

Role of Environmental Health (EH) in *Legionella* Response

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Background

Legionella pneumophila

- Waterborne bacteria that causes pneumonia known as Legionnaires' disease
- About 1 out of every 10 people who gets sick with Legionnaires' disease will die due to complications from their illness
- Preventable through a Water Management Program (WMP)
- Many different varieties (Serogroups)
- Serogroup 1 is most common
- Grows best between 77 to 113°F
- Can colonize poorly maintained water systems
- Water stagnation in water pipes causes decreased levels of disinfectant and creates ideal environments for *Legionella* to grow

Communication with SNHD

- Best to have one main contact for each facility
 - Third-party consultant could be the main contact
- Keep lines of communication open
- Questions are encouraged
- All email communications are subject to public records request

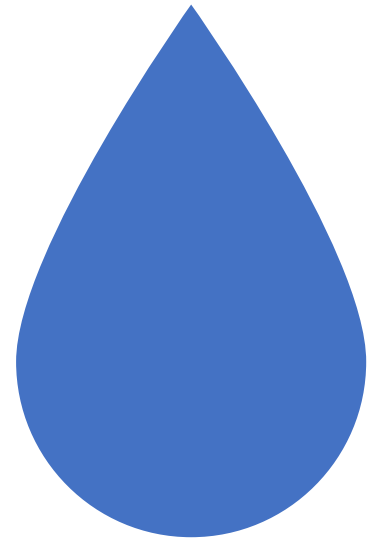
Helpful Resources

- **CDC Legionella Homepage**
 - <https://www.cdc.gov/legionella/index.html>
- **Prevent Legionnaires' Disease Training**
 - <https://www.cdc.gov/nceh/ehs/elearn/prevent-LD-training.html>
- ***Legionella* Environmental Assessment Form (LEAF)**
 - <https://www.cdc.gov/legionella/downloads/legionella-environmental-assessment-p.pdf>
- ***Legionella* Environmental Assessment Form (LEAF) Guide**
 - <https://www.cdc.gov/legionella/downloads/legionella-environmental-assessment-marking-guide-508.pdf>
- **CDC Toolkit: Developing a Water Management Program to Reduce *Legionella* Growth and Spread in Buildings**
 - <https://www.cdc.gov/legionella/downloads/toolkit.pdf>
- **ASHRAE Standard 188**
 - <https://www.ashrae.org/technical-resources/bookstore/ansi-ashrae-standard-188-2018-legionellosis-risk-management-for-building-water-systems>
- **ASHRAE Standard 12**
 - https://www.techstreet.com/ashrae/standards/guideline-12-2023-managing-the-risk-of-legionellosis-associated-with-building-water-systems?product_id=2568228

Third-Party Consultants

- **Considerations When Working with *Legionella* Consultants***
 - <https://www.cdc.gov/legionella/wmp/consultant-considerations.html>
- **ELITE Certified Labs**
 - <https://wwwn.cdc.gov/elite/public/memberlist.aspx>

Water Management Programs (WMP)



Private Sector WMP Steps

1. Form a Team
2. Develop Program Goals
3. Describe Water Systems
4. Analyze Water Systems for Safety & Efficiency
5. Specify Control Locations, Control Limits, Monitoring and Corrective Actions
6. Develop Verification Strategy
7. Develop Validation Strategy

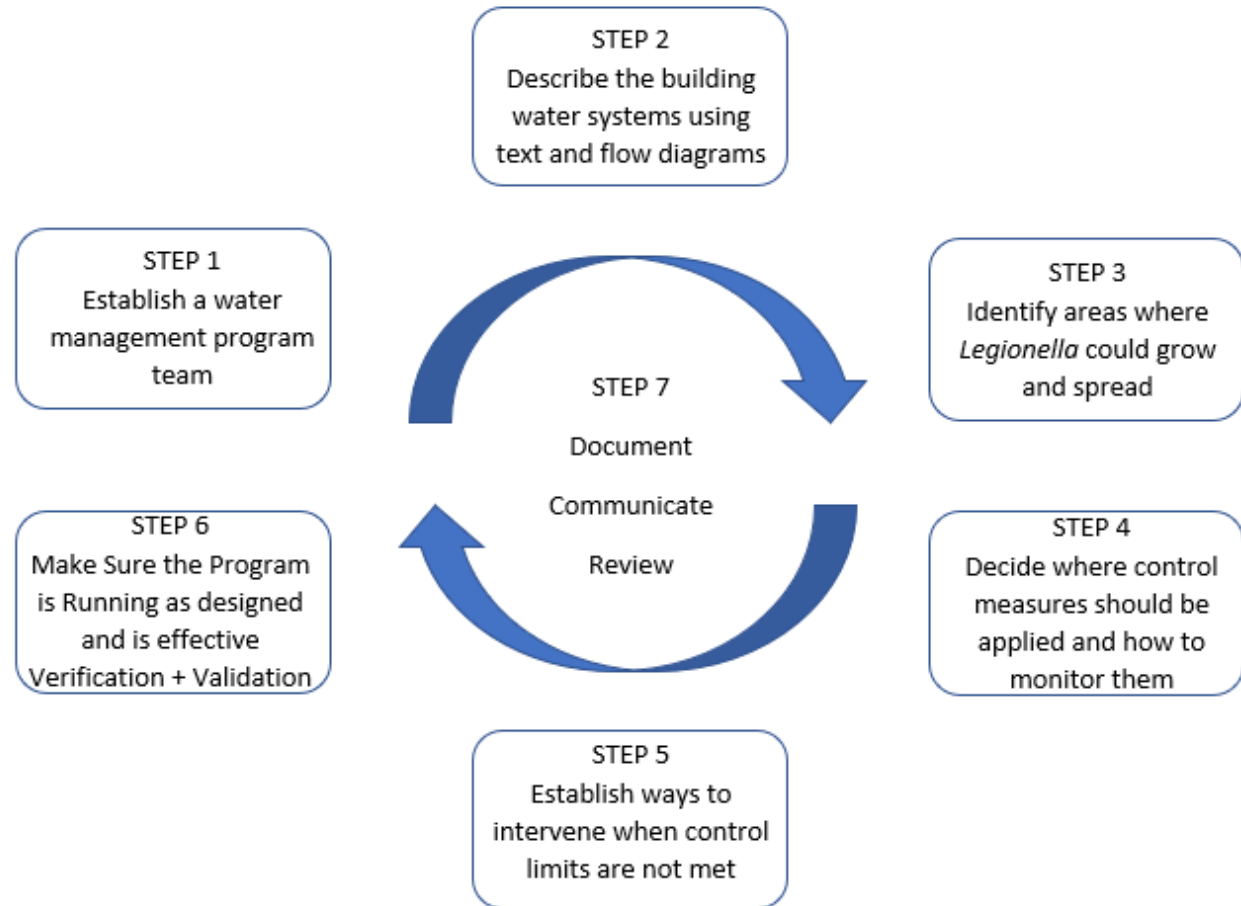
ASHRAE WMP Steps

1. Program Team
2. Describe Water Systems / Flow Diagrams
3. Analysis Of Building Water Systems
4. Control Measures
5. Monitoring/Corrective Actions
6. Confirmation
7. Documentation

CDC WMP Steps

1. Establish a water management program team
2. Describe the building water systems using flow diagrams and a written description
3. Identify areas where *Legionella* could grow and spread
4. Decide where you need to apply control measures and how to monitor them
5. Establish ways to intervene when control limits are not met
6. Make sure the program is running as designed and is effective
7. Document and communicate all activities

Seven Steps of a Water Management Program (WMP)



STEP 1 Establish a Water Management Program Team



IMPORTANT: Document who the team members are and their responsibilities

Taken from the CDC Toolkit Page 7

<https://www.cdc.gov/legionella/downloads/toolkit.pdf>

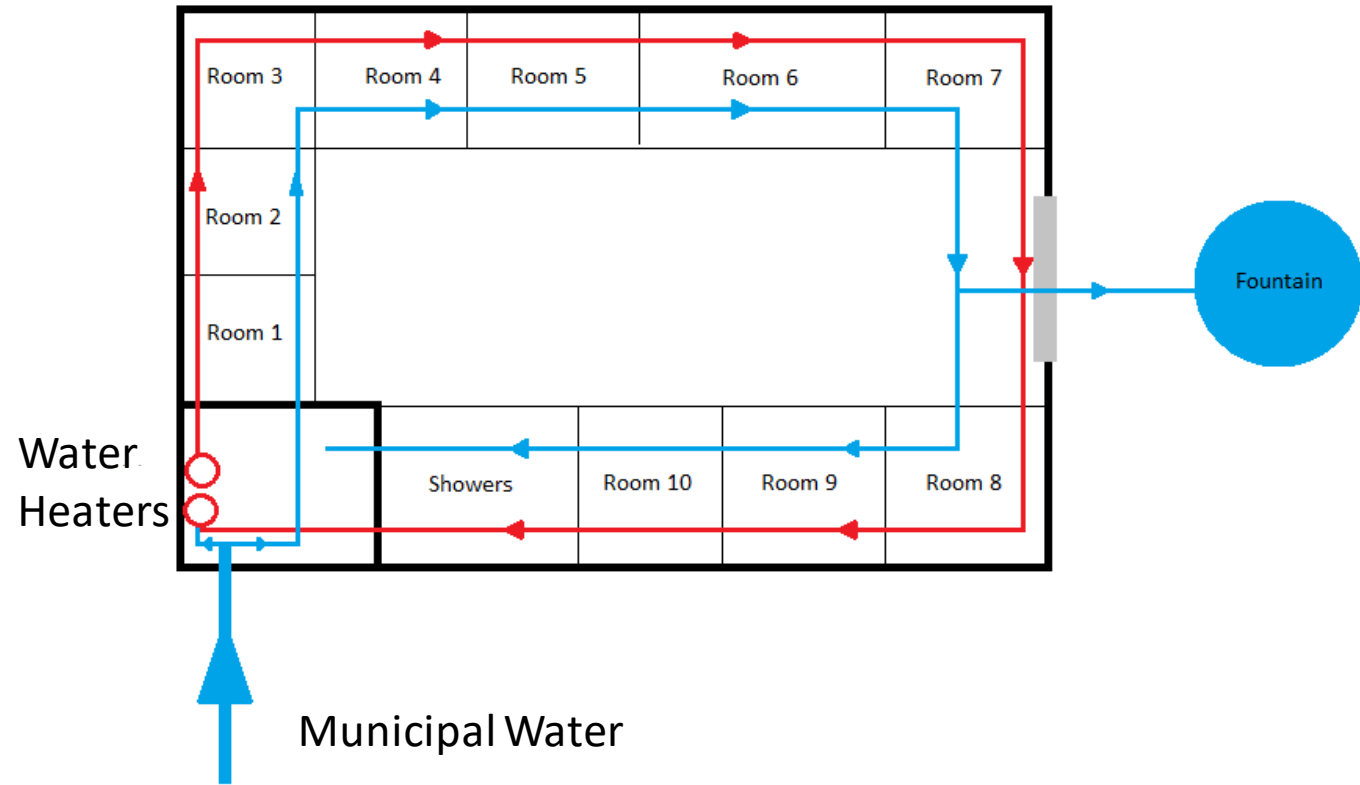
STEP 2
Describe Your
Water System
Using Text

Written description of the water system

- Describe how water flows through the building/water system
- Hot and Cold Water
- Describe fixtures details (water heater quantity/capacity, faucets, showers, fountains, cooling towers, etc.)



STEP 2 Describe Your Water System Using Text

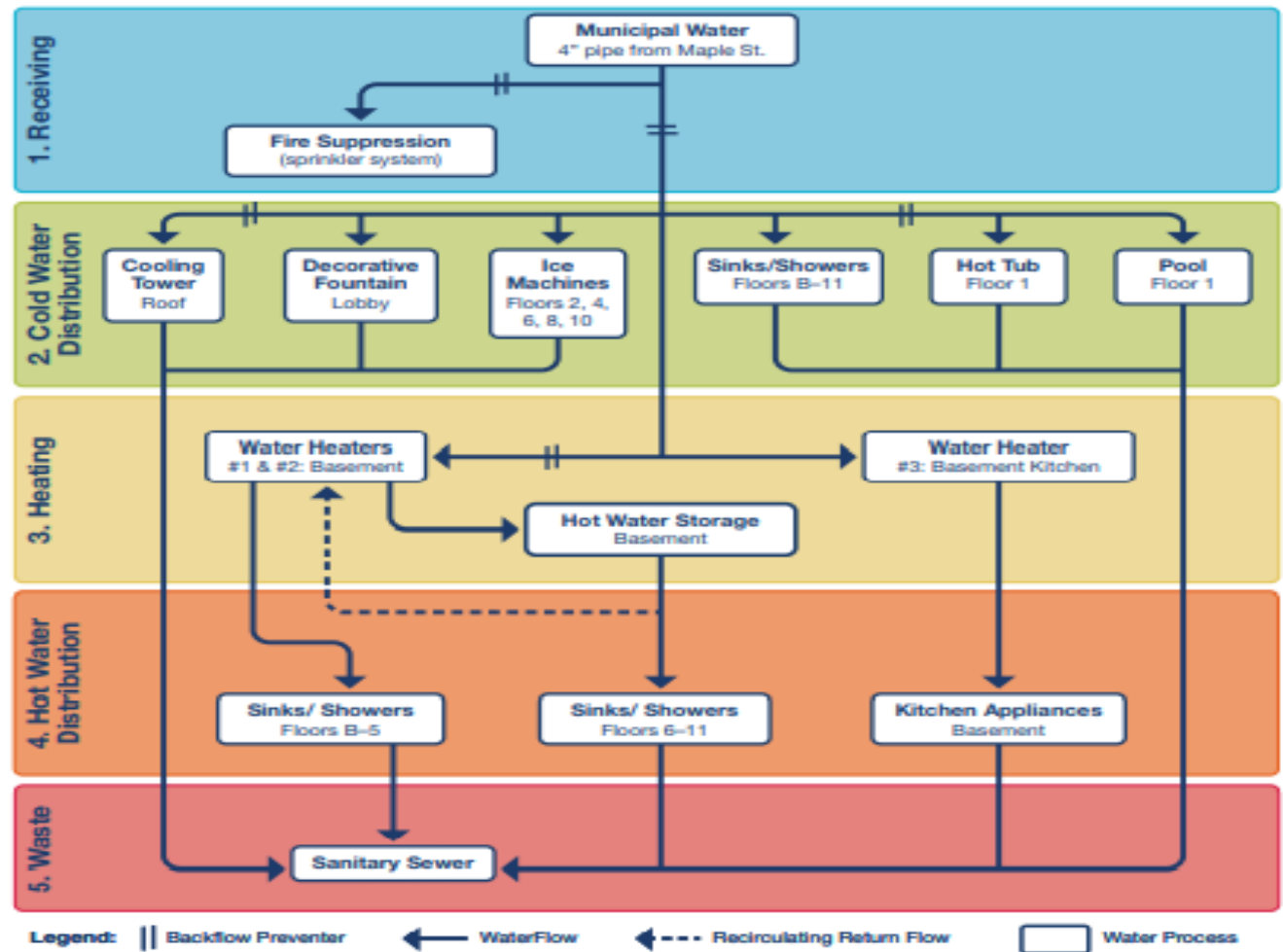


Hot Water:

Municipal water enters the building on the first floor and flows to two water heaters with 100-gallon capacity each set at 140°F. The hot water is then distributed to rooms 1-10, which each have a single faucet with an aerator. The water then flows through the shower room that has 5 separate showers that have shower wands attached. The hot water then returns to the water heater room.

Fill out for receiving water, cold water distribution, heating, hot water distribution, and wastewater. Add any applicable details.

