Water Quality Variances in Multiple Locations of a Home

Andrew J. Whelton, Ph.D.

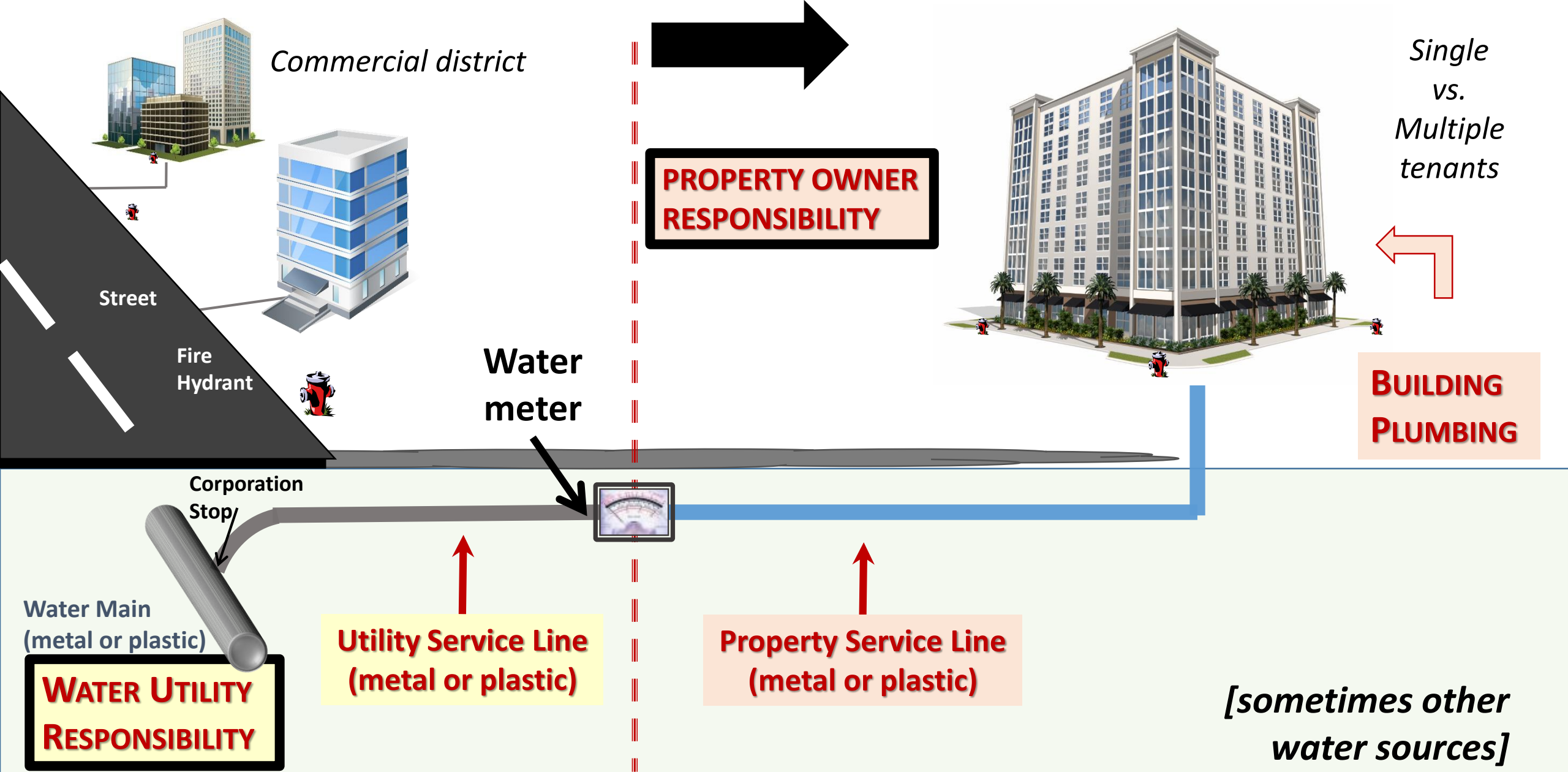**(765) 494-2160**

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The study:

An investigation of spatial and temporal drinking water quality variation in green residential plumbing, 2019
Building and Environment

1. Water quality entering the building varied seasonally.
2. **For 10.3% time, water entering the building did not contain a detectable chlorine disinfectant residual.**
3. Inside the building, stagnation time varied seasonally and across fixtures. Water at the kitchen sink in the Summer had different characteristics than water in the Winter.
4. Water pH also consistently and significantly increased in the plumbing from 7.5 to 9.4, and TTHM levels increased up to 89%.
5. Great carbon variability was found inside the building for cold (0.4-61.0 mg/L) and hot water (0.5-4.7 mg/L).

