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US EPA Water Security Test Bed - Water Infrastructure Cybersecurity Research Vision

May 2021

James Goodrich, Stephen J Reese

Changing the World's Energy Future

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Idaho National Laboratory
Idaho Falls, Idaho 83415

http://www.inl.gov

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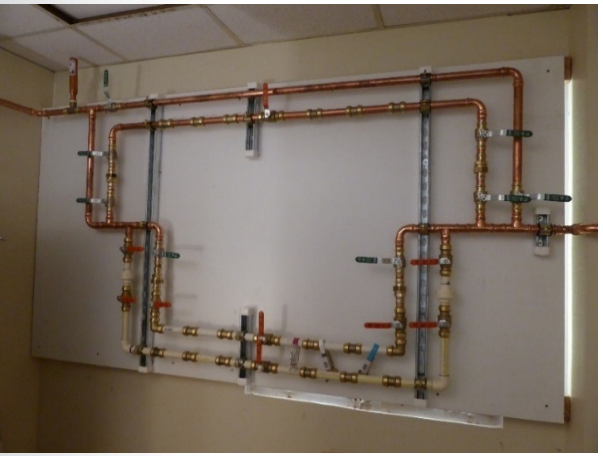
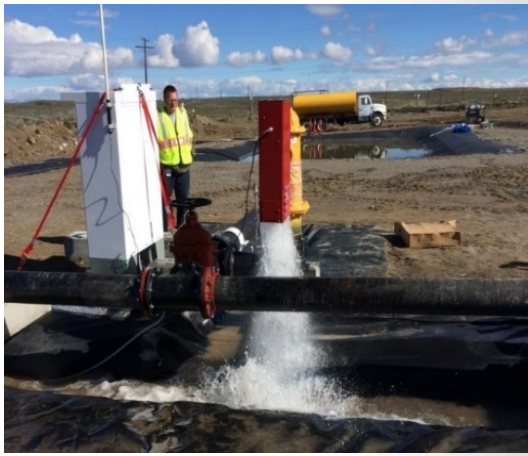
U.S. EPA Water Security Test Bed





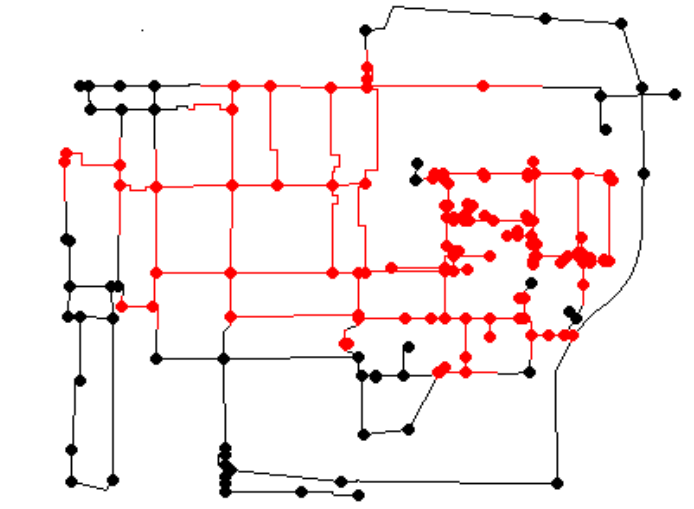
Water Infrastructure cybersecurity research vision

ORD Homeland Security Research Program

Emergency Response, Recovery, and Mitigation

Response – *Washwater or distribution system treatment for safe discharge to environment or collection system from wide-area incidents*