STEP 2 Describe Your Water System Using Flow Diagrams

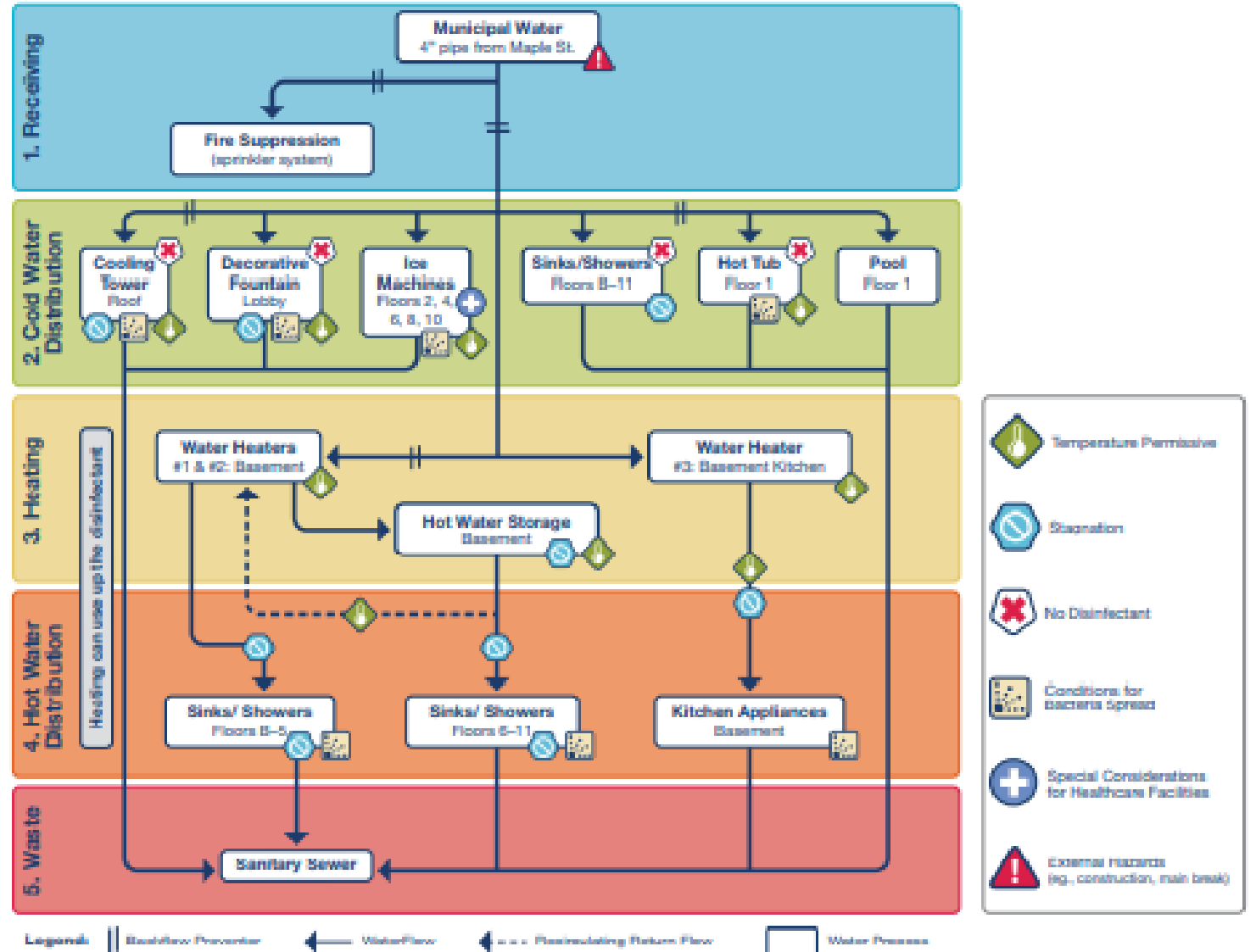


Taken from the CDC Toolkit Page 10

<https://www.cdc.gov/legionella/downloads/toolkit.pdf>

STEP 3

Identify Areas Where *Legionella* Could Grow and Spread



Taken from the CDC Toolkit Page 11

<https://www.cdc.gov/legionella/downloads/toolkit.pdf>

STEP 4

Determine Control Measures / Limits

- Identify **Control Measures** – actions that will be taken to limit growth and spread of *Legionella*
 - Heating, adding disinfectant, cleaning
- Identify **Control Points** – locations in the water system where control measures can be applied
 - Water heater
- Set **Control Limits** – for each control measure, what values should you be seeing when monitoring to prevent *Legionella* growth and spread
 - Water heater temperature (140°F), disinfectant levels (chlorine at 1 ppm)
- **Monitor** Control Limits and Control Measures on a regular basis

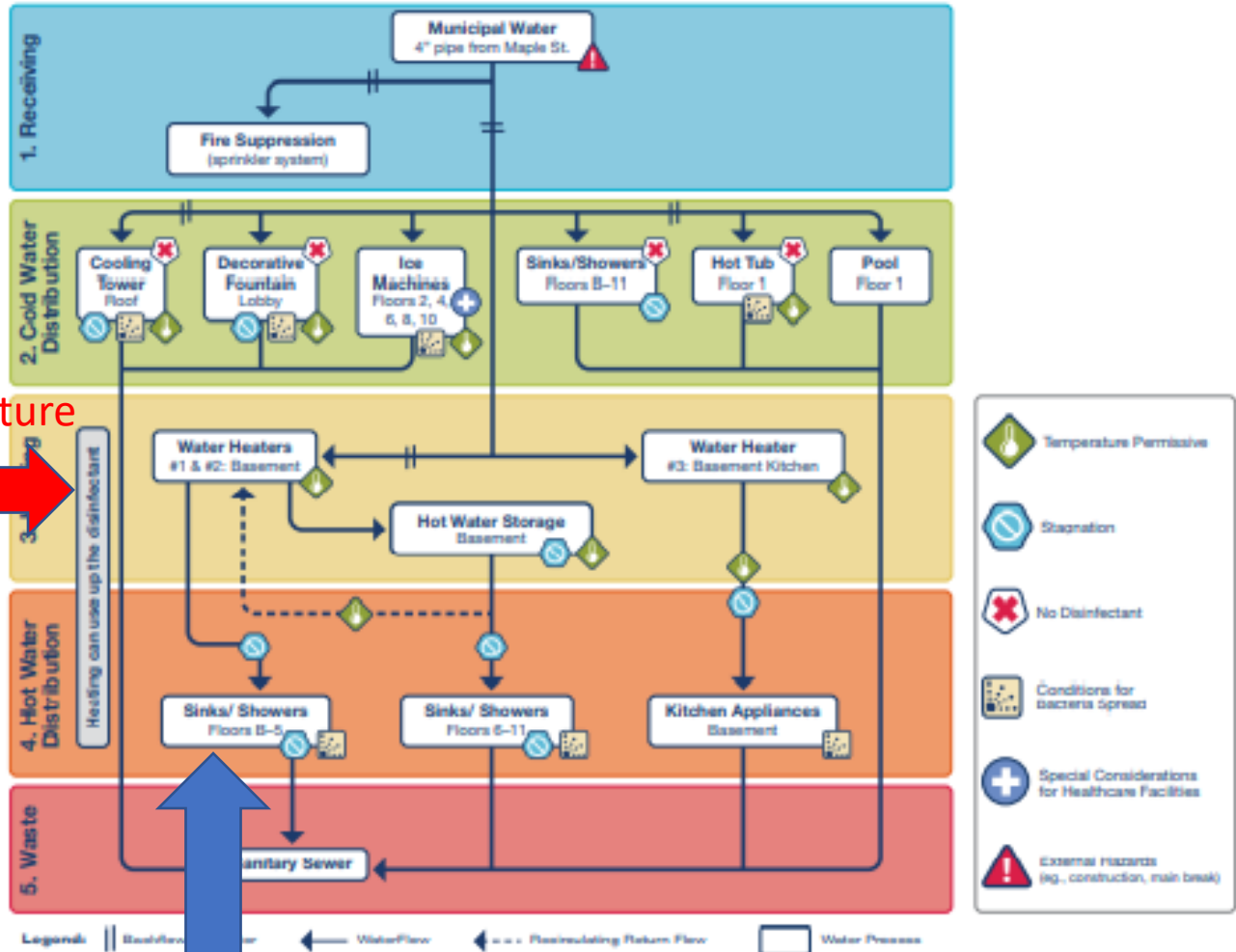
IMPORTANT:

- Document Control Measures, Control Points, and Control Limits.
- Always document actions and results when monitoring

STEP 4

Decide Where Control Measures Should Be Applied and Where to Monitor

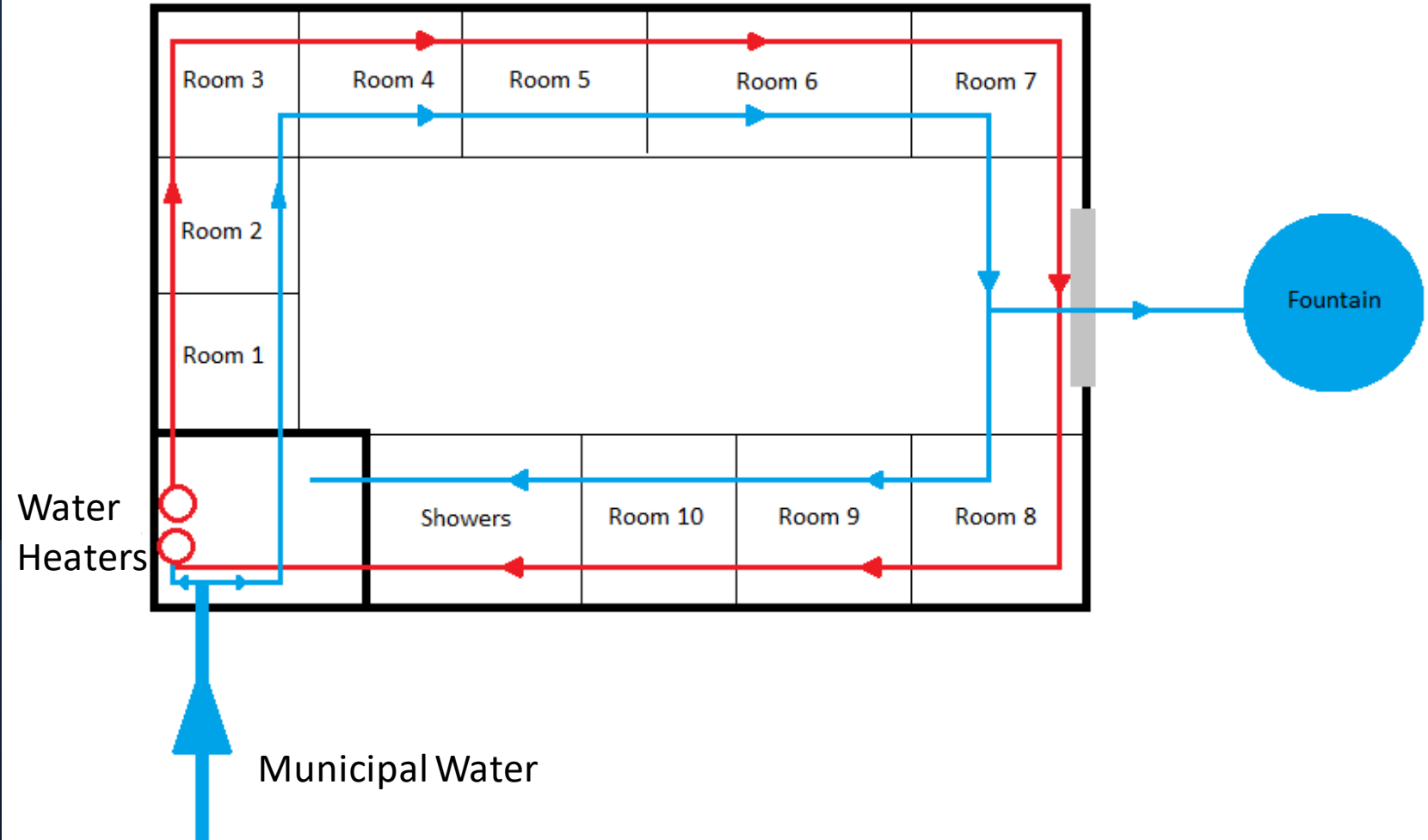
• Water Temperature



• Stagnation

STEP 4

Decide Where
Control Measures
Should Be Applied
and Where to
Monitor



STEP 5

Establish Ways to Intervene When Control Limits Are Not Met

- **Hazardous Condition Identified** – Water temperature at shower is too low (example: 105°F)
- **Control Limit** – 120°F
- **Risk** – Temperature is ideal for *Legionella* growth
- **Corrective Actions** – Investigate and repair water heaters
- **Monitoring** – Increase monitoring of water temperatures
- **Document** – Temperature logs and maintenance logs

STEP 6
Make Sure the
WMP is Running
as Designed and is
Effective

VERIFICATION

Are we doing what we said we would do?

- Are all actions and results being documented properly?
- Control Measures
- Monitoring
- Corrective Actions
- Who is taking the action?
- Flushing Logs
- Temperature Logs
- Maintenance Reports



***A person should not verify the action they're responsible for ***

STEP 6

Make Sure the
WMP is Running
as Designed and is
Effective

VALIDATION

Is our WMP actually working?

(Have we reduced *Legionella* in the
water system?)

Routine environmental testing is key
for *Legionella* prevention

STEP 7
Document and
Communicate
all Activities

“If you didn’t document it, you didn’t do it”

Documentation is important at every step of your WMP

Things to document:

- Team Members + Responsibilities
- Control Measures + Control Limits
- Monitoring Activities
- Corrective Actions Taken

Communication:

- WMP team
- Leadership
- Clients / Patients / Guests

WMP Template

Signs of a weak WMP

- Too long and unconcise (should not be 100+ pages)
- Not specific to facility (should not be too broad or general)
 - Flow diagrams and schematic drawings do not represent the facility
- No logs or proper documentation for verification
 - Flushing logs
 - Temperature logs
- Unlisted team members
- Not all 7 steps are included

SNHD COVID-19 Isolation and Recovery Site

- Built in response to the COVID-19 pandemic
- Completed in October 2020
- Temporary building with a temporary water system
- 29 beds available that could house up to 29 COVID positive patients, each for a period of up to 10 days
- 3 showers, 2 restrooms, 1 ADA shower
 - Each bathroom has 1 hand sink and 1 toilet
- 1 communal hand sink
- 1 employee breakroom with a sink
- 1 industrial water line for fire suppression system



The Southern Nevada Health District has opened the new COVID-19 Isolation and Recovery Site for clients who need a safe place to isolate but who do not require hospitalization.

SNHD COVID-19 Isolation and Recovery Site

Challenges

- Temporary water system
 - Water temperature issues
 - **Dead leg** issues within the water system
 - (a section of pipe that contains water but has no flow or is infrequently used)
- *Legionella* testing done prior to occupancy



SNHD COVID-19 Isolation and Recovery Site

Solutions

- A complete Water Management Program was created for this building
- Routine WMP activities
 - Daily Flushing – with Time and Temperature Logs for verification
 - Weekly *Legionella* testing
- Corrective actions implemented:
 - Water heater replaced due to temperature issue
 - Spot remediation of hand sink
- Consistent implementation of WMP steps



SNHD COVID-19 Isolation and Recovery Site

Outcome

- No reported *Legionella* cases associated with facility (Patients or Staff)
- Public health protected



Legionella Testing Methods – ELITE Certified Labs

- **Polymerase Chain Reaction (PCR)**
 - Presence or Absence
 - Detects *Legionella*-specific DNA or RNA, may not differentiate between live and dead bacteria
 - Results typically reported in 2 – 48 hours
- **ISO 11731:2017 Method**
 - Detects viable bacteria, detects many *Legionella* serotypes
 - Results typically reported in 10–14 days
- **On-site Inoculation Testing**
 - Seen commonly with private sector Water Consultants

Legionella Testing Methods – ELITE Certified Labs

- **Viable But Non-Culturable (VBNC)**
 - microorganisms have very low metabolic activity and cannot be detected by culture testing but are alive and can grow when conditions are favorable
 - Results typically reported within 72 hours
- **Genomadix Cube**
 - Not approved for testing results but can provide basic information quickly
 - On – site qPCR test for live *Legionella* and gives results in less than hour

Legionella Sampling Methods

- **Split Sampling**

- Hot water first draw
- A two-liter sample will be collected in a sterile bottle. One liter of the sample will be poured into the health district one-liter sterile bottle. The remaining sample will be used by the facility's water consultant.

