



Smart Utilities Advanced Monitoring Solutions for Water & Wastewater

PRESENTED BY:
KEN HAYES – SENIOR SALES MANGER
NATIONAL CORE+ TEAM



Today's Agenda

- Introductions
- Who is Core & Main
- What are Advanced Monitoring Solutions?
- Why is Monitoring Important?
- DMA – What Is It?
- Questions



Who is Core and Main?

Financial Performance:

Market Gap: (NYSE: CNM)

of Locations:

350+ branches

of Employees:

4,100+

History:

100+ years in business

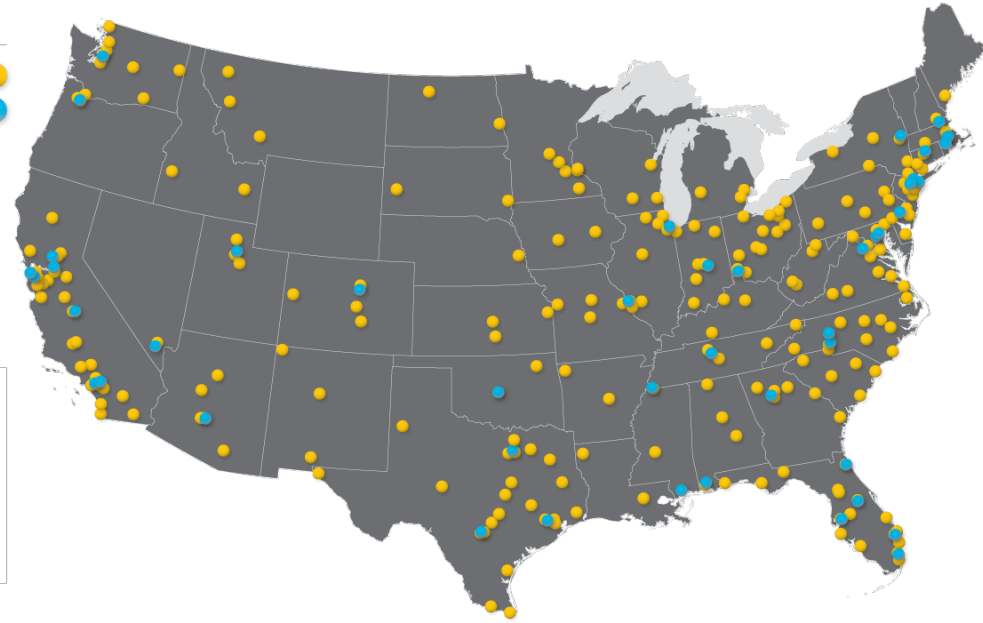
Headquarters:

St. Louis

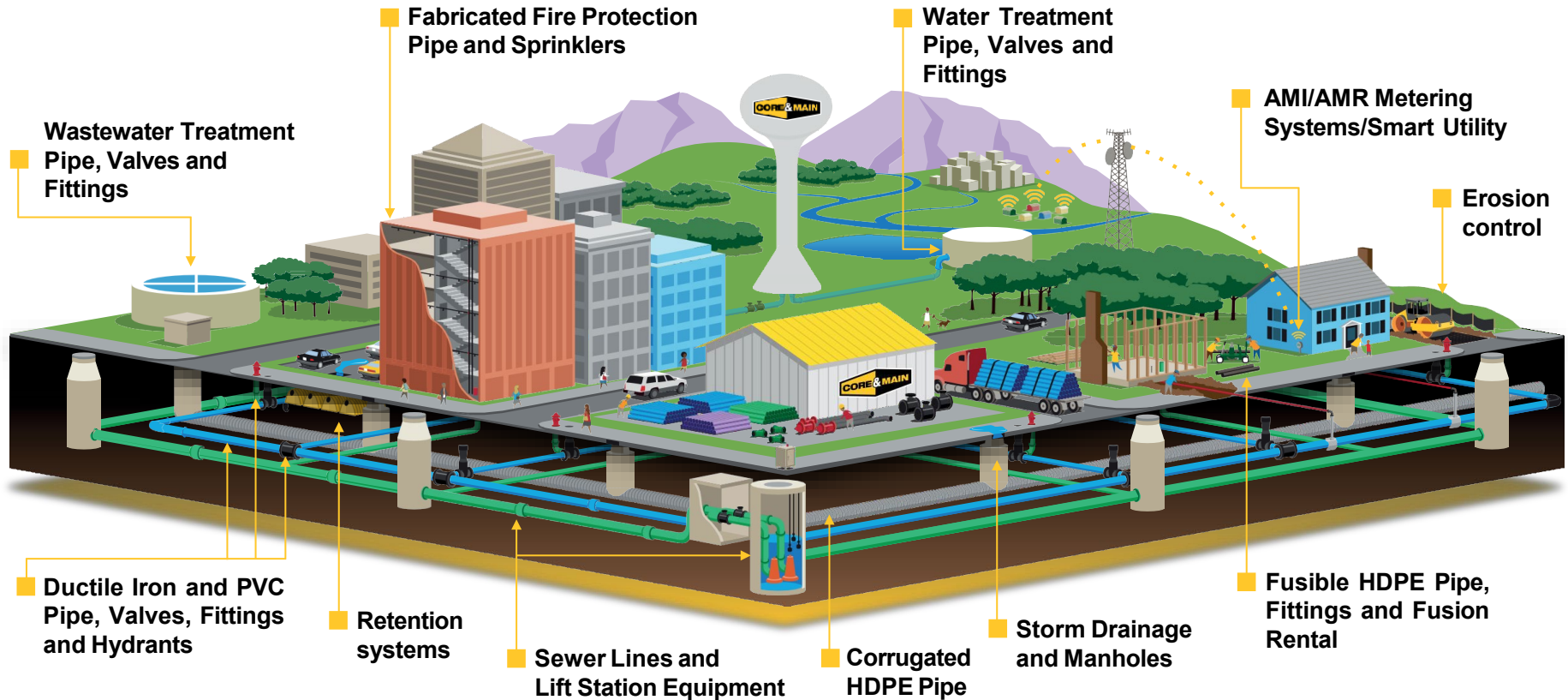
Locations

WATERWORKS

FIRE PROTECTION



PRODUCTS AND SERVICES



Implications

- Negative Customer Image
- Bad Press/ Social Media
- Losing Revenue
- Utility Confidence
- Failing Infrastructure
- Service Disruption
- Unplanned Costs
- Complex Agency Reporting
- Regulatory Violations/Fines

Town of Chelmsford cited by MassDEP for sewage violations

PUBLISHED: May 25, 2021 at 5:22 p.m.

State finds 24 'possible violations' after massive Winter Springs fish kill

Department of Environmental protection discovers wastewater plant 'bypassed the filtration and disinfection systems'

Florida Water System Hack Highlights Challenges for Public Utility Cybersecurity

Wednesday, February 24, 2021

Drinking-water quality, ongoing sewage spill: Slidell-area utility cited for violations

BY SARA PAGONES | STAFF WRITER PUBLISHED APR 12, 2021 AT 12:27 PM | UPDATED APR 12, 2021 AT 5:33 PM 2 min to read

MPCA fines Jordan Sands for wastewater violations

Apr 1, 2021

ML&P fined \$230K for wastewater effluent violations

Former Sioux City Wastewater Treatment Plant Superintendent Sentenced to Federal Prison for Violating the Clean Water Act

Fort Myers faces over \$500,000 in fines for sewage in city water

Updated: February 11, 2021 3:33 PM EST

City of Wooster to Address Violations of Clean Water Act at City's Wastewater Treatment Plant

Questions to Ponder....



CORE & MAIN

ADVANCED MONITORING SOLUTIONS

for Wastewater

Image of a worker in a hard hat and safety glasses talking on a radio while holding a clipboard.

 <p>SSO/CSO Monitoring</p>	 <p>Flow / Infiltration & Inflow</p>	 <p>Smart Pumping Solutions</p>	 <p>Pump Station Emergency Level Monitoring</p>	 <p>Environmental & Compliance Monitoring</p>
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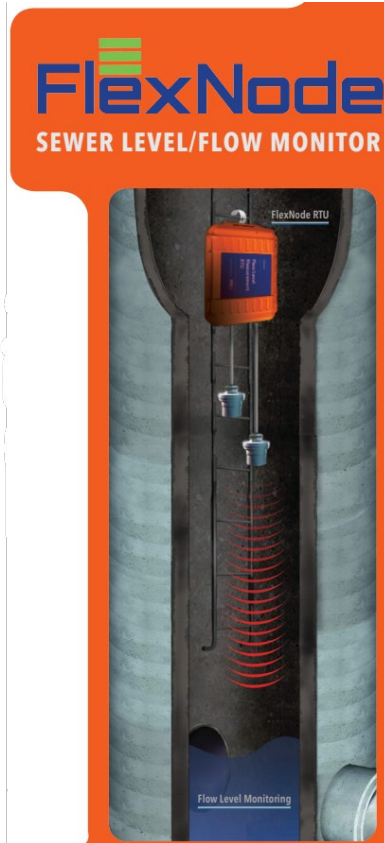
- What are your top issues?
- Have you spent money on particular areas, (i.e. manholes, basins, lift stations, water quality) BUT you still have recurring issues?
- What technology, if any, have you deployed?
- What studies have been performed?
- Have you engaged your engineers and trusted partners in working on issues?

