Wireless Networks for Water Treatment

Using Open Standard Wireless LANs

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Benefits of Wireless LANs

- Much lower short and long term costs than wired networks
- ROI practically immediate
- Flexibility in design and deployment
- Efficiency
- No recurring costs
- Infinitely scalable
- Secure

Security of WLANs

- Robust Security Networks (RSNs) by standard
- Based upon FIPS-197: Advanced Encryption Standard (AES)
- Up to 256 bit deep encryption
- Enterprise WLAN uses 802.1X mutual authentication algorithms (EAP)
- Redundant paths (mesh), integrated firewalls and Wireless Intrusion Protection Systems (WIPS) are available.

Open Standard WLANs

- Based on open IEEE Wireless Standards (802.11)
- Lower cost to implement and operate than hard wiring – maintenance and upgrade negligible
- No recurring costs as in proprietary systems
- Vendor Neutral - extensive cross platform communication due to standardization
- All data types compatible - WLAN is simply another type of communication medium
- You own the unlicensed RF spectrum and equipment - no additional costs
- Latest standard supports aggregate 1.7 GBPS

Ancillary Benefits of WLANs

- Voice and video delivery within coverage
- RFID tagging and asset tracking
- Integration into CMMS
- Facilitation of “Mobile Worker” platforms
- Reduction in lost time activity
- Ability to access O&M/Vendor data at site
- Complete control of RF propagation within fence line
- Easily integrates with Existing Plant LAN