- **Side by Side Sampling**

- SNHD collects sample first followed by facility's water consultant
- Swab sample collected by SNHD first and water consultant mirror SNHD's method



SNHD *Legionella* Investigation Process

December 28, 2023

The Center for Disease Control (CDC) Notifies SNHD of a Single Case of Legionellosis associated with a Hotel in Las Vegas



Date of Site Visit

FACILITY NAME
ADDRESS
CITY, STATE ZIP

RE: Travel related Legionnaires' disease case

Dear Facility Management:

Your assistance is requested in compliance with Nevada Administration Code (NAC) 441A.280.

NAC 441A.280 Duty of persons to cooperate with health authority during investigations and carrying out of measures for prevention, suppression, and control of communicable diseases. A case, suspected case, carrier, contact or other person shall upon request by a health authority, promptly cooperate during:

1. An investigation of the circumstances or cause of a case, suspected case, outbreak, or suspected outbreak.
2. The carrying out of measures for the prevention, suppression, and control of a communicable disease, including procedures of exclusion, isolation, and quarantine.

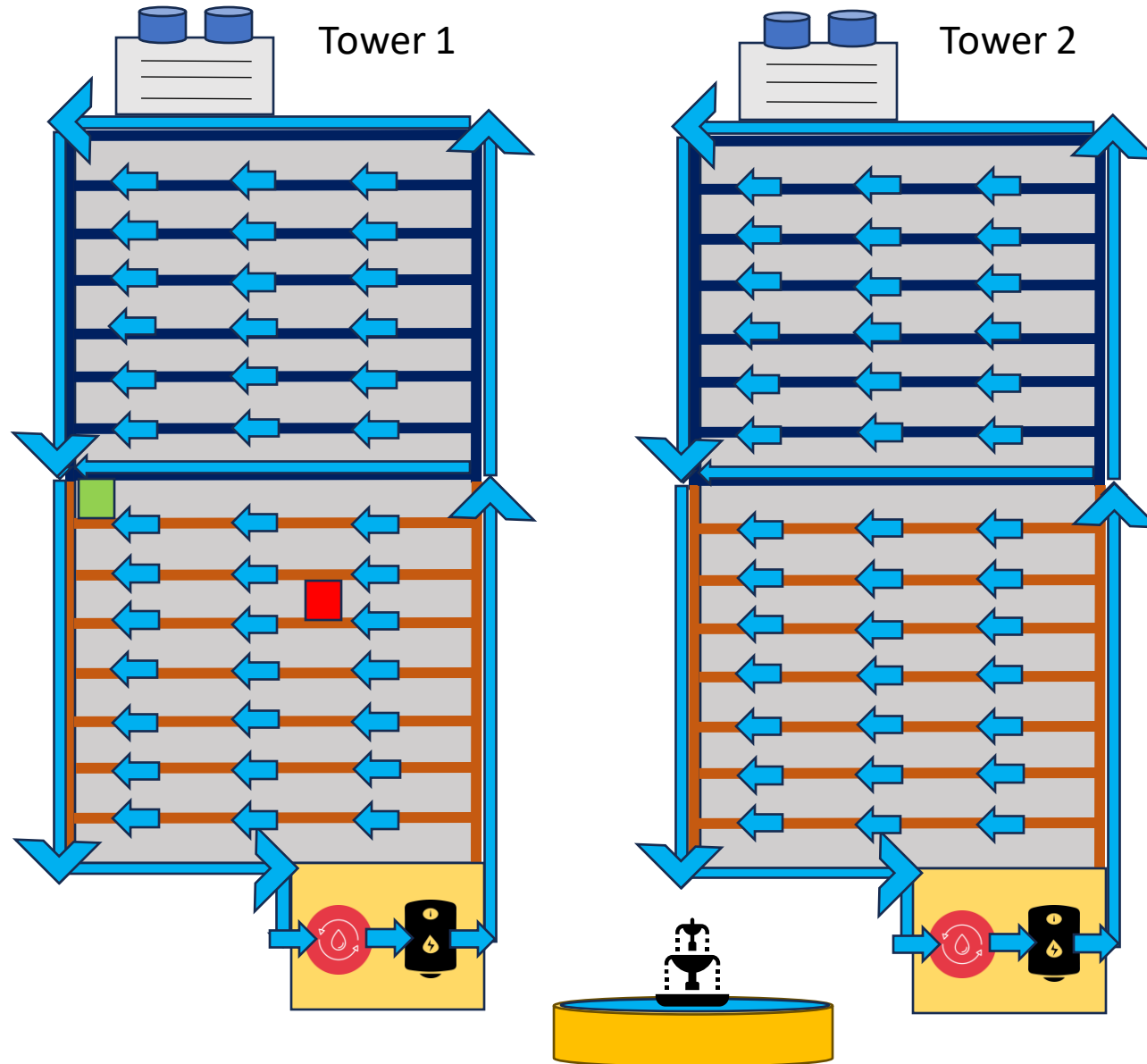
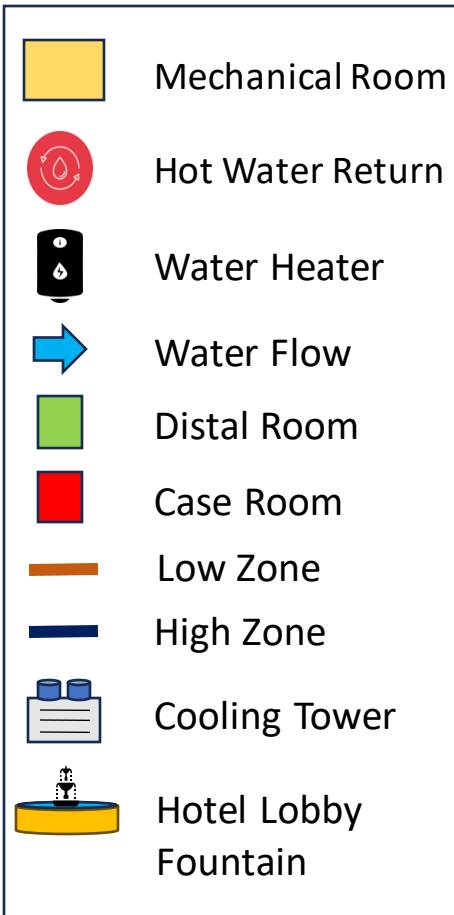
The Southern Nevada Health District (SNHD) has been informed by the Centers for Disease Control and Prevention (CDC) of a confirmed case of Legionnaires' disease whose illness may be associated with your facility. This person reported staying at FACILITY NAME during the incubation period prior to disease onset between DATE 1 – DATE 2.

SNHD is requesting a meeting to assist in verifying the client's stay and the room number, as well as perform an environmental assessment as recommended by CDC. Thank you for your anticipated assistance in this matter. Should you have any questions, please feel free to contact [REDACTED], Senior Disease Investigation and Intervention Specialist, at [REDACTED] or [REDACTED] Communicable Disease Supervisor, at [REDACTED].

Sincerely,

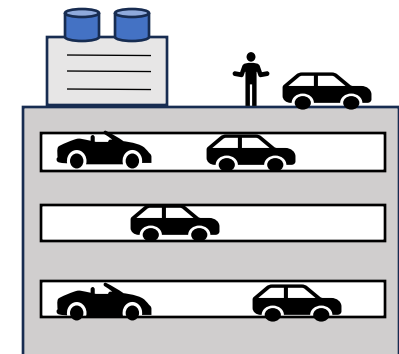
[REDACTED]
Director of Disease Surveillance & Control

Single Case Investigation – Site Visit

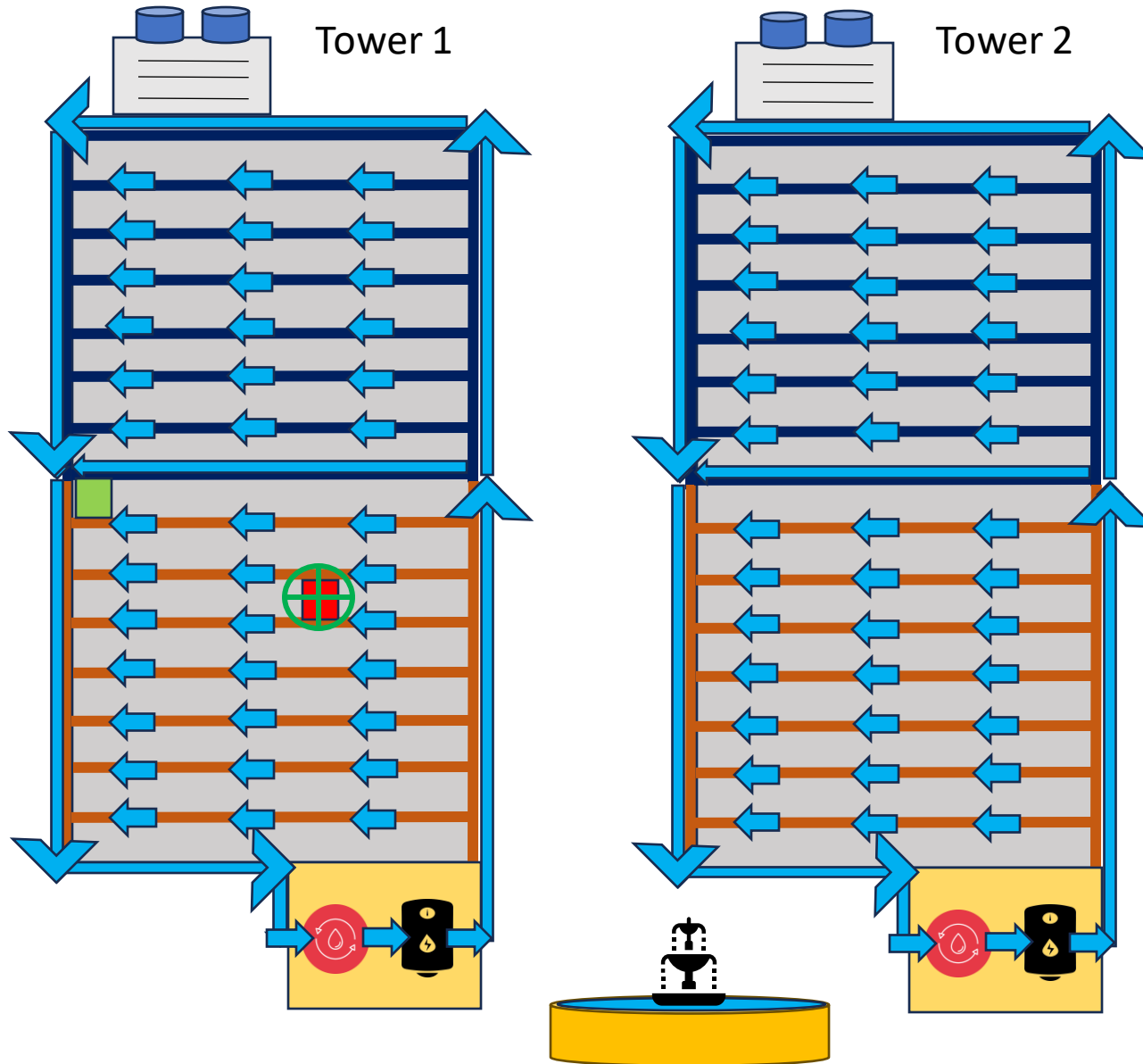
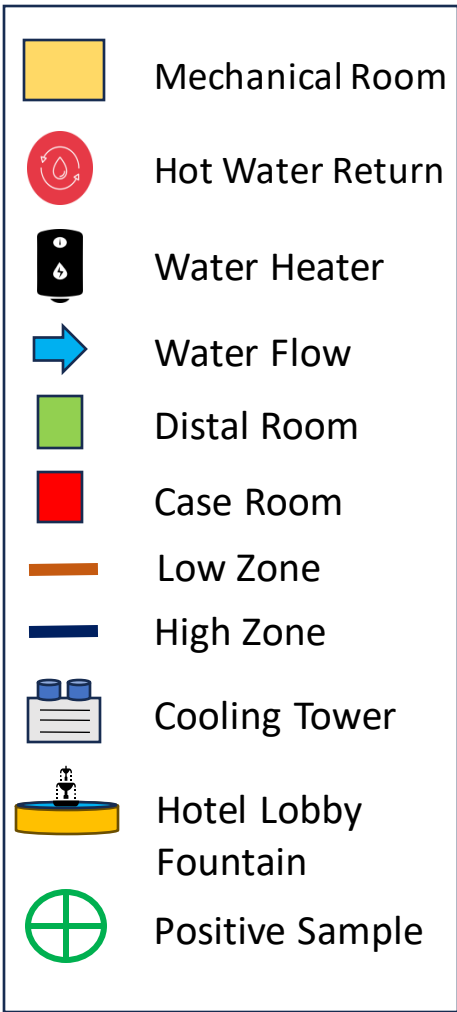


January 1, 2024

- SNHD verifies patient stayed at the facility
- Samples taken at Case Room, Distal Room, Hot Water Return, Hotel Lobby Fountain, and Cooling Towers