CORE+ AMS WW Solutions



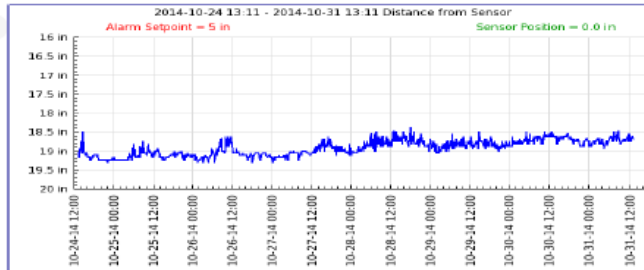
SSO/CSO Level Monitoring

- Proactive Blockage and Overflow Detection and Notification **before an overflow occurs**
- Targeted and efficient resource dispatch to **optimize cleanout** & maintenance activities
- Flow meters, manhole level sensors, network communications
- Integrated data analytics and management platform
- Machine learning-enabled **trend advisories**
- Near real-time **actionable data**



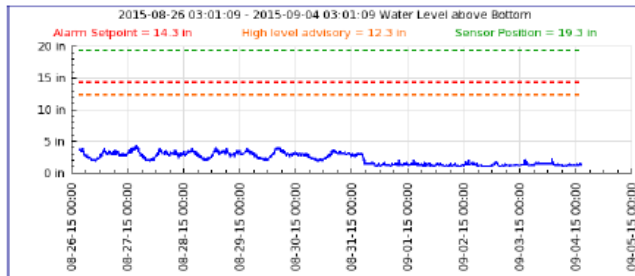
Keeping a close eye on SSO's

Trending Examples



Trend Rise

- Downstream restriction
 - FOG
 - Roots
 - Foreign obstruction
 - Lift station down

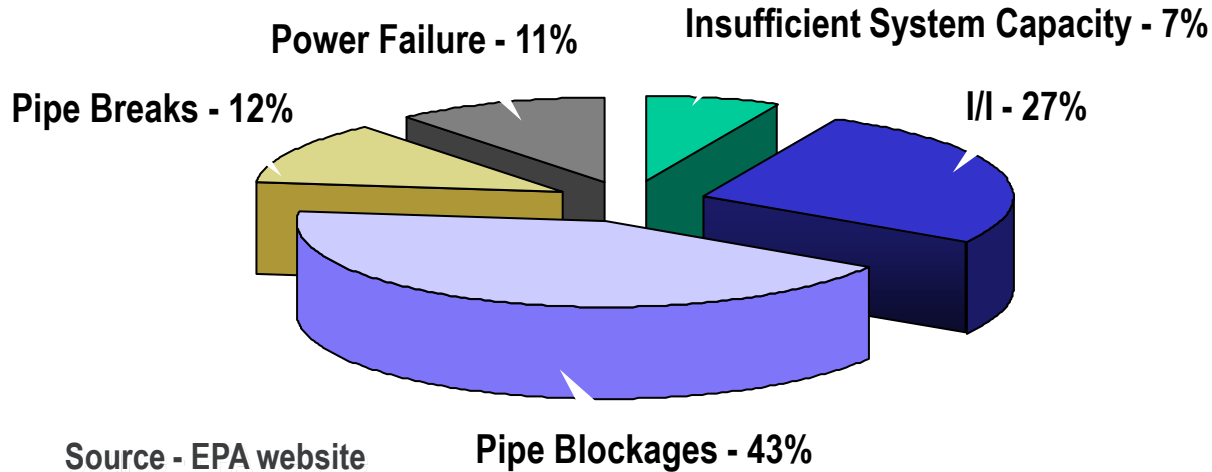


Trend Fall

- Upstream restriction
 - FOG
 - Roots
 - Foreign obstruction
 - Lift station down



Sanitary Sewer Overflows



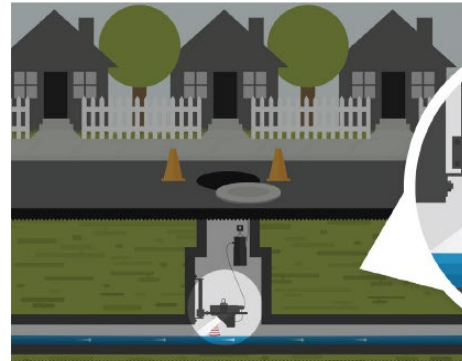
Based on a sample of six Cities
Causes of SSOs can vary significantly

CORE+ AMS WW Solutions



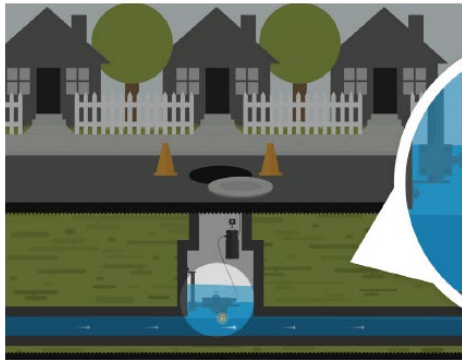
Flow Monitoring & I/I Analysis

- Near real-time identification of rain-derived inflow and infiltration (I/I) **sources**
- Wet and dry **weather pattern analysis**
- Determines **precise amounts** of Inflow & Infiltration
- Prioritizes basin/lift station maintenance activities and **reduces mobilizations**
- Flow/velocity interval measurements, sewer basin rainfall, and the basin's water **consumption data**
- **Actionable data** via dashboards, graphing, reporting, and **machine learning-enabled analytics**



FLO-DAR

Doppler radar captures velocity and ultrasonic measures level



Surcharge Velocity Sensor

Electromagnetic technology and a pressure transducer capture data during surcharge scenario

CORE+ AMS WW SOLUTIONS



FlexFlow IQ

NON-CONTACT PULSE-RADAR FLOWMETER



CORE+ AMS WW SOLUTIONS



FlexFlow IQ

NON-CONTACT PULSE-RADAR FLOWMETER



- Alden-Labs Verified and Validated for Accurate Flow Measurement ± 0.4 inch or ± 10 mm
- Communicates via Cellular, Satellite, Sensus, LoRaWAN, Itron Gen5 and Modbus
- Simple integration with SCADA, PLC or telemetry systems
- Perfect solution for difficult flow conditions: high solids content, high temperature, shallow and caustic flows, high velocities and large open channels

CORE+ AMS WW SOLUTIONS



FLEXFLOW IQ

Doppler radar captures velocity and
radar measures level

CORE+ AMS WW SOLUTIONS



SURCHARGE LEVEL SENSOR

Pressure transducer capture data
during surcharge scenario

CORE+ AMS WW SOLUTIONS



WIRELESS LOGGER

Communicates via Cellular, Satellite, Sensus,
LoRaWAN, Itron Gen5 and Modbus

CORE+ AMS WW SOLUTIONS



How Do We Use This...



Graphing Create time series and scatter

Start Date: Dec 9, 2006
 End Date: Dec 20, 2006
 Flow Channel: Weir Flow (cfs)
 Dry Weather Pattern: Winter
 Rainfall Gauge: Demo Rainfall US (in)

SUPPORT

Hourly Rainfall Flow 1hr Avg RDII Flow 24hr Avg RDII Flow QWF

You can plot several channels

Auto I&I Automatically Estimates Infiltration and Inflow in your sewer flow data using the I&I Envelope Method (also known as the Q vs. I method).

SELECT CHANNELS:

- Temp
- Velocity
- 5K
- PS601 GPDII
- 614NF
- 63NF
- 658NF
- 666NF
- 667NF
- 668NF
- 669NF
- 67NF
- 683NF
- 685NF
- 691NF
- 692NF
- 704NF

INFINITI - BH04 // ENVELOPE // STORM EVENTS

Select Storm Event

#	START	END	6 HR MAX RAINFALL	PEAK 1 HR AVG RDII FLOW
1	2013-12-22 06:15	2013-12-23 13:15	1.53 in	0.34 MGD
2	2014-01-09 22:30	2014-01-11 12:00	1.48 in	0.62 MGD
3	2019-04-19 03:45	2019-04-19 10:00	1.29 in	1.82 MGD
4	2014-03-16 04:30	2014-03-16 11:30	1.01 in	0.29 MGD
5	2017-04-05 07:30	2017-04-05 22:15	0.95 in	0.62 MGD
6	2013-12-28 15:00	2013-12-29 05:45	0.93 in	0.29 MGD
7	2017-01-21 09:00	2017-01-21 13:15	0.78 in	0.67 MGD
8	2015-07-31 19:45	2015-07-31 22:15	0.78 in	0.17 MGD
9	2015-12-23 00:45	2015-12-26 00:30	0.76 in	0.78 MGD
10	2017-06-20 10:45	2017-06-20 23:00	0.75 in	0.22 MGD
11	2015-08-22 19:00	2015-08-23 10:15	0.75 in	0.67 MGD
12	2014-02-21 03:45	2014-02-21 06:45	0.70 in	0.23 MGD
13	2013-12-14 07:45	2013-12-15 01:15	0.67 in	0.21 MGD
14	2016-02-02 21:45	2016-02-03 11:45	0.67 in	0.64 MGD
15	2014-05-14 18:00	2014-05-15 07:45	0.65 in	0.36 MGD