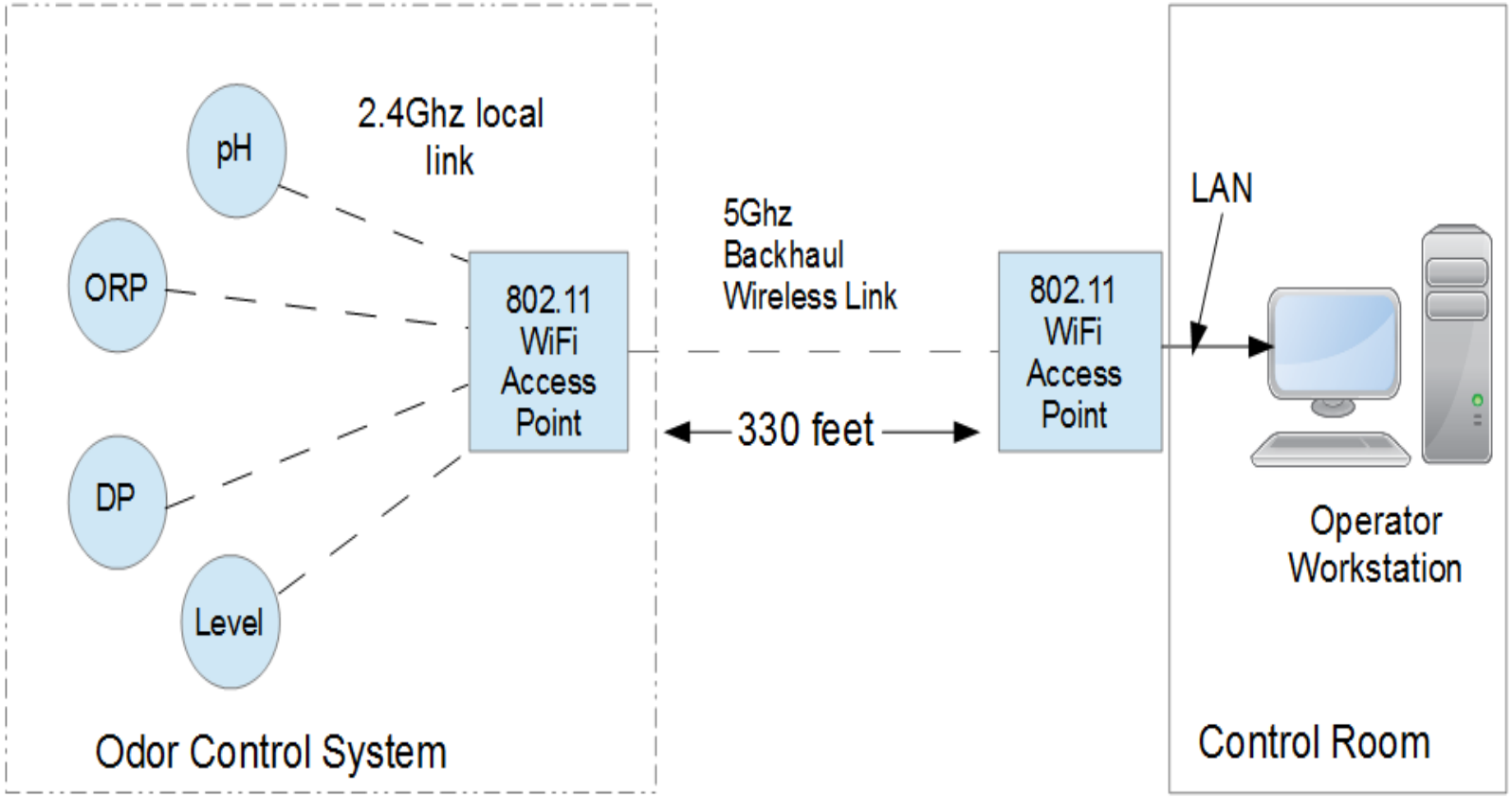
Proof of Concept at SWPCA

- Testing of a WLAN was done at the Stamford Water Pollution Control Authority Plant in Stamford, CT. in 2014
- Part of a comprehensive SCADA upgrade
- Primary OCS was used as test bed
- Test was a success and proved the viability of using a WLAN for process monitoring.
- WLAN will be incorporated into SCADA

