

Joint WSCAC and WAC Meeting

Waterworks Museum
Chestnut Hill, MA
February 11, 2020—10:30 A.M.

WSCAC Members:

Michael Baram, WSCAC Chair
William Copithorne, Town of Arlington
Steven Daunais, Tata & Howard

Bill Kiley, BWSC
Paul Lauenstein, NepRWA
Janet Rothrock, League of Women Voters

WAC members:

Mary Adelstein
Philip Ashcroft, NEWEA
Wayne Chouinard, Vice Chair, Arlington DPW
Adriana Cillo, BWSC
Stephen Greene
James Guiod, MWRA AB

Taber Keally, NepRWA
Karen Lachmayr, WAC Chair
Belinda Stansbury (on phone)
Kannan Vembu
Dan Winograd

Guests:

Sally Carroll, MWRA
Lexi Dewey, WSCAC
Andreae Downs, WAC
Teresa Keene, Burlington DPW
Wendy Leo, MWRA

Andres Ripley, NepRWA
Meg Tabacsko, MWRA
Danielle DiRuzza, MWRA

WAC Business

Andreae requested any edits to the WAC December minutes. No edits were offered, and a motion was made and seconded to approve the minutes. The minutes passed unanimously.

Presentation

Andreae introduced Adriana Cillo, the Educational Coordinator of Boston Water and Sewer Commission (BWSC), and Meg Tabacsko, MWRA Project Manager for School Education, and Danielle DiRuzza, School Program Administrative Coordinator, both from the Massachusetts Water Resources Authority.

Adriana is a member of WAC, and is the Educational Programs Coordinator with BWSC. At the start of her presentation, she explained that she spent her first 5-6 months of the job learning about BWSC, and then developed a program that would introduce BWSC to people who were unfamiliar with it. She provides education and outreach to approximately 2,500 kids and 600-700 adults annually.

Adriana shared a presentation that she uses for Boston schoolchildren. She shows images and information about the Quabbin and Wachusett Reservoirs and explains what an aqueduct is, so they learn how the water travels from the Quabbin Reservoir to their homes. She reviews ways we use

water every day (e.g. drinking, cleaning), and then shows how the wastewater moves from towns to Deer Island for treatment.

Adriana noted that she spends extra time on a slide that features FOG – fats, oil, and grease – and how to dispose of these materials properly: cooling and throwing them in the trash (can it, cool it, trash it). This keeps FOG out of the sewer system where it clogs pipes. She asked BWSC operations staff to call her if there were backups in the storm drains or sewers near her house, so she could take photos of what workers were pulling out. She shares these photos with kids and adults. Parents often comment to her on her school programs, so she knows children are bringing home the information they learn in class.

FATS, OIL, AND GREASE = FOG



Cool it. Can it. Trash it.



BOSTON WATER AND SEWER COMMISSION



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 WE ARE ALL CONNECTED

The next section of her presentation addressed “flushable” wipes and other items that people flush that impact the sewer system. Adriana emphasizes that wipes clog pipes, and shows pictures of them being removed from the pipes. This gets a strong reaction from the kids.

Adriana includes slides of Deer Island, and a map of what happens to wastewater when it leaves the house and flows to Deer Island.

She uses projects like building waterways and games to explain the movement of water and

wastewater. The games are good for children in kindergarten to fourth grade (e.g. a poster “where does it go?” where kids learn where to put different categories of trash), and for older kids (e.g. a game from Rhode Island on where stormwater goes). She also teaches kids about local shellfish, and how stormwater discharges affect them.

Adriana also ensures that informational flyers are available in multiple languages, and gives out free merchandise to promote her messaging, e.g. doggie bags and pencil cases.

In addition to children, Adriana speaks to seniors and the public at different places in Boston including senior centers, the Boston Aquarium and Boston Parks.

Lexi asked how the messaging appeals to seniors. Adriana said that seniors are often very surprised at the FOG and the wipes issues, and are open to learning and altering their behavior. She discusses

bottled water, and talks about where their drinking water comes from, including the history of Boston's water supply.

Paul asked how well this message gets back to parents, and Adriana said that she gets feedback from parents and teachers saying that the kids internalize the messaging and bring it home. BWSC is very supportive of the public education and outreach that Adriana does.