SELECT A DATE RANGE

Last 7 Days

FROM

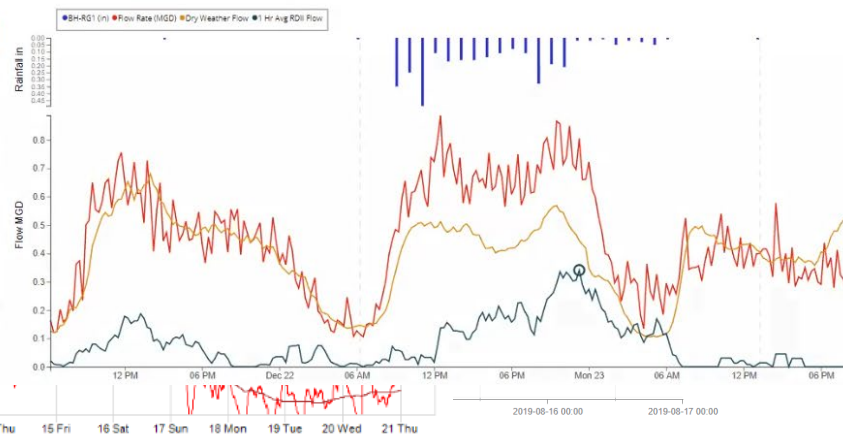
2019-08-09 00:00

TO

2019-08-16 23:59

SELECT GRAPH TYPE

RDII Chart for Storm Event #1 - 2013-12-22 06:15 to 2013-12-23 13:15



CORE+ AMS WW Solutions



Environmental Water Quality Monitoring

- Practical and proactive approach to **monitoring water quality** to increase the public health level of service
- Help the utility identify and address conditions leading to **fish kills, algae blooms**, and other environmental issues
- Battery-powered Internet of Things (IoT) devices/sensors and analytics software
- Monitors **water quality parameters** including Pressure, Level, Conductivity, Turbidity, Total Chlorine, Free Chlorine, Temperature, pH, Blue-Green Algae, Chlorophyll, Dissolved Oxygen, and Hydrogen Sulfide

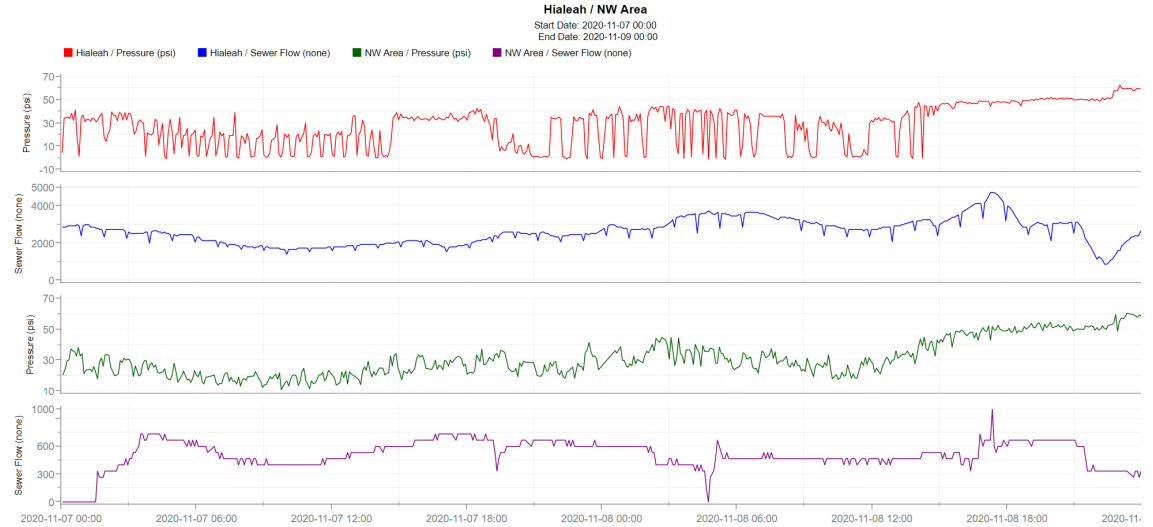
Pump Station Emergency Level Monitoring

- Proactive **monitoring of the levels** inside their sewer pump stations during emergency operating conditions
- Pump station data analysis to ensure the pumps are **operating at optimal energy and performance efficiencies**
- Near real-time **awareness of emergency generators'** operational status and fuel levels
- Route maintenance personnel to **mission-critical infrastructure** requiring the most **urgent intervention**
- Battery-powered Internet of Things (IoT) devices/sensors and analytics software

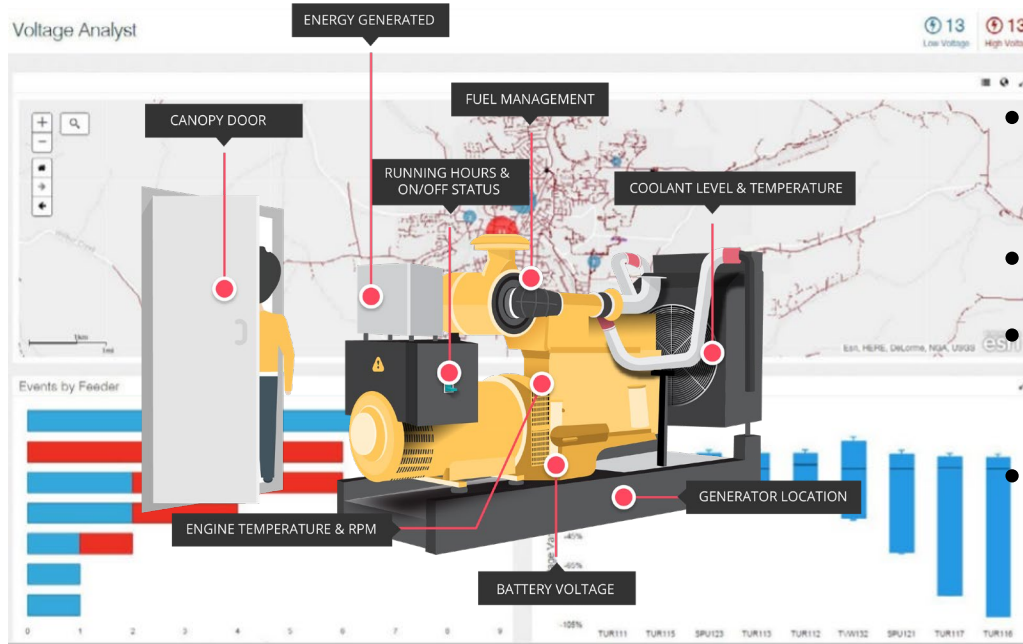
Force Main Monitoring



How do we do it?



Pump Station Optimization & Resiliency



- Turn your Pump Station into an accurate flow meter.
- Advanced Pump Curve Analysis
- Emergency Generator and Wet Well Level Monitoring
- Energy Integration and Analysis

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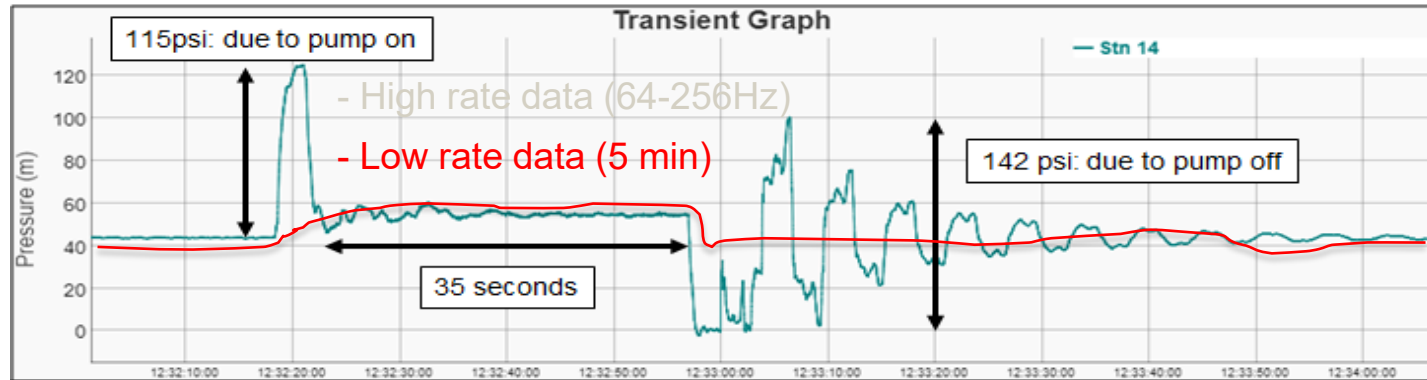


FlexFlow IQ Integrates with Lift Station Monitoring

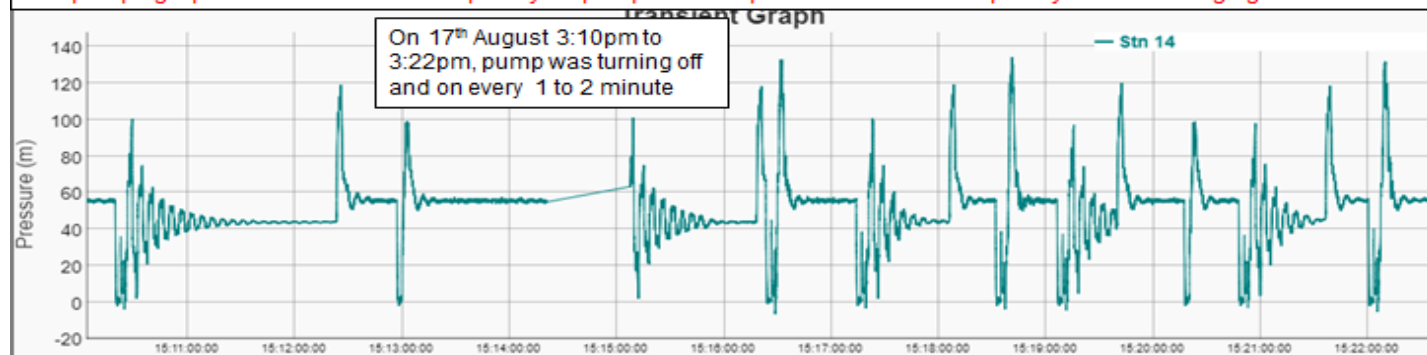


- Lift Station Monitoring
- AC Power
- Pump Failure Alarm
- Wet Well Monitoring

What do we do with the data?



