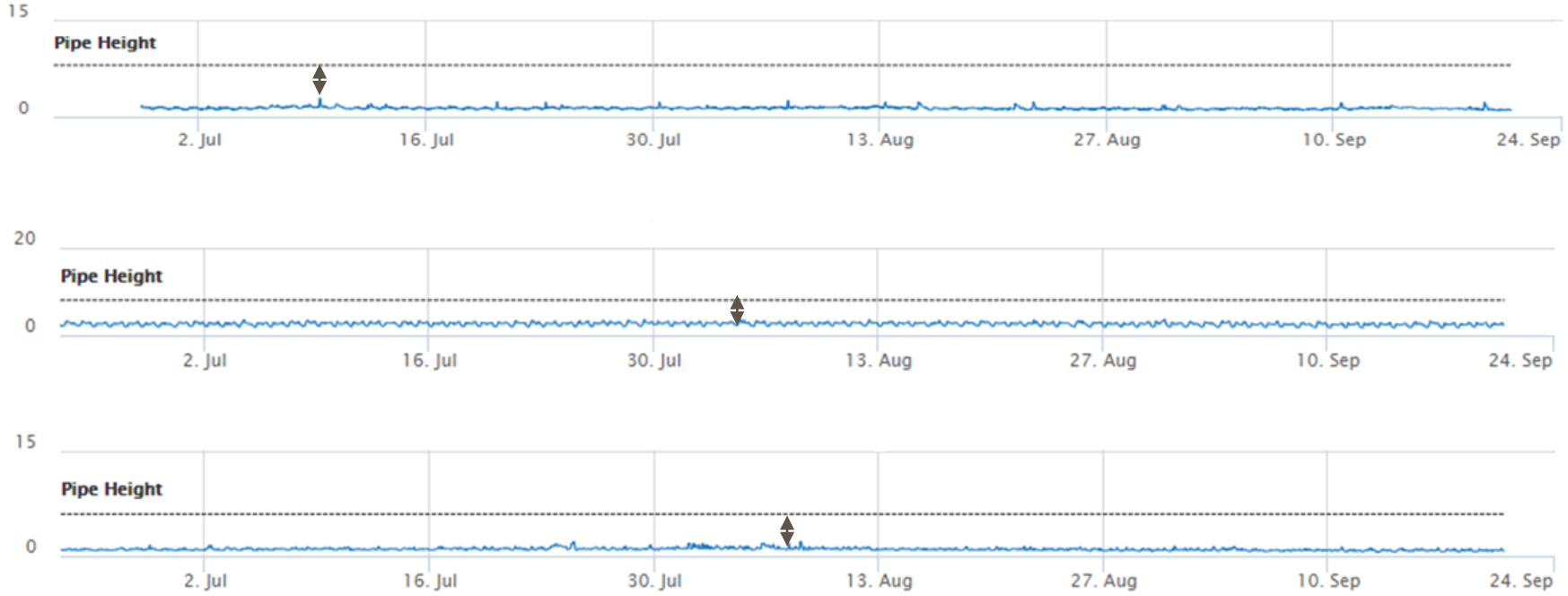


La Mesa- Typical Diurnal Patterns

First 4-months: stable depths at 8 locations

Pipe height: never exceeded

Action: none, do *not* clean

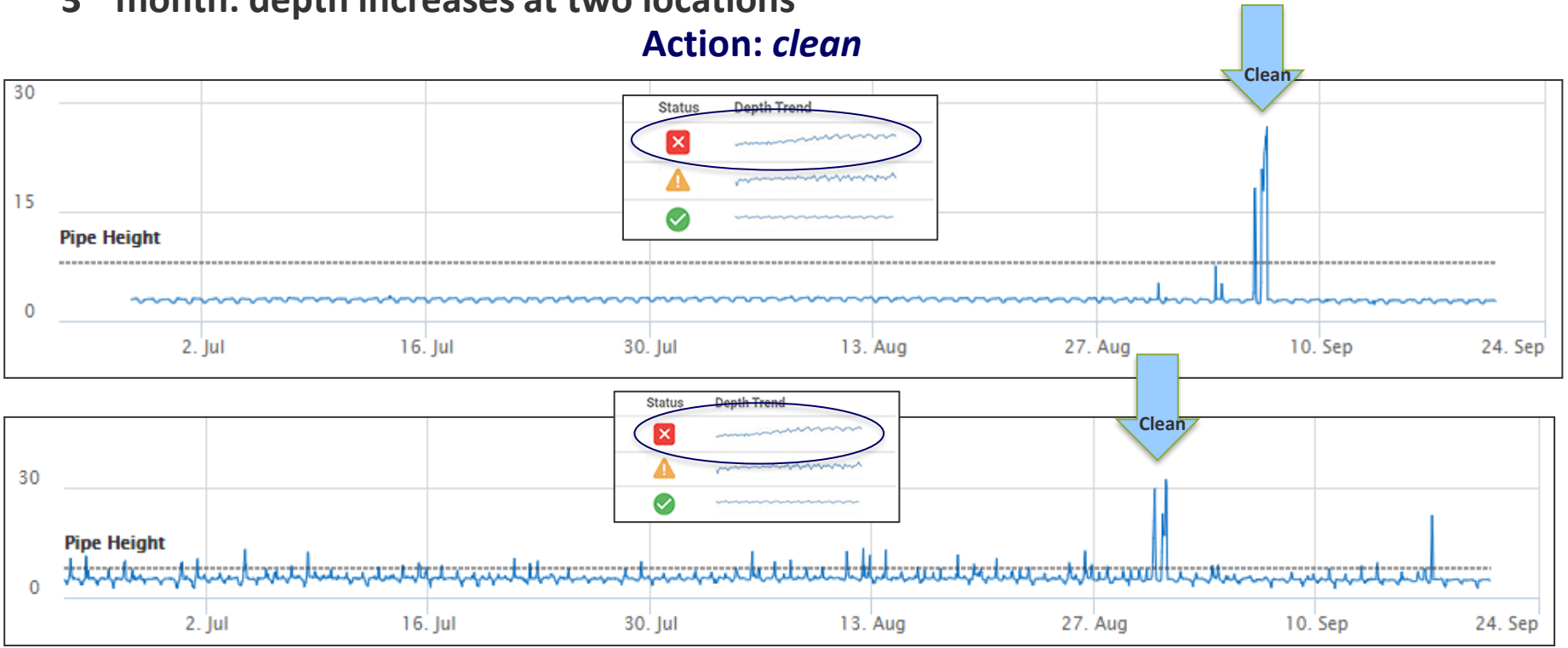


Segments Requiring Action

First 2-months: stable depths

3rd month: depth increases at two locations

Action: *clean*



Take Away: optimization does *not* eliminate but right-sizes cleaning

La Mesa, CA – Tabulated Results

Six-Months

Green = Not cleaned

Red = Cleaned

Site Location	Jul-18		Aug-18		Sep-18		Oct-18		Nov-18		Dec-18	
	Clean?	*Type*	*Clean?*	*Type*	*Clean?*	*Type*	*Clean?*	*Type*	*Clean?*	*Type*	*Clean?*	*Type*
70thSt	No		No		No		No		11/26/18		No	
Colorado	No		No		No		No		11/26/18		No	
EchoDr	No		No		9/17/2018	Grease	No		11/26/18		No	
HarbinsonAve	No		No		No		No		11/26/18		No	
JessieAve	No		No		9/11/2018	Grease/Roots	No		11/26/18		No	
JuliettePl	No		No		No		No		11/26/18		No	
LakeMurray	No		No		No		No		11/26/18		No	
NeboDr	No		No		No		No		11/26/18		No	
PanormaDr	No		No		No		No		11/26/18		No	
PineSt	No		No		No		No		11/26/18		No	

Monthly Results

Month 1:	0 cleaned
Month 2:	0 cleaned
Month 3:	2 cleaned
Month 4:	0 cleaned
Month 5:	10 cleaned
Month 6:	0 cleaned
Total	**12 cleaned**

