

Water Safety During Healthcare Construction

Applying ICRA, WICRA, and Water Management Principles



Brianne McGuire

Director of Business Development
& *Nephros Water Institute* Program Lead

Presented by the

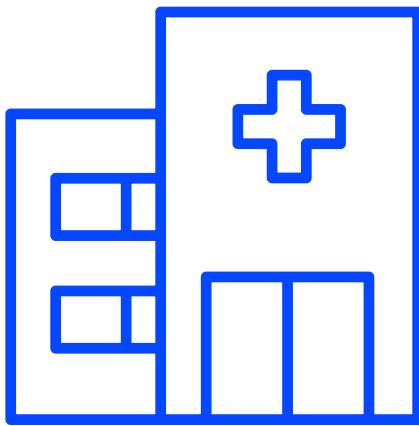


THE
NEPHROS
WATER
INSTITUTE

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

1

CONFIDENTIAL



Water Management Program

Maintaining safe building water
conditions before, during, and after
the project



ICRA / ICRA 2.0

Manage
environmental
risks created by
construction



WICRA

Focus on
water-related
impacts

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

2

2

Learning Objectives

Identify how construction, renovation, plumbing changes, and external infrastructure work can affect water safety

Understand how ICRA, ICRA 2.0, WICRA-type assessment, and WMPs support complementary parts of project-related risk management

Integrate project-based water risk assessment to the facility's broader water management program

Apply practical controls before, during, and after project activity that align with compliance expectations

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

3

3

Why This Conversation Matters Now More Than Ever

Healthcare construction remains a major, ongoing operating reality

U.S. health care construction spending was approximately \$74.5B seasonally adjusted annual rate in May 2026

Hospital infrastructure is aging > renovation and reinvestment more urgent

AHA reported that the average age of hospital plant, a measure of hospital infrastructure age, rose by more than 10% over two years

External water infrastructure work is also increasing

EPA estimates \$625B in drinking-water infrastructure needs over 20 years

Water main breaks and repairs remain a recurring disruption risk

AWWA reported approximately 260,000 water main breaks annually in the U.S. and Canada, with about \$2.6B in annual repair costs

Guidance has expanded beyond *Legionella* alone

Current guidance increasingly addresses other waterborne pathogens, physical hazards, chemical conditions, and control-related impacts

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

4

4

The Impact of Construction on Water

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

5

Construction Changes Building Water Conditions

Shutdowns / low use	➡	Stagnation, water age, residual loss
Tie-ins / valve work	➡	Pressure disruption, sediment or biofilm disturbance
New piping or fixtures	➡	New materials, new exposure points, commissioning needs
Phased occupancy	➡	Completed spaces may remain low-use
Equipment replacement	➡	New water-fed devices may require WMP review
Reopening after work	➡	Functional readiness may precede water safety readiness

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

6

6

Construction Can Affect Water Safety From **Inside** OR **Outside**

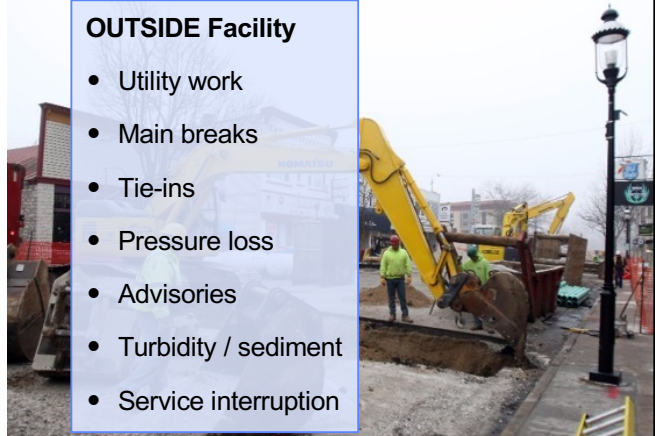
INSIDE Facility

- Shutdowns
- Tie-ins
- Dead legs
- Fixture replacement
- Low-use areas
- Phased occupancy
- Water-fed equipment
- Reopening



OUTSIDE Facility

- Utility work
- Main breaks
- Tie-ins
- Pressure loss
- Advisories
- Turbidity / sediment
- Service interruption

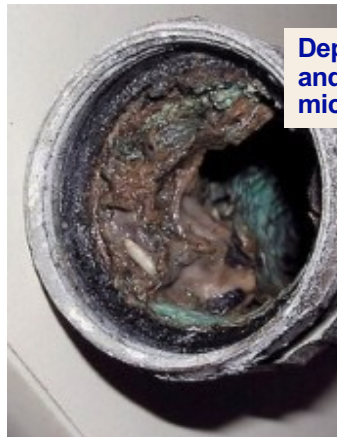


© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

7

7

Internal Conditions Impact Water Quality



Deposits, corrosion, scale, sediment, and biofilm can affect flow, residual, and microbial persistence



Image sources, left to right: <https://www.antaaplumbing.com/blog/biofilm-in-drains-slow-smelly-pipes/>; <https://edaphic.com.au/what-is-biofilm/>; Nephros photo, taken onsite at New Jersey hospital.