Instances when pump is turning on and off at very fast intervals – recommend to check if it is possible to optimise the pumping operation and reduce frequency of pump start/stop so as to reduce frequency of the damaging transients



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Water Quality Composite Sampling

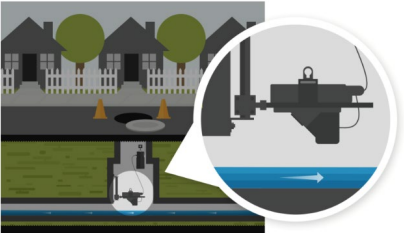
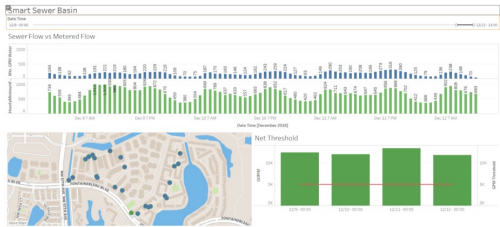
- **Industrial Pollution Monitoring**
- Identify common compounds and other water quality characteristics
 - Conventional: Ammonia as N, Biochemical Oxygen on Demand (BOD), Total Suspended Solids (TSS)
 - Toxic: Cyanide
 - Metals: Arsenic, Cadmium, Chromium, Copper, Lead, Mercury, Molybdenum, Nickel, Selenium, Silver, Zinc
 - Salts: Total Dissolved Solids (TDS), Chloride
- Device **captures hourly water samples** throughout a 24-hour period
- Utility or state-certified lab for **analysis & reporting**

Collection System Capacity Study

- Identify **planned development impacts**
- Temporary flow metering at **specific wastewater collection system points**
- Considerations for site plans, current collection system **observed capacity, I&I impacts**
- Professional Engineer analysis **executive summary and detailed supporting data** on the expected impacts on the existing wastewater system capacity (CMOM)
- Short-Term/Long-Term **Capacity Study report**

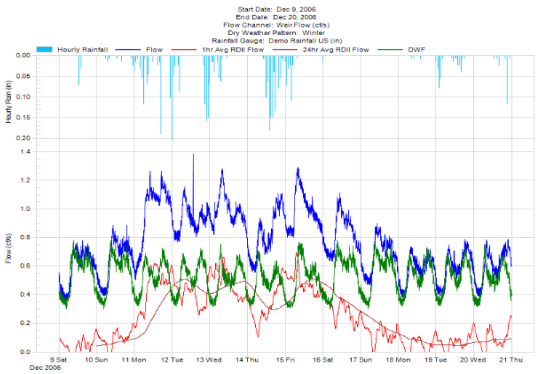
What does WW AMI look like?

Wastewater Data Analysis

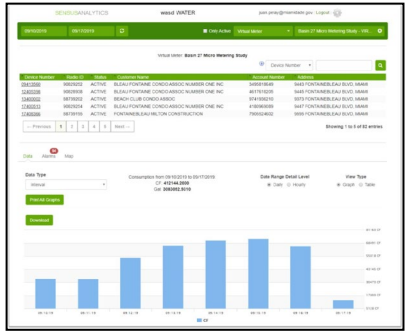


Engineering Data Analytics

Deploy WW Equipment



Water Data Analysis



How Does It Work?



Miami Dade Water and Sewer Manage Water

Welcome | Home | System Settings | Learn | Help | Log Out

Dashboard Alerts Reports **Devices** Groups System Intelligence

Single ID Device ID Search Saved

Meters Sensors Smart Gateways Base Stations

Not all commands are supported for all devices. Selecting actions that are not supported by a device will result in a failed action for the unsupported device.

Actions 82 Devices Selected

Installed Active Basin 27

82 Matches Save Search

wasd WATER

juan.pelay@miamidade.gov | Logout

09/11/2019 09/18/2019 Only Active Virtual Meter Basin 27 Micro Metering Study - VIR

Virtual Meter: Basin 27 Micro Metering Study

Device Number

Device Number	Radio ID	Status	Customer Name	Account Number	Address
09413560	90829252	ACTIVE	BLEAU FONTAINE CONDO ASSOC NUMBER ONE INC	3495818649	9443 FONTAINEBLEAU BLVD, MIAMI
12405398	90828938	ACTIVE	BLEAU FONTAINE CONDO ASSOC NUMBER ONE INC	4617618205	9445 FONTAINEBLEAU BLVD, MIAMI
13400002	88739202	ACTIVE	BEACH CLUB CONDO ASSOC	9741936210	9373 FONTAINEBLEAU BLVD, MIAMI
17400613	90829254	ACTIVE	BLEAU FONTAINE CONDO ASSOC NUMBER ONE INC	4180969089	9447 FONTAINEBLEAU BLVD, MIAMI
17408366	88739195	ACTIVE	FONTAINEBLEAU MILTON CONSTRUCTION	7905024602	9595 FONTAINEBLEAU BLVD, MIAMI

Showing 1 to 5 of 82 entries

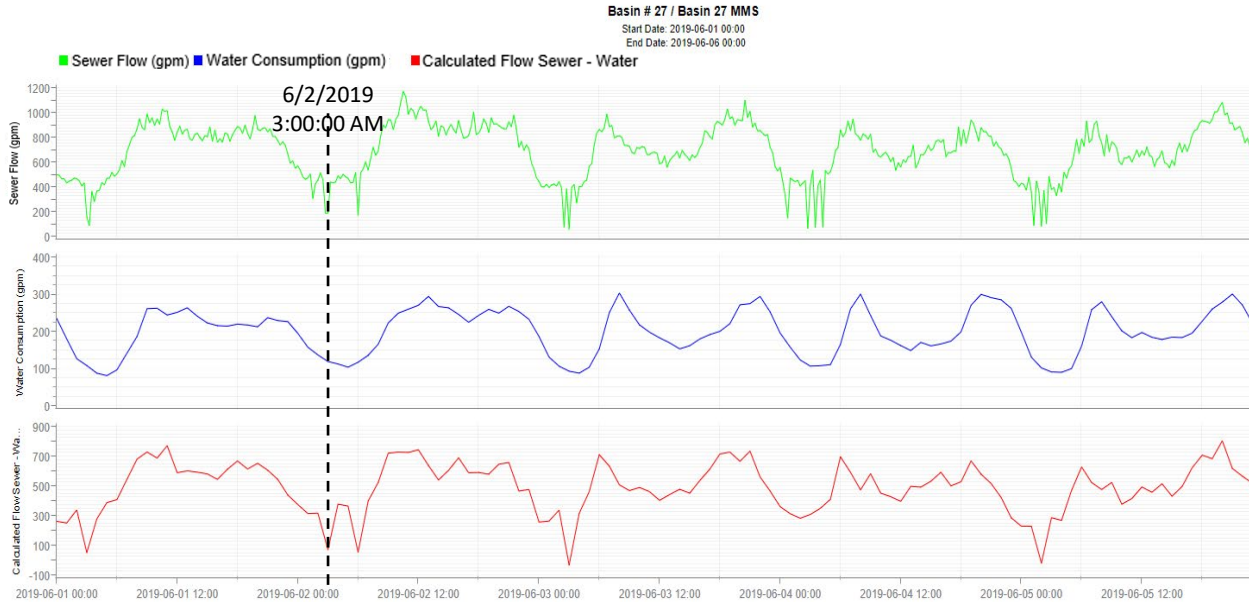
Data Alerts Map

Data Type Interval Consumption from 09/11/2019 to 09/18/2019: CF: 431371.1000 Gal: 522680.1410