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THE UNIVERSITY OF MEMPHIS

Buildings on municipal water supply

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Commercial district

Single vs. Multiple tenants

PROPERTY OWNER RESPONSIBILITY

Street

Fire Hydrant

BUILDING **P**LUMBING

Water meter

Corporation Stop

Water Main (metal or plastic)

WATER **U**TILITY **R**ESPONSIBILITY

Utility Service Line (metal or plastic)

Property Service Line (metal or plastic)

[sometimes other water sources]

The home where water was tested

The Most Monitored Home in America

West Lafayette, Indiana
Less than 100 yards from Purdue
3 Bedroom, 1.5 baths
Water saving fixtures
Trunk-and-Branch design
PEX piping
Renovated in 2014

Thermocouples throughout piping, 1x /sec
Indoor air temperature, 1x /sec
Flowrates at every fixture, 1x /sec
Energy use per device, 1x /sec

www.ReNEWWHouse.com

October 2017-October 2018

30,000+ individual water quality measurements completed - does not include flow monitoring, pressure monitoring, or qPCR

2.64 billion online plumbing related measurements

This will be the integrative water quality-hydraulic model for a single-family home

2014, building plumbing renovated with new PEX, trunk and branch design; low flow fixtures

Drinking water source:
Public water system: Groundwater, treated with free chlorine residual and a corrosion inhibitor, PVC and Iron water mains

October 2017-November 2018
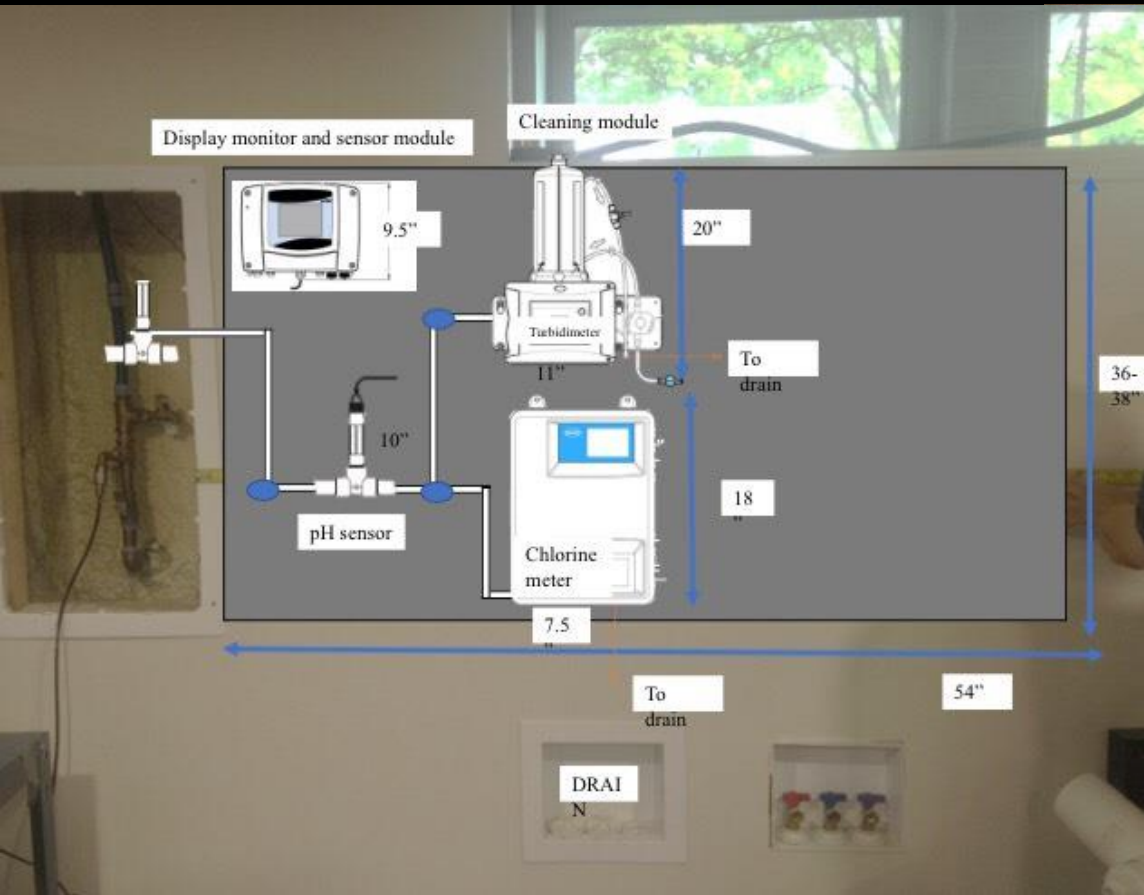
25+ people worked on this