Meg Tabacsko, MWRA Project Manager for School Education, and Danielle DiRuzza make up the MWRA Education team. They see over 10,000 students through the more than 300 classroom presentations they do each school year.

Meg shared how they typically start out the presentations to get the children engaged in the topic. Instead of PowerPoints, they use printed images, games and jars of water from various stages of the water cycle (straight from the Quabbin, to entering Deer Island for treatment, to exiting Deer Island after treatment). These examples make a huge impression on the children. She regularly receives feedback from teachers and parents on kids bringing the information home and talking about it.

Meg and Danielle make sure that the presentations are fun as well as educational to help the kids remember what they're learning about. They offer a field trip to Romney Marsh where kids can see staff doing water monitoring.

The City of Revere has joined MWRA in classroom education by opening catch basins near schools Meg and Danielle are visiting. Kids are able to see storm drain cleanings and the trash in the nearby catch basins. Children remember the presentations and information years later, and ask Meg and Danielle to come to camps or other schools. Meg and Danielle bring stickers, magnets, books and a coloring book called Dwayne the Storm Drain to school programs. MWRA runs an annual writing and poster contest, open to all schools in the MWRA service area, grades k-12. An award ceremony is held annually at Deer Island in May.

Paul asked whether the lessons tie in at all with the state education goals. Meg said yes, they tie it in with specific subjects such as math, science, history, and in fifth grade, there's a water subject requirement.

Janet asked if there was any attempt to work with the state education framework, integrating the program into state requirements. Meg answered that many teachers are working the program into their curriculum themselves, relating the program to the frameworks. They work with 36-38 communities each year.

Since they are unable to go to more schools, Meg and Danielle share their programs and materials with other interested groups, such as watershed groups that have school programs.

Mary Adelstein asked whether there's any opportunity to create Public Service Announcements or other ways to reach adults and teach them what should not be flushed down the toilet, or proper use of a garbage disposal. Meg said that New England Water Environment Association and New England Water Works Association are working to educate the public on just these issues. Adriana noted that BWSC does send out notices and has information on their website. MWRA uses their website, brochures, and their annual Consumer Confidence Report. They also attend community events to promote education. Both agreed that more outreach is always helpful.

There was a discussion of wipes, and how they used to be labeled as flushable, but do not break down. Now, more wipes are engineered to break down slightly better than before. They still shouldn't be flushed.

Adriana is hoping to implement a program where people can adopt a storm drain. San Francisco does such a program, and she said they seem to have had a positive impact. Bill pointed out that the efforts to raise awareness, while there are some shortfalls, have already had a positive impact.

Paul asked about the cost of the program vs the benefits. If the program were expanded to meet the demand, would the benefits pay for the extra costs? Meg responded that it's very challenging to put a cost benefit on public education. There are many anecdotes that demonstrate the positive effect, but the value of education is hard to determine in numbers.

Karen asked about what happens to the kids' posters after the competition. Meg explained that the winning submissions are displayed at the Waterworks Museum.

Another WAC member asked whether the school presentations include information on combined sewer overflows. Adriana discusses it with the adults, and Meg has a section on the topic for high school students.

Janet Rothrock joined the meeting, thus making a quorum. Lexi requested a motion to approve the January meeting minutes. The minutes passed unanimously.

Andreae reminded WAC members of the next WAC meeting on March 6, and provided a draft fact sheet discussing wipes' dispersability and labeling requirements. She noted that there will be some pushback from the manufacturing companies, but eventually she hopes to get legislation passed to require stringent labeling standards. Mary offered several edits to the language. Kannan noted that the biodegradability of flushable wipes is increasing, but the bottom line is still that toilet paper is the only thing that should be flushed. Paul suggested that an effective addition to a legislative briefing might be Meg's or Adriana's presentations.

Lexi offered copies of the updated Massachusetts Drought Management Plan, and encouraged people to share these with their communities and organizations.

Andreae recognized Meg's recent receipt of the Water Environment Federation's Public Education and Outreach Award.

The meeting was adjourned.