Date Range Detail Level Daily Hourly View Type Graph Table

Print All Graphs Download

Pilot Basin 27 Results



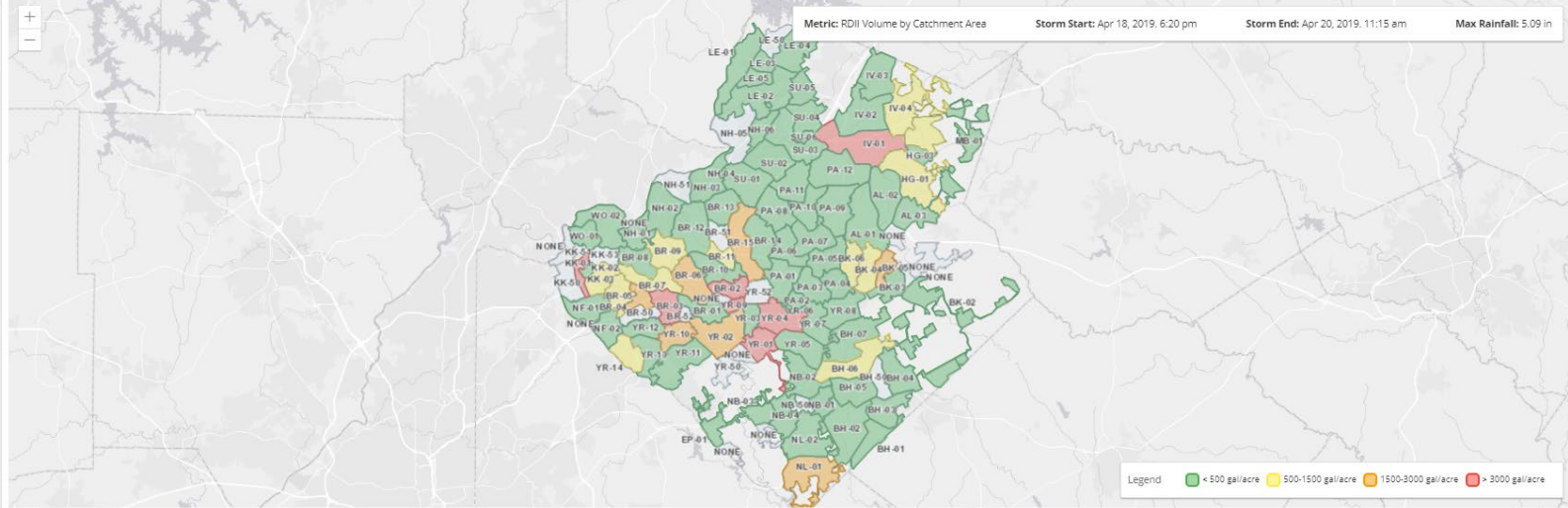
Date & Time Flow Data Selected

Date/Time	Sewer Flow (gpm)	Water Flow (gpm)	Net Flow (gpm)
6/2/2019 3:00:00 AM	191.2	119.7	71.5
Net Flow (gpm) =	(Sewer Meter Flow Data) - (Water Consumption Data)		
Net Flow (gpm) =	191.2 - 119.7 = 71.5 gpm		
GPDIM =	((Net Flow)*1440) / Total IDM		
GPDIM =	(71.5 gpm*1440)/34.9		
GPDIM =	2,949.7		

Smart Utility Monitoring



- SAT AUG 24 2019
- THU AUG 01 2019
- WED JUL 31 2019
- SAT JUL 13 2019
- SAT JUL 13 2019
- FRI JUL 05 2019
- SUN JUN 23 2019
- THU JUN 06 2019
- MON JUN 03 2019
- SUN JUN 02 2019
- MON APR 22 2019
- THU APR 18 2019**
- SUN APR 14 2019
- FRI MAR 08 2019
- SUN MAR 03 2019
- TUE FEB 19 2019
- TUE FEB 12 2019
- WED JAN 23 2019
- WED JAN 02 2019
- SAT DEC 29 2018
- THU DEC 27 2018
- THU DEC 20 2018



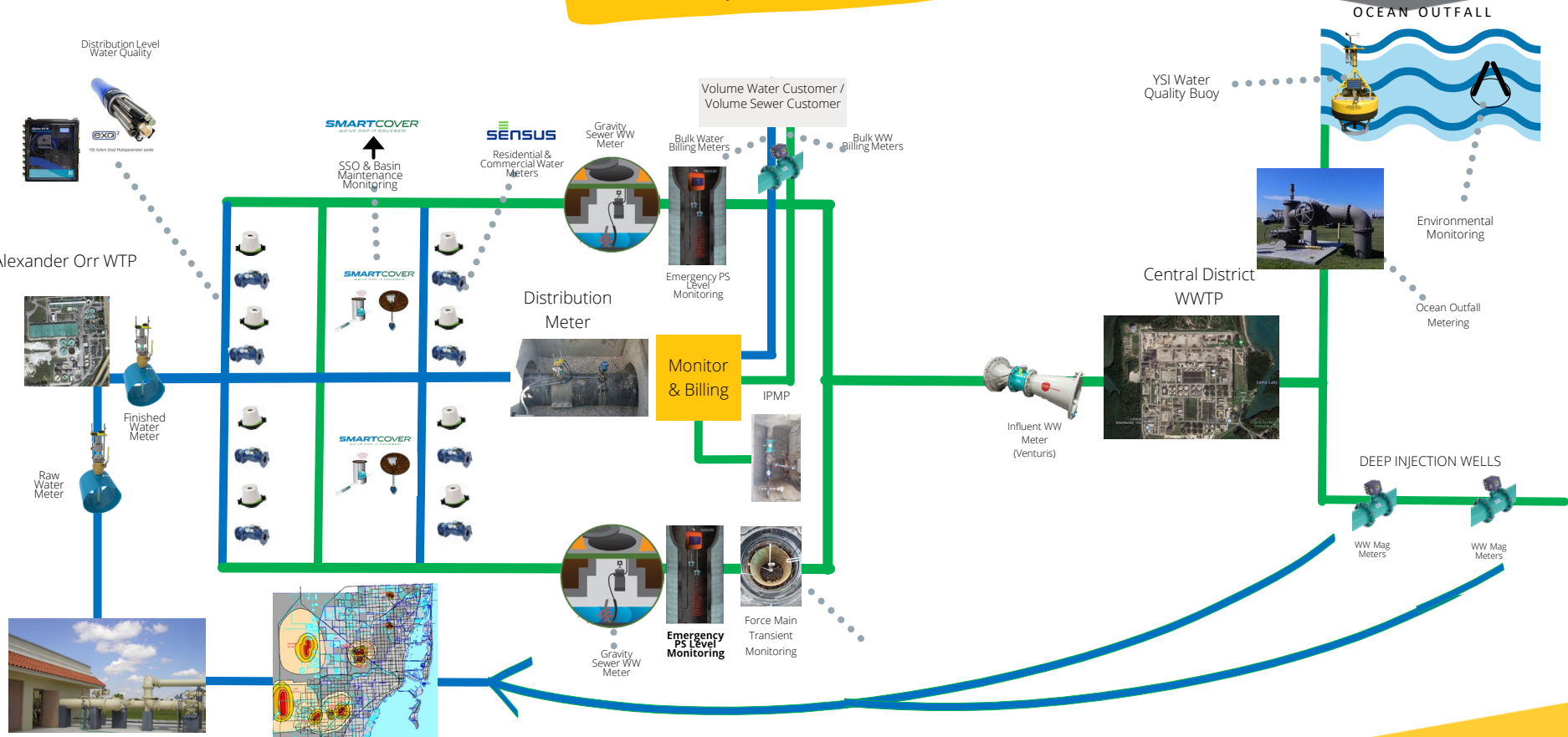
Esri, HERE, NPS

Powered by Esri

- Choose Metric:
- RDII VOLUME BY CATCHMENT AREA (GAL/ACRE)**
- RDII VOLUME BY PIPE LENGTH (GAL/LF)
- RDII FLOW BY PIPE AREA (MGD/IN-MILE)
- PEAK FLOW BY AREA (MGD/ACRE)
- CV RAIN CAPTURED (%)

SITE	CATCHMENT AREA	PIPE LENGTH	PIPE AREA	TOTAL RAINFALL	RDII VOLUME BY CATCHMENT AREA	RDII VOLUME BY PIPE LENGTH	RDII FLOW BY PIPE AREA	PEAK FLOW BY AREA	CV RAIN CAPTURED
AL-01	[DETAILS] 83798715 ft ²	27.78 mi	192.12 in.-mile	0 in	0 gal/acre	0 gal/LF	0 MGD/in.-mile	0 MGD/acre	0 %
AL-02	[DETAILS] 85619069 ft ²	26.88 mi	246.58 in.-mile	3.56 in	76.09 gal/acre	5563.87 gal/LF	0.01 MGD/in.-mile	0 MGD/acre	0.08 %
AL-03	[DETAILS] 70618612 ft ²	36.15 mi	231.48 in.-mile	3.56 in	462.73 gal/acre	20751.34 gal/LF	0.03 MGD/in.-mile	0.001 MGD/acre	0.48 %
AL-04	[DETAILS] 54587740 ft ²	16.23 mi	129.77 in.-mile	0 in	0 gal/acre	0 gal/LF	0 MGD/in.-mile	0 MGD/acre	0 %
BH-01	[DETAILS] 78538520 ft ²	26.94 mi	316.16 in.-mile	0 in	0 gal/acre	0 gal/LF	0 MGD/in.-mile	0 MGD/acre	0 %
BH-02	[DETAILS] 104177468 ft ²	21.41 mi	347.47 in.-mile	0 in	0 gal/acre	0 gal/LF	0 MGD/in.-mile	0 MGD/acre	0 %
BH-03	[DETAILS] 61257884 ft ²	22.09 mi	208.99 in.-mile	0 in	0 gal/acre	0 gal/LF	0 MGD/in.-mile	0 MGD/acre	0 %
BH-04	[DETAILS] 98316005 ft ²	39.57 mi	263.5 in.-mile	4.12 in	358.79 gal/acre	20464.7 gal/LF	0.05 MGD/in.-mile	0.002 MGD/acre	0.32 %
BH-05	[DETAILS] 44936761 ft ²	20.46 mi	181.58 in.-mile	0 in	0 gal/acre	0 gal/LF	0 MGD/in.-mile	0 MGD/acre	0 %