Continuous monitoring of water flow, air and water temperature at service line and all plumbing components
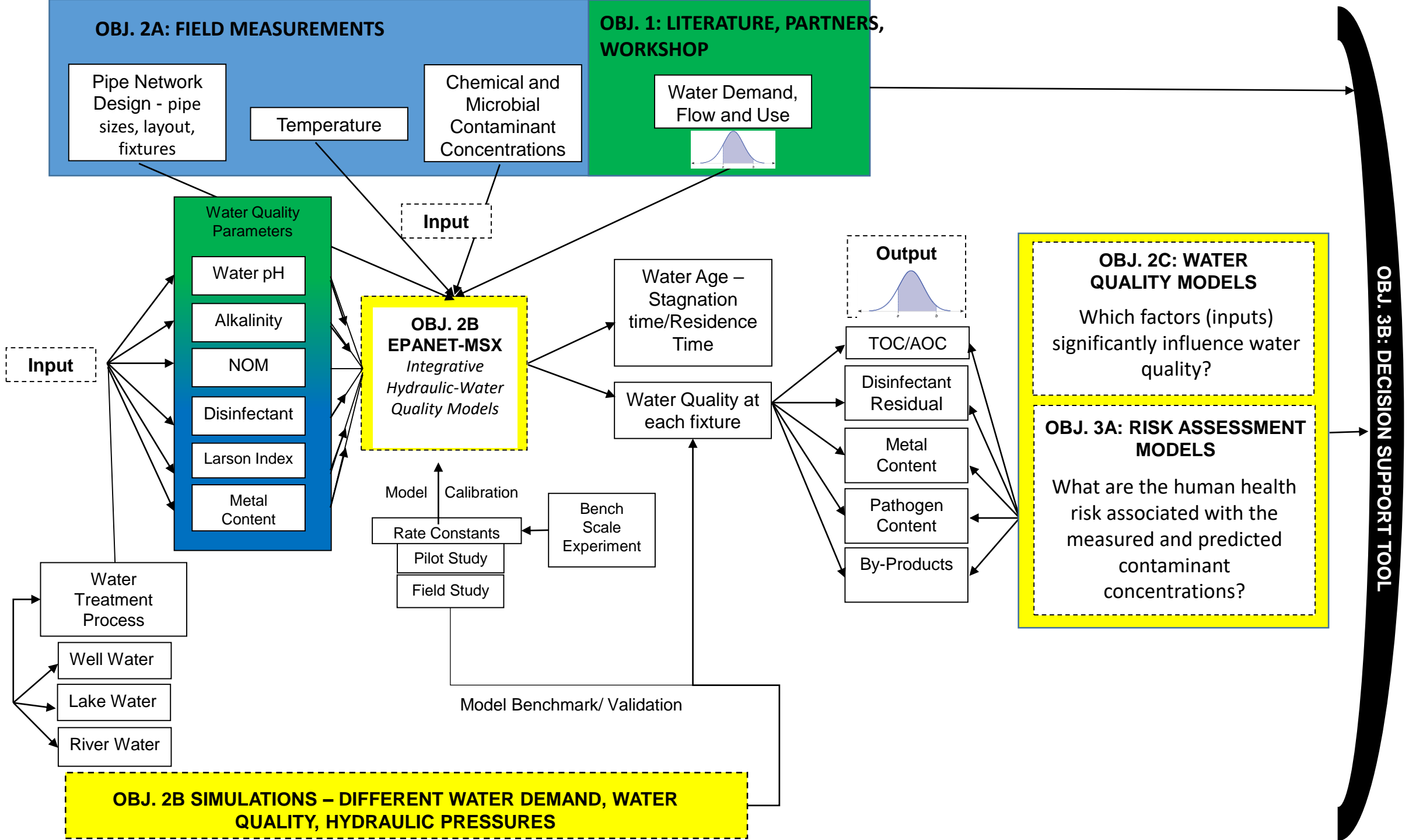**= 2.64 billion data points**

Pressure monitoring continuous during water sampling, 2-3 week periods

More than 222,223 labor hours for water sampling and analysis (**does not include data interpretation, reporting and other activities**)

58 sampling events, 5 locations, hot and cold water, 7am, 12pm, 3pm

Display monitor and sensor module

Cleaning module

9.5"

20"

Turbidimeter

11"

To drain

pH sensor

10"

Chlorine meter

18"

36-38"

7.5"

To drain

54"

DRAIN

Where are we headed?

Study Authors

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