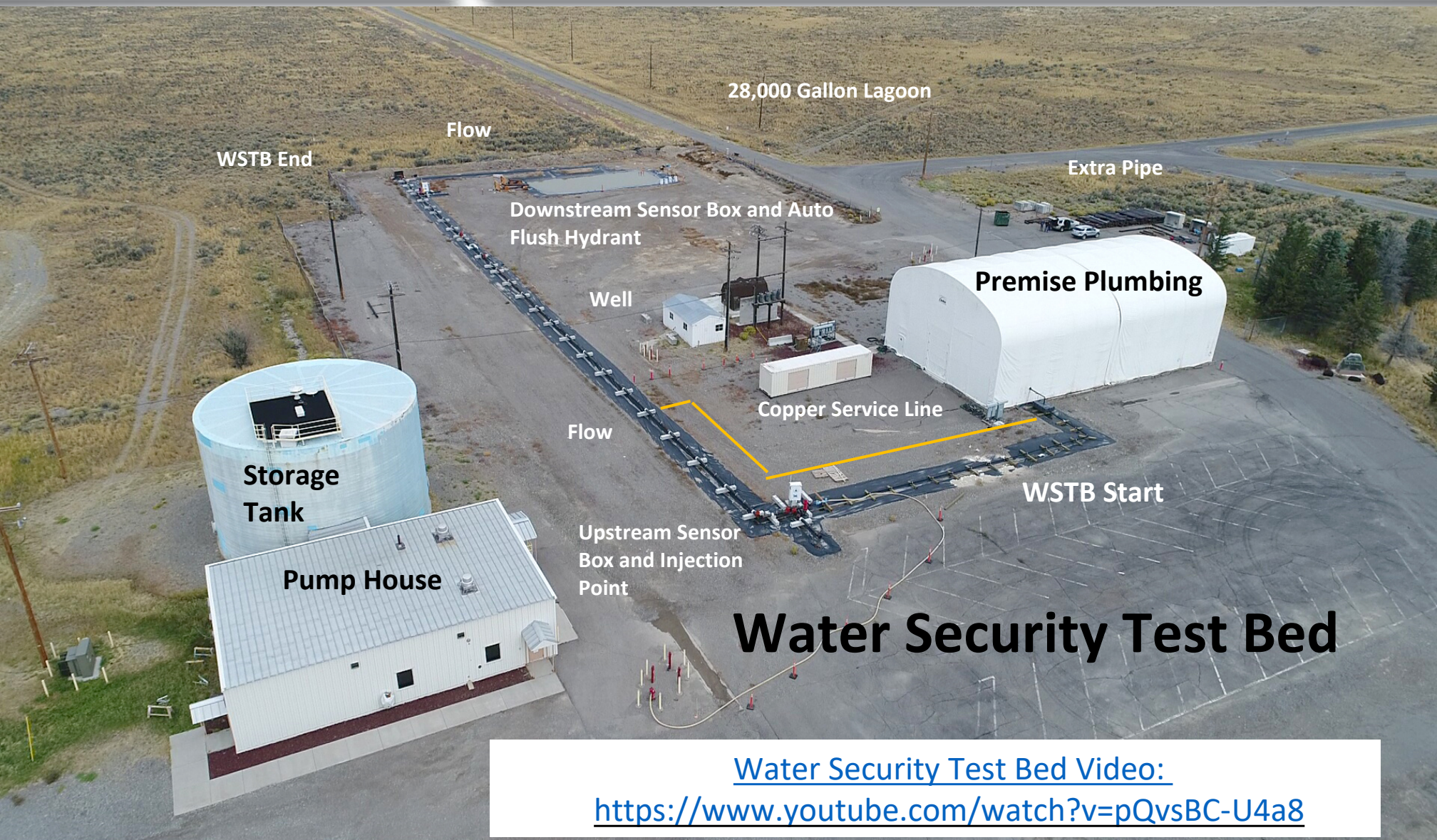
Recovery - *Provision of drinking water from compromised distribution systems*



Mitigation – *Strategic Pre-deployment and hardening at critical locations and institutions (hospitals, prisons, nursing homes)*

Why We Are Here

What is the WSTB?