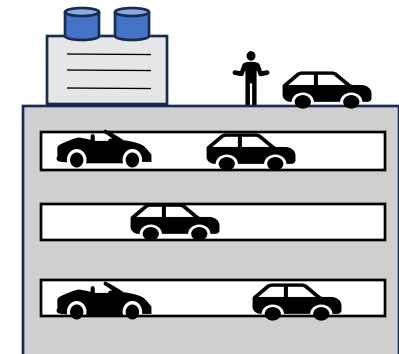


Single Case Investigation – Results Released

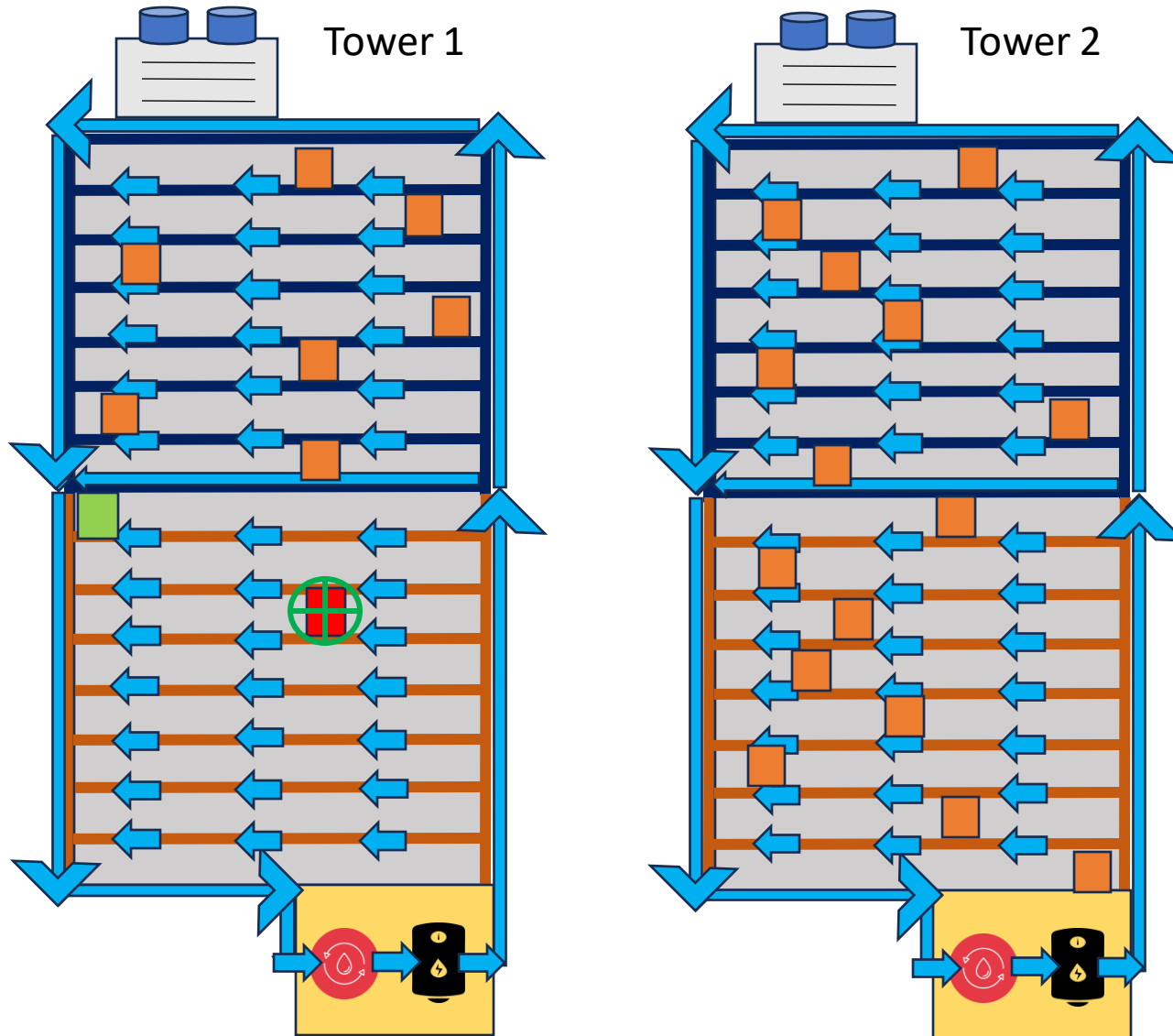
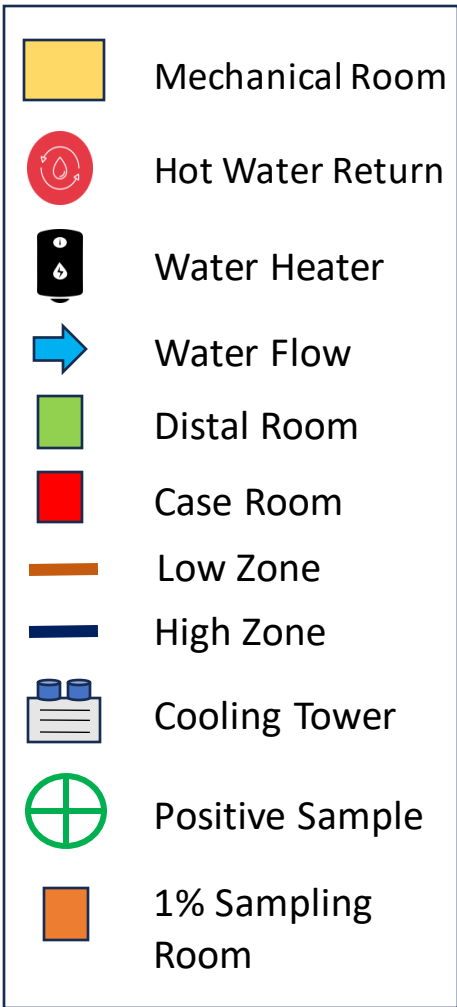


January 15, 2024

- Results are released two weeks after sampling
- Water samples are positive for *Legionella* in the case room of Tower 1 lower water zone.



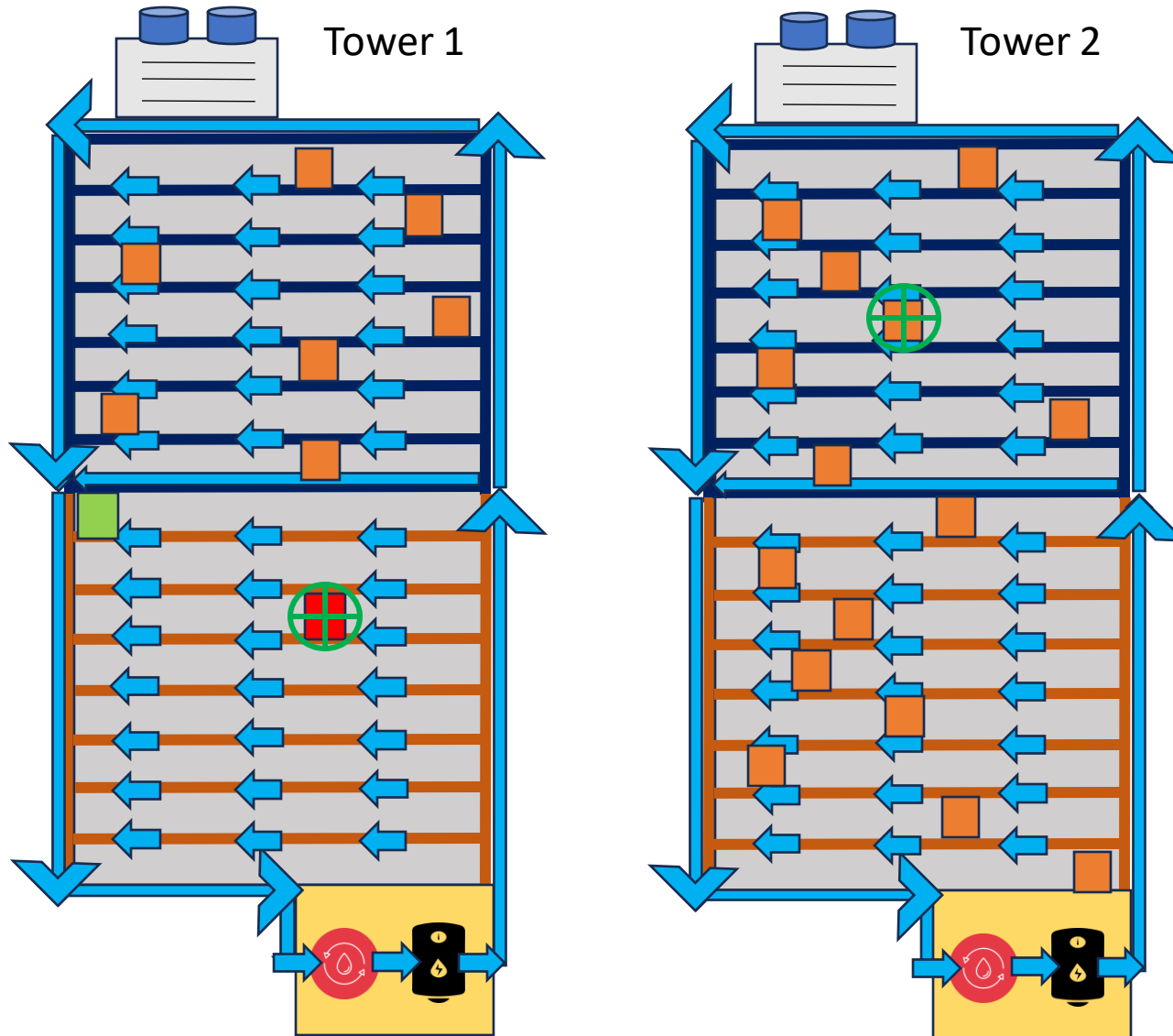
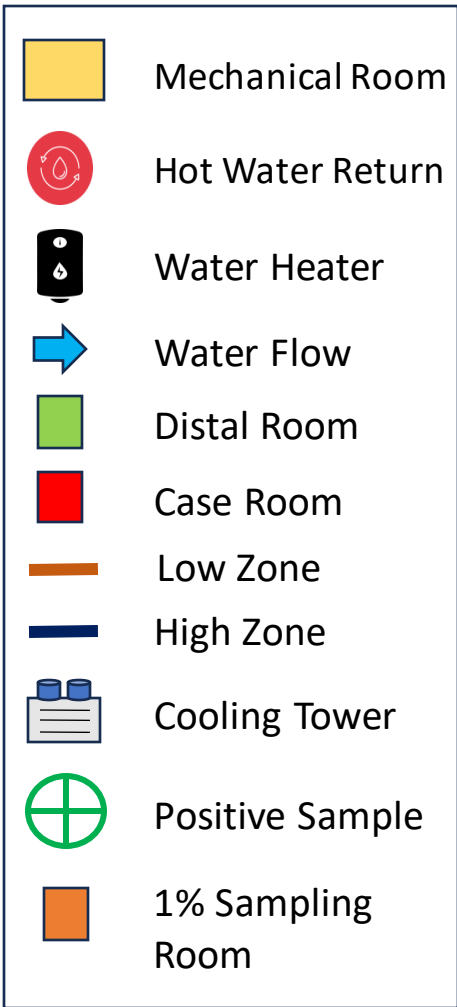
1% Sampling of Guest Rooms in Other Water Zones



February 1, 2024

- Example facility with 2 towers and a total of 4000 guest rooms (1% is 40)
- Facility takes samples from 40 random guest rooms

1% Sampling – Results Released



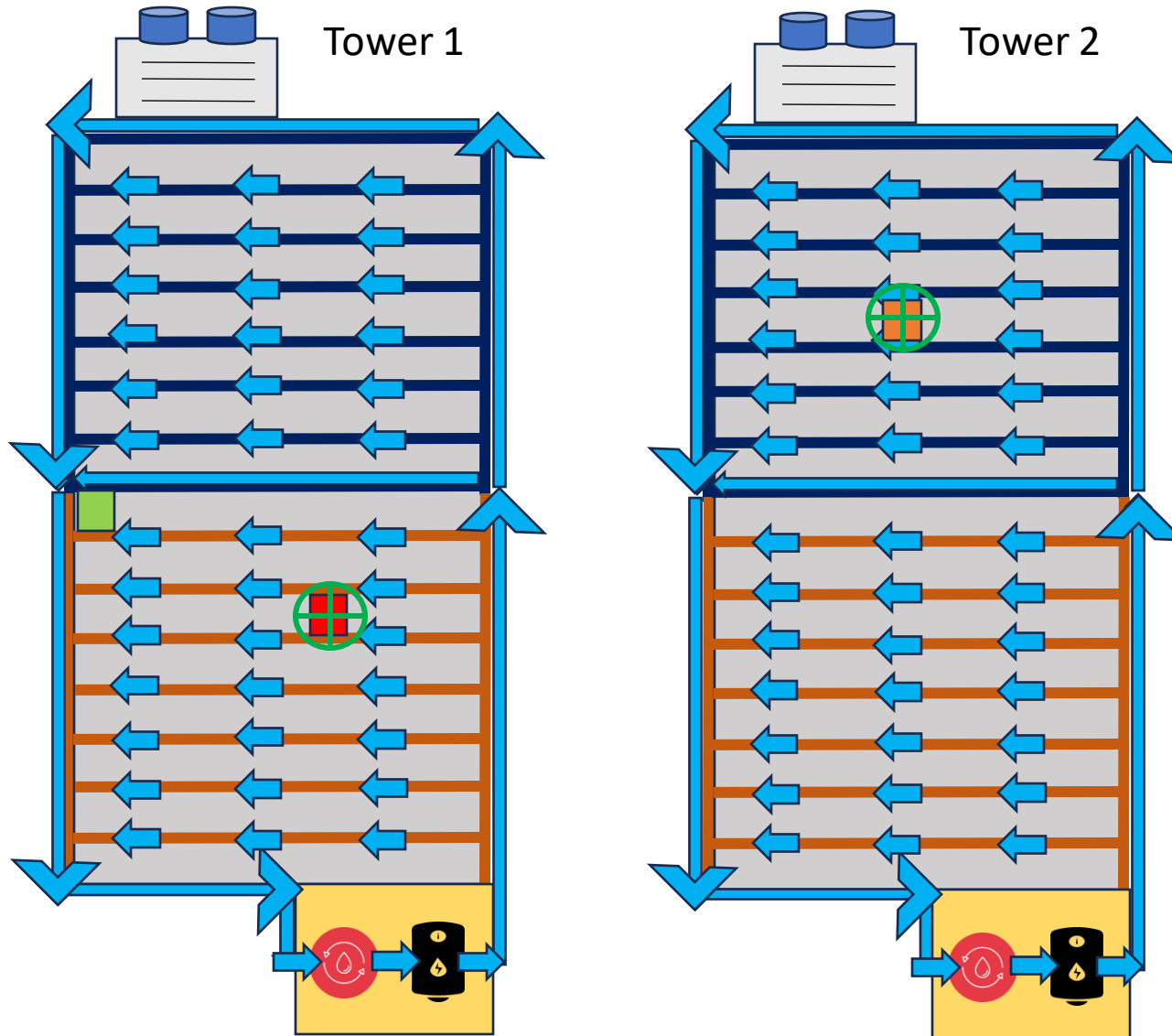
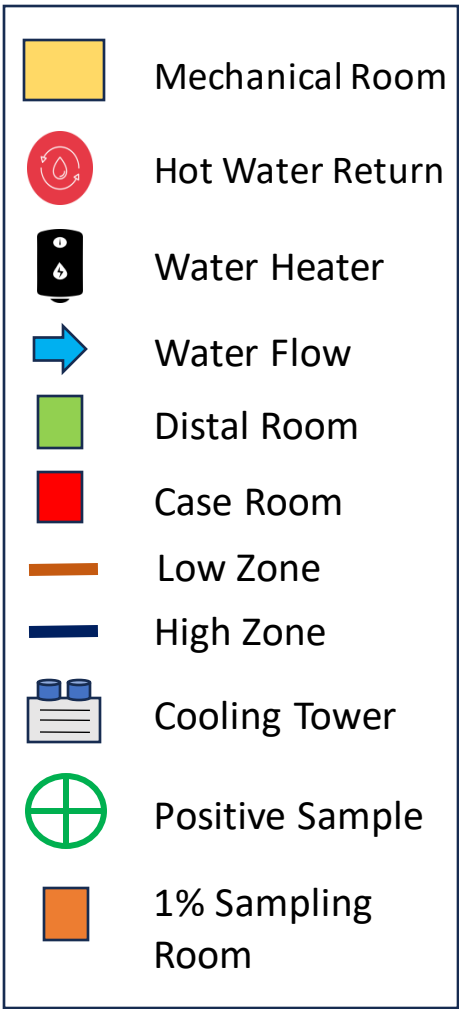
February 15, 2024

- Positive sample in 1 guest room of Tower 2 in the upper water zone

Remediation

February 15, 2024

- Remediation of affected water zones from investigation and 1% sampling.