Smart Utility System

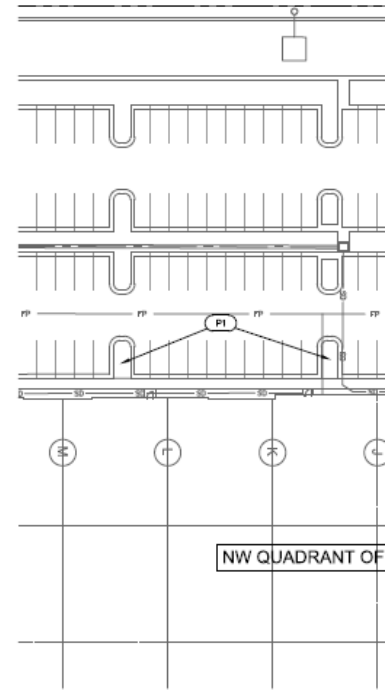
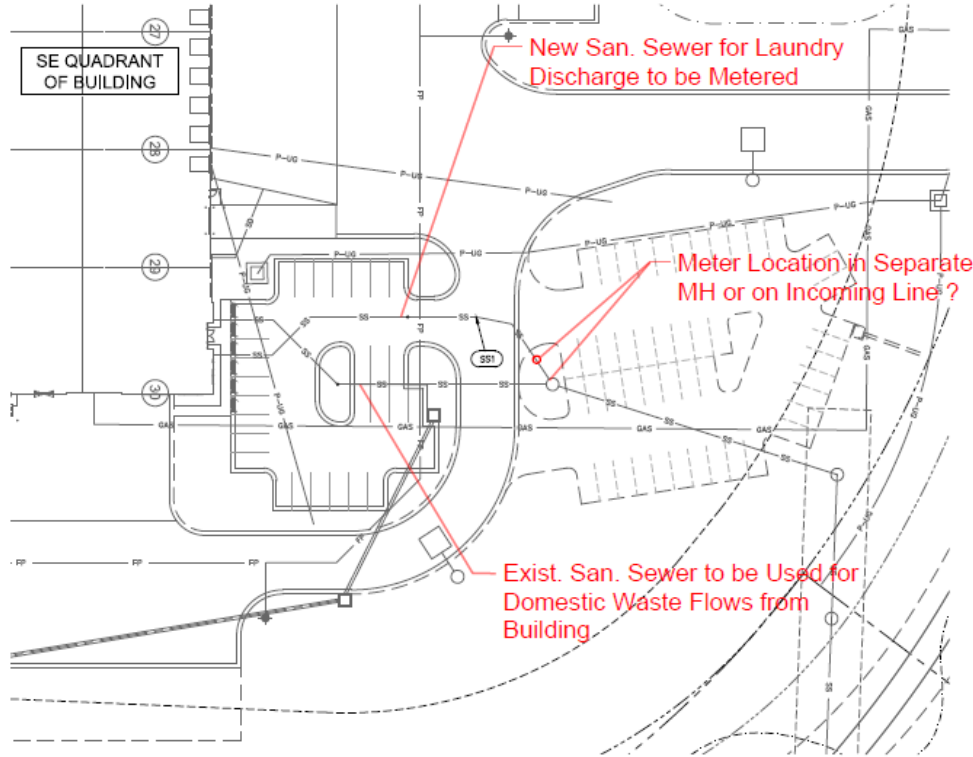


