

# Enabling the Mobile Field Worker with Real-time Intelligence

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Smartly, utilities are responding digitally:  
Smart Water Networked to save \$600M  
annually of up to 70% water quality  
monitoring



ch2m.<sup>SM</sup>

# Agenda



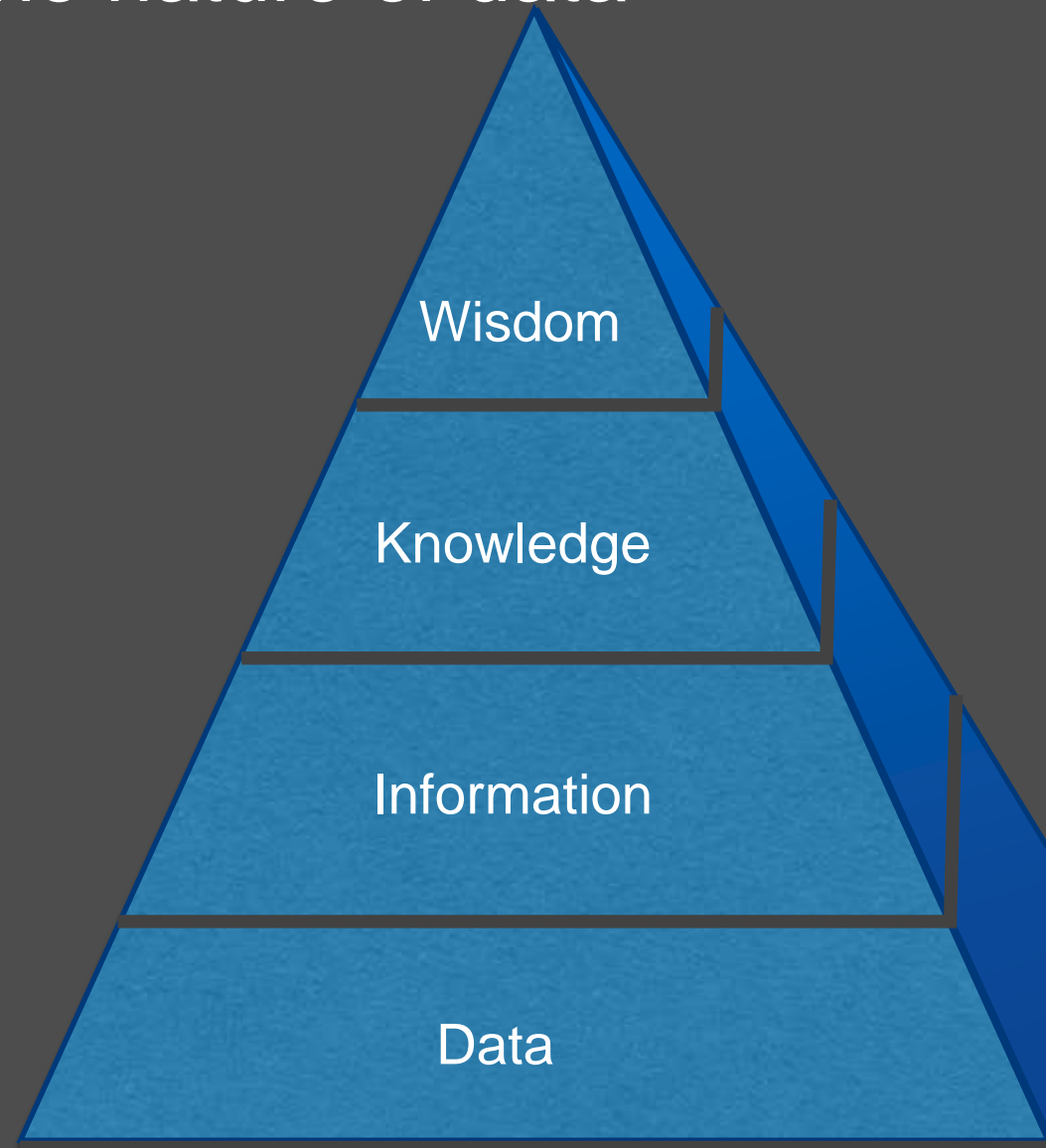
Increase Operations Excellence [Op-Ex]  
(Wisdom)