Summary for Six Months

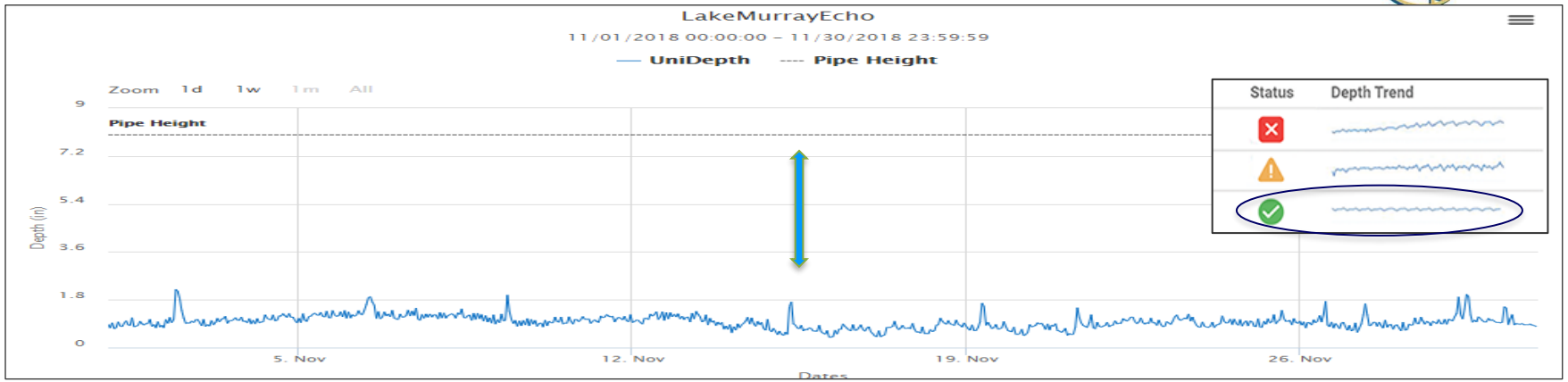
- Expected: Clean 60x (6 months x 10 sites)
- Actual: Clean 12x*
- Reduction: 48 cleanings (80%)

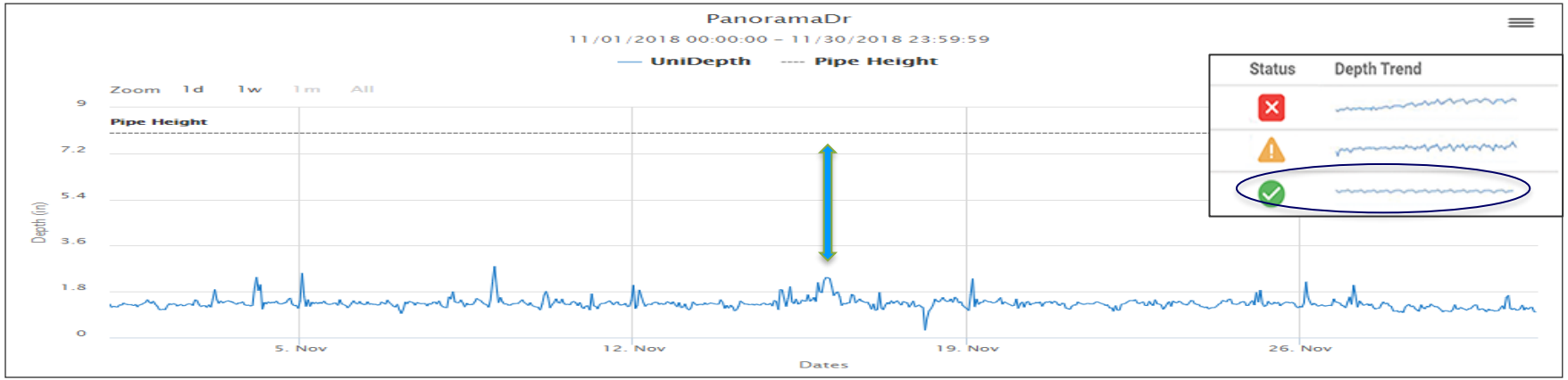
***Note: November all sites cleaned without necessity…**

November Cleaning Required?

Month-5: segments cleaned but *not* required.

Take away: it's *tough* to change old habits!





Results and Return

Frequency	Scheduled Cleaning (6-months)	Actual Cleaning	Change (Reduction %)	Cost/Segment	Total
Monthly	6	1	83%	$ 400	$ 2,000
Monthly	6	1	83%	$ 400	$ 2,000
Monthly	6	2	67%	$ 400	$ 1,600
Monthly	6	1	83%	$ 400	$ 2,000
Monthly	6	2	67%	$ 400	$ 1,600
Monthly	6	1	83%	$ 400	$ 2,000
Monthly	6	1	83%	$ 400	$ 2,000
Monthly	6	1	83%	$ 400	$ 2,000
Monthly	6	1	83%	$ 400	$ 2,000
Monthly	6	1	83%	$ 400	$ 2,000
6-Months	**60**	**12**	**80%**		**$ 19,200**

CITY OF LA MESA
JEWEL of the HILLS

Costs Overview

- Cost of truck
- Insurance
- Vehicle maintenance parts and labor
- Fuel
- Tools and materials
- Personnel labor and benefits