WAC will next meet Friday, March 6, 10:30 am, at the MAPC third floor Conference room, 60 Temple Place, Boston

WSCAC will next meet on March 10, 2020, at 10:00 am at the MWRA Facilities in Southborough. Please [visit our website](#) for more information on this meeting.

February Director's Report (WAC)

WSCAC 12/10

Lisa Gustafson, Quabbin & Ware Watershed Public Access Plan. Updated from 2009 plan.

Recap—process of the revision of the plan and public input. Ware River advisory committee. Asked for management principles going into the update process.

Stakeholder survey online. Learned:

1. Top 3 activities—hiking, bicycling on roads, walking dogs
2. Doing these activities: on the rail trail (2—east-west & No-South: Ware River and Grand Central). Rutland, Barre Falls Dam (Hubbardston).
3. Conflicts: none (83%), 2nd ATVs, 3rd Trash, 4th Dogs.
4. Problems using land: 1. Lack of restrictions/too many restrictions (biking, swimming, ATVs, horseback riding); others: Boating, aquatic invasives, oversized boats, trail usability, parking & road conditions
5. Illegal activity witnessed: ATVs, dirt bikes, mountain bikes; trail use by mountain bikers, dogs off leash.

Solution analysis—sitting down & talking to everyone.

Looking instead of having individual trails for every use, all on multi-use trails. Cyclists, horseback riders, hiking, even snowmobiles. XC Skiers anywhere that walking is allowed—but not in Quabbin. Exceptions in some areas. Same rules for everyone, easier for rangers to enforce.

WSCAC members raise issues, including hunting that has meant trucks stuck on the land. DCR believes that deer hunting helps protect trees. BUT considering limits on access, which is now 24/7.

Also proposing hunting licenses. Only access on foot.

First draft plan view to the Ware AC in January, then 30 day public comment. Final plan release, along with implementation schedule (signage, closing access to some areas, enforcement plan). Now have 1 full time ranger & 2 seasonal rangers.

Now at 9 full time rangers for watershed. Want to add 4 more. Unarmed, but work with state and environmental police. Can issue citations. Also have parking citations, because gates have no parking allowed, and yet were still getting blocked. Range from \$25-\$300 depending on the offense.

12/11 MWRA Board-cancelled

12/12 Boston Harbor Environment Network

CZM—Christina Kennedy “Marine Invasive Species Monitoring in Boston Harbor”

Main vector—shipping industry (ballast water dumping, or ship’s surface)

Continued introductions with international shipping. Often understudied. Management options are limited. Prevention and early detection is key.

For instance seaweed—fewer native kelp species, more invasives. Tolerate the higher temperatures in the gulf of Maine.

Winter temperatures limit species spread. Counter with education, monitoring.

Rapid assessment surveys every 5 years or so. Take temperature, salinity, visual examination & record species.

Another survey measures dissolved oxygen, turbidity, collects specimens. Uses EPA divers, photos & video. Take to lab to identify.

Caveats—snapshot in time. Participant numbers and abilities vary, temperature variation.

Most species have been present since 2008, when monitoring started. Sea potato has expanded southward from Nova Scotia—it is from the Northwest Pacific. Found one in Boston Harbor, but regularly encountered north of here and some found in RI. Also red algae—grateloupia turuturu, from NW Pacific, working its way northward. First found at Rowes Wharf in 2007.

Relatively new—since 2010, European rock shrimp.

Kiki Schreiber Marine Science Center Northeastern Effects of Oyster Culture on wild organism communities

Oyster reefs declining. Aquaculture on the rise. Variety of farming methods. Offer similar ecosystem services and habituate for fish and other organisms. Don't know different effects of gear types, site and season?

Looked at 3 different set ups—bare, cage and rack. Used underwater videos, to see visitation rates—number of species in an hour. In august racks had more fish, but decreased in october. Cages in subtidal had more fish than intertidal. Crabs liked bare sub tidal environments more in October, less in august, switched for racks. Could be avoiding the striped bass, which are predators, or could find more food when have access to the bottom.

SeaAhead—blue tech innovation. Alissa Peterson, executive director

Venture innovation for the ocean—startup platform. At the CIC building, 50 Milk St. Ocean sustainability, technology. Founded May 2018.