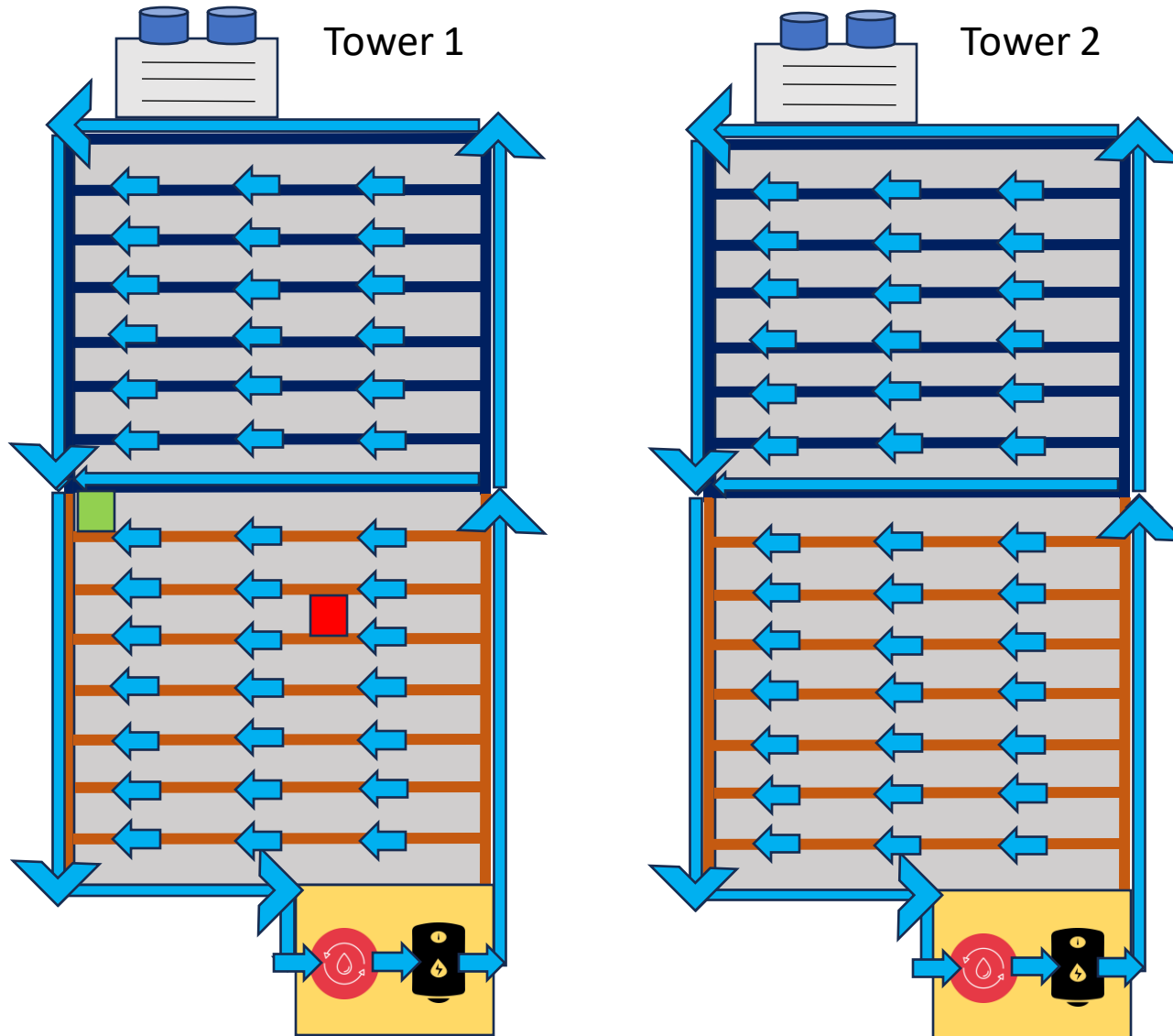


Post Remediation Sampling Schedule

- **3 biweekly** sampling (every 2 weeks)
 - Once samples are non-detect for *Legionella*, the facility moves to:
- **3 monthly** sampling (every month)
 - Once samples are non-detect for *Legionella*, the facility moves to:
- **3 quarterly** sampling (every three months)
 - Once samples are consistently non-detect for *Legionella*, the SNHD single case investigation of Legionellosis will be considered complete.

* If any sample comes back positive at any point during the post-remediation sampling schedule, the sampling schedule resets to the first biweekly schedule

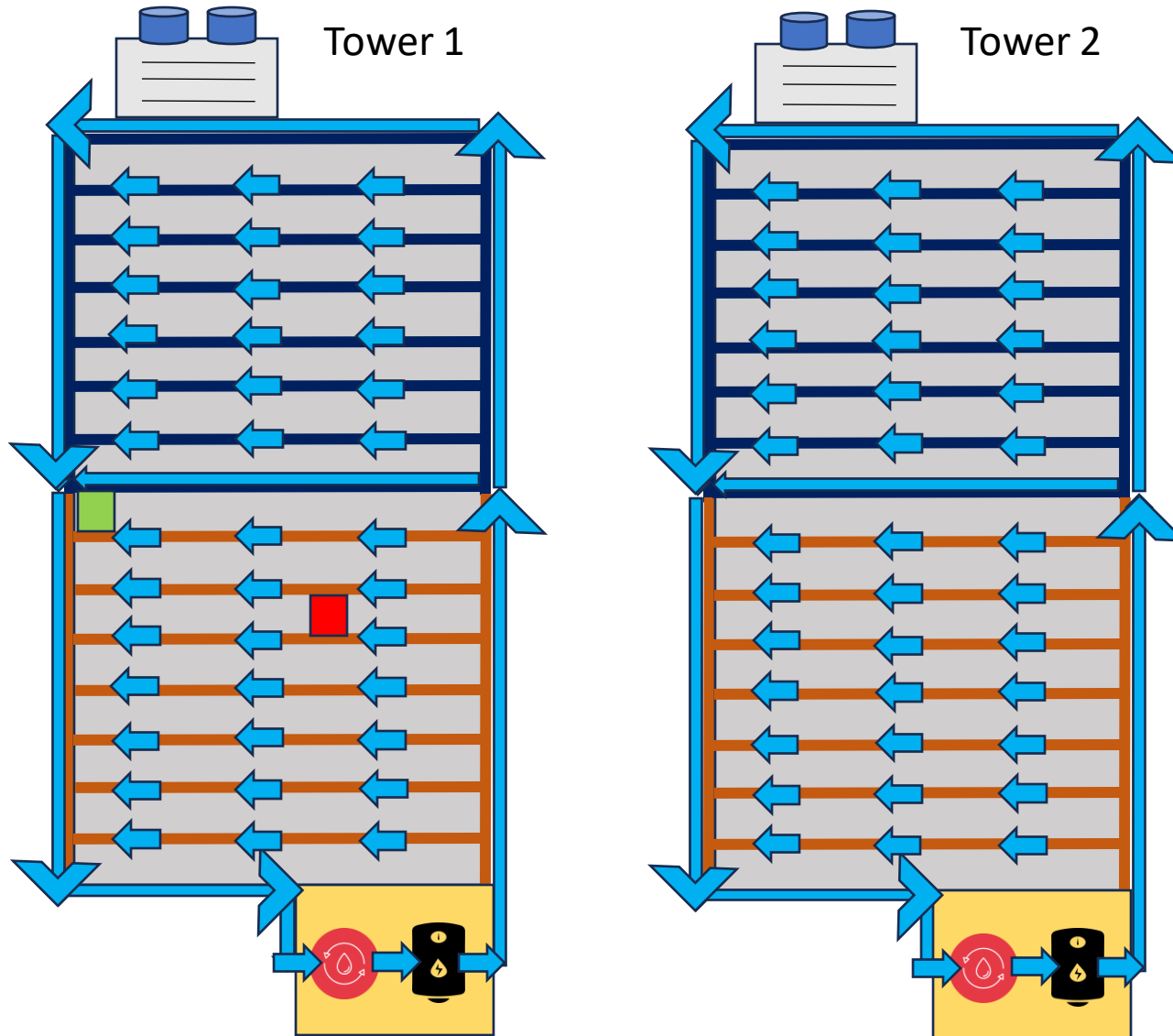
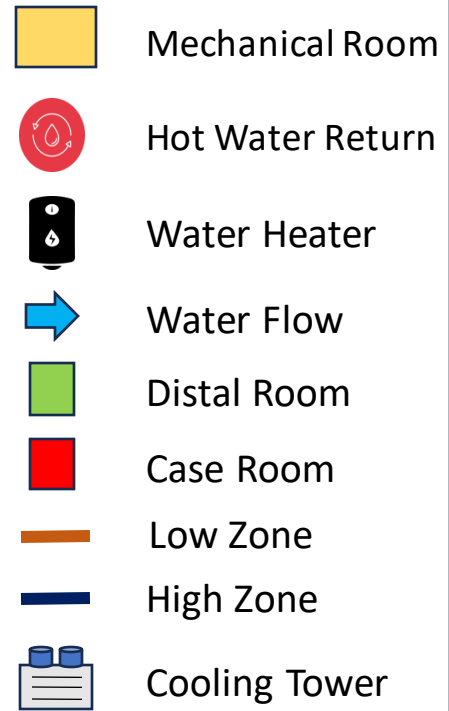
1st Biweekly Sampling



March 15, 2024

- Water samples are non-detect for *Legionella*
- 1% of rooms drop off

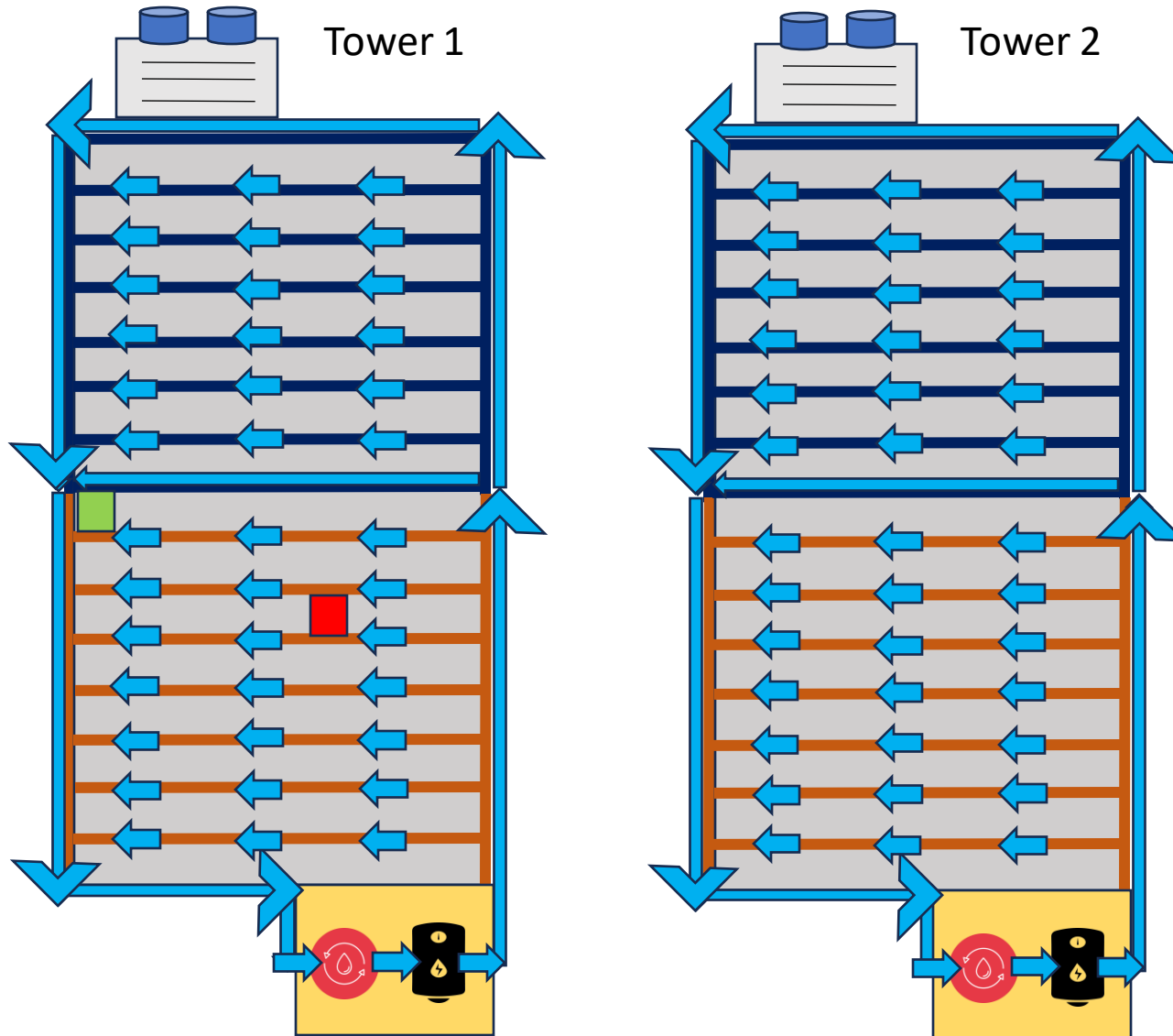
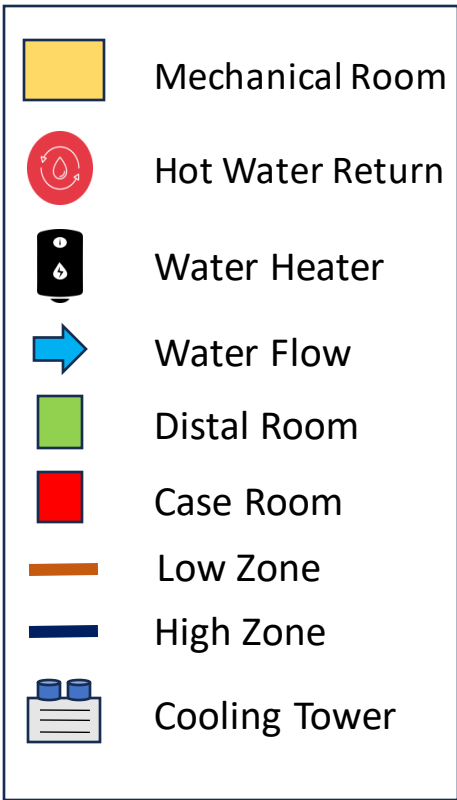
2nd Biweekly Sampling