Productivity Savings

Renton, WA - Case Study

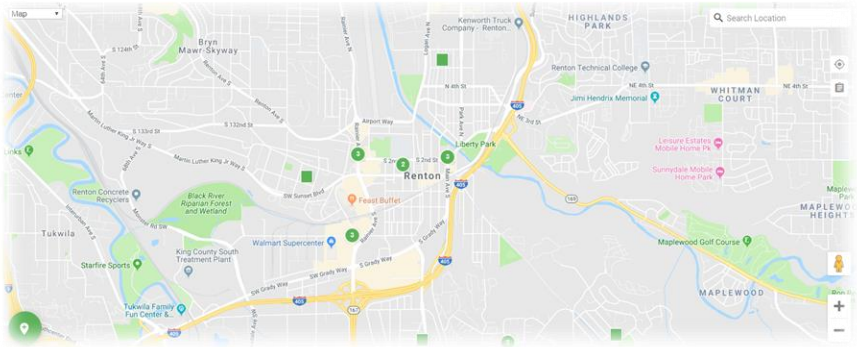
Situation

System 232 miles sewer

Process High Frequency Cleaning: weekly & monthly segments

Challenges Unable to clean entire system

Study Scope Duration: 4-months
20 segments: 8 weekly, 12 monthly



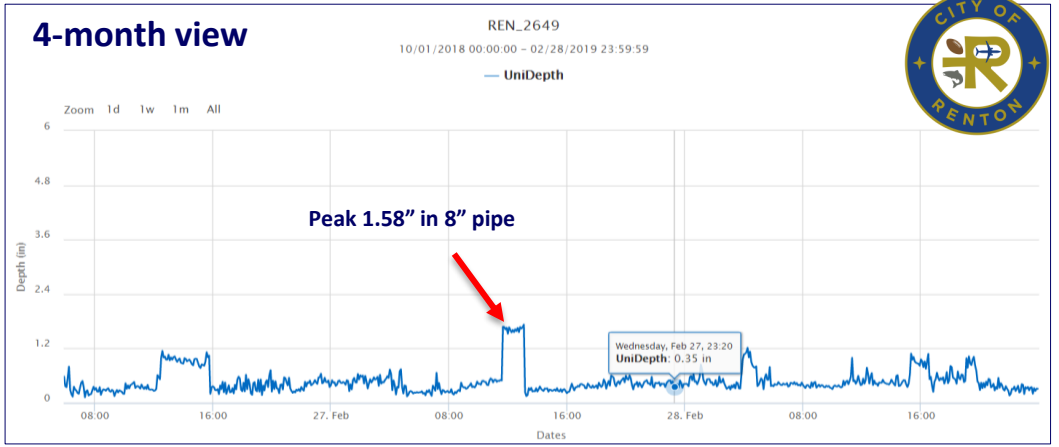
Typical *Weekly* Segment Pattern

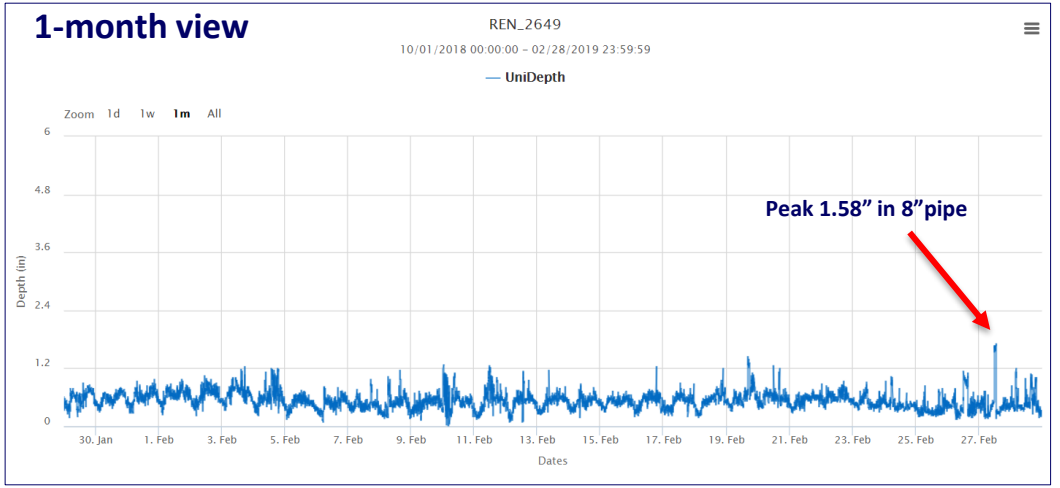
Site

Pipe Diameter:	8”
4-Month Peak Height:	1.58”
Action:	do not clean

Cleaning Frequency Change

Schedule-driven:	19
Actual:	0
Cleaning Reduction:	100%





Typical *Monthly* Segment Pattern

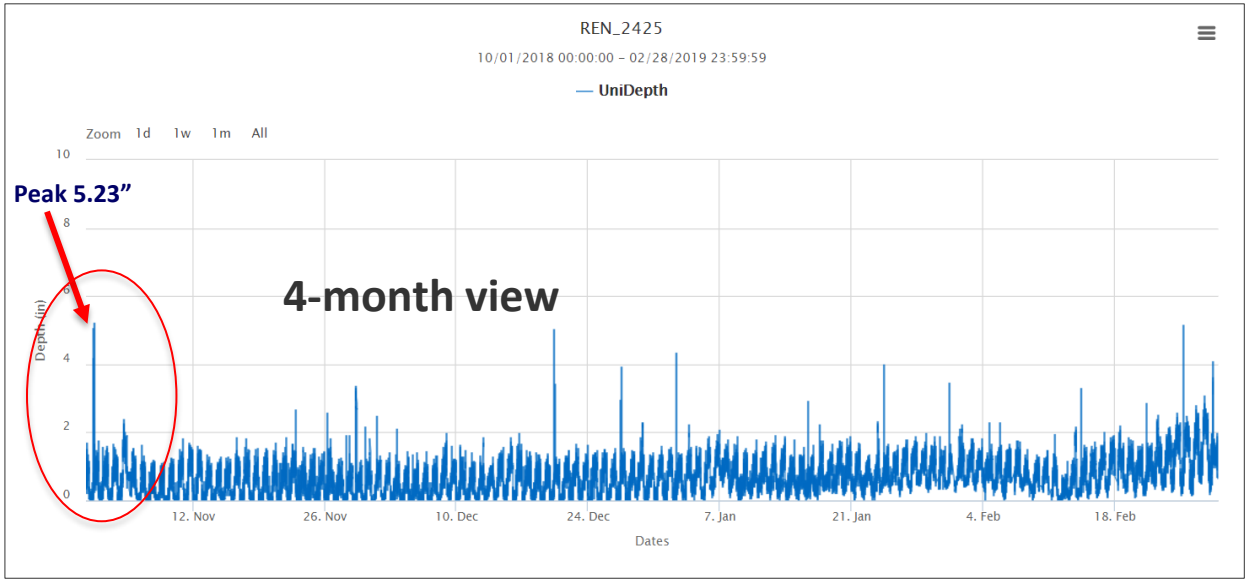
Site

Pipe Diameter: 10”

Peak Height: 5.23”

Cleaning Frequency

Schedule-driven:	4
Segment-Driven:	0
Reduction:	100%



Renton - Results and Return

Site Name	Pipe Size	Frequency	Scheduled 4-Months	Actual	% Change	Cost/Segment	Savings
