



Emerging Water Quality Issues

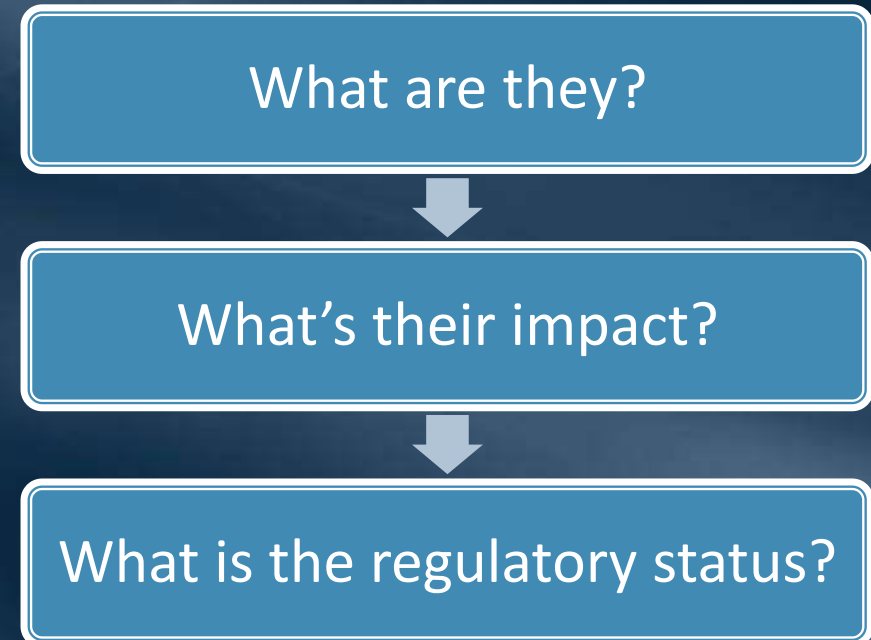
Engineering and Operations Committee

Item 6a

August 16, 2021

Outline

- A visit to the past
- What is an emerging issue or contaminant?
- Per- and Polyfluoroalkyl Substances (PFAS)
- Microplastics
- Cyanotoxins
- Preparing for the future



An Emerging Water Quality Issue in 1980s

MEMORANDUM

December 7, 1989

To: Principal Microbiologist

From: Senior Microbiologist M. H. Stewart

Subject: Update on Cryptosporidium Outbreak in London by Tony Rachwal of the Thames Water Authority

1. On Tuesday, November 21, 1989, Tony Rachwal of the Thames Water Authority met with staff of Metropolitan's Water Quality Division to discuss the recent Cryptosporidium outbreak in London, England. The following paragraphs summarize the highlights of this meeting and examines implications for Metropolitan.

Summary of London's Cryptosporidium Outbreak

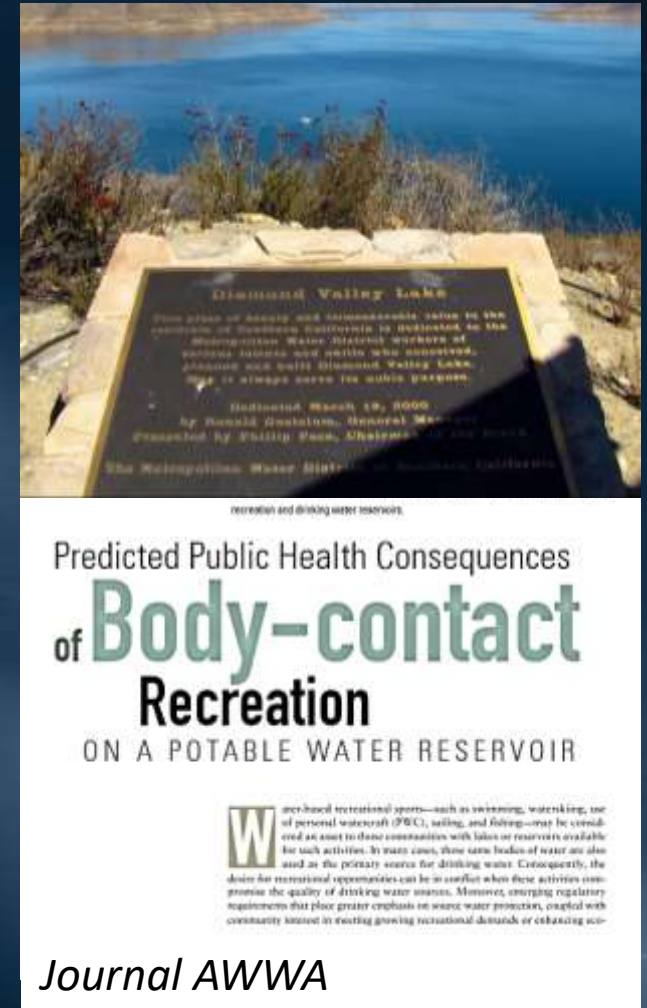
2. From January through March 1989, the Oxford and Swindon areas outside of London experienced a waterborne disease