March 29, 2024

- Water samples are non-detect for *Legionella*

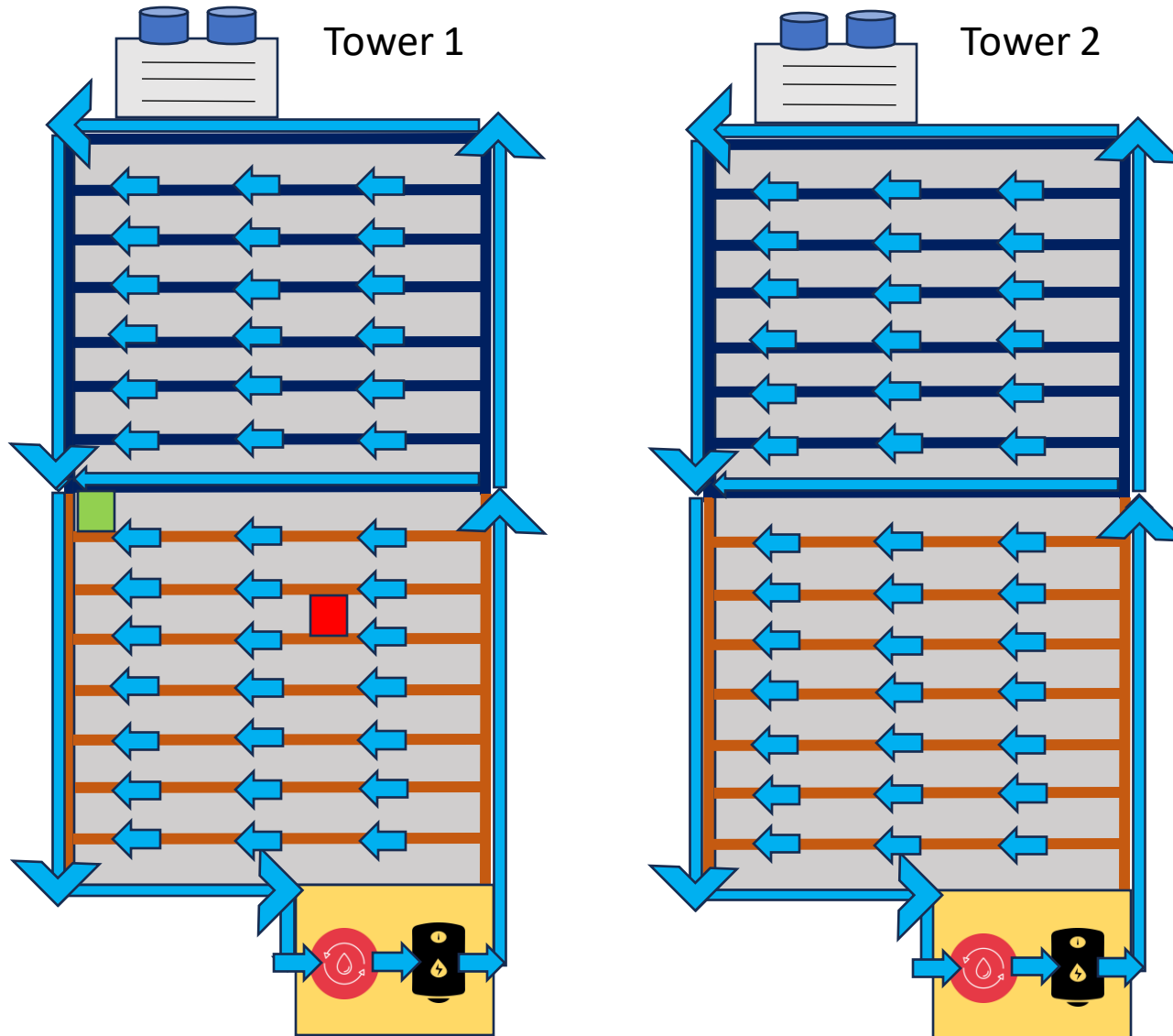
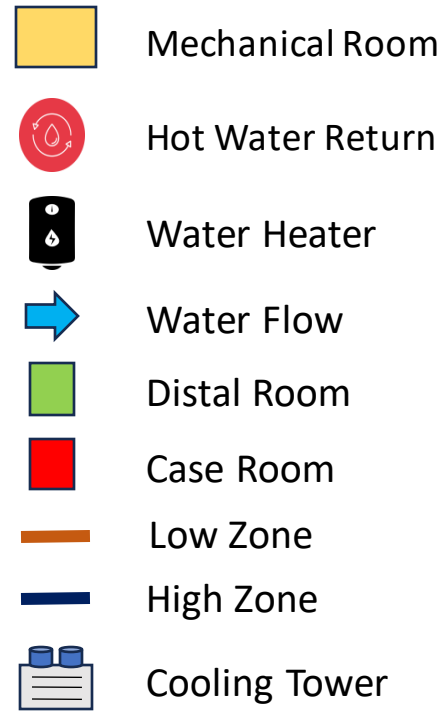
3rd Biweekly Sampling



April 15, 2024

- Water samples are non-detect for *Legionella*

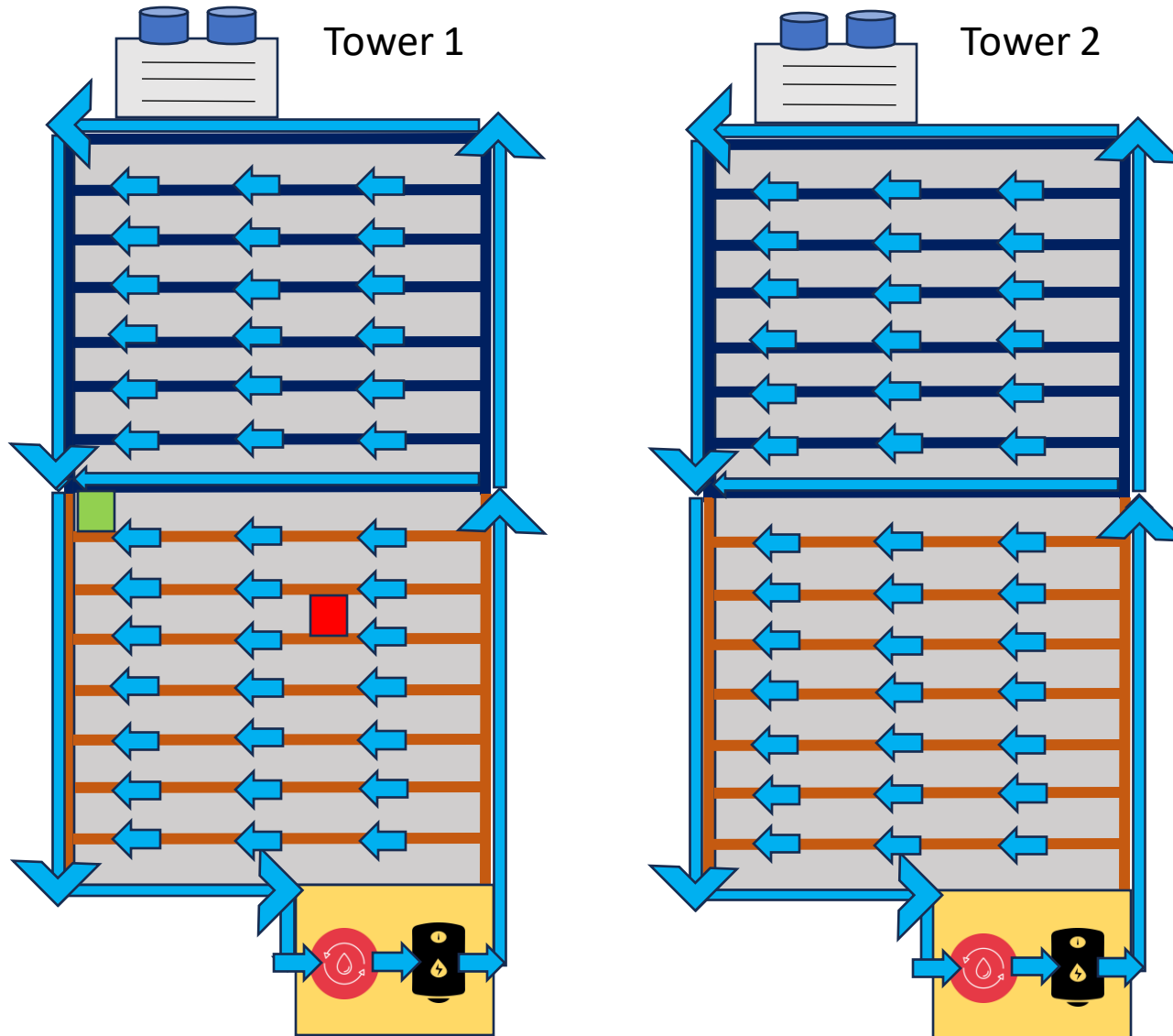
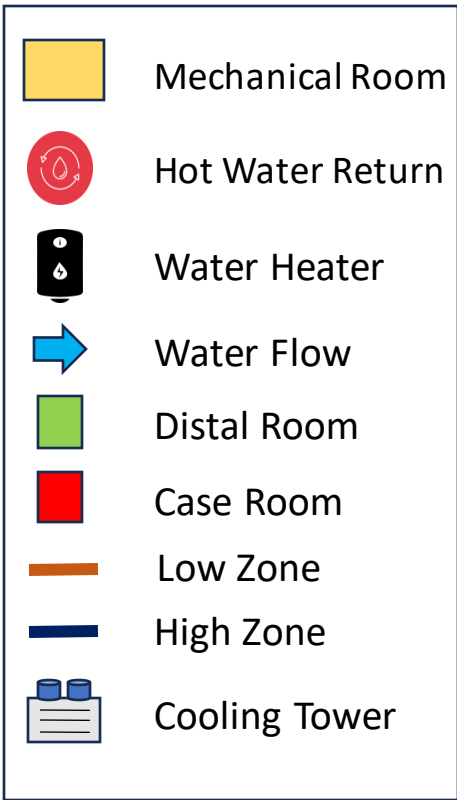
1st Monthly Sampling



May 15, 2024

- Water samples are non-detect for *Legionella*

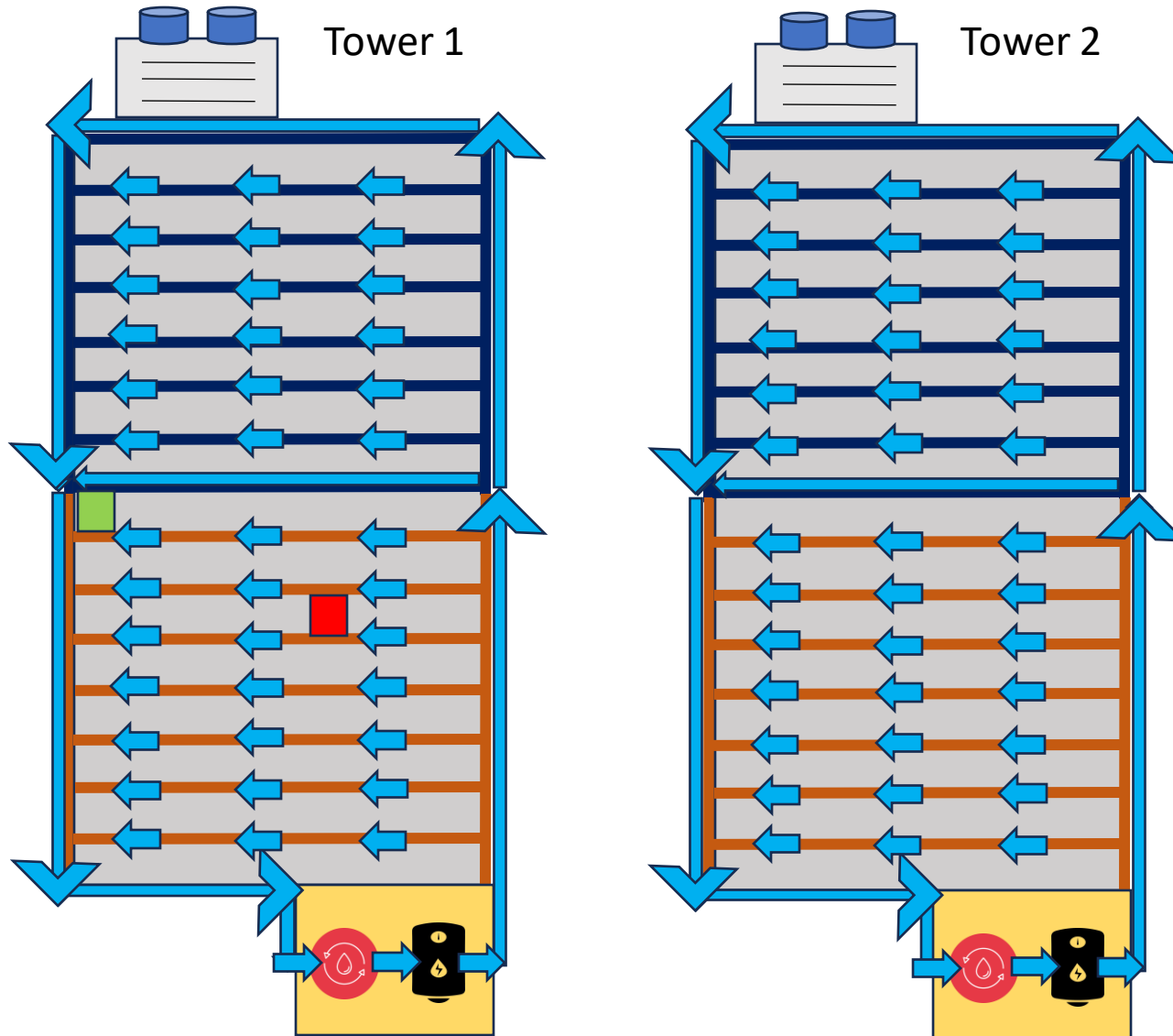
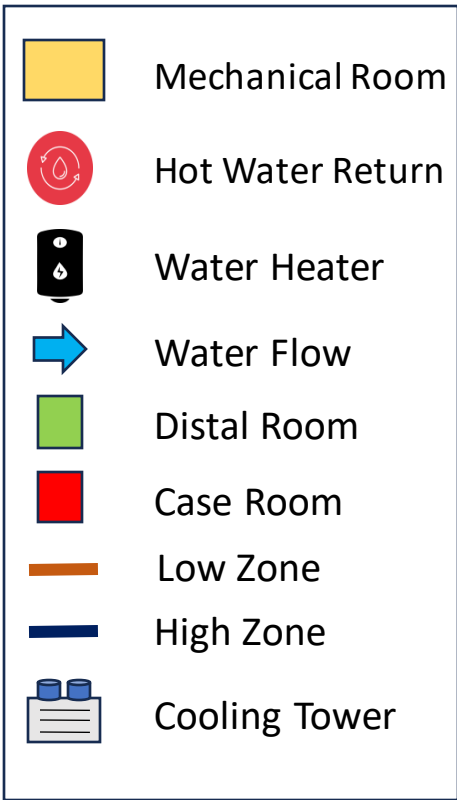
2nd Monthly Sampling



June 15, 2024

- Water samples are non-detect for *Legionella*

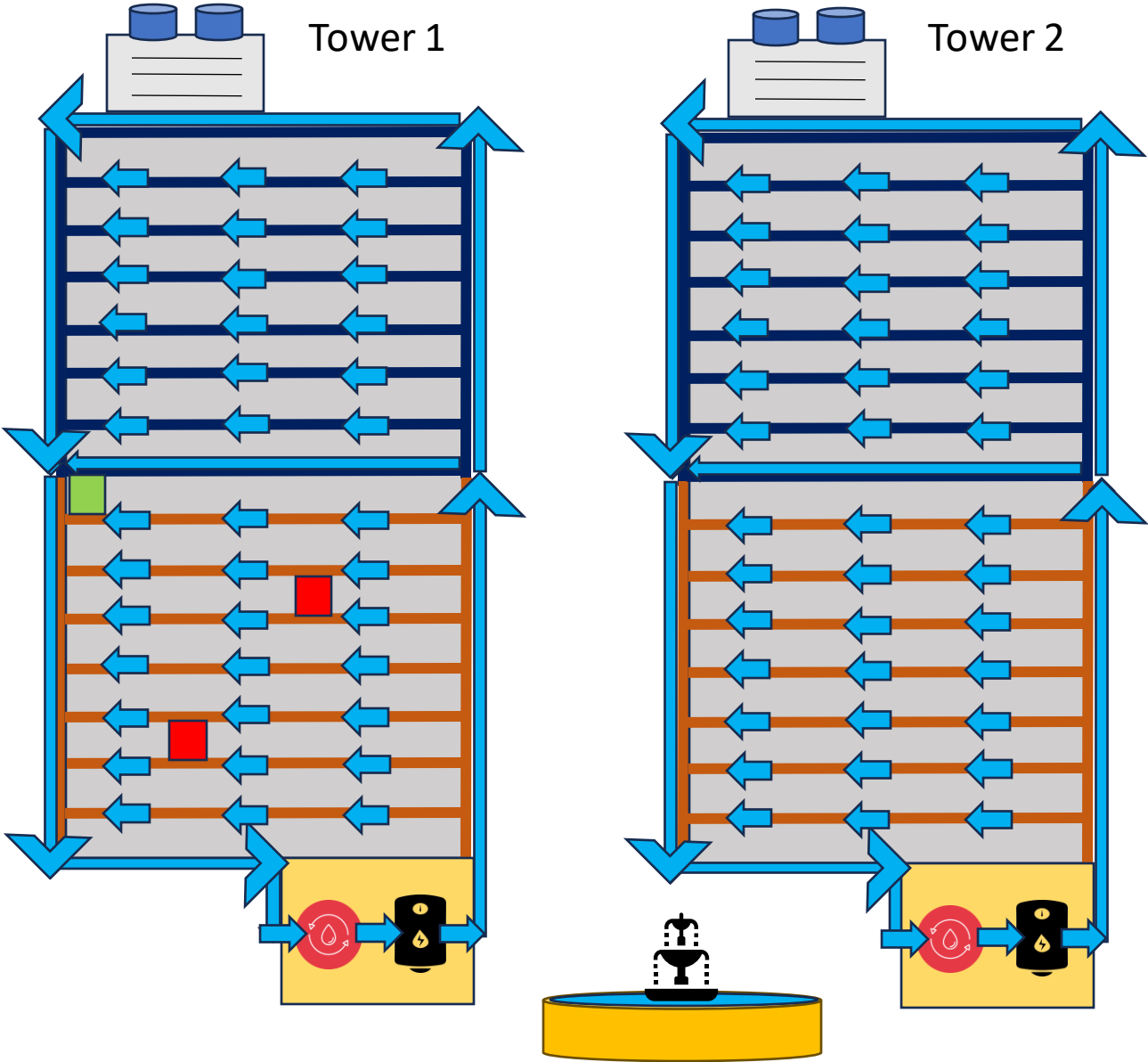
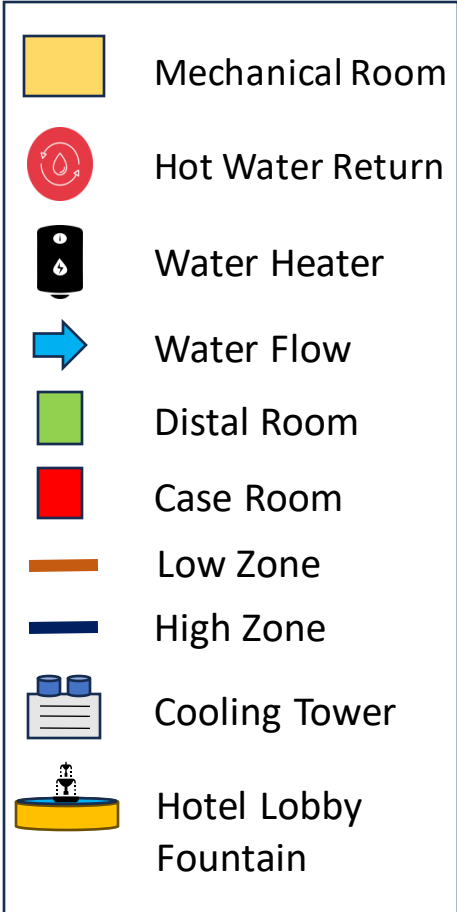
3rd Monthly Sampling