Maritime industries; fisheries, offshore renewable energy, coastal resilience, plastic & pollution:

- Shipping, ports, logistics
- Fisheries, aquaculture, supply chains, marine products and pharma
- Hardware—robotics, sensors, energy storage,
- Software—data science, AI cyber security
- Systems—offshore energy/fishing
- Resilient infrastructure, wastewater

Now at 20 startups, mostly northeast. Network, funding, customers, pilot sites, testing...

Results: Oyster tracker, offshore wind, water treatment for cruise ships, traceable seafood app,

In Feb—investment group (Blue Angels); innovation, grant program for new company formation

Dept of Fish & Game: Aisling O'Shea
Ma In-lieu fee Program

Provides compensatory mitigation for impacts to aquatic resources.
S 404 permits—DFG administers the mitigation. Ca. \$1m/year. Preservation, enhancement and restoration.

1-95 Embankment (abandoned) in Rumney Marsh. Ed Reiner, EPA

Now marsh restoration, including Belle Isle. Google EPA Rumney Marsh for everything ever done in this marsh. Bisected by a railroad, Rt. 107 and the I -95 embankment. Tidal restoration never happened.

King Tide flooding happens on both sides of the embankment. Doesn't protect from flooding. Can we ever remove it? Someone thought it was protecting Saugus in 1989. New study by EPA. Shows the highest tides are in areas with tidal restrictions. Also scouring near the tide gates.

Suggested solutions—removal of fill, removing the berms since don't add flood control. Should instead be in Saugus back yards where getting flooding NOW.

GreenRoots John Walkey

Work in Chelsea & East Boston bordering Chelsea Creek.

Development and fill in East Boston-filled in over time to create Logan. Flooding projections show that the newest developments will be the first flooded.

Shore plaza east, waterfront affordable housing. Under each building is open air parking.
BPS school.

Lombardo properties—designated port area. King Tide flooding.
Boston East, housing, harborwalk, on the waterfront, luxury.

Turn corner—the mark at DeNormadie Wharf 9Hodge Boiler Works, luxury condos underground parking

Clippership Wharf-luxury condos.

Portside at east pier—more units. Flood prevention here shunts water into the adjacent neighborhood.

East Boston Greenway is a channel for water. Boston Climate ready models show East boston flooding via the greenway. Looking to mitigate/harden the waterfront. Looking at living shoreline.

Salt marsh? Needs several hundred acres, not just the small amount proposed. One measure is a popup dam to block water coming in one area.

Shaws parking lot already floods at king tide. Lewis Wharf has tide coming in through the storm drains.

Suffolk Downs—built in the mid-1930s on salt marsh. Planning massive amount of building (6-7x of Assembly Row), but also 40 acres of open space to contain water. But probably not enough for 100

years out. Links belle Isle marsh to Chelsea creek. Already seeing some salt marsh collapse—more water coming in. No place for salt marsh to go if build on Suffolk Downs.

GreenRoots concerns are that the decision-makers don't have a good understanding of climate change impacts on coastal habitats. Retreat is a taboo topic. At same time, pressure to build on "under-utilized" land is huge. Inequity in the measures taken to address coastal flooding risks. People living where no big project planned are left out.

Water Resources Commission 12/12

Hydrologic conditions for Nov.—streamflow. Temperature & precipitation variable—indication of climate change. Groundwater lagging as result of sept drought. Snowfall deficit in Nov. Nov. temperatures colder than usual. December outlook more precipitation and higher temperatures.

WaterSmart Innovation conference report

Water efficiency technologies, particularly from the western part of the country.

1. Internet of Things
 - a. Smart water meters—including home devices that can be attached to home water meters and pipes so user can track remotely. San Antonio investigated whether they would help people save water. Found it was useful to defuse angry water customers.
 - b. Smart water software platforms — Acton is using watersmart at 25-30K/year and helps both the utility and the customers to figure out water usage and billing.
2. Greater data granularity
 - . Low vs. high resolution
 - a. Opportunities and challenges
3. Research to support management
 - . Evaluate rebate programs—turf removal, irrigation controllers. Have researched which technologies (pool covers, smart irrigation, etc) are most effective, so target rebates at the high performance ones.