1	8	Weekly	19	0	100%	$ 400	$ 7,600
2	8	Weekly	19	1	95%	$ 400	$ 7,200
3	8	Weekly	19	0	100%	$ 400	$ 7,600
4	10	Weekly	19	0	100%	$ 400	$ 7,600
5	8	Weekly	19	3	84%	$ 400	$ 6,400
6	8	Weekly	19	2	89%	$ 400	$ 6,800
7	8	Weekly	19	0	100%	$ 400	$ 7,600
8	10	Weekly	19	0	100%	$ 400	$ 7,600
			152	**6**	**96%**		**$ 58,400**
9	8	Monthly	4	0	100%	$ 400	$ 1,600
10	8	Monthly	4	0	100%	$ 400	$ 1,600
11	8	Monthly	4	0	100%	$ 400	$ 1,600
12	8	Monthly	4	0	100%	$ 400	$ 1,600
13	8	Monthly	4	0	100%	$ 400	$ 1,600
14	10	Monthly	4	0	100%	$ 400	$ 1,600
15	8	Monthly	4	2	89%	$ 400	$ 800
16	8	Monthly	4	0	100%	$ 400	$ 1,600
17	8	Monthly	4	0	100%	$ 400	$ 1,600
18	8	Monthly	4	1	95%	$ 400	$ 1,200
19	8	3 Months	1	0	100%	$ 400	$ 400
20	8	3 Months	1	0	100%	$ 400	$ 400
			42	**3**	**93%**		**$ 15,600**
Total			**194**	**9**	**95.4%**		**$ 74,000**