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

8

8

**Change and subsequent risk is
often invisible...
...and undetected until there's a problem**

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

9

Stagnation Is a Construction and Reopening Risk

- Shutdowns and low-use periods increase water age
- Phased occupancy can leave “completed” areas underused
- Dead legs and capped branches may persist after renovations
- Offline equipment and fixtures may not receive normal turnover
- **Return-to-service planning should define flushing, monitoring, and signoff**



© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

10

10

Operational readiness is not the same as water system readiness

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

11

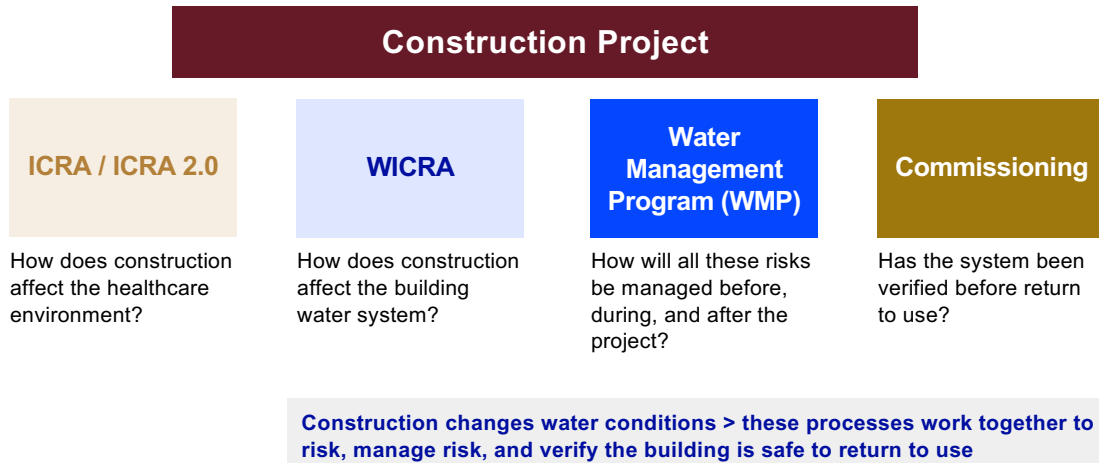
Managing Construction Water Risk Requires More Than One Process

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

12

CONFIDENTIAL

One Project, Multiple Connected Processes



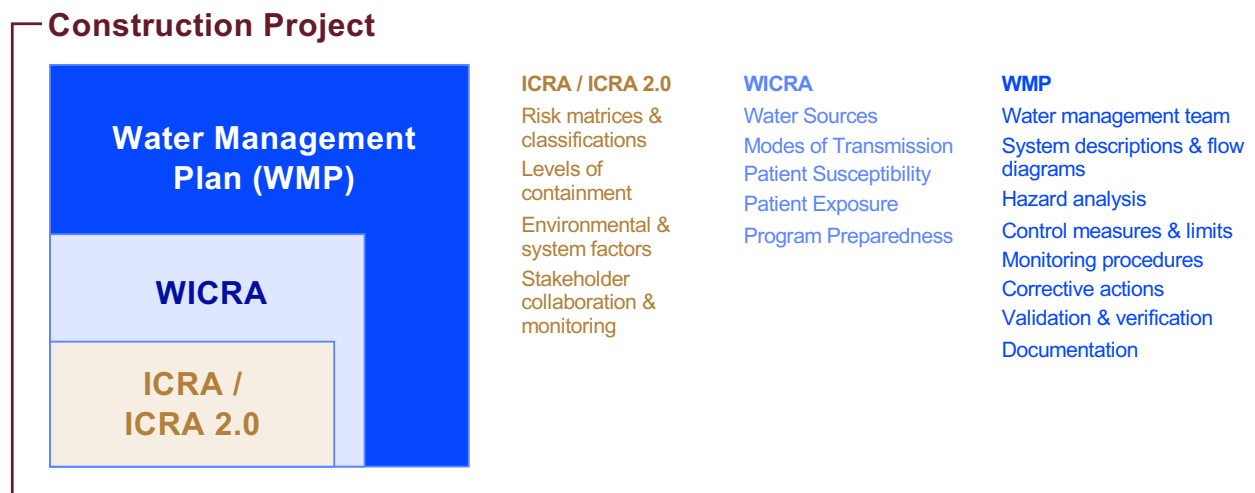
© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