Propose examining:

- Annual consumption trends
- Seasonal variation
- Peak demand by high water users

Feedback: what should be the state's highest priority?

Reading also has watersmart. Really focuses attention on water use anomalies.

So much churn in this landscape—by the time the state procured one technology, it could be already obsolete. NEWIN has been tracking newest technologies in water—becoming part of NEWEA (is this true, Philip?).

WRC Annual Report now online.

Using the M36 audit in MA to Improve Water Management

Duane LeVangie, program chief, DEP working with Weston & Sampson. 9 communities

Unaccounted for water is a measure of public water supply performance. Reflects

- Leaks
- Meter issues

- Unmetered uses not documented
- Billing issues
- Theft
- Data handling errors in the system

M36 is a free audit software that tries to account for all Unaccounted for Water.

W&S has done 56 audits of the 9 communities—bottom up and top down. Some communities don't even have consistent home meters (Hadley). Some have multiple styles of meters.

Lessons learned: focus on the master meters, calibration, age, right size. Customer meter inaccuracies.

Acton—replaced master meets, customer meters (10 yr project), got digital information from meters. Flagged if suspected leak or tampering. Customers can view their own data. Use e forms and in-field iPads.

Real losses from leaks in Acton—worth \$49K/year. But water theft is real.

Water Resources Commission 1/9/20

Hydrologic conditions—more precipitation than usual in Dec. No drought indicators. One area of the Cape had 9" of rain. Average temperatures were around normal, but daily temperatures ranged from average by 18+/- . Streamflow is high or above normal. Groundwater also mostly above normal except at one very deep well mid-state.

WRC annual report voted out—will be sent to legislators to give them or their staff an idea of what the commission does.

Burlington—application to join MWRA water supply. MEPA deadline past. Not evaluation yet, just a snapshot of the situation.

IN the Shawsheen, Ipswich and Boston Harbor water basins. 7 wells, 1 reservoir supplied by the Shawsheen. Want to purchase up to 6.5 MGD to supplement. Three of the 7 wells have dioxane, Mill Pond lacks redundancy and its supply pipe has to be cleaned several times a year.

Proposed connection from Lexington. Max day demand is high enough that even with watering restrictions (irrigation) running low on water. Looked at several alternatives, but no other suitable sites—contamination, lack of capacity...

Comments due 1/10. MEPA decision 1/17. WRC will look at water conservation & forestry management. Agencies are also asking for info on reasonable in stream flow. According to MWRA, Burlington is in a water emergency now, taking water from MWRA, as the Mill Pond is offline.

Flood insurance Joy Duperault of DCR

— 341 MA communities (out of 351) are in the national flood insurance program.

Over 60K policies

Coastal communities have about 82% of those.

Many in very high risk flood zones. About 3000 repetitive loss properties. Top: Scituate, revere, Hull, Marshfield, Quincy.... Some are Nor'easter damage, some just stormwater. \$416m for MA (over \$2b for FL).

FEMA has updated the coastal maps, does not have updated maps for central and western maps. Don't count rain, only water from a river, lake, ocean, etc. Currently "cleaning up" 1970s maps by adding LIDAR info by watershed.

Congressional report on what FEMA maps would look like if included future conditions—nationwide, coastal flood plains would expand by about 55%, riverine by 45%. That's bad enough, that states and localities are creating their own maps.

Much of coastal MA is not covered—more than \$32.6 billion in property. Many don't have to be insured. Much of it is outside of FEMA floodplain. She recommends flood mitigation measures—to save on flood insurance and to save in the long run.

FEMA asked governor to show MA compliance with national flood insurance program. Vandana put together the report on state projects and which agencies administer and enforce the standards on them.

WSCAC 1/14

Members' discussion: what are the committee responsibilities, what committee wants to tackle in 2020

1st: MWRA work

2nd DCR work

After that: other member interests

Whit: brainstorm ideas first

Watershed & DCR at Trust: green forestry standards; DCR vacancies—any portion of DCR, even water supply, is under a hiring cap.

Now at 136 employees of 150 needed, and only 2 are advertised. EEA Secretary's decision—at the top. Trust is writing a letter to EEA to ask if water supply can be exempt from this cap. WSCAC is going to write a supporting letter.