Productivity Savings

Case 3 – One Full-Year Implementation

Prior Frequency	Scheduled (One Year)	Actual	Reduction	% Reduction	Cost/Segment	Productivity Savings
Monthly	12	1	11	92%	$ 595	$ 6,545
Monthly	12	1	11	92%	$ 595	$ 6,545
Monthly	12	1	11	92%	$ 595	$ 6,545
Monthly	12	2	10	83%	$ 595	$ 5,950
Monthly	12	2	10	83%	$ 595	$ 5,950
Monthly	12	0	12	100%	$ 595	$ 7,140
Monthly	12	1	11	92%	$ 595	$ 6,545
Monthly	12	2	10	83%	$ 595	$ 5,950
Monthly	12	1	11	92%	$ 595	$ 6,545
Monthly	12	2	10	83%	$ 595	$ 5,950
Monthly	12	2	10	83%	$ 595	$ 5,950
Monthly	12	1	11	92%	$ 595	$ 6,545
Monthly	12	1	11	92%	$ 595	$ 6,545
Monthly	12	1	11	92%	$ 595	$ 6,545
Monthly	12	1	11	92%	$ 595	$ 6,545
Monthly	12	2	10	83%	$ 595	$ 5,950
Monthly	12	2	10	83%	$ 595	$ 5,950
Monthly	12	2	10	83%	$ 595	$ 5,950
Monthly	12	2	10	83%	$ 595	$ 5,950
Monthly	12	2	10	83%	$ 595	$ 5,950
Monthly	12	2	10	83%	$ 595	$ 5,950
Monthly	12	2	10	83%	$ 595	$ 5,950
Monthly	12	2	10	83%	$ 595	$ 5,950
Monthly	12	1	11	92%	$ 595	$ 6,545
	300	**38**	**262**	**87%**		**$ 155,890**

Scope

- 12-months
- 25 monitored segments
- *Monthly* frequencies
- Large city, higher costs

Extras

Three SSOs prevented

Take-away

Productivity savings & SSO prevention enhance results

Optimized Cleaning Five-Fold Advancements

1. Reduced cleaning enabling re-allocation of valuable staff resources.
2. Reduced wear on pipes – improving asset life.
3. Gain full-time SSO prevention monitoring.
4. Less time in streets- reducing traffic risks.
5. Ongoing data capture useful for applications i.e., model calibration.

Conclusion

Optimized Cleaning creates healthier, efficient processes…

It eliminates…

- Over-stressed operations
- Excessive pipe wear
- No ongoing SSO protection

It provides…

- Visibility to the collection system
- Predictability
- Fast pay-back
- Immediate performance improvement

Peace of mind

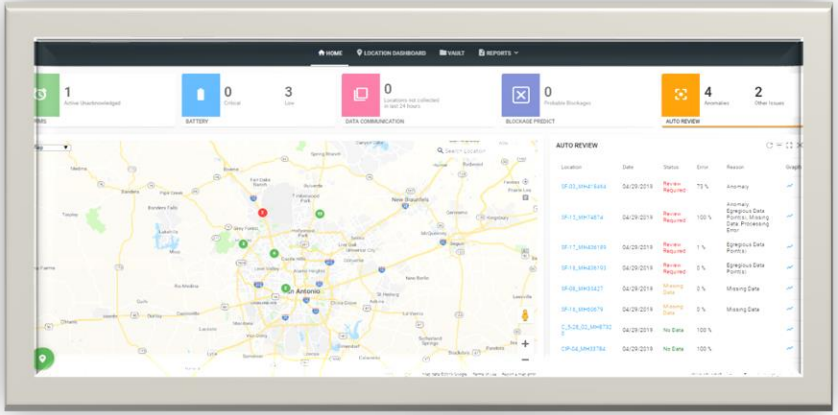
About ADS

Serving wastewater utilities for more than 46 Years

Serving Collection System Monitoring Applications

Comprehensive Monitoring Solutions

- Equipment:
  - Flow
  - Level
  - Rain monitors
- Software with Analytical Apps
- Turn-key field service
- Analysis services



Thank You!

Questions?

Jay Boyd
Director of Market Development
jboyd@idexcorp.com
442-245-0008