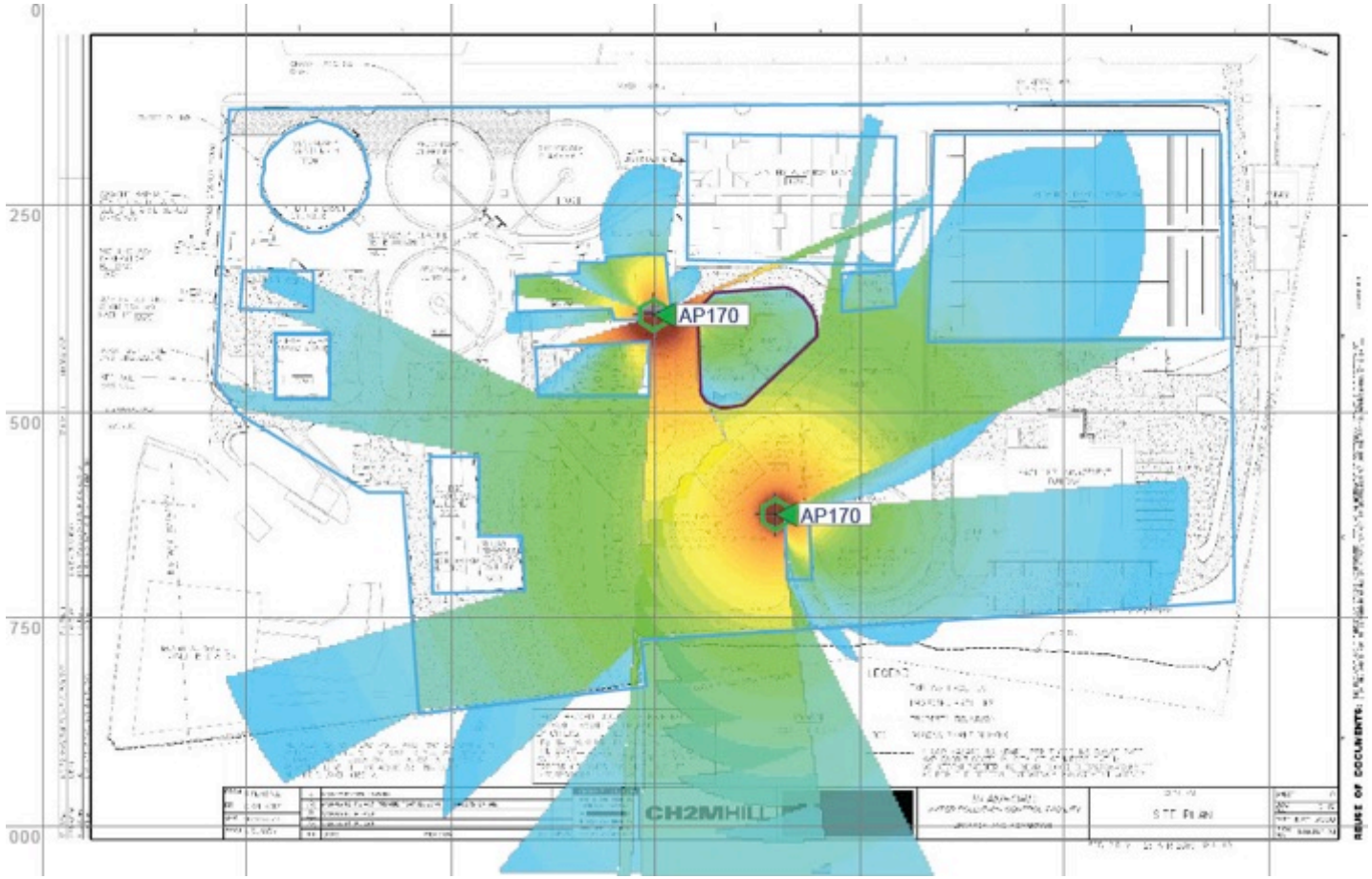
SWPCA Plant


STAMFORD WPCA
111 HARBOR VIEW AVENUE
1 RAW SEWAGE PUMPSTATION/BAR SCREEN BUILDING
2 SWITCHGEAR/ GENERATOR BUILDING
3 SECONDARY CLARIFIER AREA
4 BIOLOGICAL REACTOR AREA
5 METHANOL BUILDING
6 FACILITIES MANAGEMENT BUILDING
7 PRIMARY CLARIFIER AREA
8 PRIMARY SLUDGE PUMPING STATION BUILDING
9 BLOWER MAINTENANCE BUILDING
10 SLUDGE THICKENING/DEGRITTING BUILDING
11 OPERATIONS/ADMINISTRATION BUILDING
12 UV DISINFECTION BASIN AREA
12A PARTS STORAGE BUILDING
13 CHEMICAL BUILDING
14 EFFLUENT FLOWMETER VAULT
15 SOLIDS PROCESSING BUILDING
Magee Avenue Entrance
MAGEE AVENUE
HARBOR VIEW AVENUE
Main Entrance
FE discharge
Emergency Congregation Area