Leverage Data

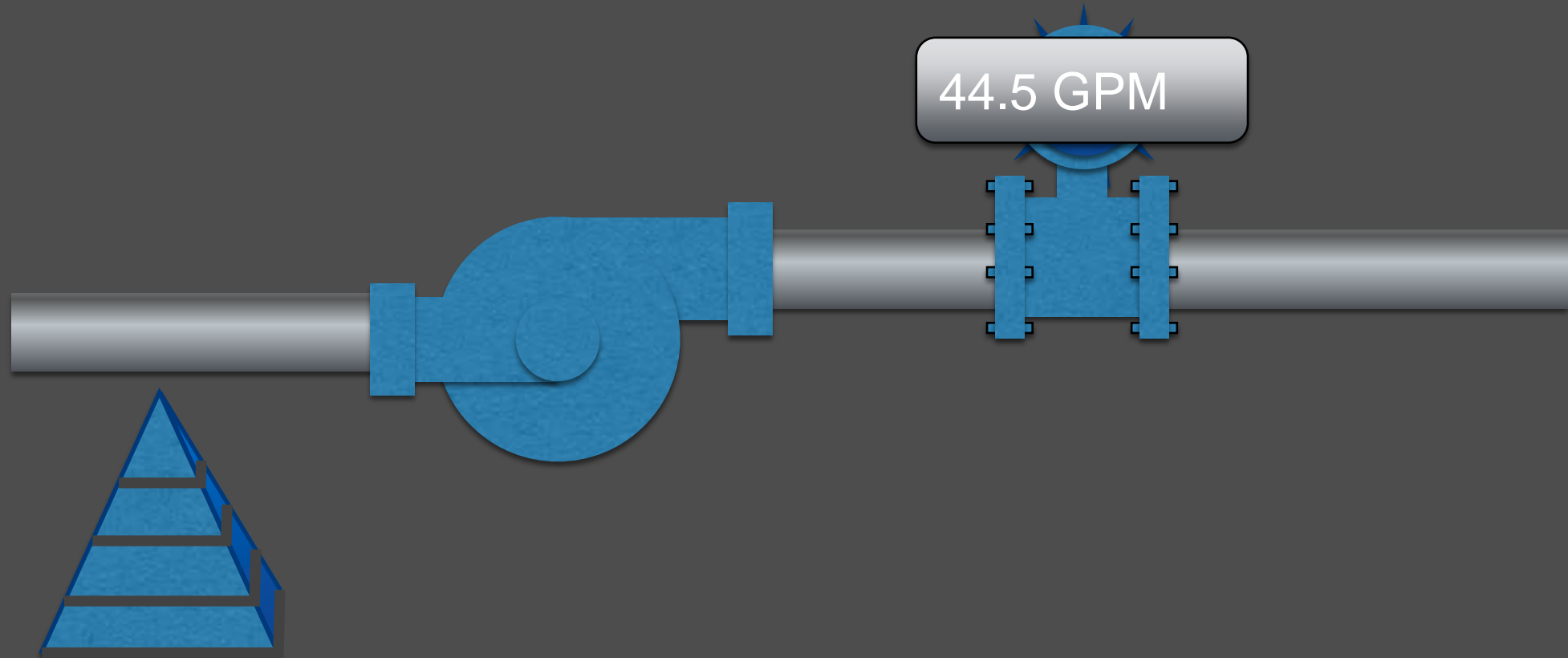
Secure Solution



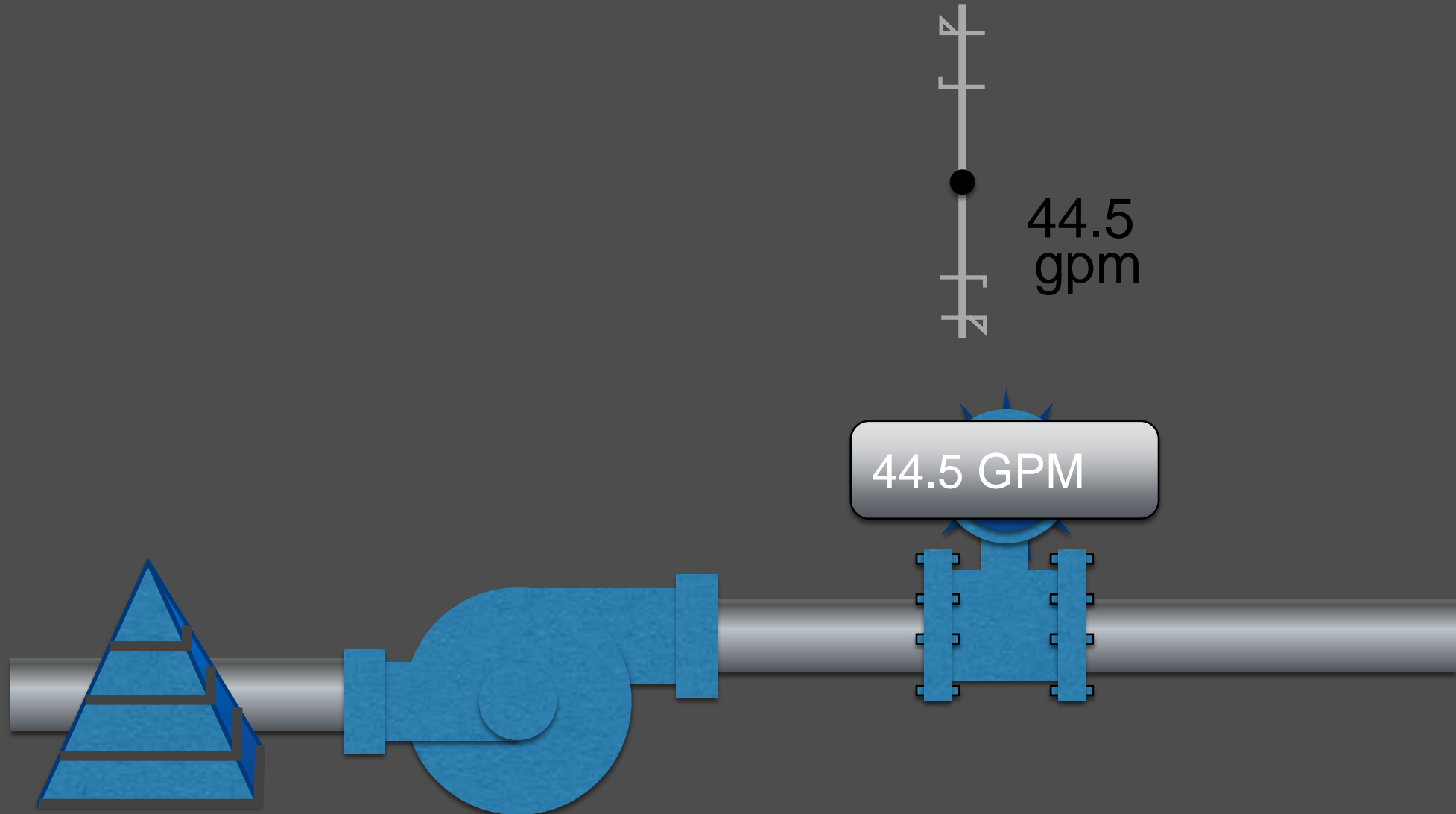
# Increase Op-Ex (Wisdom) by leveraging data, context, and understanding the nature of data