Water Security Test Bed Video:
https://www.youtube.com/watch?v=pQvsBC-U4a8

Key WSTB Research

- 2017 SME Workshop
- Pipeline and Premise Plumbing Decontamination/Rehab
  - *Bacillus globigii*
  - Bakken crude oil
  - Aqueous fire fighting foam (PFAS)
  - Malathion
  - Raw Water
- Radiological Detection
- Emergency Water Treatment

Past Collaborators and Interested Organizations

- **EPA Region 8:** Bakken Crude Oil Decon
- **EPA OGWDW:** Low pressure contaminant injection
- **Lawrence Livermore National Laboratory:** Plastic scintillation fiber rad detector
- **Air Force Institute of Technology:** Aqueous Fire Fighting Foam treatment (PFAS) and decon
- **DC Water:** Provided Large pipe and Lead Service Lines, Raw Water, Smart Water Fountain (planned)
- **Universities**
  - Boise State University (cyber), Montana State University (biofilm, *Legionella*)
- **Water consulting firms**
  - Several interested in using the Test Bed for cybersecurity and in responding to water industry RFPs

WSTB Video

Cybersecurity Research Objectives

"Evaluate using Operational Technology (OT) equipment and methodologies to protect, detect, respond, and recover from various cybersecurity attacks on water infrastructure equipment using EPA's Water Security Test Bed"

Current WSTB OT Cybersecurity Team

Collaborators:

- DC Water
- Schneider Electric
- West Yost Associates
- Idaho National Laboratory (INL)
- Boise State University
- CIPAC/GCC/SCC
- DHS/CISA/NRMC
- NSA

University Publishing Sensitivities and Vulnerabilities

- NDAs between participants including Universities
- Parallel communication Tracks
  - Hardware and software vulnerabilities communicated to vendors to rectify (no public disclosure)
  - EPA and INL clearance procedures in-place to identify any additional vulnerabilities and prevent sensitive disclosures

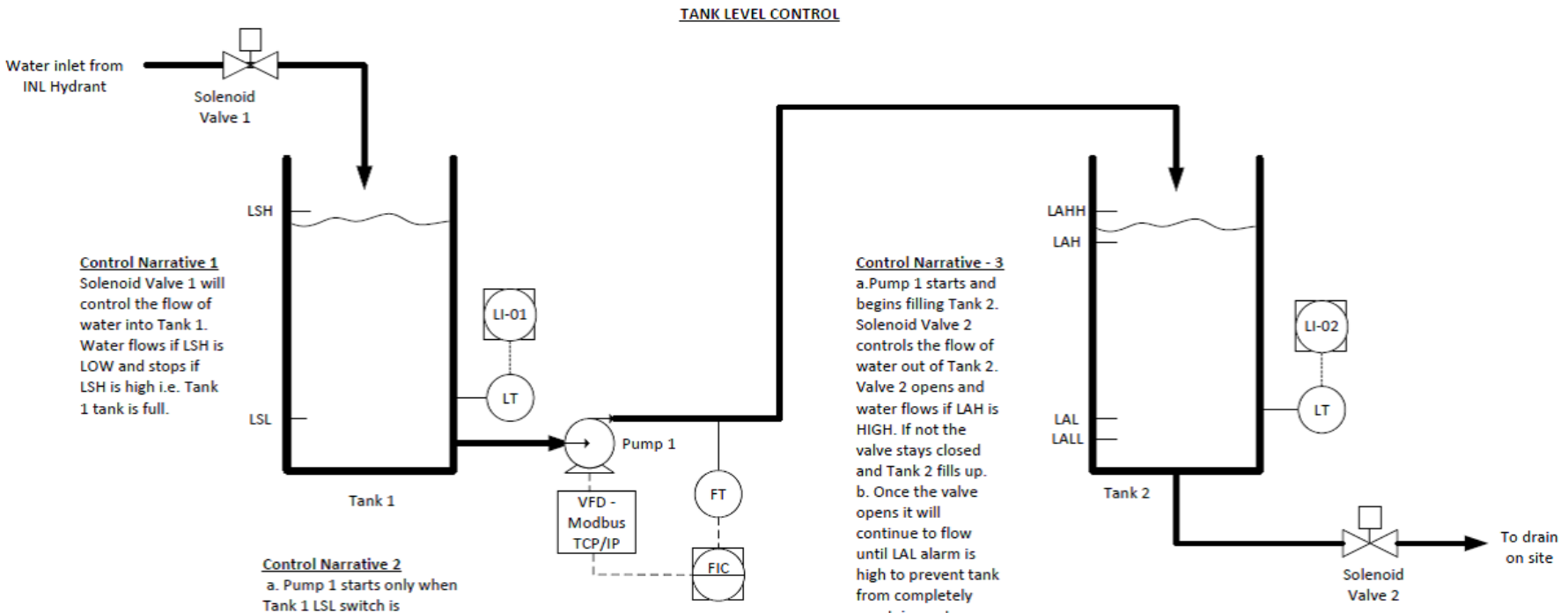
» *Focus on Resilience and Consequence Reduction improvements for public disclosure*