SWPCA Network Concept



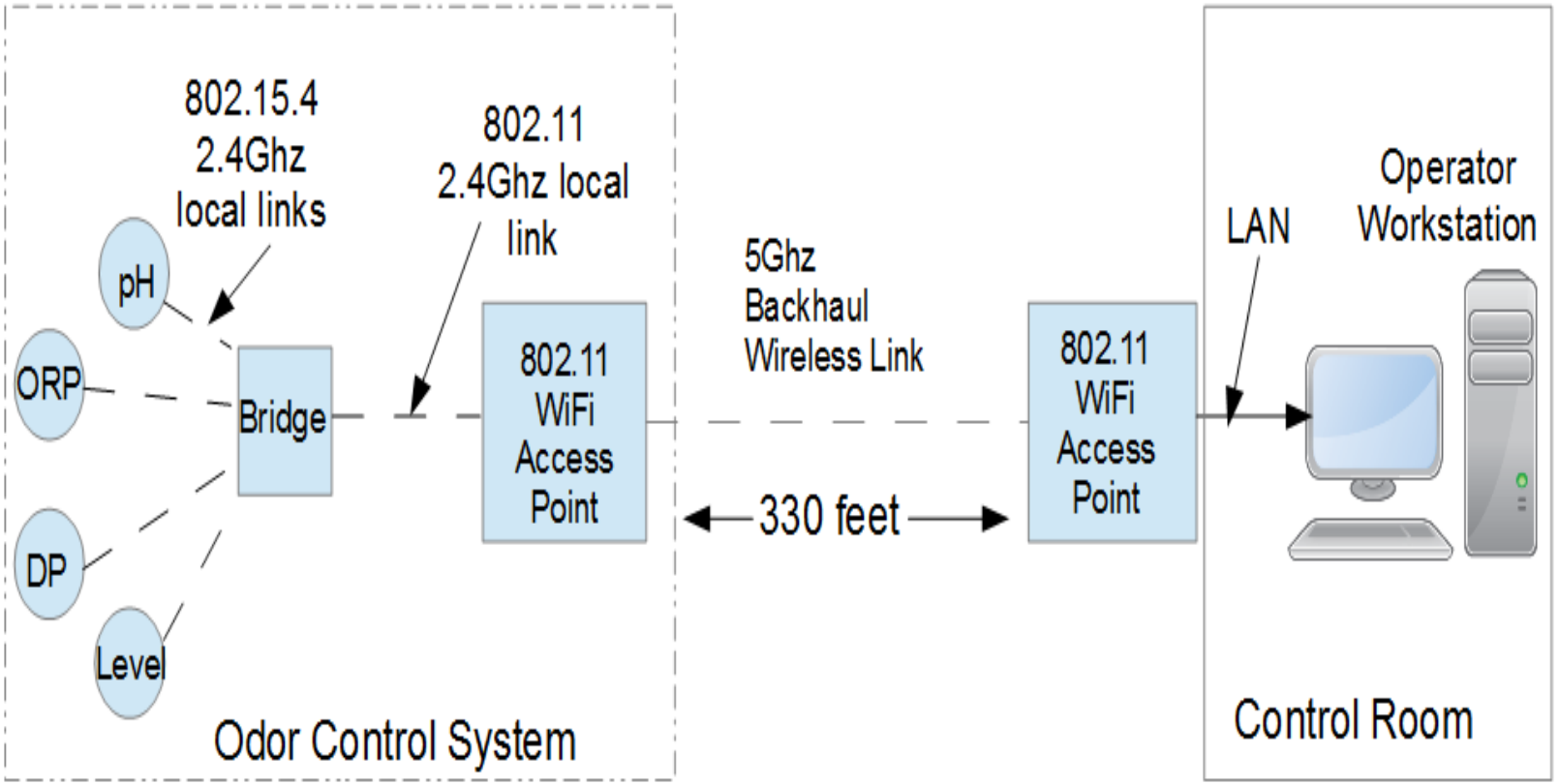
Site Survey



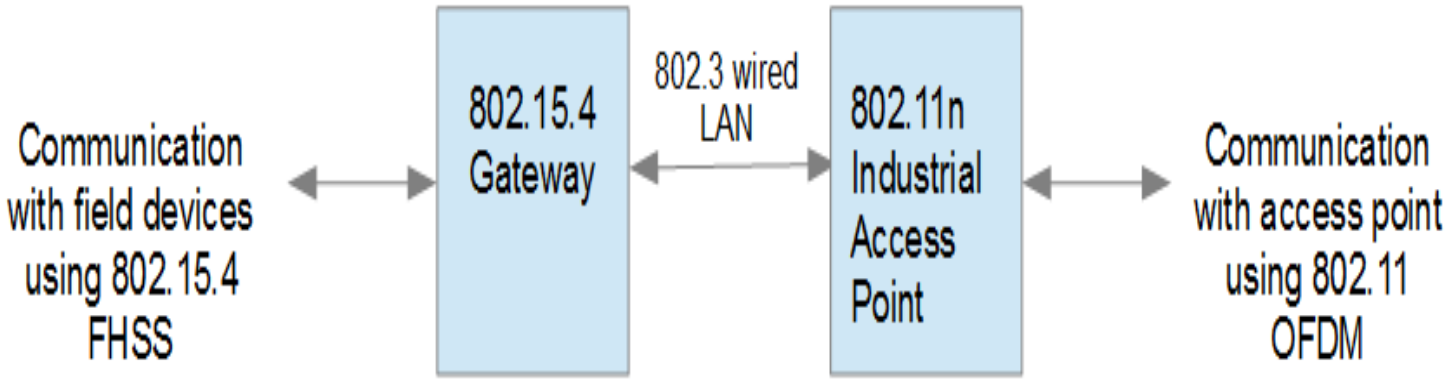
Instrument Network

- Uses the WiHART protocol
- WiHART conforms to IEEE 802.15.4 – also the basis for Bluetooth
- HART instruments are widely available
- Low duty cycle requires lower power requirements
- THUM Transceivers convert any HART instrument to wireless
- Requires data translation from 802.15.4 to 802.11