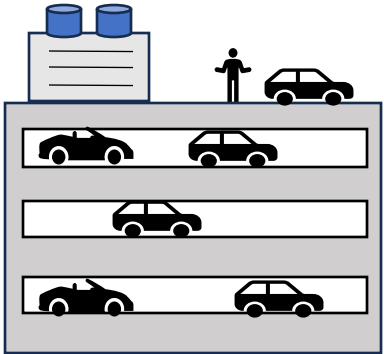
July 15, 2024

- Water samples are non-detect for *Legionella*

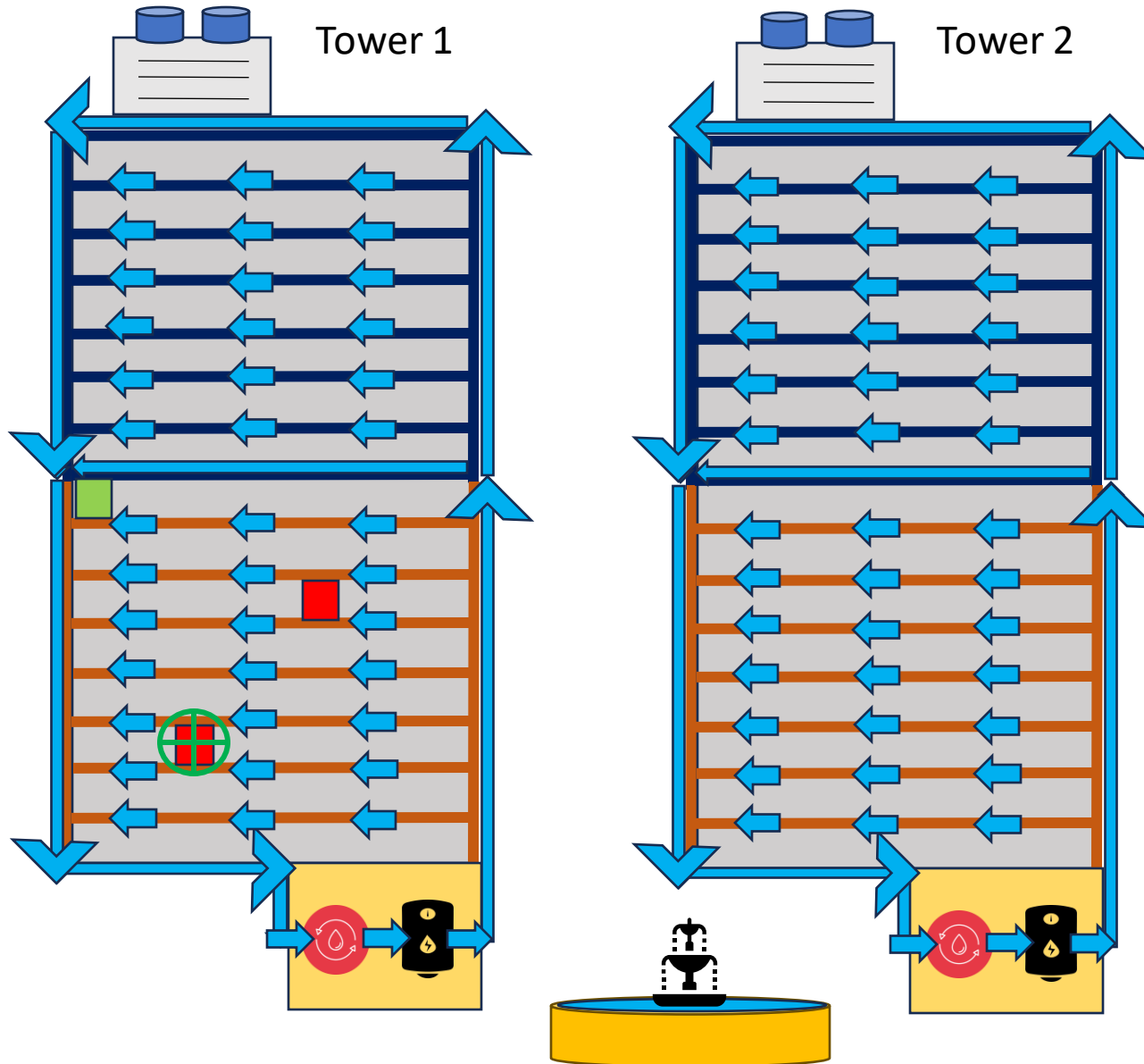
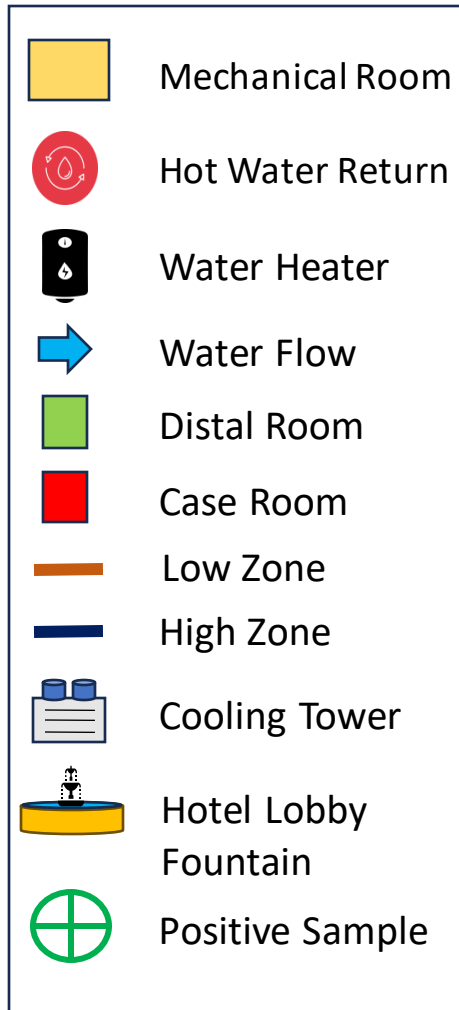
Outbreak Investigation – Site Visit



- October 1, 2024**
- Second confirmed case reported to SNHD
 - SNHD verifies patient stayed at the facility
 - Samples taken at Case Room, Distal Room, Hot Water Return, Hotel Lobby Fountain, and Cooling Tower

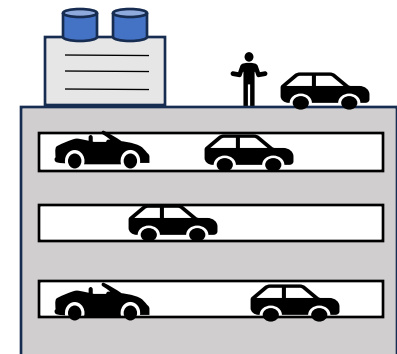


Water Samples Positive for *Legionella* Confirmed Outbreak



October 15, 2024

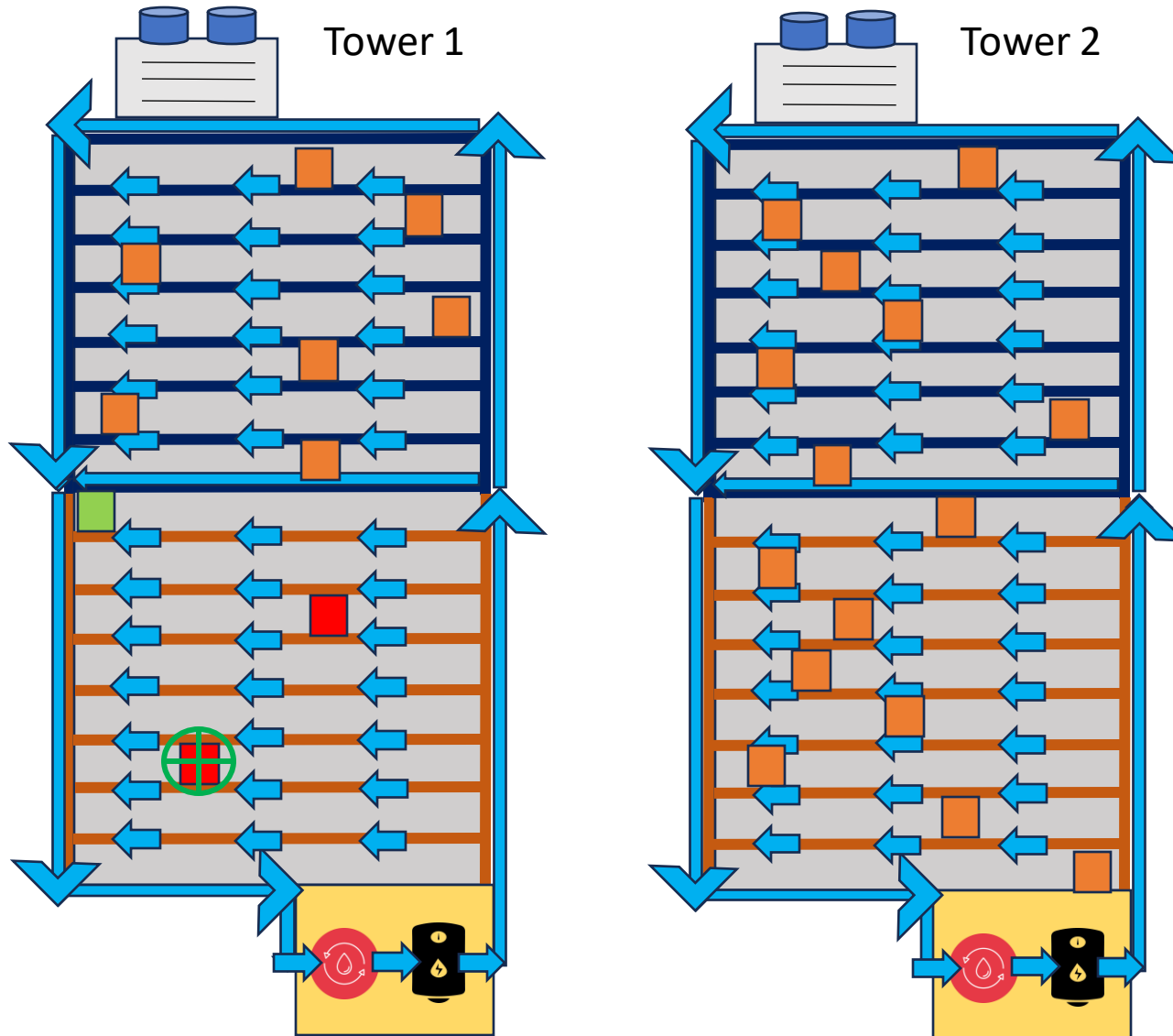
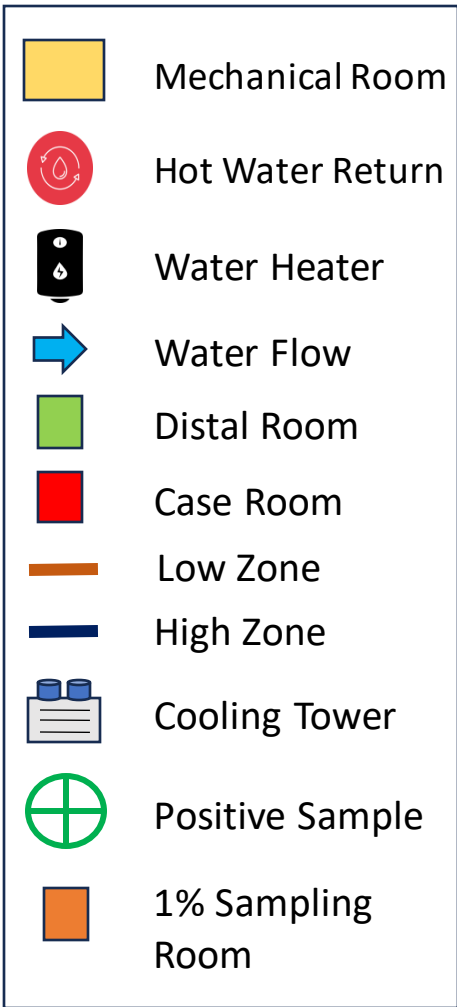
- Water samples are positive for *Legionella* in the case room of Tower 1 lower water zone
- Post remediation sampling resets



Confirmed Outbreak

- SNHD reviews investigation file in anticipation of media interviews
- Division of Surveillance and Control (DSC)
Office of Disease Surveillance (ODS)
Office of Acute Communicable Disease Control (ACDC) conducts Epidemiology outbreak response
- SNHD releases public notification of confirmed outbreak of Legionnaires' disease