13

13

CONFIDENTIAL

Major Elements of Oversight



© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

14

14

CONFIDENTIAL

ASHE Guidance (ICRA, ICRA 2.0, and WMC-ICRA)

ICRA Answers The First Question: What Construction Risks Does This Project Create?

If water systems are affected, those findings should trigger additional water risk evaluation

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

15

CONFIDENTIAL

CDC Guidance (WICRA)

WICRA Answers The Next Question: How Did The Project Change Water Risk?

WICRA helps establish WMP focus on construction & renovation > it does not replace the WMP

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

16

CONFIDENTIAL

ANSI/ASHRAE Guidance (188 & 514)

The WMP Carries Risk Management Forward

The WMP turns project findings into ongoing operational controls before, during, and after construction

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

17

CONFIDENTIAL

The common thread is a repeatable process:

Know the system, identify risk, define controls, monitor, correct, document, and review when conditions change

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

18

CONFIDENTIAL

CMS and JC Requirements

Maintain Required Water Management And Infection Prevention Processes

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

19

CONFIDENTIAL

Required Compliance

Maintain Required Water Management And Infection Prevention Processes

CMS requirements

- The infection prevention and control program must include surveillance, prevention, and control of HAIs, **this monitoring includes maintenance, repair, renovation, and construction activities**

Joint Commission requirements

- EP 2: **Joint Commission cites CDC's WICRA tool as an example for conducting a water-related risk assessment, not as the mandatory named format.**
- EP 4: **requires review of the water management program annually and when changes occur,** including when changes have been made to the water system that add risk, when new equipment or at-risk water systems are added that could generate aerosols or be a *Legionella* source, and when commissioning a new wing or building

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

20

20

CONFIDENTIAL

Compliance Expectations for Surveys

Survey Expectation	What The Facility Must Be Able To Show
Construction is included in infection prevention oversight	The infection prevention program monitors maintenance, repair, renovation, and construction activities that could affect the sanitary environment.
Water risk is assessed when the project can affect building water systems	The facility identifies where Legionella and other opportunistic waterborne pathogens could grow or spread because of the project.
The WMP is reviewed when water-system changes add risk	The water management team reviews changes to plumbing, water systems, aerosol-generating equipment, stagnant areas, new wings, or commissioned/recommissioned spaces.
Patient risk is considered	The assessment accounts for immunocompromised or high-risk patient populations and the type of water exposure.
Controls are defined and implemented	The facility documents project-specific controls such as flushing, monitoring, fixture restrictions, temporary controls, POU filtration, sampling when required or indicated, and return-to-service steps.
Monitoring and corrective actions are documented	The facility keeps records of monitoring results, out-of-range findings, corrective actions, and follow-up.

A surveyor is looking for evidence of a closed-loop process:

- **Assess Risk >**
- **Define Controls >**
- **Implement Controls >**
- **Monitor >**
- **Document >**
- **Correct >**
- **Review WMP If Conditions Change**

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

21

21

Eliminating Confusion

MISCONCEPTION

Construction closeout means the water is ready

ICRA address all construction risk

The WMP covers steady-state operation, so no project review is needed

Flushing alone solves project-related risk

If a fixture works, it is safe to use

REALITY

Functional completion does not confirm water safety readiness

Water impacts need to be explicitly assessed

Construction can change the system and trigger review

Controls should match the risk condition and be verified

Use-site risk depends on water conditions, exposure, and population

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

22

22

CONFIDENTIAL

Execution & Recommendations

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

23

Risk-Based Outlet Prioritization

**Factors ordered
by risk weight:**



- Population served
- Aerosol-generating use
- Consequence of failure
- Low use or intermittent use
- History of positive results, disruptions or complaints
- Temperature/residual instability
- Operational criticality