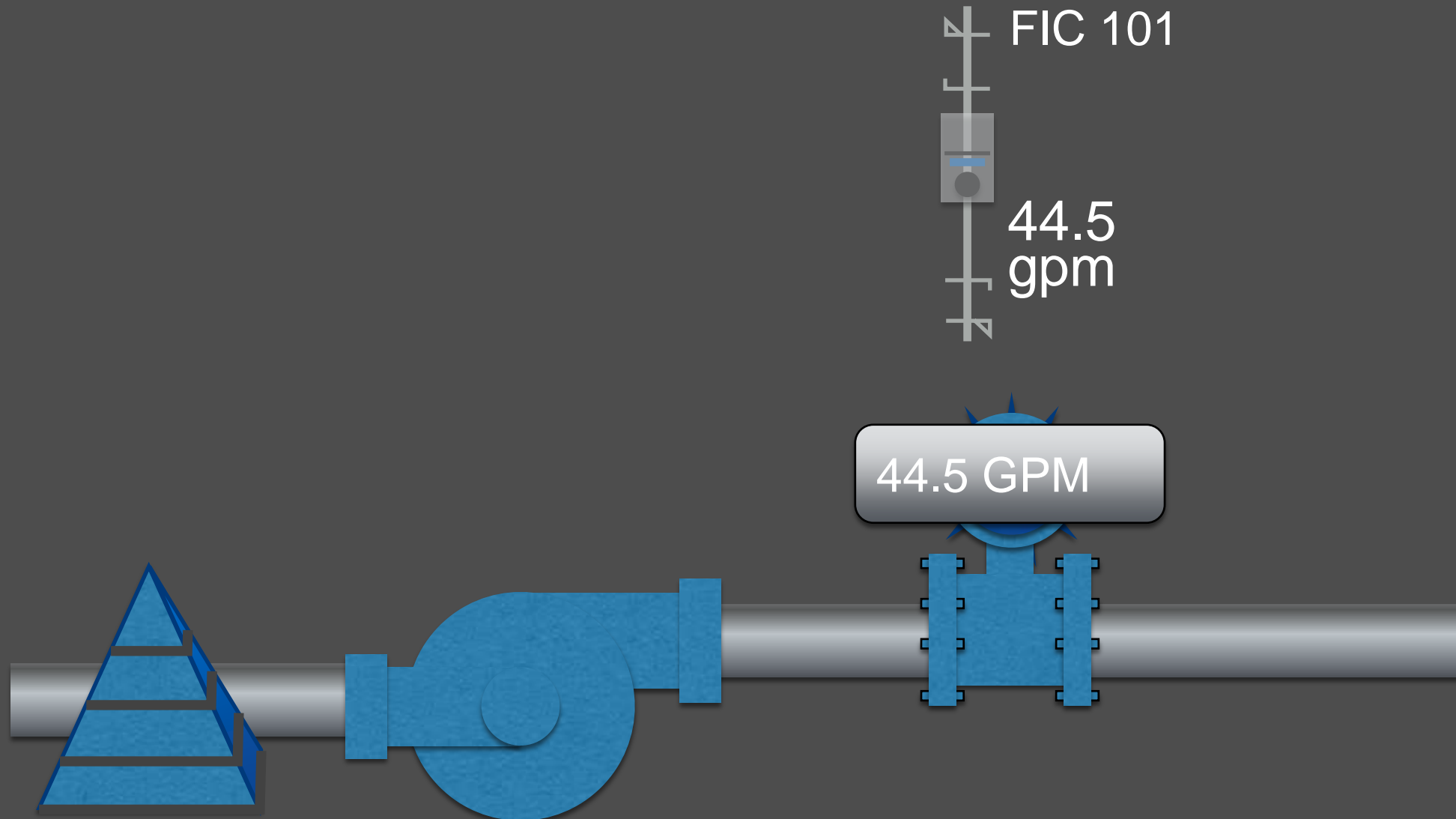
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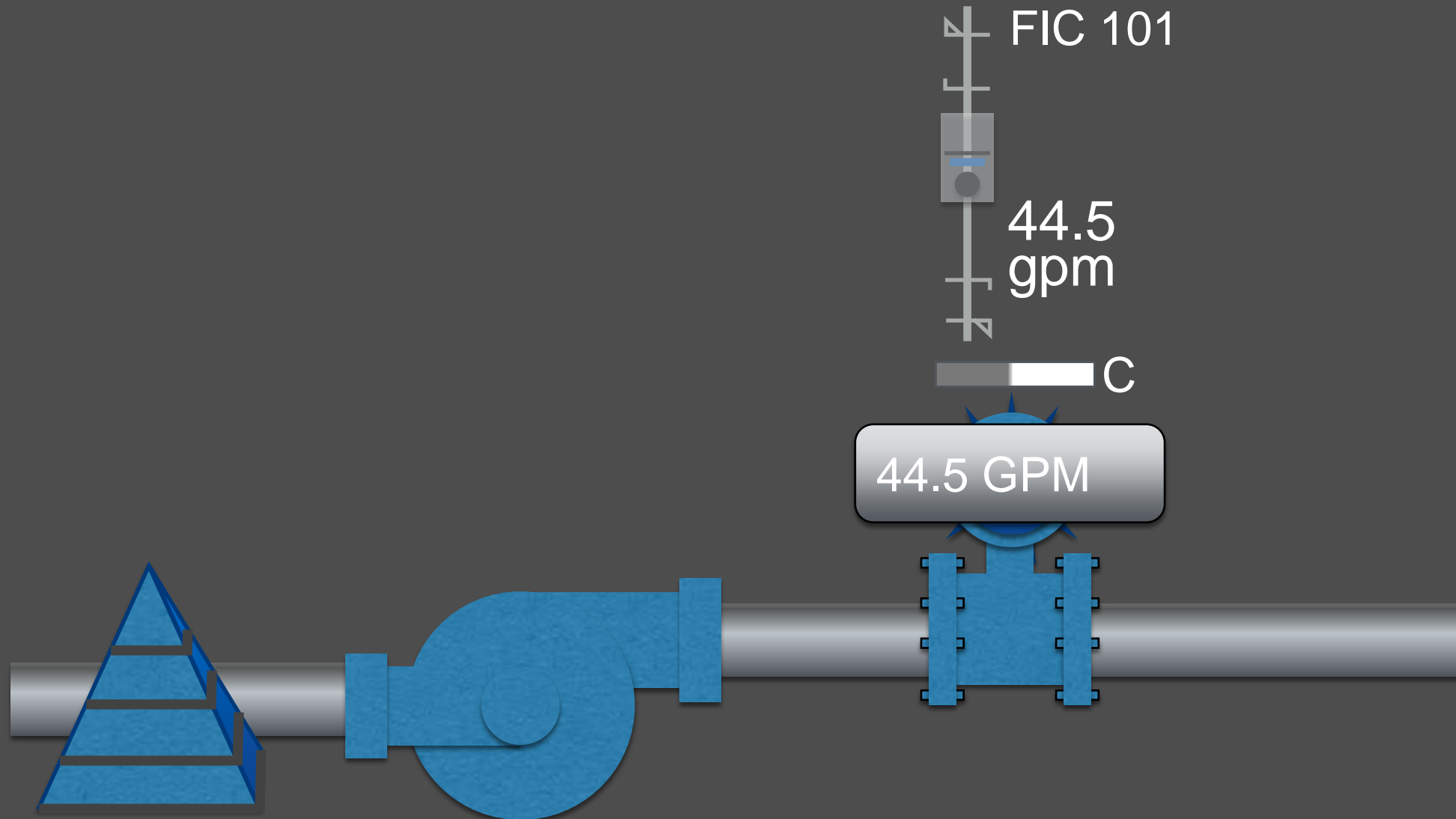
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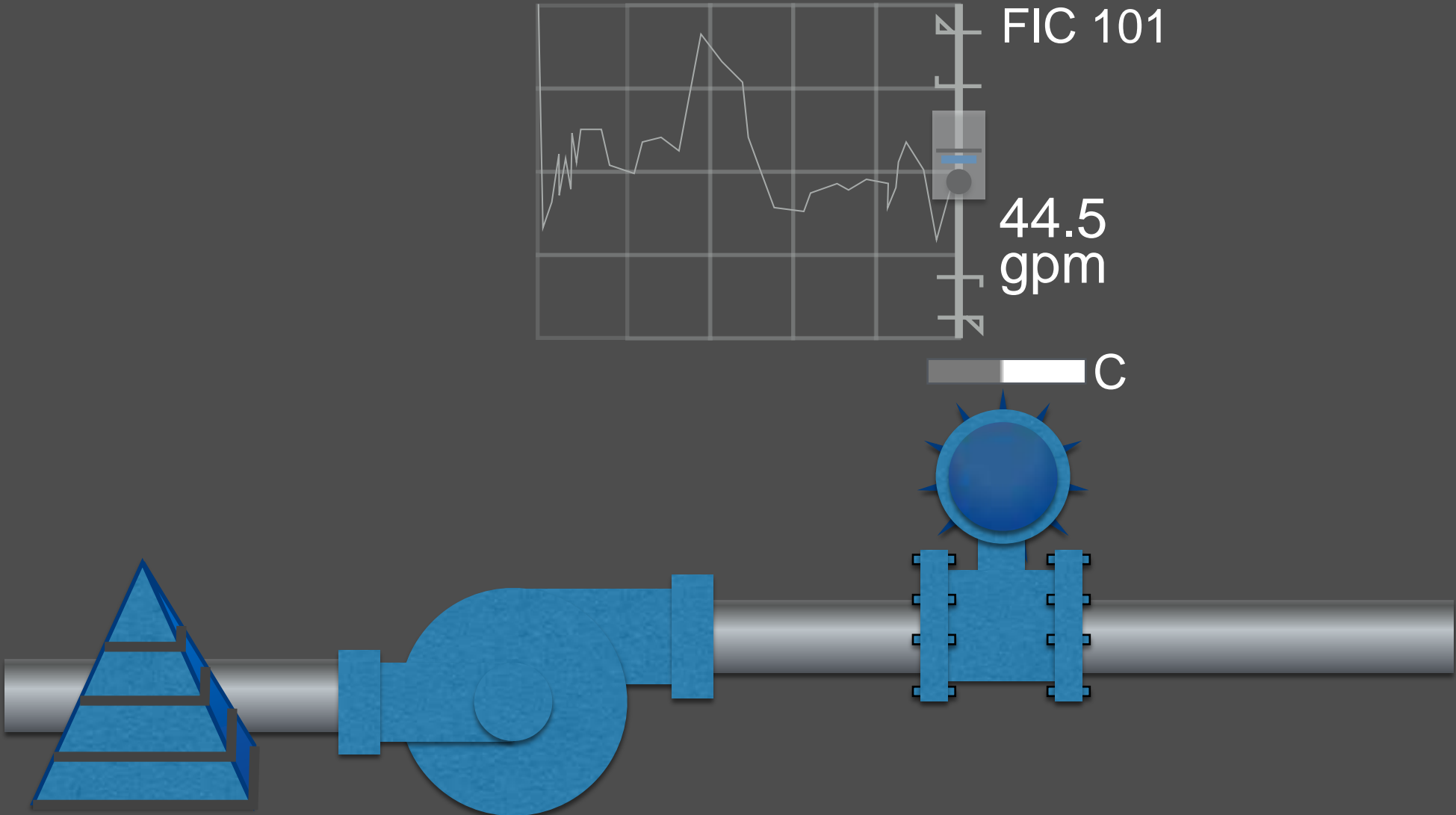


# Increase Op-Ex (Wisdom) by leveraging data, context, and understanding the nature of data





# Increase Op-Ex (Wisdom) by leveraging data, context, and understanding the nature of data



# Mobile Tools – iPhone's, iPad's, Android and Surface

Why do you have a smart phone or laptop?