OT Cybersecurity Future

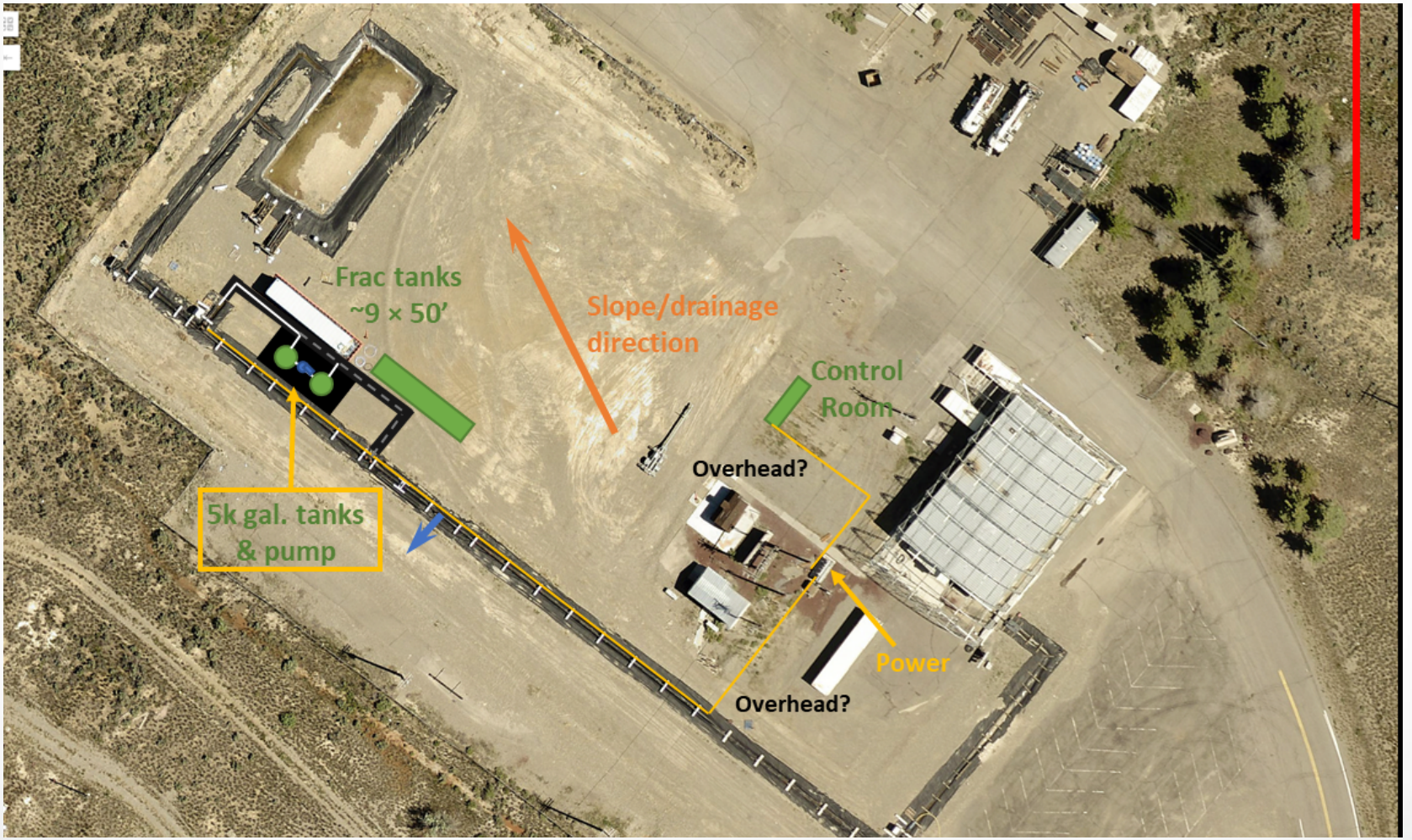
Cybersecurity and SmartGrid Integration Capacities