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

24

24

Practical Controls Before, During, and After Work

Phase	Practical Controls
Before Work	Map affected systems, identify high-risk users, define shutdown plan, assign flushing / monitoring / signoff ownership
During Work	Manage outages, protect open piping, restrict use where needed, maintain communication, document deviations
Before Reopening	Flush, inspect, clean fixtures, verify parameters, sample if required or indicated, document readiness
After Reopening	Monitor complaints or abnormal conditions, close corrective actions, update WMP, review lessons learned

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

25

25

CONFIDENTIAL

“More Control” to “Smarter Control”

Shift from:

- Flush more
- Disinfect more
- Sample more



To:

- Where is the risk highest?
- Where is exposure most likely?
- Which outlets serve vulnerable users?
- Which locations are low-use or difficult to maintain?
- Which control measures are sustainable with available staff?
- Which controls reduce both risk and maintenance burden?

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

26

26

What Are the Right Controls

Strategy	Best Used When...	Limitation
Flushing	Water age, low use, or dead legs are the concern	Labor-intensive; temporary; must be verified by control parameters
Temperature Management	Hot or cold water is drifting into growth-supportive ranges	Energy, scalding, system design, and consistency constraints
Cleaning / Maintenance	Sediment, scale, aerators, showerheads, hoses, tanks, or device components create protected surfaces	Requires recurring access, scheduling, and documentation
Chemical Disinfection	Broader system conditions require residual support or corrective action	Distribution limits, chemistry constraints, permitting, repeat application, disinfectant-resistant organisms
Testing & Monitoring	The program needs baseline data, validation, or response confirmation	Identifies conditions; does not prevent exposure by itself
System Modification	Dead legs, oversized piping, or design issues are the root cause	Capital-intensive; may require shutdowns or project coordination
POU Filtration	Exposure risk is concentrated at selected outlets or water-fed equipment and added point-of-use control is appropriate based on the WMP, risk assessment, or temporary corrective action plan	Targeted vs. system-wide control; replacement and inventory requirements

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

27

27

CONFIDENTIAL

Where POU Microbiological Filtration Fits

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

28

CONFIDENTIAL

Most Construction Controls Change Water Conditions

- **Flushing** removes stagnant water
- **Disinfection** reduces microbial burden
- **Temperature management** discourages growth
- **Cleaning** removes deposits and biofilm

Construction changes the system first > controls change it again > verification confirms whether conditions are ready for use

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

29

29

CONFIDENTIAL

System-level controls may not serve every use site equally following construction

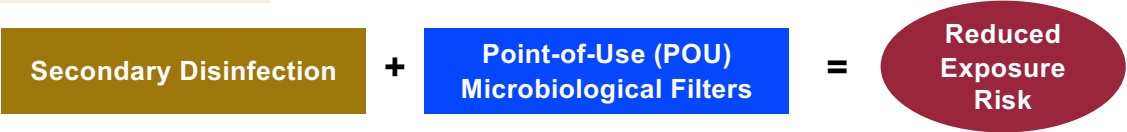
© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

30

Some Risks Require Layered Controls

Effective programs **combine system-level controls** with **targeted controls** at high-priority locations

SAMPLE PAIRING



© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

31

31

CONFIDENTIAL

POU Filtration Is Not All the Same

	CHEMICAL / PHYSICAL	MICROBIOLOGICAL
MECHANISM OF CONTROL	Binding or stripping of dissolved materials	Physical retention
EXAMPLES OF TARGETED CONTAMINANTS	Chlorine, Taste, Odor Scale Chloramines Sediment / Particulate Soluble Lead PFAS	[MICROFILTRATION] Bacteria [ULTRAFILTRATION] Bacteria Viruses Endotoxins*

*Nephros ultrafiltration retains endotoxins via size exclusion (consistent performance regardless of chemistry) but most endotoxin filters on the market rely on charged membranes as method of control.

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

32

32

Where POU Microbiological Filtration Can Be of Use

Project Condition	POU Filtration May Add Value When...
Shutdown / low-use period	Water access must resume before confidence is fully restored at selected outlets
Plumbing tie-in or pressure disruption	Affected use sites need temporary exposure reduction during monitoring or corrective action
New or reopened patient care area	Vulnerable users are present and return-to-service controls need added redundancy
System-level control gap	Residual, temperature, or other controls are not reaching selected distal points as intended
Ongoing remediation	Water use must continue while root-cause correction proceeds
High-risk fixture or equipment	The exposure pathway is direct, aerosol-generating, patient-facing, or operationally critical