[Click to edit Master text styles](#)



Communication (text, phone & e-mail)

Access Information (Internet)

Increase productivity

...

# We can use mobile devices as operational tools!

Technology has evolved in the utilities but we have two key problems, we are only able to review on average 30% of the data we collect today.



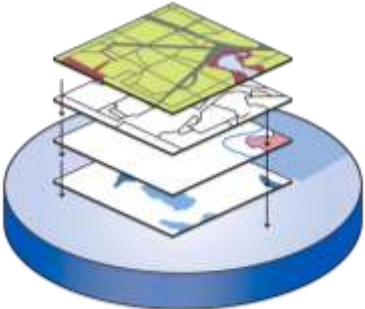
In addition the technology we have implemented isn't focused on operations and doesn't support communication between software packages, e.g. isolated from each other.

# What's the solution?

# Smart Utility Platform



# Typical Software Applications



Contaminant Warning and GIS Application



Contaminant Warning and GIS Application



Surveillance and Security Applications



Energy and Process Optimization



Laboratory Management



Business Dashboard and Reporting Applications



Remote and Mobile Operations Applications



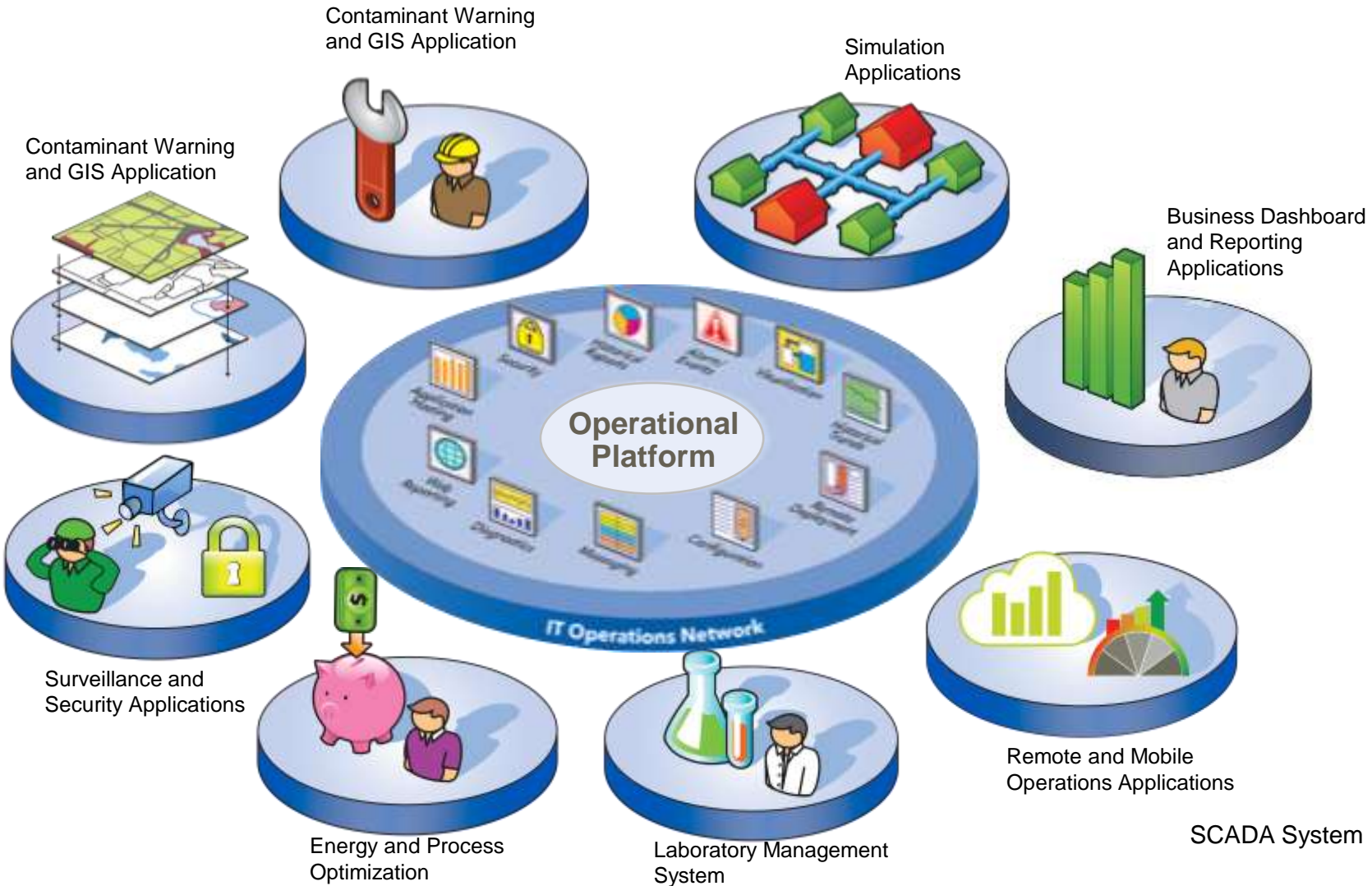
Simulation Applications



system



# Smart Utility Platform: Leverage application to communicate on a common platform with accessibility from mobile devices



# Enabling Mobility

Integration/  
Visualization

Dashboard  
Application Server



VPN



LAN



Analytics



Models



60-Day Data  
Warehouse



EDS

Source  
Data



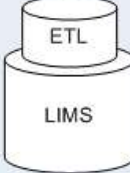
Map  
Services  
GIS



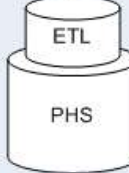
ETL  
Consumer  
Complaints



ETL  
OWQM



ETL  
LIMS



ETL  
PHS



ETL  
ESM

# Smart Utility Dashboard

The screenshot displays a web-based utility dashboard. At the top, a browser window shows the URL <http://realtime.net/DW/Utilities/index.aspx>. The main area is a map of Irving, Texas, populated with various utility markers. A detailed information window for a specific marker (M34) is open, showing the following data:

- ProblemTime: Tue Jan 29 11:28:03 GMT-0800
- Address: 7410 FIDHUSLA DR
- Zip: 75218
- OrderNumber: 00000187500
- CodeDesc: system condition
- PressureZone: East High
- Type: Main Leak/Break
- XCoord: -96.7096277331479
- YCoord: 32.8418765598103
- PressureZoneGroup: East