- Impact of cyber hacks on operations
- Rapid detection and mitigation of cyberattacks
- Improve operational technology and hardware resilience
- Water-energy nexus and interdependencies
- Emergency Responder and Operations Training/Certification
- Application to other Critical Infrastructure
- Electromagnetic Pulse (EMP) Preparedness
    - Effects and Mitigation evaluations

Tank Level Controls



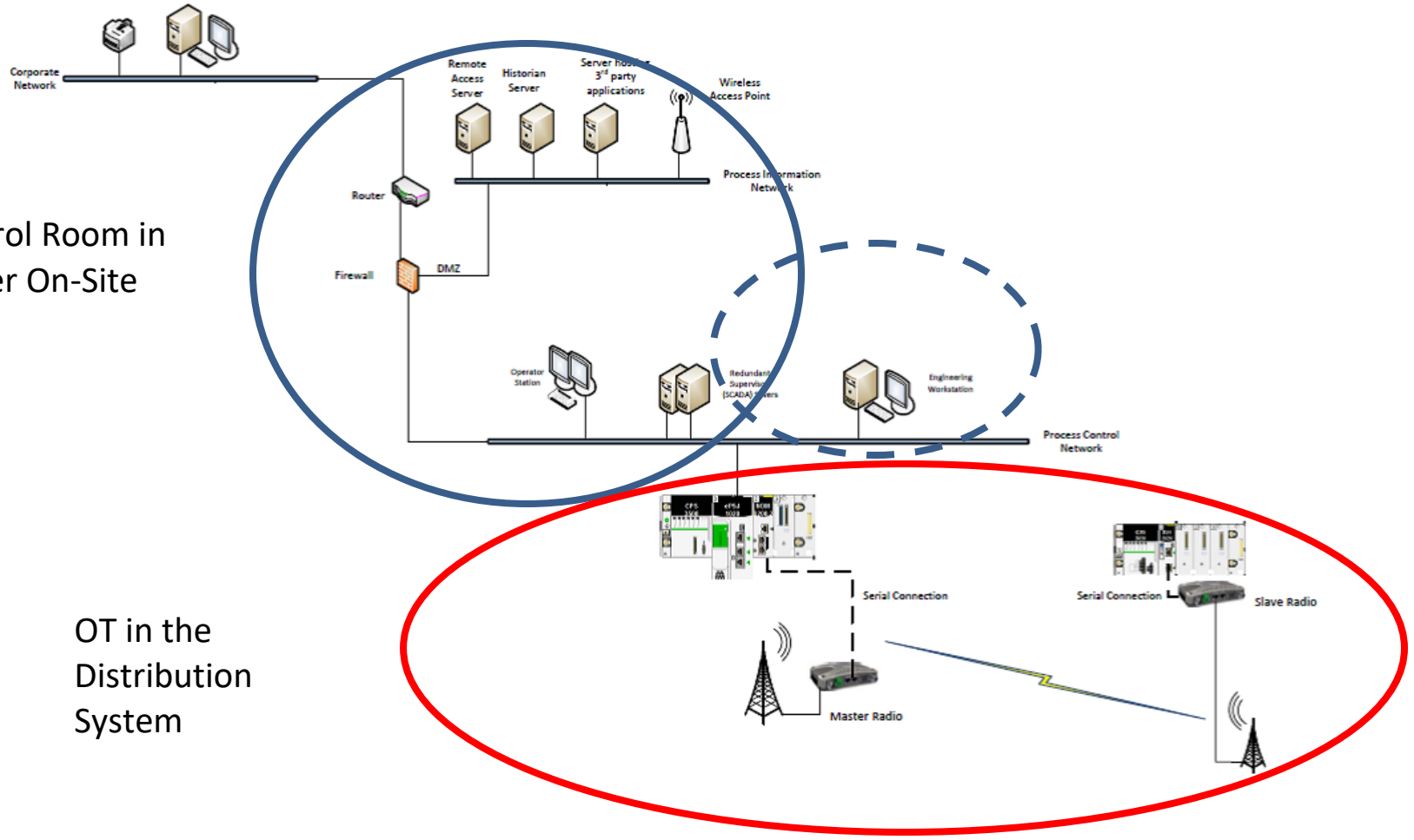
Tank, Pump, and Piping Additions



OT Layout

Control Room in Trailer On-Site

OT in the Distribution System



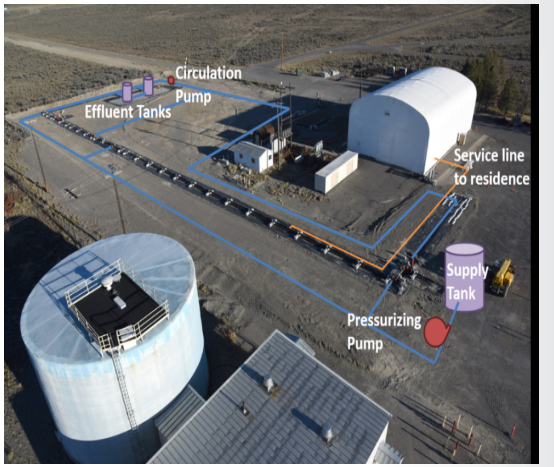
OT Cybersecurity Future

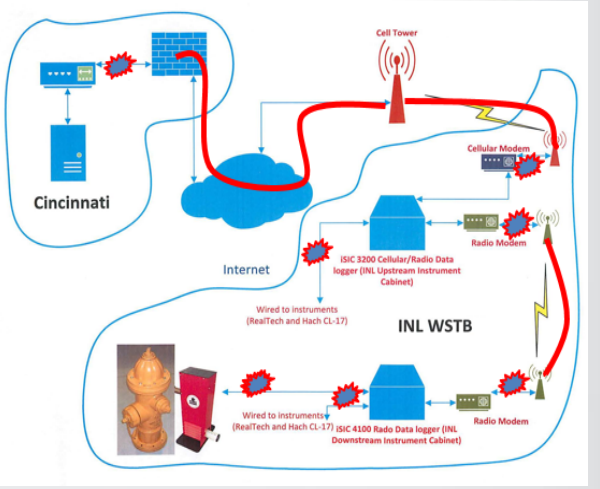
Join the Team:

- Collaborative partnership to ensure the most important critical infrastructure OT cybersecurity challenges are being addressed

- Guidance on the long-term overarching design of the WSTB cybersecurity research plan
  - Specific OT attacks
  - Selection of technologies to challenge

- Communicate findings to government and water industry stakeholders





Thank you

EPA WSTB Contact:
James A. Goodrich, Ph.D.
Sr. Science Advisor
513-569-7605 (Office)
513-658-1055 (Mobile)
Goodrich.James@epa.gov

Idaho National Laboratory Contact:
Stephen Reese
Water Security Test Bed Project Lead
208-526-0070 (Office)
208-569-7658 (Cell)
stephen.reese@inl.gov

www.epa.gov/emergency-response-research

Water Security Test Bed Video: https://www.youtube.com/watch?v=pQvsBC-U4a8

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