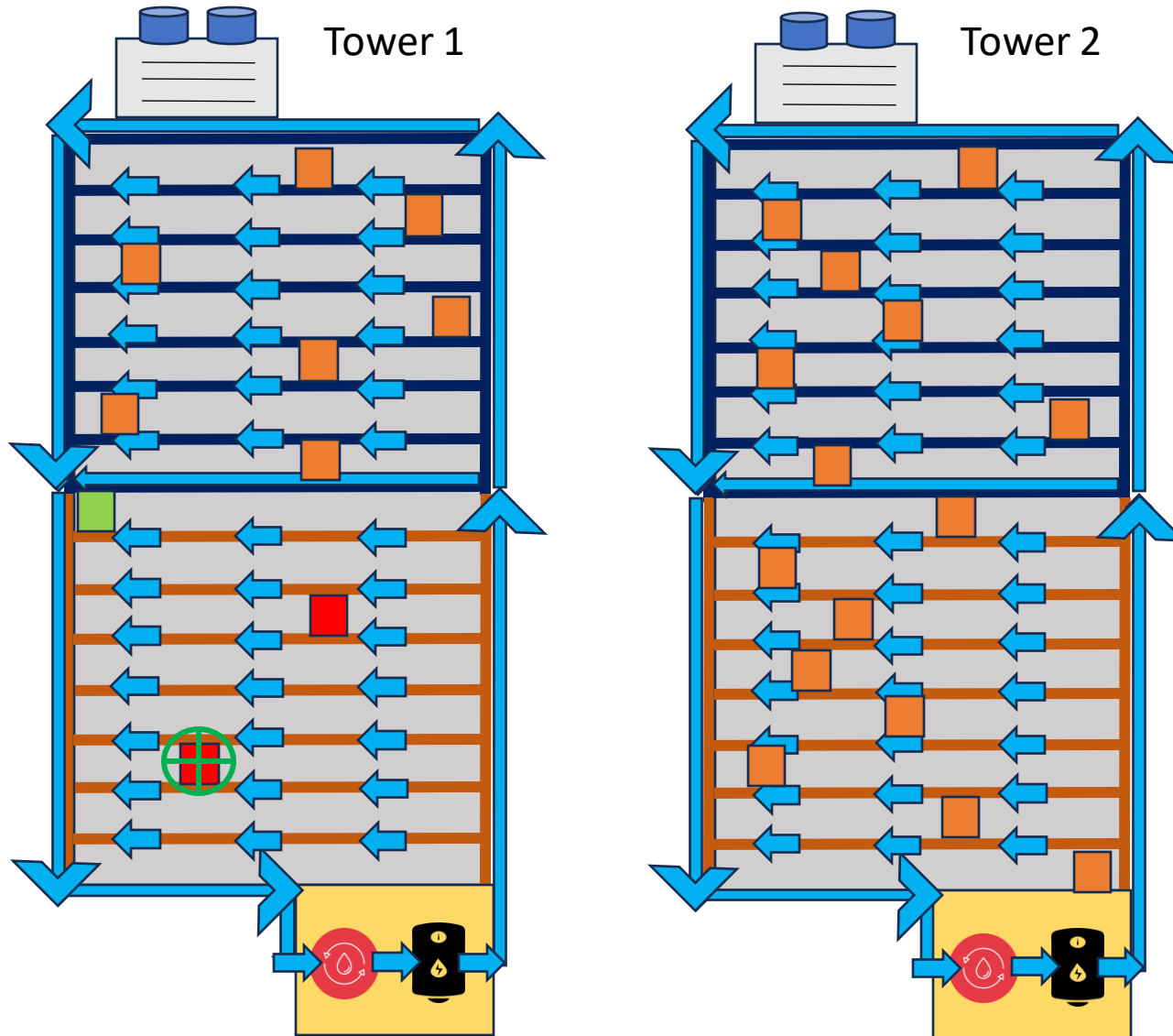
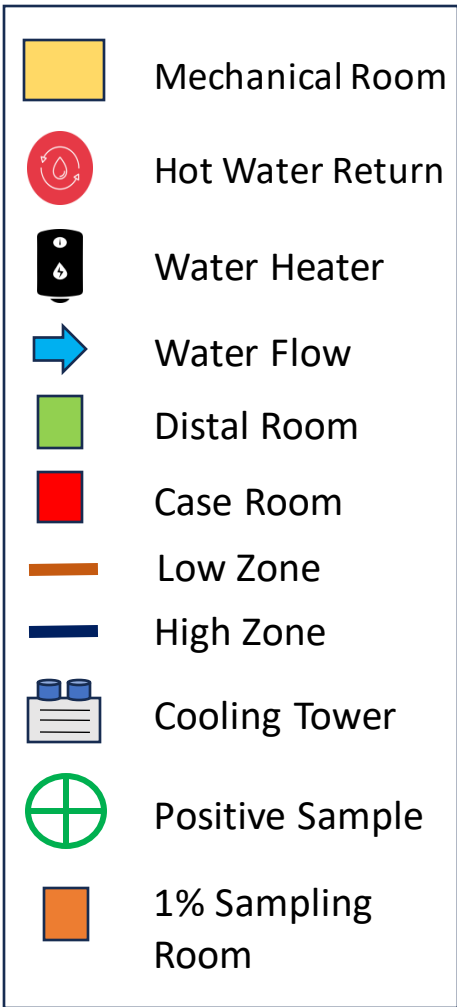
1% Sampling of Guest Rooms in Other Water Zones



November 1, 2024

- Facility takes samples from 40 random guest rooms

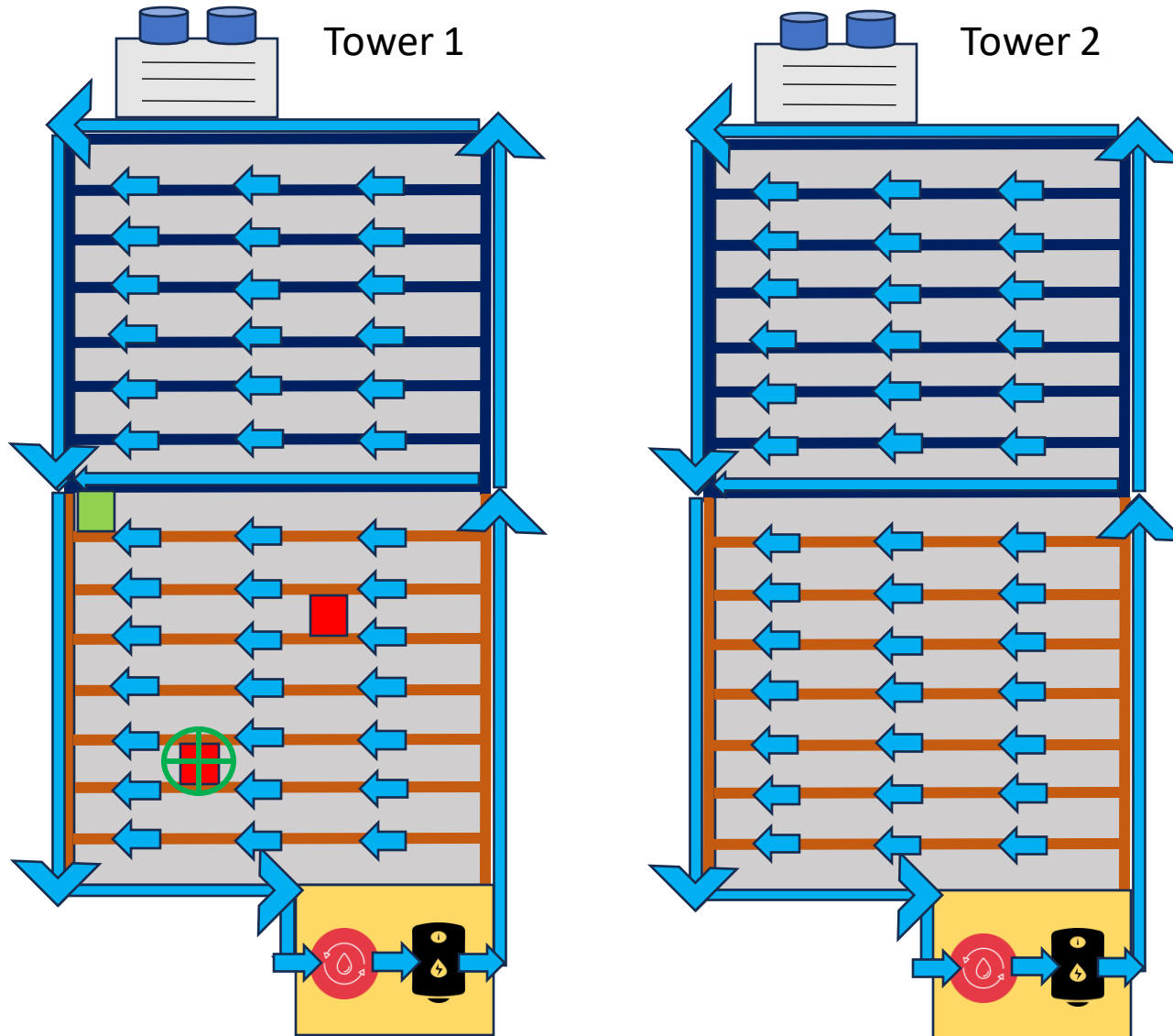
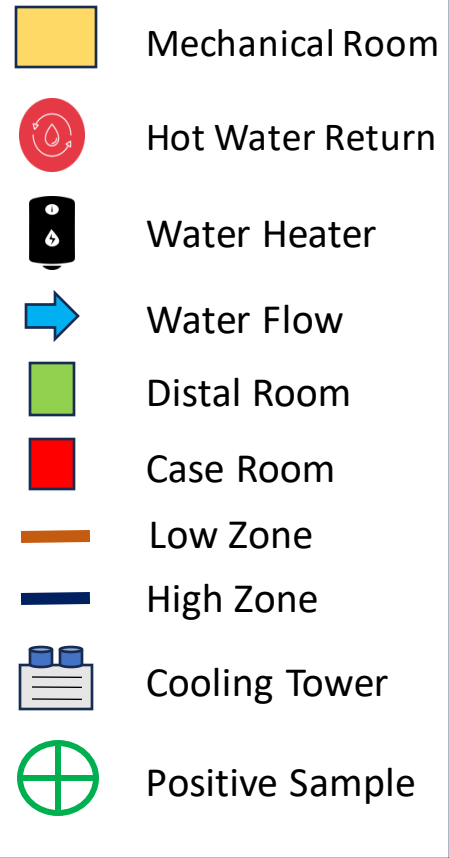
1% Sampling – water samples non-detect for *Legionella*



November 15, 2024

- Results from 1% sampling are non-detect for *Legionella*

Remediation



November 15, 2024

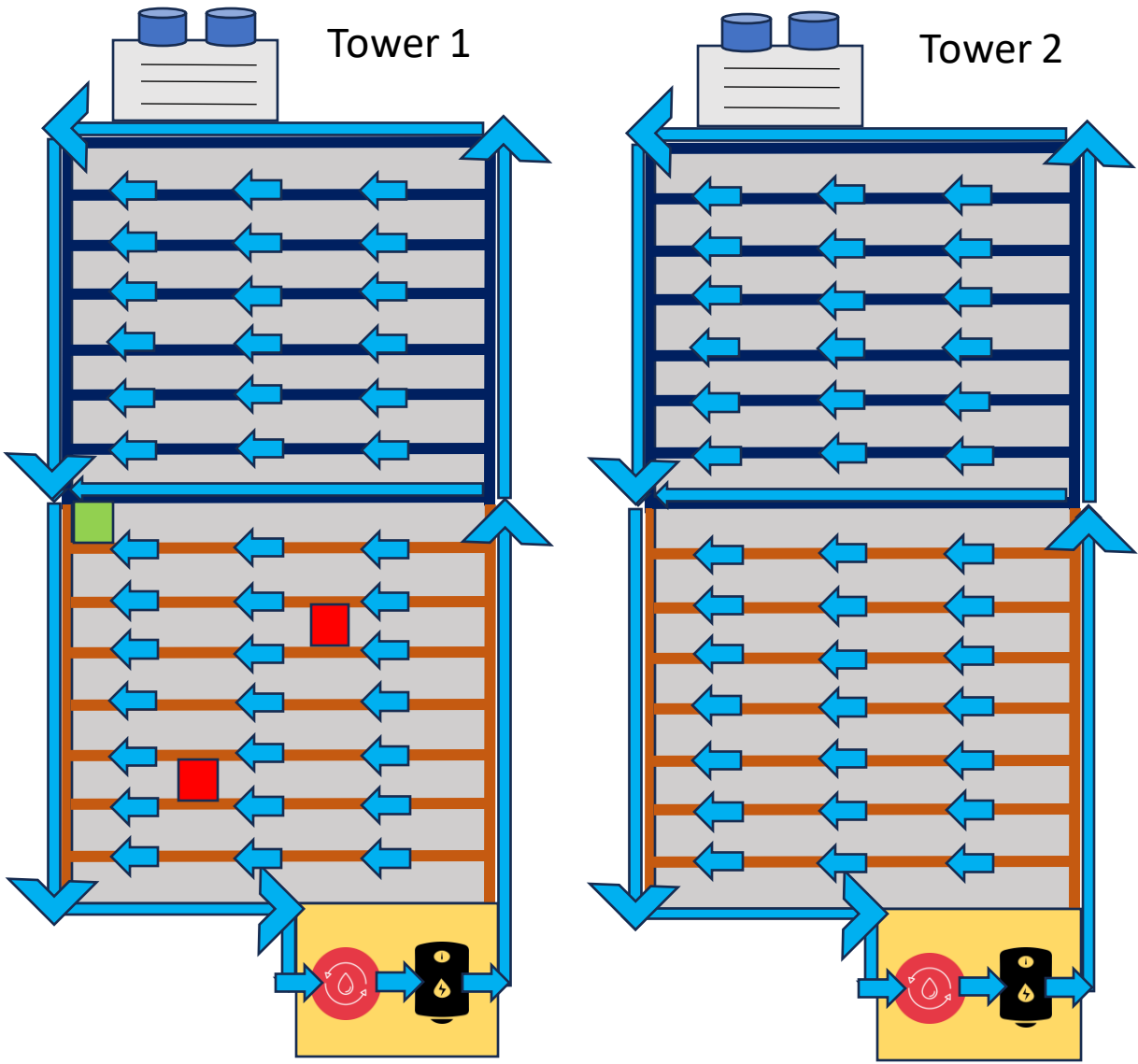
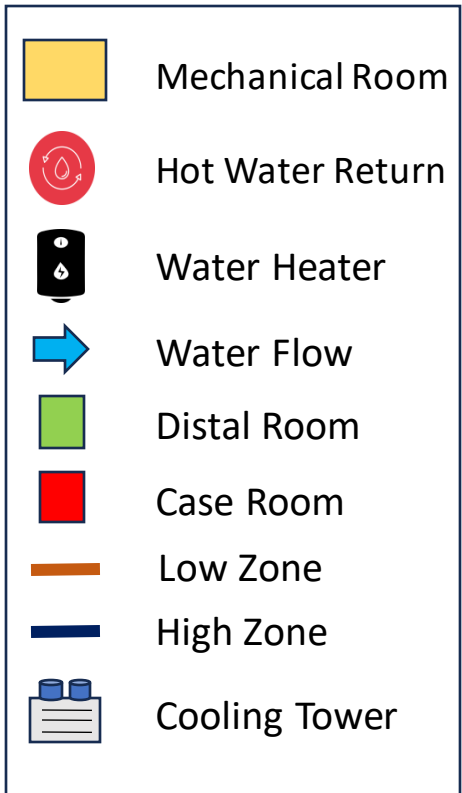
- Remediation of affected water zones – Tower 1 lower water zone

Post Remediation Sampling Schedule

- **3 biweekly** sampling (every 2 weeks)
 - Once samples are non-detect for *Legionella*, the facility moves to:
- **3 monthly** sampling (every month)
 - Once samples are non-detect for *Legionella*, the facility moves to:
- **3 quarterly** sampling (every three months)
 - Once samples are consistently non-detect for *Legionella*, the SNHD single case investigation of Legionellosis will be considered complete.

* If any sample comes back positive at any point during the post-remediation sampling schedule, the sampling schedule resets to the first biweekly schedule

Post Remediation Sampling Schedule



- All samples non-detect
- Investigation closed

SCHEDULE	DATE
1st biweekly sampling	November 15, 2024
2nd biweekly sampling	December 1, 2024
3rd biweekly sampling	December 15, 2024
1st monthly sampling	January 15, 2025
2nd monthly sampling	February 15, 2025
3rd monthly sampling	March 15, 2025
1st quarterly sampling	June 15, 2025
2nd quarterly sampling	September 15, 2025
3rd quarterly sampling	December 15, 2025

December 15, 2025

SNHD outbreak investigation of Legionnaires' disease concludes after 3rd quarterly sample results are non-detect.

Questions?

Contact Information

Robert Cole
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