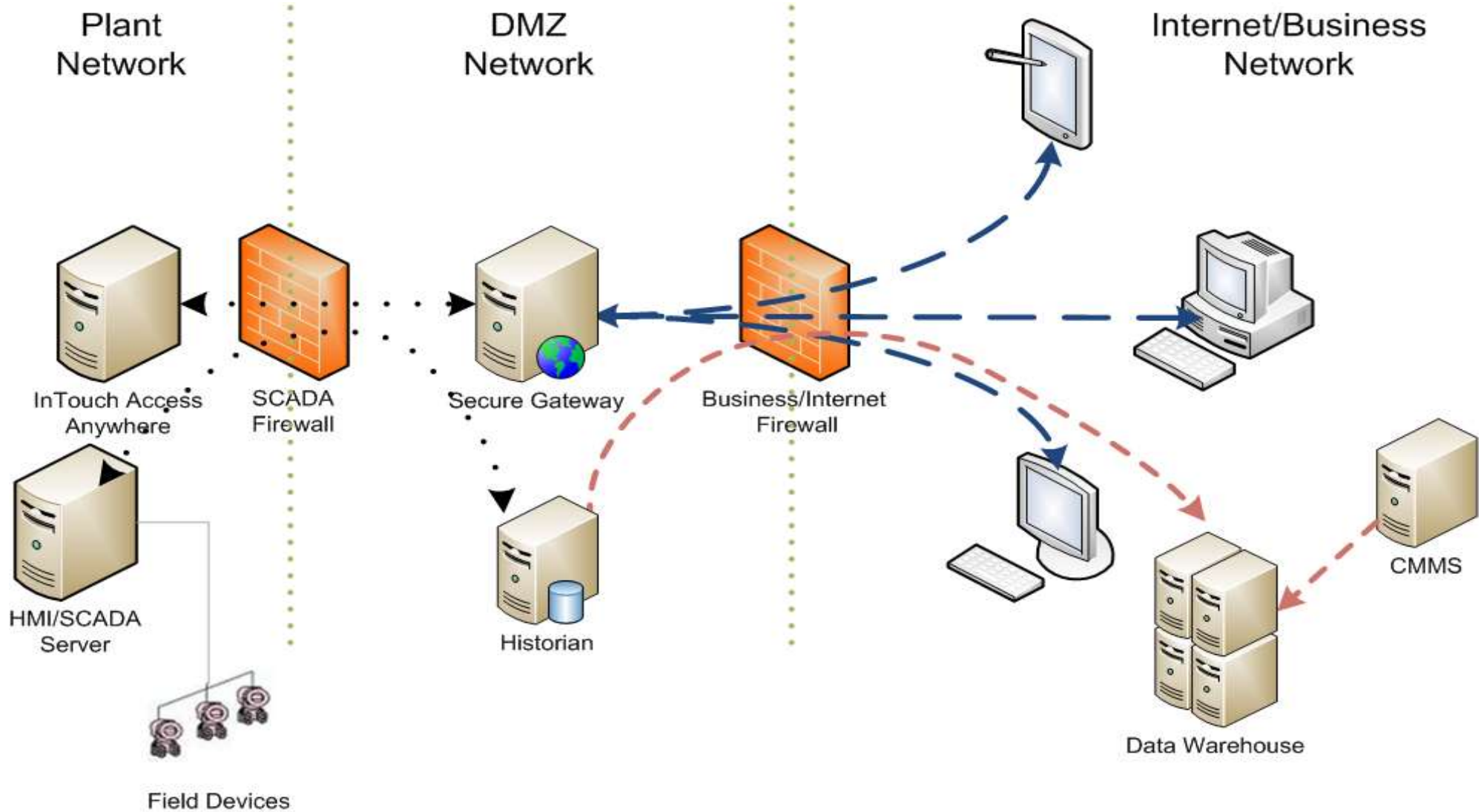
Below the map is a toolbar with actions like Save CSV, Zoom to Selected, Select All, Clear Selection, Switch Selection, Remove Selected, Hide Selected, Show Selected, and Print Selection. A table below the toolbar lists utility incidents with the following columns:

ProblemTime	Address	Zip	OrderNumber	PressureZone	CodeDesc	Type	Date	XCoord	YCoord	PressureZoneGroup
Tue Jan 29 11:28:03	7410 FIDHUSLA DR	75218	00000187500	East High	system condition	Main Leak/Break				
Mon Jan 28 20:15:32	6101 ROCKWELL DR	75220	00000187254	North High	water leak	Facility/Construction		-96.822581677343	32.8646666612665	North
Mon Jan 28 20:08:02	7520 WINDYBUSH DR	75225	00000187219	North High	system condition	Main Leak/Break		-96.77355725244	32.8717375798555	North
Mon Jan 28 20:06:32	8288 WYTON	75214	00000187204	North High	system condition	Main Leak/Break		-96.70420040437	32.819472614238	North
Mon Jan 28 19:58:11	4757 CLAYTON DR	75229	00000187201	East High	water leak	Facility/Construction		-96.88811118107	32.828415480000	East
Mon Jan 28 18:42:32	3144 N WINDYBUSH	75234	00000187137	Central Low	system condition	Main Leak/Break		-96.82948152147	32.718811023079	Central

# Dash Boards Aren't Just SCADA



# Network Segments Enable Secure Remote Access and Application Integration



# Replacing Paper with Mobile Based Field Data Collection

BUILDING 30: HEADWORKS

DATE 1-10-13

MIDS HARRIS Days HARTMAN SWINGS

TIME:	2400	0400	0800	1200	1600	2000
RAW INF LEL	0	0	0			
RAW INF H2S	3.6	.3	0.3			
COARSE BAR SCREEN						
COARSE BAR SCREEN	ON/OFF	ON/OFF	ON/OFF	ON/OFF	ON/OFF	ON/OFF
SCREEN 1	ON	ON	ON			
SCREEN 2	-	-	OFF			
TIMER (ON/OFF)	OFF	OFF	MANUAL			
CONVEYOR	CH'D/OK	CH'D/OK	CH'D/OK	CH'D/OK	CH'D/OK	CH'D/OK
	OK	OK	✓OK			
Conveyor oil	CH'D/OK	CH'D/OK	CH'D/OK	CH'D/OK	CH'D/OK	CH'D/OK
	OK	OK	✓OK			
Hopper level	FEET	FEET	FEET	FEET	FEET	FEET
	2.07	2.0	2.5			
SCREW PUMP	FEET	FEET	FEET	FEET	FEET	FEET
INLET LEVEL	<sup>M.H.</sup> 2.07 1.45	1.0	0.9			
Emergency Overflow Ponds						
Overflow To	(Yes/No)	(Yes/No)	(Yes/No)	(Yes/No)	(Yes/No)	(Yes/No)
Pond	NO	NO	EMPTY			
Pond #2 Level	MT	MT	-			
Return Valve	OPEN/CLOSED	OPEN/CLOSED	OPEN/CLOSED	OPEN/CLOSED	OPEN/CLOSED	OPEN/CLOSED
From #2 to #1	Closed	Closed	Closed			
Pond #3 Level	Closed MT	MT	-			
Return Valve	OPEN/CLOSED	OPEN/CLOSED	OPEN/CLOSED	OPEN/CLOSED	OPEN/CLOSED	OPEN/CLOSED
From #3 to #1	Closed	Closed	Closed			
Dewatering Pump						
RPM	OFF	OFF	OFF			
Vacuum	↓	↓	↓			
Fuel Level						

Comments:

Area #7 Air Blowers & Grit Pumps

DATE 1-10-13

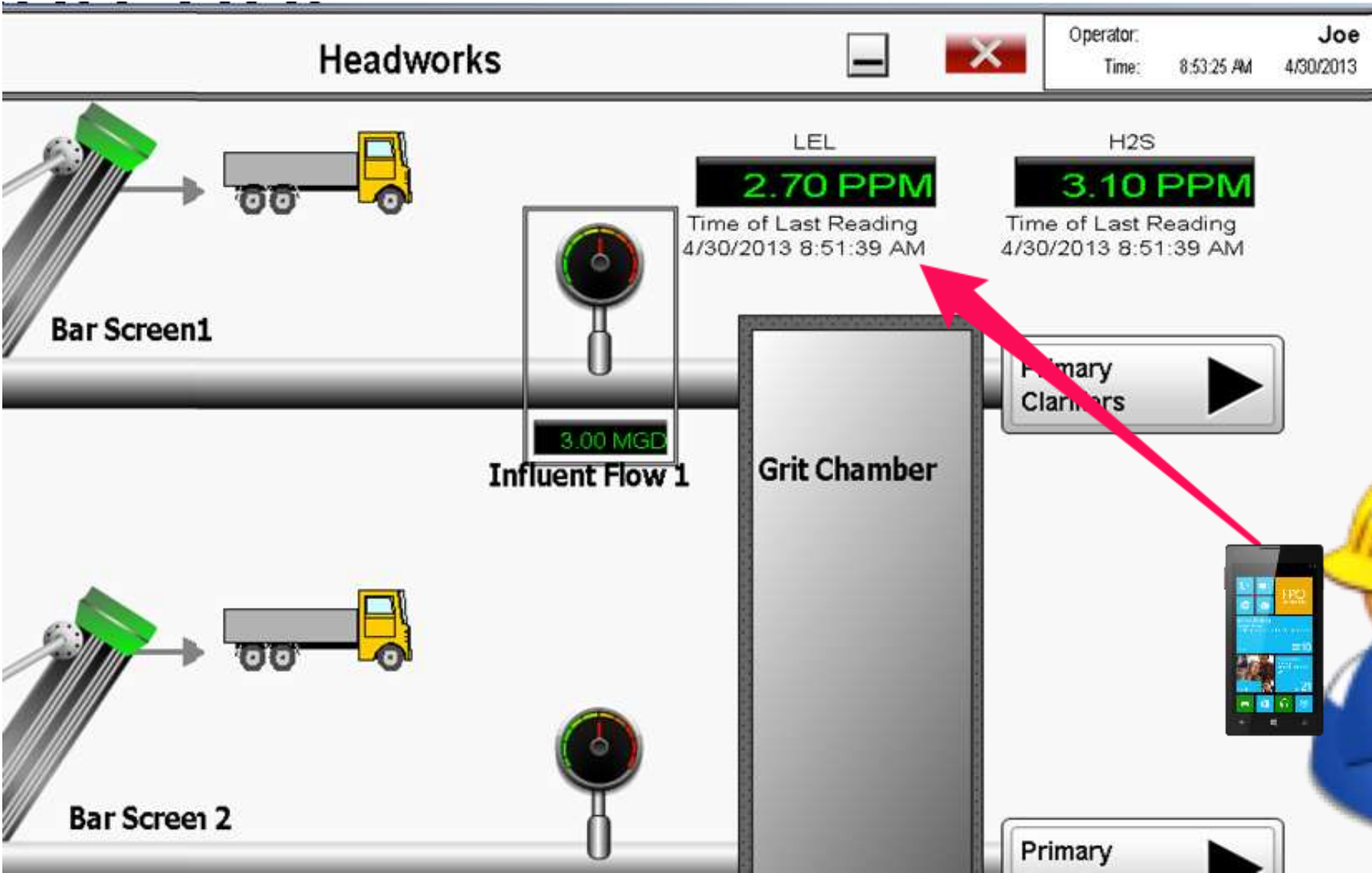
MIDS Days SWINGS

Time:	2400	0400	0800	1200	1600	2000
	psi	psi	psi	psi	psi	psi
Process air manifold	3.09	2.99	3.02			
Air blower #1 on/off	OFF	-	OFF			
Air blower #1 (vacuum)	-	-	-			
Air blower #1 receiver	-	-	-			
Air blower #2 on/off	OFF	-	OFF			
Air blower #2 (vacuum)	-	-	-			
Air blower #2 receiver	-	-	-			
Air blower #3 on/off	ON	ON	ON			
Air blower #3 (vacuum)	0	.1	0			
Air blower #3 receiver	5.2	5.2	4.4			
Air blower #4 on/off	OFF	-	OFF			
Air blower #4 (vacuum)	-	-	-			
Air blower #4 receiver	-	-	-			
Grit Pumps						
Grit pump #1 (loc/remote)	ON	ON	ON			
G.P.#1 seal water	6.1	6.1	6.1			
G.P.#1 packing ck'd/ok	OK	OK	✓OK			
G.P.#1 inlet psi	2	2	2			
G.P.#1 outlet psi	15	15	14			
Grit pump #2 (loc/remote)	OFF	-	OFF			
G.P.#2 seal water	-	-	-			
G.P.#2 packing ck'd/ok	-	-	-			
G.P.#2 inlet psi	-	-	-			
G.P.#2 outlet psi	-	-	-			
Grit pump #3 (loc/remote)	ON	ON	ON			
G.P.#3 seal water	6.6	6.5	6.6			
G.P.#3 packing ck'd/ok	OK	OK	✓OK			
G.P.#3 inlet psi	1	1	1			
G.P.#3 outlet psi	15	15	14			
Grit pump #4 (loc/remote)	OFF	-	OFF			
G.P.#4 seal water	-	-	-			
G.P.#4 packing ck'd/ok	-	-	-			
G.P.#4 inlet psi	-	-	-			
G.P.#4 outlet psi	-	-	-			
Grit pump #5 (loc/remote)	OFF	-	OFF			
G.P.#5 seal water	-	-	-			
G.P.#5 packing ck'd/ok	-	-	-			
G.P.#5 inlet psi	-	-	-			
G.P.#5 outlet psi	-	-	-			
Seal water for grit pump.	P/S	P/S	P/S	P/S	P/S	P/S
Truck Bay Sump						
ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok
sump pump #1	OK	OK	✓OK			
run time hours	21256.7	21256.9	21257.1			
ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok	ck'd/ok
sump pump #2	OK	OK	✓OK			
run time hours	21676.6	21676.5	21677.0			

PUMP DOWN SUMP TO THE LOW LEVEL ALARM ONCE PER SHIFT. DO NOT LEAVE PUMP UNATTENDED  
 ✓ 0745



# Field Data Collection Device



# eFIM – Sample System Overview

**CITY OF REDDING CALIFORNIA**

City of Redding California  
Clear Creek Wastewater Treatment Plant O & M Manual

Search w/in Doc Text

Log Out

- Home
- General Plant Description ▶
- Process Control ▶
- Raw Wastewater Pumping ▶
- Headworks ▶
- Primary Treatment** ▶
- Bioreactors ▶
- Secondary Clarification ▶
- Effluent Filtration ▶
- Chlorination ▶
- Dechlorination ▶
- Solids Processing ▶
- Anaerobic Digestion ▶
- Storage Ponds ▶
- Outfall ▶
- Plant Systems ▶
- Laboratory ▶
- Instrumentation and Controls ▶
- Construction DWG ▶
- Drawing Library ▶
- Administration ▶
- Search ▶