- 1976: First recognized as human pathogen
- 1976 – 1982: Seven cases reported in humans
- 1984: First waterborne outbreak (Texas)



30 Years of Research, Regulation, and Monitoring including actions at Metropolitan

- 1993: Milwaukee outbreak (~400,000 cases)
- 1995: MWD's *Cryptosporidium* Research Action Plan
- 1997: 1st Intl. Conf. on Waterborne *Cryptosporidium*
- 1997: Routine pathogen monitoring
- 1998: SWTRs require $\geq 99\%$ removal
- 2002: No body-contact recreation at DVL
- 2003: Ozone disinfection at treatment plants
- 2006: Mandated monitoring under LT2ESWTR
- 2019→: Evaluating removal at Advanced Purification Center



What Makes an Emerging Water Quality Issue?

- Non-regulated chemicals and microbes
- New or developing regulations
- New occurrence data
- New health effects information
- Legislative action
- Increased public awareness

*Regulated
Contaminants*

*Emerging
and
Unknown
Contaminants*

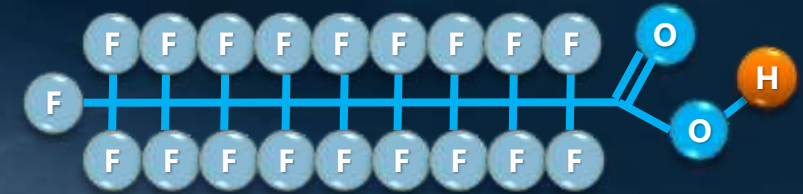


*Image credit: Uwe Kils, Wiska Bodo;
www.ecoscope.com/iceberg/*

Per- and Polyfluoroalkyl Substances (PFAS)

Per- and Polyfluoroalkyl Substances (PFAS)

- First developed in the 1940s “*Miracle chemicals*”
- >7,800 chemicals used in products that resist oils, stains, and water
- PFOA and PFOS are the most common
 - Voluntary phase out started in 2000
- Extremely stable in environment “*Forever chemicals*”
 - Soil, air, surface water, groundwater, wastewater plant effluent, sewage sludge and landfills



PFAS: Impacts and Consequences



Source: SWRCB

- Enter water supplies mainly from industrial discharges and stormwater runoff
- Detected in some groundwaters above California Notification and Action Levels
 - Detected in Metropolitan's service area
- PFOA and PFOS not detected in Metropolitan's source and treated waters
- Can cause high cholesterol, thyroid and liver disease, low birth weights
 - More human health information needed

PFAS: Regulatory Status

- No national or state drinking water regulations (no MCLs)
- 2016: USEPA Health Advisory for PFOA + PFOS = 70 ng/L

California Actions	PFOA (ng/L)	PFOS (ng/L)
Notification Levels (2019)	5.1	6.5
Response Levels (2020)	10	40
Public Health Goals (2021, proposed)	0.007	1

- State mandated monitoring of various facilities, industries, and water utilities

Microplastics

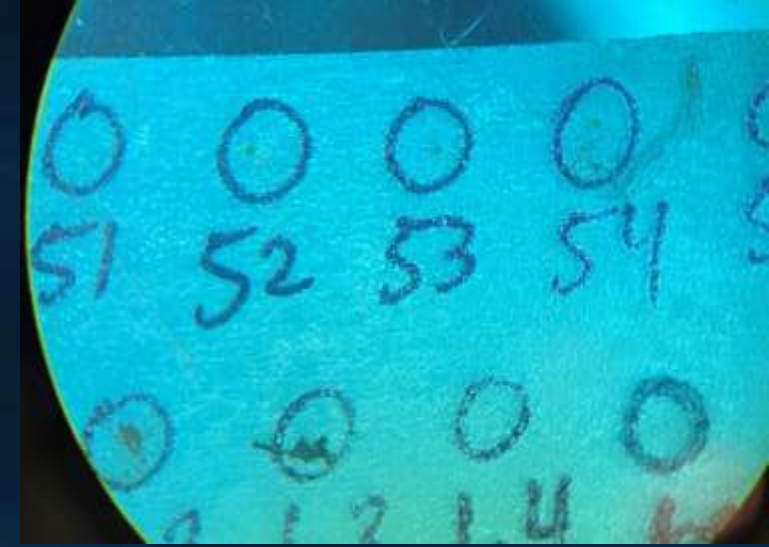
Microplastics

- Plastic particles 1 nm to 5 mm in size
- Sources of microplastics
 - Car tires, clothing fibers, cosmetics, personal care products
 - Industrial discharges, atmospheric deposition, surface runoff, wastewater discharges
- WHO: *“low or no concern of human health hazards”*
 - Additional research needed on potential health effects
- Water treatment processes typically achieve >90% removal
- Science on microplastics in water is still developing