MWRA DCR and UMass are investigating use of road salt near the Wachusett. Holding trainings for municipalities.

Salt in the drinking water (and in runoff to impaired waters under MS4) is a statewide issue. NH looking at lifting liability for ice on parking lots. Private contractors in particular are over-spreading salt.

Burlington anticipates joining the MWRA water system because of contamination of 3 of its wells. Pretty much a shoo-in. WSCAC has submitted initial comments on conservation and drought management. Burlington will eventually be a full user at about 1mgd.

High irrigation rate in Burlington—nearly double winter use age—outdoor meters & \$9 rate.

James—rates are much lower now. So would be surprising if irrigation rate didn't get higher.

Threats to water supply: PFAS, glysophate (Roundup)— regulations, actions,

Kurt—brief PFAS overview: AB doing primer on Thursday. Impact on MWRA water—watershed management issues. State is trying to deal with it. EPA at 70ppt advisory. Health effects over time are severe for sensitive populations even at that level. Cancer, immune system suppression & more. MA looking at setting a standard of 20ppt for drinking water.

Q—is there a way to regulate and test for the class of chemicals?

Currently best test catches 14 compounds.

Dupont has now bought the reverse-osmosis treatment for drinking water.

MWRA water is the safety net—1ppt in the Quabbin. Wachusett is more contaminated.

Is glysophate showing up in the water supply? Not used on DCR watershed properties, but possibly railroad?

What are the health effects? Legislation before Mass legislature. Binds to soil particles, but degrades quickly. Mobile in soil? Yes. And harmful to soil. Levels in grain products including cheerios.

Health effects—increases risk of Non-Hodgkins lymphoma by 45%. Main issue is roundup ready seeds and heavy application. No place for monarchs in the agricultural center of the country.

Final issue Climate Change & flooding. Old vs. new data in flood mapping. Carbon footprint.

Floating solar panels? Not on drinking water reservoirs, but retention basins. Japan is in leadership here. China has the largest. In US 24,000 artificial lakes. Could generate 10% of US electricity supply if ½ of them were covered.

Question of MWRA plan for climate mitigation, zero emissions, etc—will add to the Deer Island tour as a topic to cover along with combined heat & power.

Should this be publicized and disseminated? Should MWRA put its climate goals on the website, along with a date for net zero?

What climate data is the MWRA using? Want update on master plan that includes climate adaptation.

MWRA Board 1/15

Wastewater

Contract awards:

- Cleaning contract for Deer Island.
- Delivery of hydrogen peroxide at Deer Island (used for odor control). Significantly cheaper price from new contractor. Issue is cost of reliable truck drivers.
- Odor control/HVAC system at Nut Island—engineering contract. Result of the fire and HVAC equipment being at the end of its useful life. Also reconfiguring odor control system and creating better access (lessons learned from the fire). Will replace underground fuel tanks and replace emergency spillway gates. Board questions whether fire insurance is covering enough

of the cost—MWRA notes that got the maximum possible (about \$4m). This contract is for considerably more (\$57m), but has a much broader scope.

Change orders

- Nut Island headworks, engineering—increase time and some funding. 13 months additional for design (no extra \$) and 10 months to construction engineering & management because original contract was too aggressive. Also upgrading SCADA to match other headworks'. \$1.5m increase. Board members object to the change order, saying it's too large. Staff thought the project was simpler, thus the lower cost estimate originally. Laskey—not clear at start the difficulties with retaining the open space and removing the soils. Not a lot of options at this point. Without engineers on site, complexity can overwhelm progress on construction.
- O&M of Union Park CSO Pump Station—extending contract for a year, twice, as allowed by original contract. Woodard & Curran are the contractors.
- Remote headworks and shafts to Deer Island Study: extension of time because of difficulty of finding low-flow periods in which to do that. 2018 contract for \$1.3m. Also have had to clean grease off walls of shafts to inspect walls. Want another 6-7 weeks to receive test results and complete final report. No increased cost. Are finding degraded concrete and exposed rebar.

Water Supply

UPDATE: Water line section 22 alternatives analysis—part goes through Neponset River estuary—concrete on pilings over an environmentally sensitive area. Rest goes through residential areas. Doing leak detection—no active leaks. Developing test pit and boring programs. Will need permits and have developed hydraulic model runs.