Primary Treatment-All

CEPT - Ferric Chloride and Polymer Feed System ▶

**Primary Clarifiers** ▶

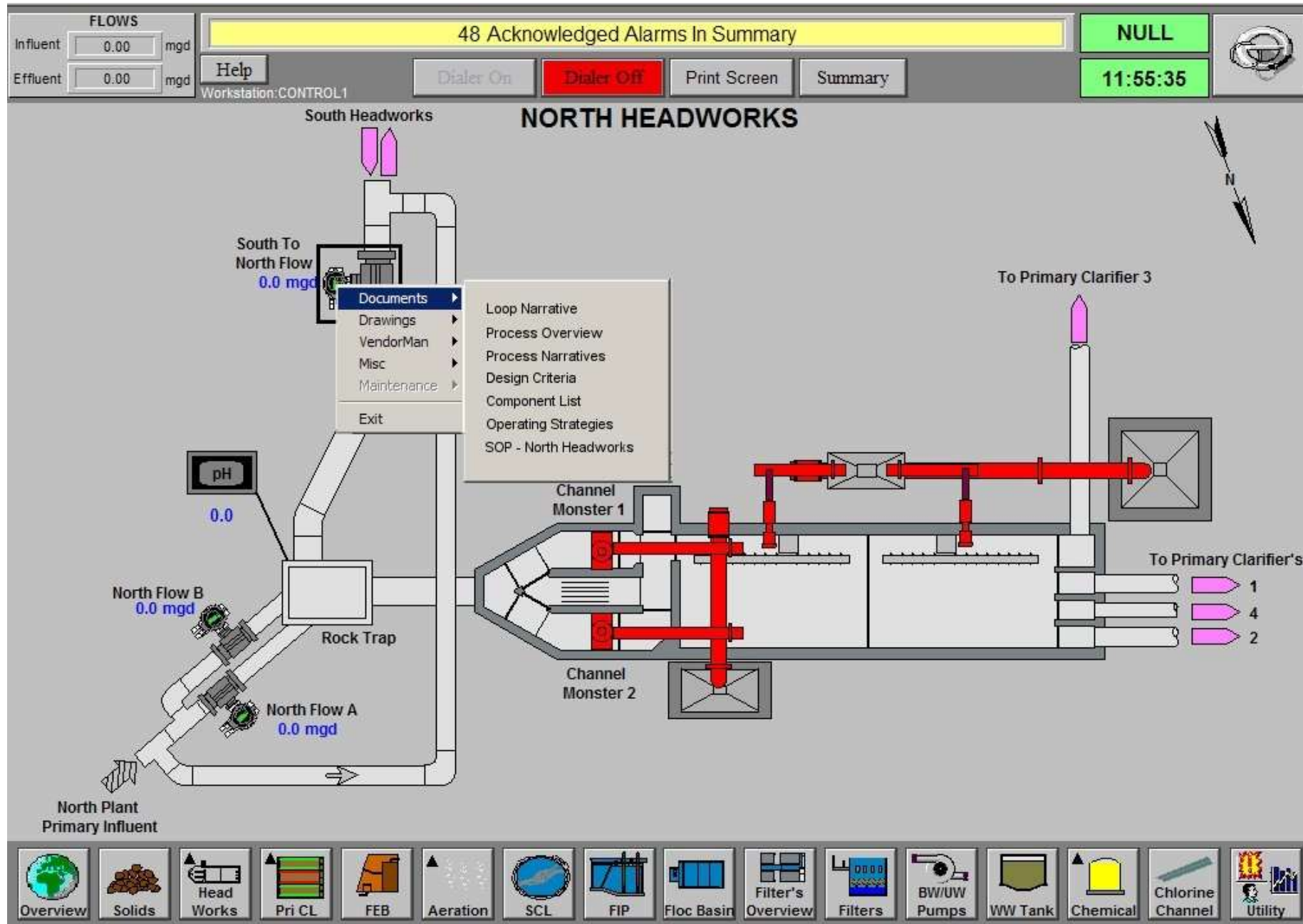
Primary Clarifiers-All

Primary Skimmings Pumping ▶

Primary Effluent Distribution ▶



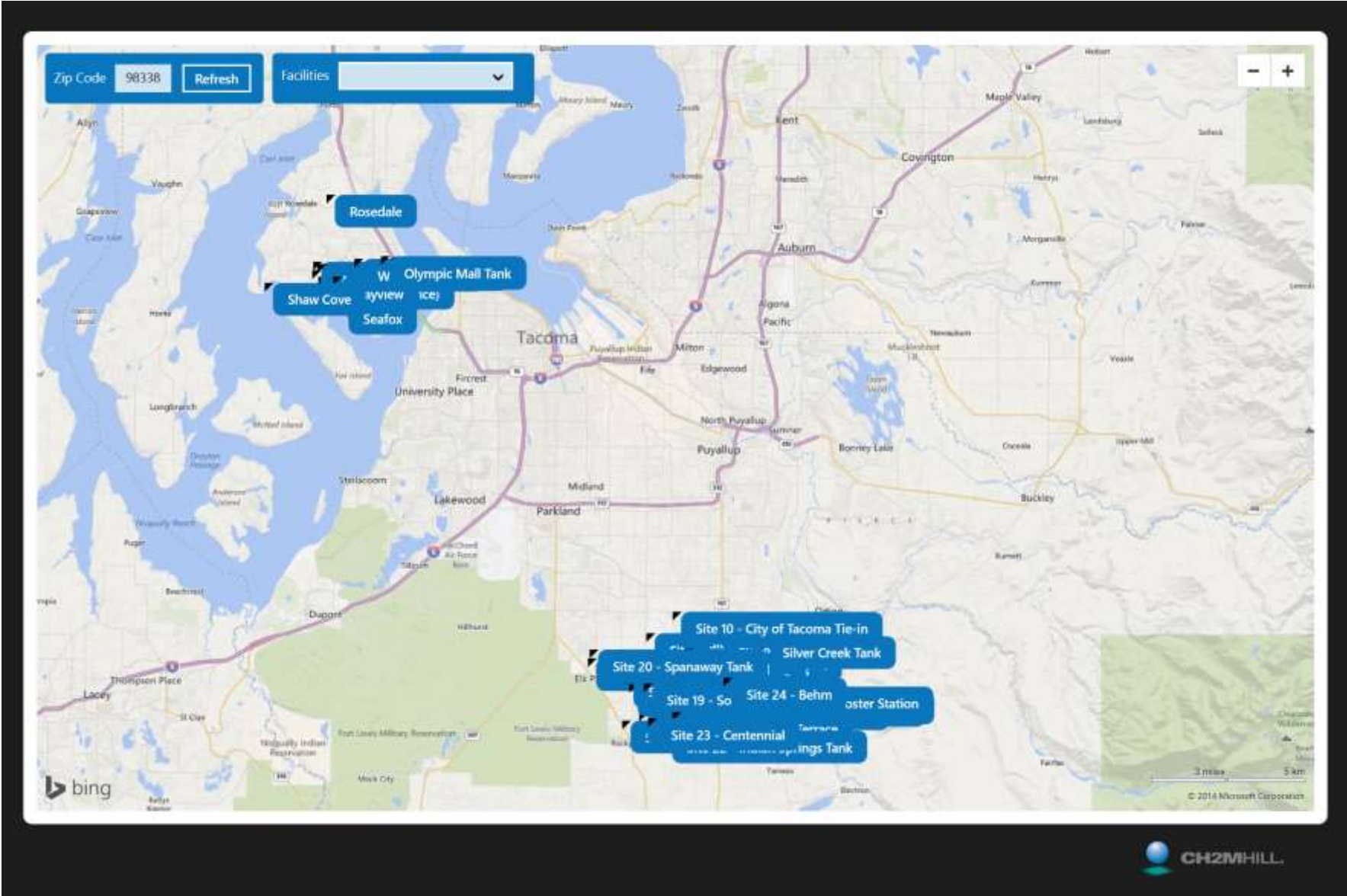
# eFIM – Sample System Overview



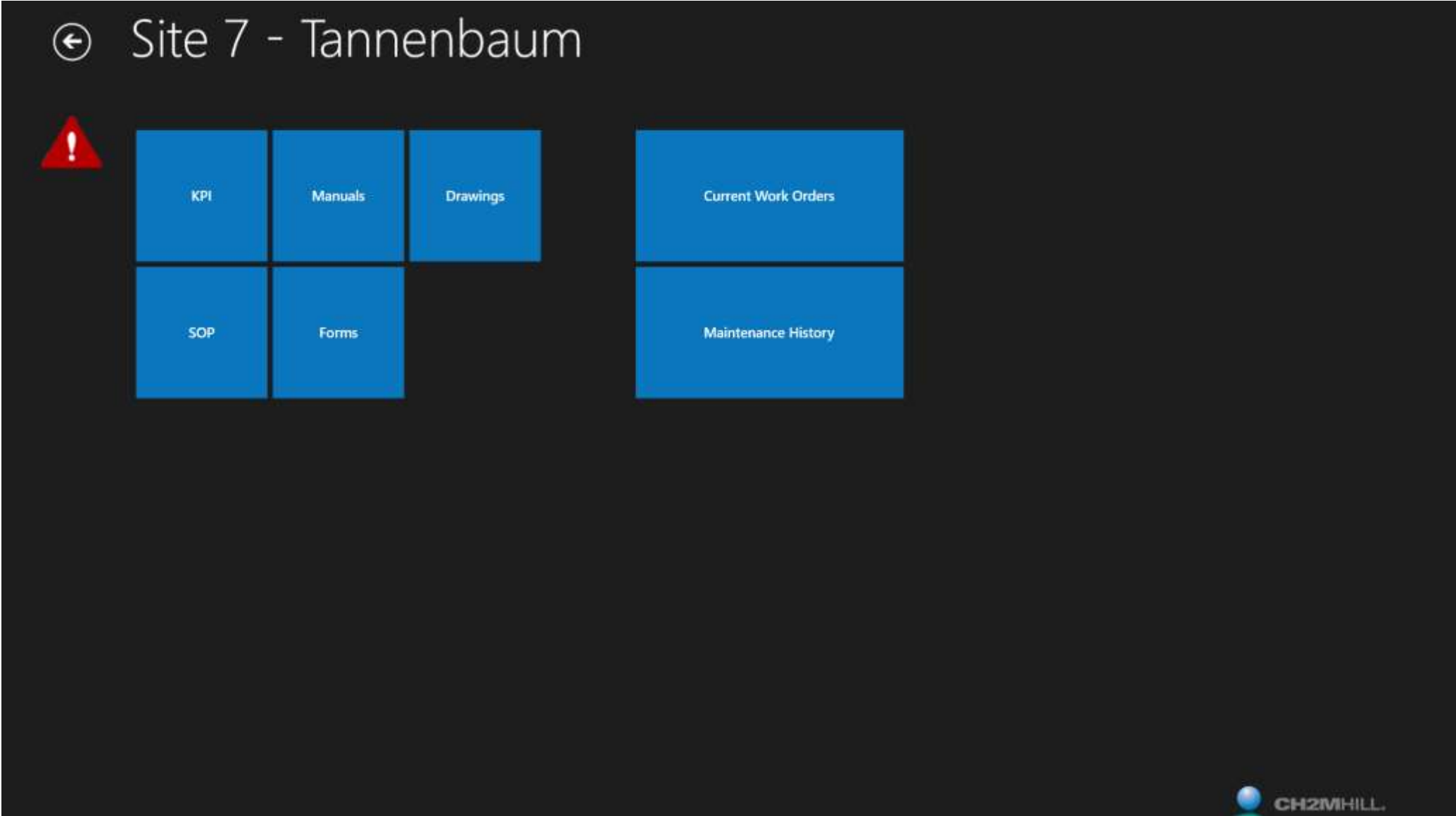
# CH2M HILL's Win 8 "Alpa" Smart Utility Software



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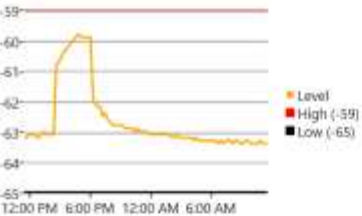
# CH2M HILL's Win 8 "Alpa" Smart Utility Software

## ← Site 7 - Tannenbaum

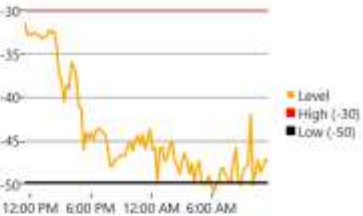
### Current Alarm List

8/26/2014 5:11:00 AM	Well3_Level	Reading exceeds 'Low' limit.
8/26/2014 5:55:00 AM	Well3_Level	Reading exceeds 'Low' limit.
8/26/2014 6:09:00 AM	Well3_Level	Reading exceeds 'Low' limit.
8/26/2014 7:51:00 AM	Well3_Level	Reading exceeds 'Low' limit.
8/26/2014 8:49:00 AM	Well3_Level	Reading exceeds 'Low' limit.
8/26/2014 10:02:00 AM	Well3_Level	Reading exceeds 'Low' limit.