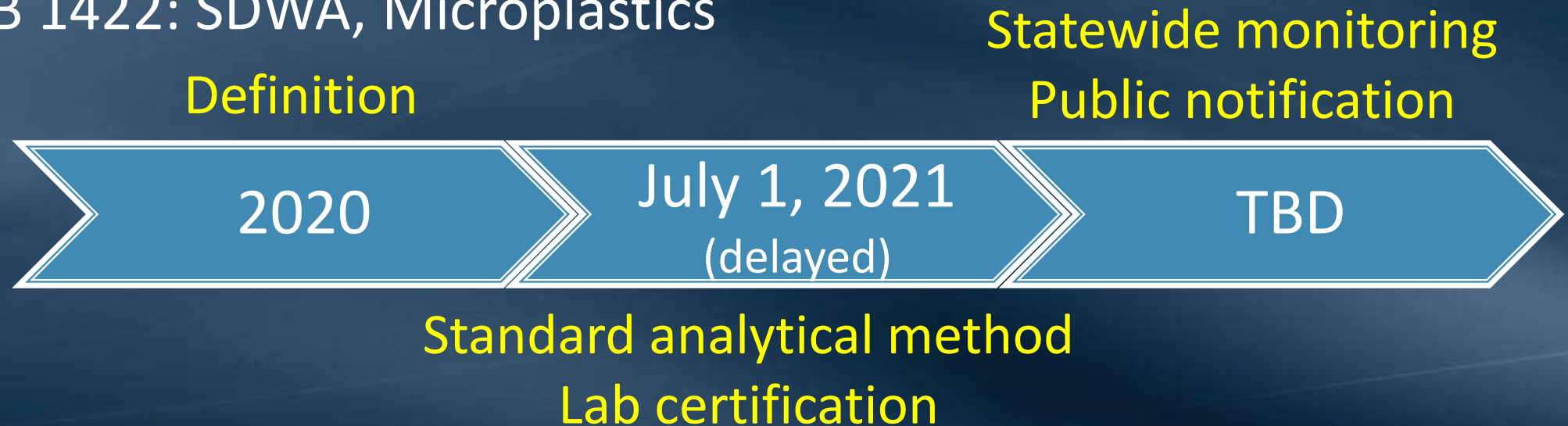
Microplastics Analytical Methods

- No standard or validated sampling, extraction, and identification methods
- False-positives, method interference
- Time consuming and potentially costly methods
- Metropolitan participated in SWRCB-funded methods evaluation study (2019-2021)
 - Study results being used to inform statewide monitoring program



Microplastics: Regulatory and Legislative Activities

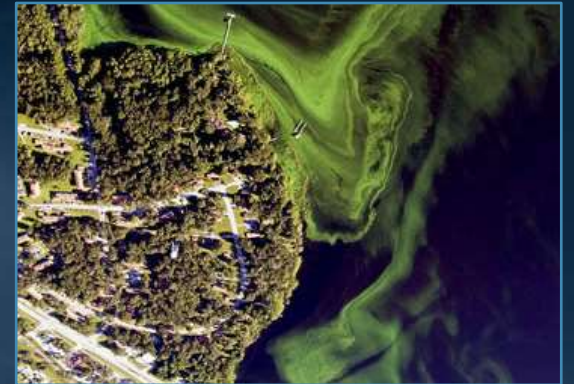
- No national drinking water regulations
- CA, AB 888: Waste Management
 - Prohibits plastic microbeads in personal care products
- CA, SB 1263: Statewide Microplastics Strategy
 - Risk assessment, occurrence data, source reduction
- CA, SB 1422: SDWA, Microplastics



Cyanobacterial Toxins- Cyanotoxins

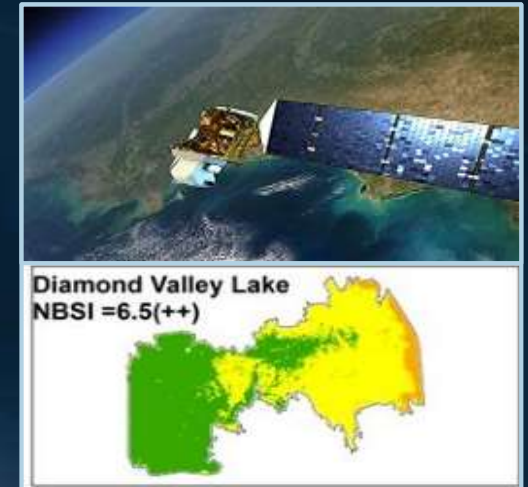
Cyanobacterial Toxins- Cyanotoxins

- Cyanobacteria occur naturally in all bodies of water
 - Photosynthetic bacteria, not contaminants
- Some cyanobacteria produce taste and odor compounds (MIB/Geosmin)
- Some cyanobacteria produce cyanotoxins
 - Can cause a variety of illnesses
- Livestock/pet deaths linked to cyanotoxins in untreated water