Contract Award: Wachusett Dam Bastion building—1904 construction. Cracks in concrete ceiling, doorway walls. Building houses controls and electrical cable. Need new roof with waterproofing, rebuild walls, doorway & stairs with reinforced concrete, reinstall granite parapet. Awarded design contract at about \$700K.

Personnel

Changes in job titles and descriptions. Mostly union negotiated.

Hires: business systems analyst in MIS, to a current MWRA employee. Manager of metering & managing—internal; associate general council from Boston.

Administration & Finance

Information: year to date expenses vs. budget: under budget by \$10.5m direct expenses lower mostly wages & maintenance. Indirect were under by \$3.5 m because of lower than expected payments for watershed services. DCR is providing MWRA with expenses and invoice MWRA, which pays them. True up quarterly. Actual look like \$3.1m.

Favaloro: Water supply protection Trust, DCR admitted there is a cap on hiring in watershed division. Not EoEA, not Commissioner, but Administration & Finance. Trust is sending a letter to A&F requesting an exemption to the cap. Advisory Board will also take up Thursday. Asks that the Board put in a word that the water supply staff should not be part of the cap. Rate payer money, not DCR budget.

Committee votes to ask Laskey to write & send such a letter to A&F and Governor. Consequences of not staffing in the watershed mean filtration waiver disappears—very expensive to add filtration. Watershed staff down by 10%. 14 open positions, 2 are advertised. Nothing critical not being done,

but not clearing roads. Unsustainable to add work to existing staff. Pappastergoin wants to withhold money that is not being spent by DCR.

Debt came in as budgeted. Expect interest rates to remain lower for longer.

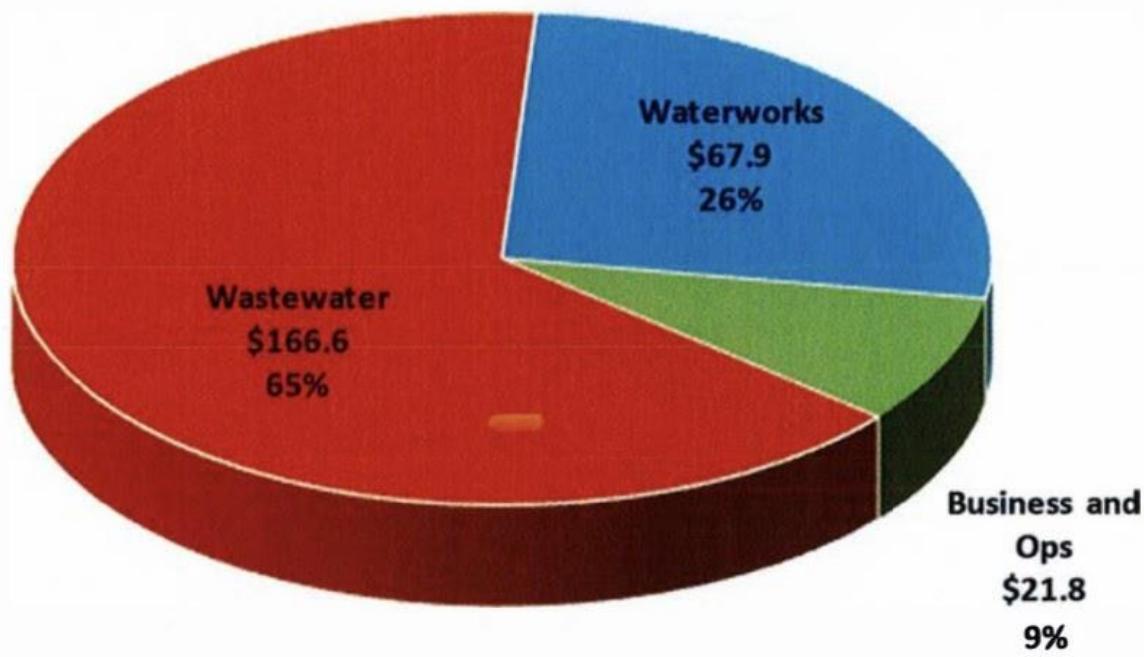
HEEC costs also as budgeted. Project is almost complete. By April or May should know cost of new cable.