Nuuly Project



Green Field: Raymore Commerce Center

Nuuly Project



UTILITY KEYNOTES: (xx)
SANITARY SEWER
SS1. 6" SANITARY SEWER SERVICE TO BE INSTALLED BY LAND LORD
PAUFUPUT

Advanced Monitoring Solutions



Water Quality



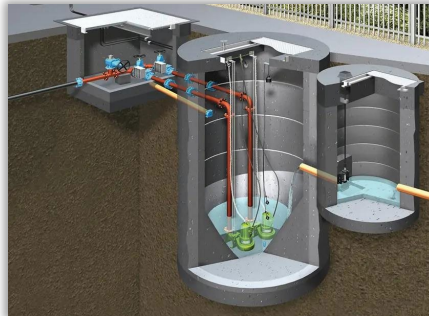
Sewer Main Breaks



Storm Preparedness



Sanitary Sewer Overflow

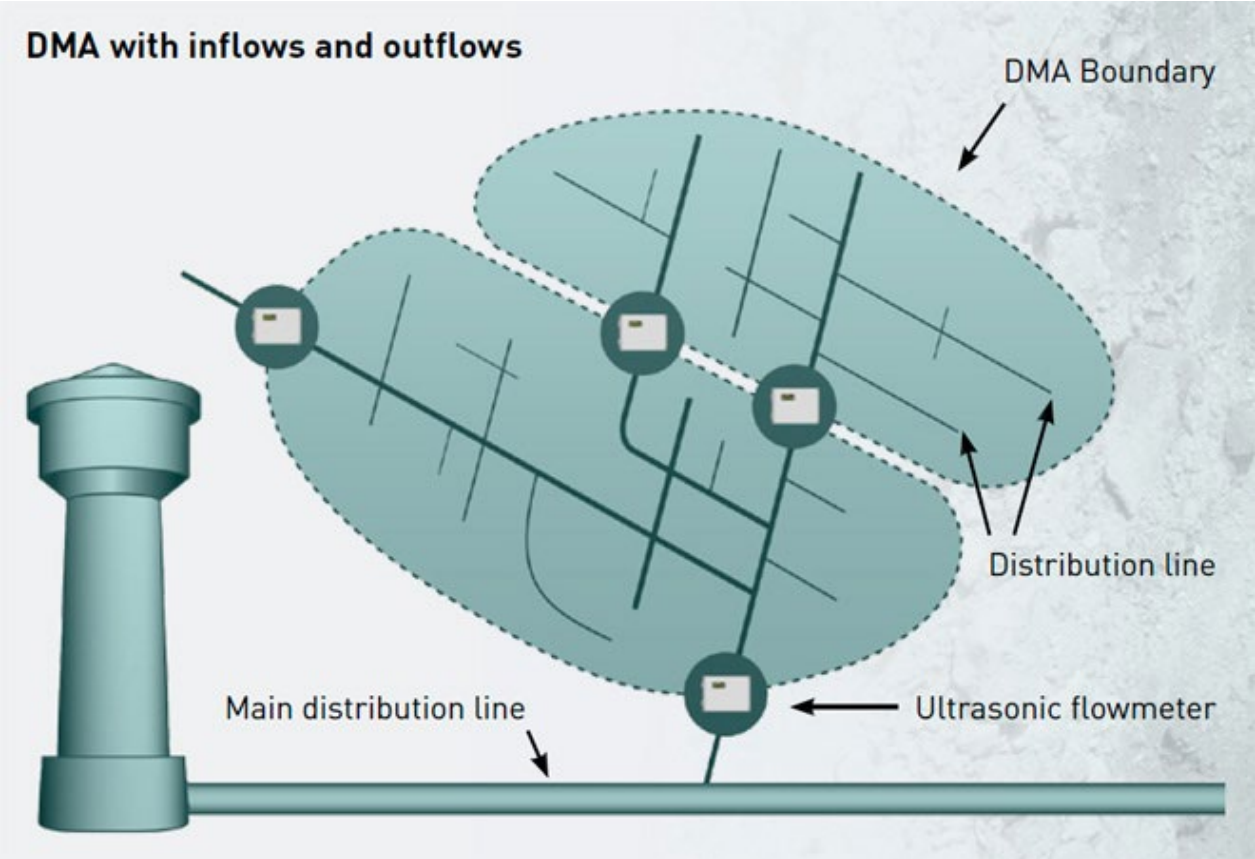


Pump Station Early Warning



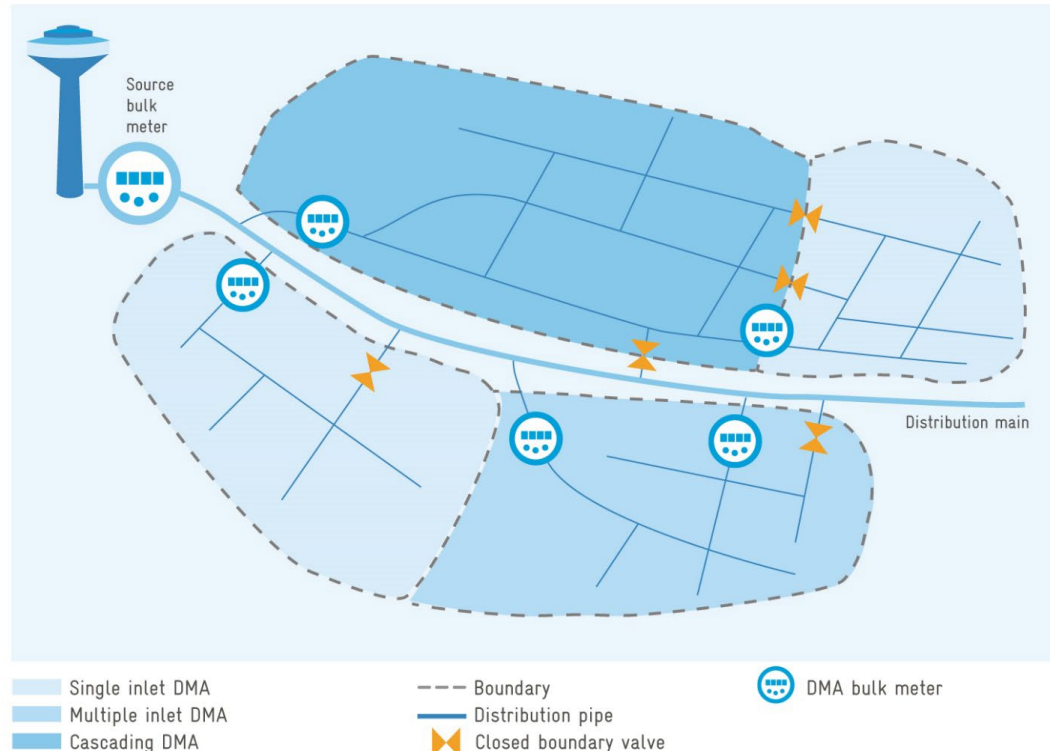
Volume Sewer Customer I&I Analysis

What is District Metering?



What is District Metering?

Figure 6.2 Typical layout of DMAs, based on [22]



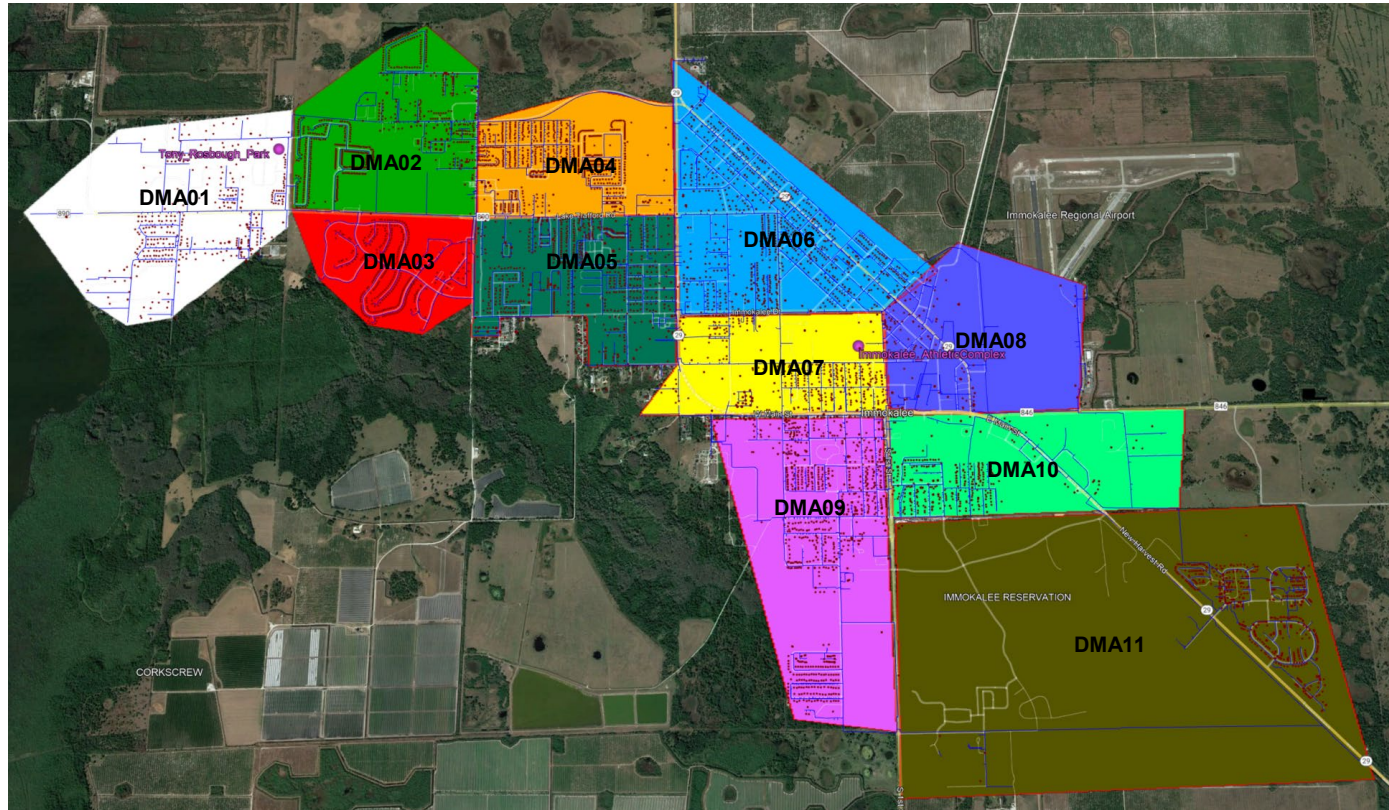
- Segmenting the distribution system
- Analyzing these segments to identify causes of NRW
- Using data to evaluate the effectiveness of remediation and CIP efforts

How do you build a District Metering Analysis

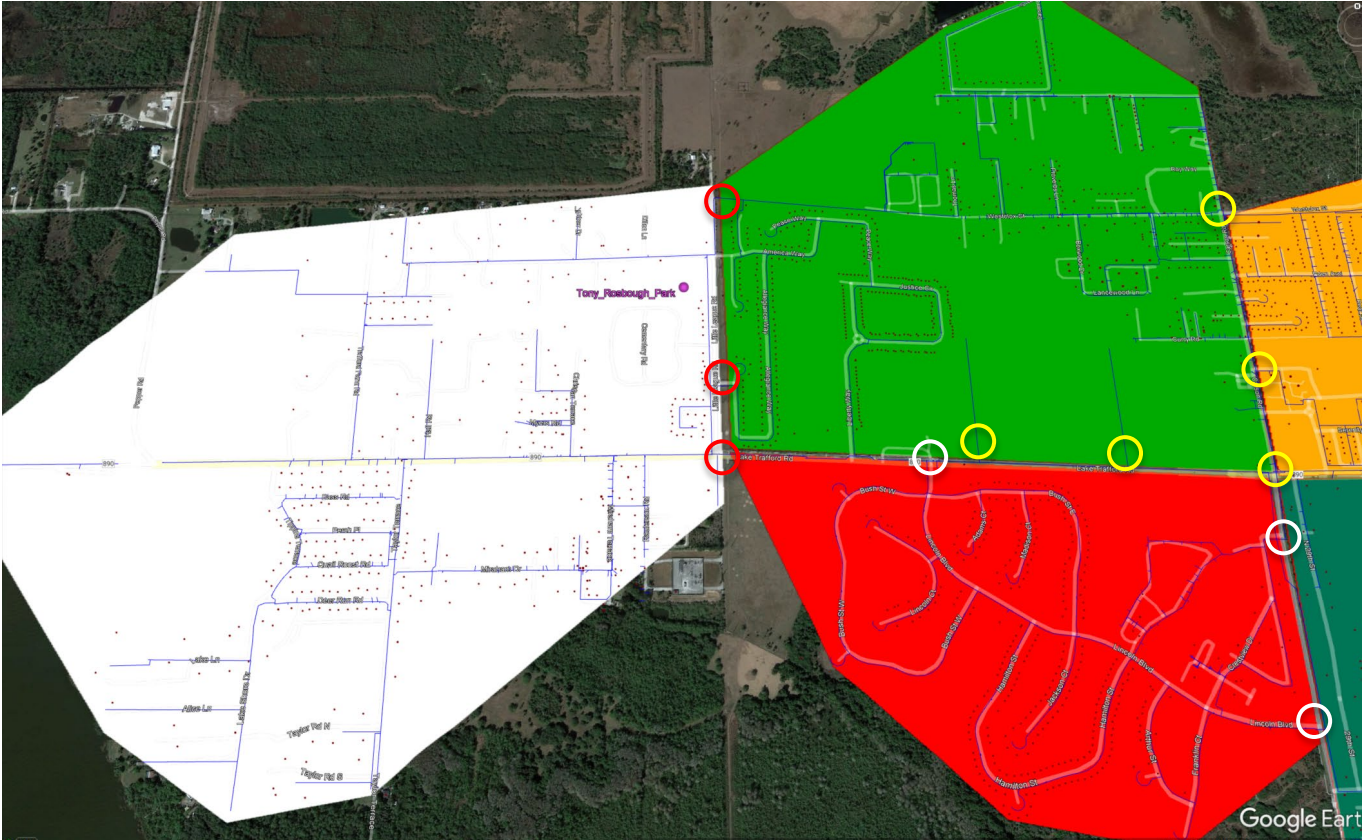


[District Metering Areas | Sectioning the distribution network | AVK - YouTube](#)