Final System

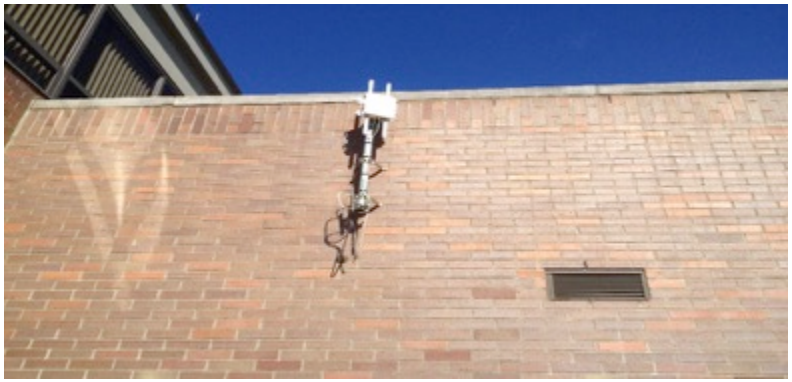


Translational Bridge



Block diagram of Translational Bridge

Wireless Devices Used in POC



Cost Comparison

Table 1: Cost comparison: Wired and wireless links for SWPCA

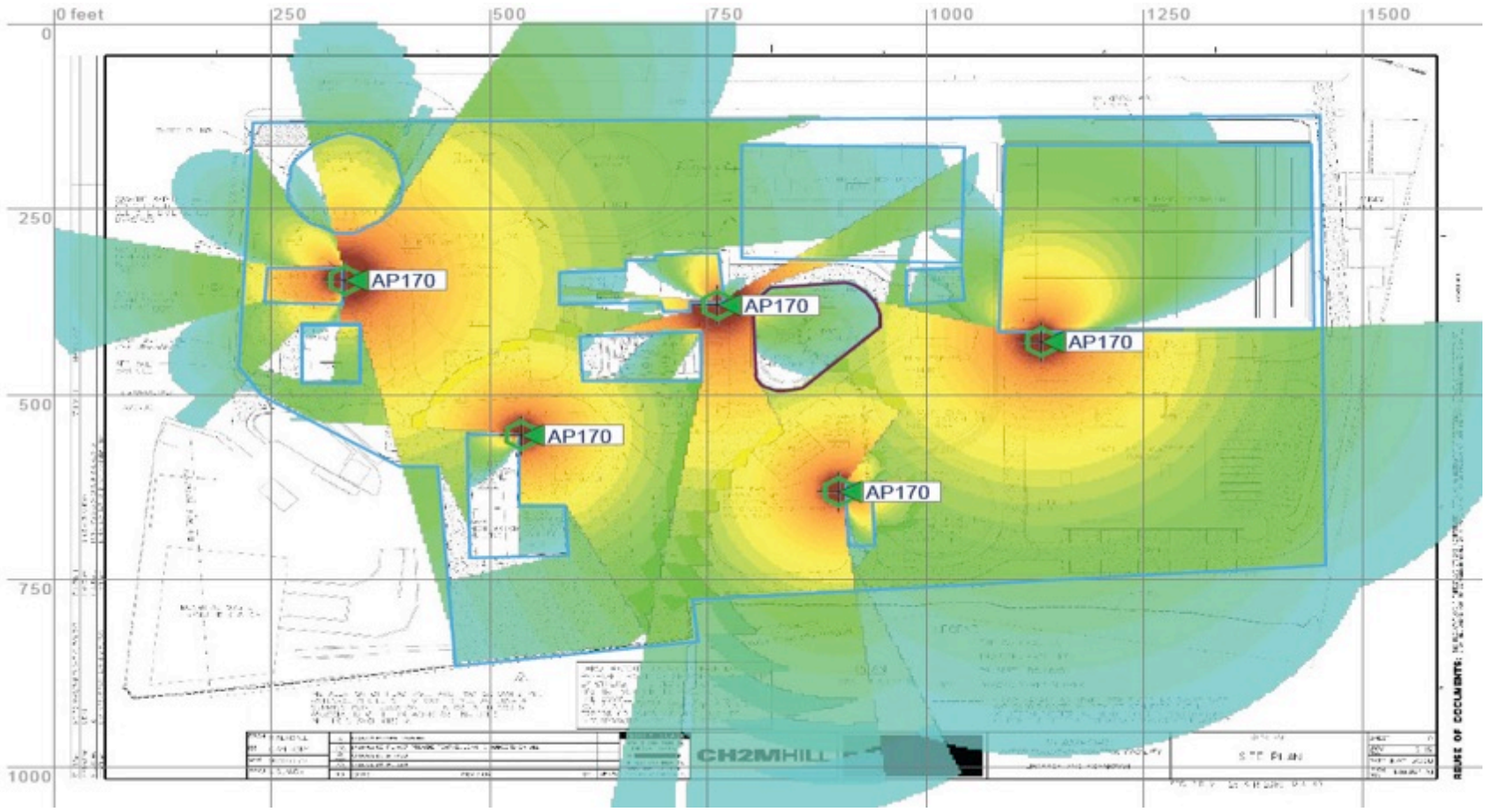
330 ft wired link in trench		330 ft wireless link	
Excavation 140 yds	$6,500	Design/site surveys	$2,500
Saw cut 300 ft pavement	$3,000	Access points: 2 @ $800	$1,600
Stone base	$1,000	Electricians: 1 day @ $1,120/day	$1,120
Backfill	$4,500	IT configuration	$1,200
Patching	$3,500		
Conduit and cable	$500		
Router and accessories	$600		
Electricians (5 days @ $1,120/day)	$5,600		
Design, management, IT, misc.	$5,000		
Wired grand total	$30,200	Wireless grand total	$5,420

Wireless communications *saved considerable cost in the Stamford Water Pollution Control Authority application, $5,420 compared to $30,200. Courtesy: SWPCA*

SWPCA POC Results

- Results of the POC were very favorable
- Staff was enthusiastic and used the system regularly
- Staff has asked that mobile worker be included in SCADA upgrade
- SWPCA expects to realize extraordinary costs savings from use of WLAN
- SWPCA test was a short term, limited POC designed to disprove WLAN viability.

Proposed Final System



Wires vs. Wireless

Table 2: Wires vs. Wireless, side-by-side industrial summary

Wires	Wireless
Expensive	Inexpensive
Labor intensive	Minimal labor cost
Long installation time	Minimal installation time
Extensive downtime	Minimal downtime
Long-term deterioration	No deterioration
Old technology is inflexible	New technology is flexible

Stamford Water Pollution *Control Authority anticipates savings to accrue over time with less deterioration and greater flexibility to make changes or additions. Courtesy: SWPCA*

Questions?

- For Further Information:
  - Control Engineering Magazine:
    - February 2015 Cover Story : Integrating Wireless With Wastewater – in 2 Days
    - Wireless Tutorial Blog: Industrial Wireless Networking
  - Emerson Proven Results:
    - Waste Treatment Facility realizes ROI and improves odor control with Emerson Wireless Networks
    - Monroe County Waste Treatment Facility Improves Safety with Wireless Monitoring of Safety Showers

Thank You

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