Cyanotoxins: Impacts and Consequences

- Human illnesses linked to recreational water
- 2014, Toledo: “Do Not Drink”/“Do Not Boil”
- 2018, Salem, Oregon: “Do Not Use”
- Metropolitan’s Cyanotoxin Monitoring Program
 - Year-round monitoring in source water lakes
 - Developing and improving detection methods
 - Diamond Valley Lake closed for 5 weeks in 2018 based on California voluntary recreational guidelines
(no impact on drinking water- recreational water only)



Cyanotoxins: Regulatory Status

- No national or state drinking water regulations

USEPA 10-day HA*	< 6 yrs old	6 yrs and above
Microcystins	0.3 µg/L	0.6 µg/L
Cylindrospermopsin	0.7 µg/L	3 µg/L

* HA, Health Advisories (2015)

- California 2021: Proposed drinking water Notification Levels (NL)

Cyanotoxin	CA NL
Microcystins	0.03 µg/L
Cylindrospermopsin	0.3 µg/L
Saxitoxin	0.6 µg/L
Anatoxin-a	4 µg/L

Preparing for the Future

Preparing for the Future

Potential Emerging Constituents

- Pharmaceuticals and personal care products
- Disinfection by-products
- Antibiotics and biocides
- Microbial pathogens
- Industrial chemicals
- Biological toxins
- Nanoparticles
- Microplastics
- Hormones
- Pesticides

2021: EPA Draft Fifth Contaminant Candidate List (CCL5)

66 chemicals (including PFAS, cyanotoxins, DBPs), 12 microbes

Unregulated contaminants that may be present in water and may be harmful

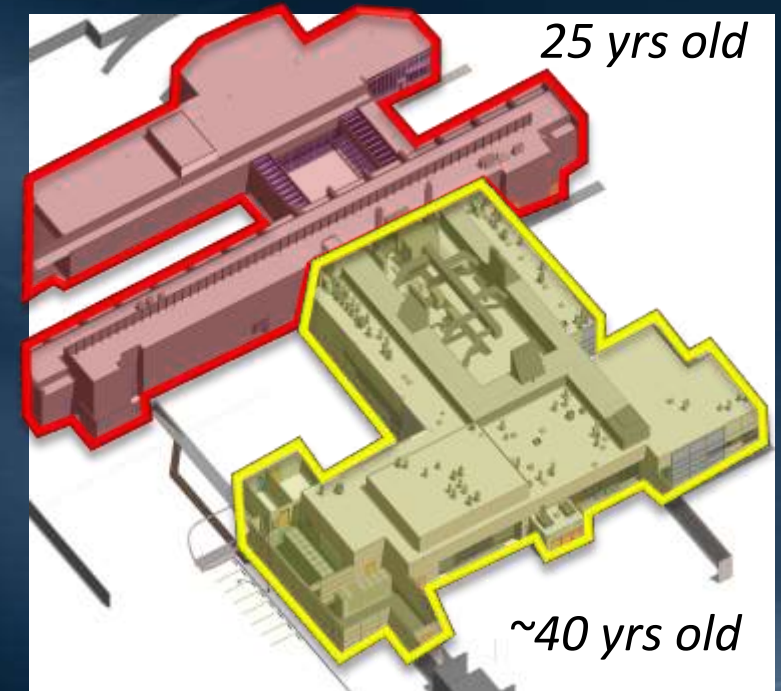
Emerging Area: RRWP Reuse Research

- 2019→: Testing at Advanced Purification Center
 - Tertiary MBR (completing Oct. 2021)
 - Secondary MBR (starting Jan. 2022)
- Developing and optimizing detection methods for future monitoring
 - Toxicity (bioassays), PFAS, low molecular weight compounds
- Optimizing treatment and DPR research (future)
 - Blending strategies



Water Quality: Preparing for Emerging Challenges

- Engaged in national and state efforts to improve knowledge on emerging issues and contaminants
 - Water Quality is participating in methods development
- Detection and testing requires state-of-the-art facilities
 - Clean rooms, dedicated instruments, proper separation of work areas
- Current WQ facilities may not be adequate for future needs
 - Planning for laboratory improvements



Water Quality Laboratory, La Verne

Water Quality's Mission

To safeguard the public's drinking water