How do you build a District Metering Analysis



Identify DMAs

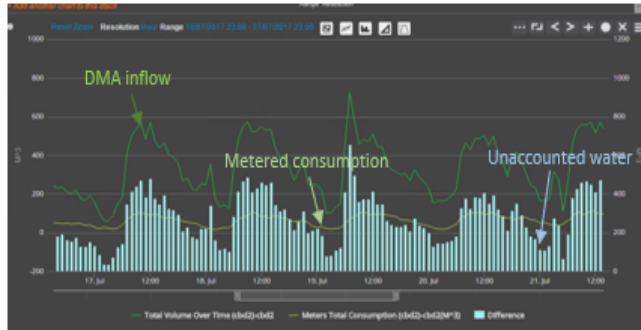


District Metering Software



Virtual District Metering (vDMA) helps utilities create smaller zones in the network and focus efforts on areas with high water loss

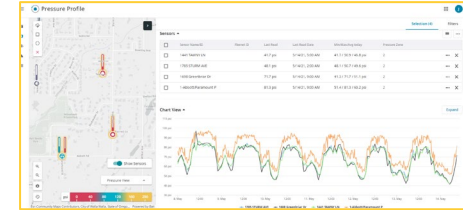
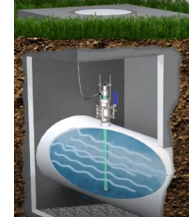
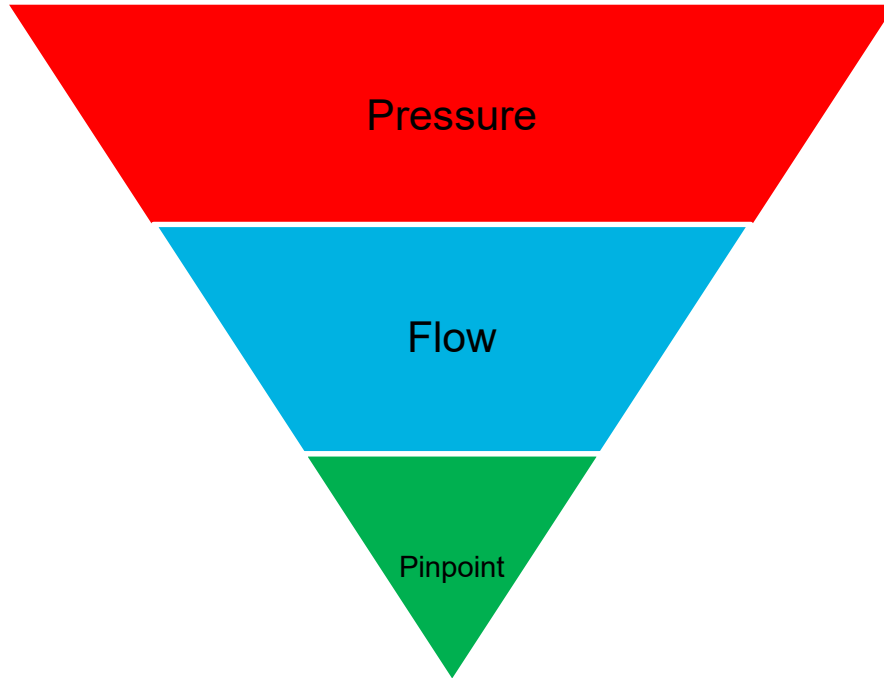
Utilities with an existing AMI system already have the foundation for zoned NRW analysis.



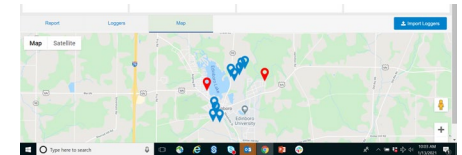
vDMA Water Balance

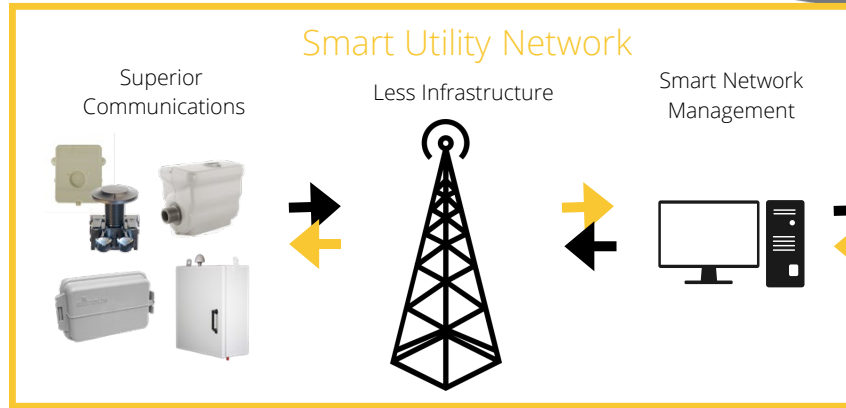


How it all comes together!



Leaks per Year vs MGD Treated Water Saved





Assets



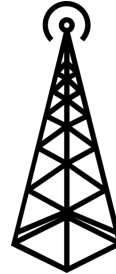
Intelligent Measurements



Superior Communications



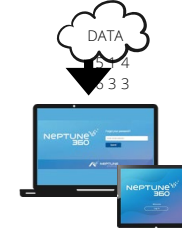
Less Infrastructure



Smart Network Management



Easy to Use Data Storage & Applications



Insightful Services



Users



Operations

AMI



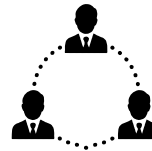
Customer Service



Accounting



Engineering



Management



Planning



Consultants

Benefits

Revenue Capture

Cost Reductions

Risk Mitigations

Customer Service

Enhanced Sustainability

Asset Optimization

Integrated Resiliency Solution



Affordability

Sustainable
Communities

**Water Loss
Management**

Optimized Asset Mgmt.

Resilience

Emergency
Preparedness



SSO Monitoring

LCRR Audit

Operating Efficiencies

**Advanced I/I
Analysis**

Future Proofing

**Distribution Level Water
Quality Monitoring**

Public & Environmental Health

Where Utility Data Is Used....



W & WW
AMS
Deployment

Meter
Reading

Billing / CIS
Workflow

Customer
Service

Customer
Engagement

Customer
Accountability

Customer
Anomaly
Notification

Water Loss
Analysis

Integrations

Worker Order
Mobility

Automated
Processes

Operations

Engineering/
Flow Analysis

Usage
Planning

Analytics

Reporting

Financial
Management

Revenue
Assurance

Executive
Oversight

Go Beyond Smart Make Your City Brilliant



- **AMS provides off-the-shelf solutions for**
 - Wastewater,
 - Drinking water
 - Freshwater, Source Water
 - Environmental & Industrial monitoring
- Create a **Brilliant City Platform** by combining your existing instrumentation and existing SCADA system with AMI Networks.
- **Web-enable your sensors with IoT RTUs** for secure enterprise-grade solutions into a regulatory & compliance grade cloud platform, providing the highest quality of secure data.

LCRR – Service Line Identification

- **Provide utility with a service line identification audit**
 - **Pit Set** – Inlet and Outlet side of meter box
 - Expose through digging or potholing
 - **Basement Set** – At minimum service line type at meter set
 - Additional line exposure as necessary
- **Provide utility with searchable, sortable inventory of service line type**
 - **Types identified – with photos**
 - Lead –visual, scratch test at minimum
 - Galvanized requiring replacement
 - Non-lead
 - Lead status unknown
 - **Other audit items available**
 - Meter photos
 - Serial numbers
 - Condition
 - Pit photos
 - Radio photos
 - Customer audit (validate account data against meter data)
 - Rehabilitation of AMI/AMR system (correct/repair non-functioning meters and radios)



LCRR – Service Line Identification



- **Provide GPS coordinates**
 - Standard
 - Sub-meter
 - Sub-foot
- **Provide interactive map of every customer**
 - Integrate with existing customer portal
- **Provide a customer portal if needed**
- **Provide funding assistance**
 - State SRF
 - Block grants
 - Financing – Government Capital
 - Infrastructure Bill
 - Bundling with existing contracts
- **Provide Scope of Work and Project Development for future line replacement based on survey findings**

The screenshot shows a digital form for service line identification. It features the CORE & MAIN logo at the top left. The form is divided into several sections: 'INFORMATION' with fields for SERVICE LINE, OU Material, Customer Material, GPS coordinates (Lat and Long), BACKFLOW, Serial Number, Backflow installed status, and Customer Cutoff installed status; 'BOX & LID' with fields for Manufacturer, Box Model, Lid manufacturer, and Box install status; 'ADDITIONAL COMMENTS' with a large text area; and 'PHOTOS' with a grid of 10 photo slots. The photo slots are labeled: GENERAL WORK AREA BEFORE, COMPLETED BOX WORK, FLUSHING, BACKFLOW PREVENTER W/S, GENERAL WORK AREA AFTER, CURBSTOP POSITION BEFORE, CURBSTOP POSITION AFTER, CURRENT METER READING PHOTO, NEW CURBSTOP PIC, and FLOWERPOT RISER PIC. The form is set against a blue background with a white grid pattern.



Make momma proud. Eat your veggie




Burgushi: In its prime.

THE COWFISH SUSHI • BURGER • BAR



Elvis has left the burger.

A large oval frame containing a close-up photograph of a wood grain surface. A white rectangular box is superimposed over the center of the wood, containing the text.

Put the data you have uncovered
to beneficial use.