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

33

33

CONFIDENTIAL

Microbiological Filtration Works By Physical Retention

Other Controls

Depend on maintaining conditions
Performance varies with operating conditions
Influenced by chemistry
Influenced by microbial resistance
Requires maintaining system conditions

Size Exclusion

Depends on membrane pore size

Physical barrier

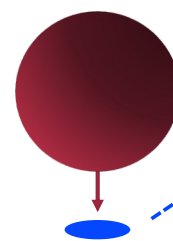
Not dependent on chemistry

Not dependent on antimicrobial resistance

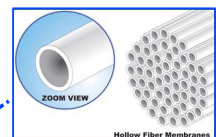
Functions at the point of exposure

If a microorganism is larger than the membrane pore, it cannot physically pass through the membrane

The smallest known bacteria size is **0.2 micron**



Zoom view of hollow fiber membranes



The Nephros **microfiltration** pore size is **0.1 micron**

The Nephros **ultrafiltration** pore size is **0.005 micron**

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

34

34

CONFIDENTIAL

POU Microbiological Filter Application Examples

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

35

CONFIDENTIAL

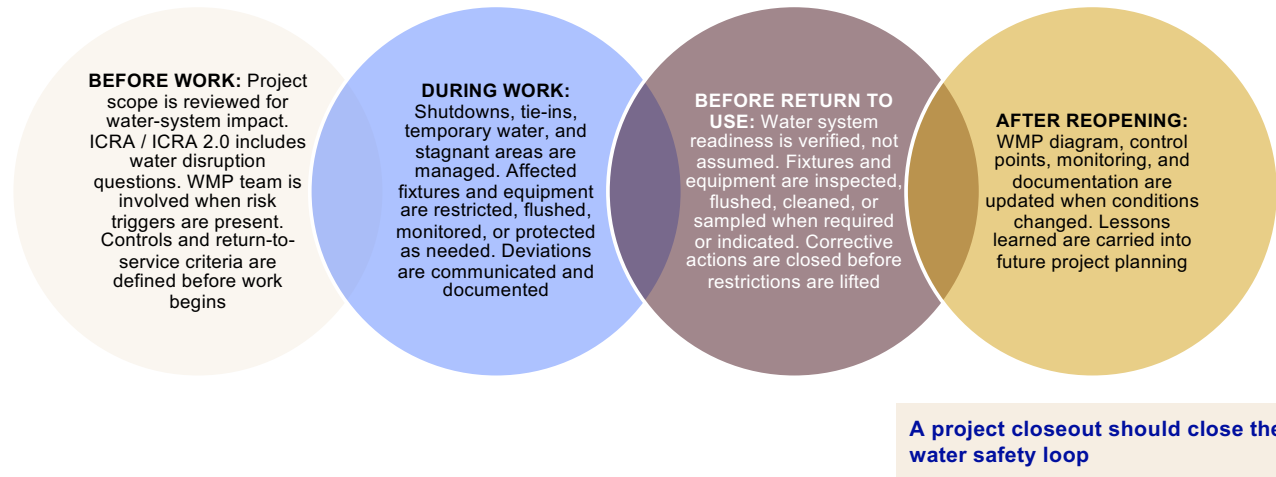
Summary

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

36

CONFIDENTIAL

What Good Looks Like



© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

37

37

CONFIDENTIAL

Takeaways

- **Risk:** Construction changes building water conditions, inside and outside the facility
- **Processes:** ICRA, WICRA, WMPs, commissioning, and compliance expectations work best when connected
- **Controls:** Controls should match the risk condition, exposure pathway, population, and operational need
- **POU Filtration:** Point-of-use microbiological filtration provides a physical exposure barrier where risk is concentrated at selected outlets or water-fed equipment
- **Practice:** The strongest approach is to assess project-related water risk before work begins, verify readiness before return to use, and close the loop after reopening

**Close of construction is not the end of the project >
the water system must be ready for the people and processes it serves**

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

38

38

CONFIDENTIAL

Q&A

© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

39

CONFIDENTIAL

Brianne McGuire
Director of Business Development
Nephros, Inc.
M: (609) 930-8227
brianne.mcguire@nephros.com

THE
NEPHROS
WATER
INSTITUTE

THE
NEPHROS
WATER
INSTITUTE

Thank you

THE
NEPHROS
WATER
INSTITUTE

NEPHROS

linkedin.com/in/thebrianne



© 2026 The Nephros Water Institute, an initiative of Nephros, Inc. Educational material intended for professional use. Redistribution requires permission.

40

20