### Well #2 Level Value



### Well #3 Level Value



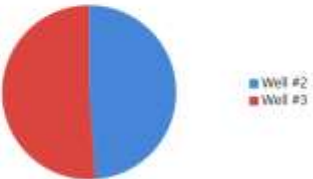
### Well Production

Flow Totals (k/Gallons)



### Pump Runtimes

(Hours)

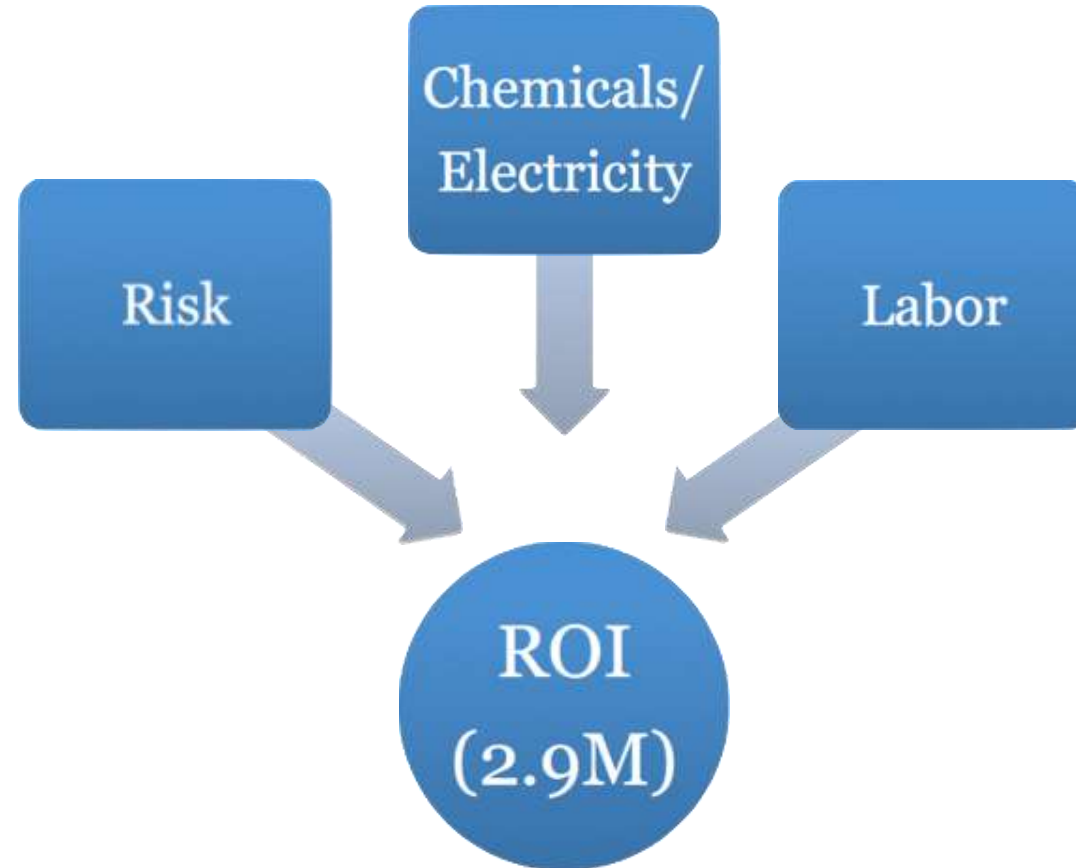




# Utility Savings are about 13% Annually with 2 year ROI – Case Study of 10 Year ROI from a Small Utility

Summary Output/Results

<b>Current Operating Costs</b>	\$ 2,527,211.54
<b>Net Present Value of Operations over Event Duration</b>	\$12,683,489.98
<b>Estimated Improvement Net Present Value of Operations over Event Duration</b>	\$9,719,208.25
<b>Return on Investment</b>	\$2,964,281.73



CMMS - Computerized Maintenance Management System  
 EA - Enterprise Asset Management System

# How do I start

## Build an Smart Utility Master Plan

- Focus on current infrastructure
- Establish an end goal
- Hold a number of workshops to explore ideas
  - Remote SCADA
  - Paper replacement
  - Inspections
  - Document repositories
- Implement early success



Thank You

Michael Karl

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