Capital expenses over budget by \$3.1 million. Largely I/I payments to communities. Water system aid is underspent.

Pension returns are north of 10%. Question on whether to use budget surplus in pension & OPEB. Decided instead to focus on defeasance because can target more precisely.

Approvals:

- CIP to Advisory Board: FY21 is 3rd of 5 year in cap period. Focus on asset protection and on redundancy (metro tunnel isn't yet in the CIP). \$4.1 billion to 2026. This next year at \$256 million.



Most of the major water supply costs come in after this 5-year cap period.

Top dollar projects this year:

- clarifier rehab on DI (\$34.5m)—longer project because have to keep some clarifiers in operation at all times. Mostly concrete corrosion at the tops of the tanks (gas). Lining these with epoxy.
- Chelsea creek headworks \$16.1m.
- Prison Point rehabilitation CSO
- Nut Island Odor Control & HVAC \$1.5m
- Northern Intermediate High (water main) redundancy

- Gravity thickener rehab \$6.4m.
- Carroll Water Treatment Plant SCADA upgrade

Biggest spender long term is the metro tunnel—ramping up. Continues to evolve. 30% contingency. Still many variables.

Full Board

Director's report: MWRA will have a booth at the Mass. Municipal Association trade show Jan 24-25. This Christmas, 2019, saw the lowest ever water usage in MWRA history at 143m gallons—historically, Christmas Day is the lowest water use day. When MWRA began, the average day was 325mg.

HEEC—Dredging and new cable done. Bigger ships now visiting Boston. Fiber optic cable (part of the cable project) connected on both ends, so now have full redundancy. PFAS—expect more in-depth briefings. Drinking water side looks good—but may get new customers as some municipal wells come off line for PFAS.

CSO outfall model may need more work, court has February deadline.

Advisory Board 1/16

PFAS

Beth Card & Steve Rhode

DEP set cleanup limit for PFAS, also limit for drinking water. Members should weigh in. (Comment until 2/25)

State may be looking to increase regulation of land application of biosolids—studying first. MWRA focused on accurate science as a basis for these regulations.

NACWA on biosolid contamination.

Rhode: PFAS facts—in use extensively since 1960s. Cause disease in lab animals and probably in humans.

MWRA water—metro boston—had 5 of 6 PFAS, all well under 20 ppt at 3 ppt. CVA 1 ppt.

Wastewater—MWRA participating in 3 studies. Stellwagen Bank & MassBay, along with effluent. Water research foundation—two studies of PFAS in wwtp—effluent levels and finished biosolid leaching. Results in 2 years.

Card—communities outside MWRA—treatment costs are excessive.

No indication that effluent may be regulated more for PFAS. Would need surface water quality standard. Biosolids is another story. Question of the right sampling method. DEP has not yet given direction there.

Estes-Smargiassi—MWRA has data on website. DEP has data for other communities/partially served. Be prepared to talk to customers ahead of the data being found without you.

DEP intends to test water in every community across the state.

Laskey—MWRA may buy the equipment so can do testing in-house.

Rhode—when found PFAS in finished water, went & tested raw water—numbers very similar.

How treat PFAS in water? Activated carbon—specific type of carbon. Reverse osmosis. But recharge of the carbon is likely to be more expensive.

Is use of PFAS going up or down? The two oldest are banned and being phased out. Total use — hard to say because there are so many kinds now.

MWRA is looking at where firefighting foams in the watershed. DEP is running a take back program, so can move to the “less harmful” foams. Also fire departments not using for practice.

Teflon? Conventional wisdom—doesn’t contribute much to the overall load of PFAS.

Mass Water Works is working on this issue. If you do test, and samples above 20 ppt, DEP strongly urges notification of the public.

MWRA focus on science—how to establish the limit, take the samples, etc? What are the public health implications, what are the limits needed, where do we need studies. Should AB and municipalities take a broader perspective? 20ppt is pretty low.

Favaloro: agree limits need to be based on good science. Whatever the limit is should be fixed, so we aren’t dealing with a moving target.

Consumer Confidence Report: (Estes-Smargiassi) MWRA will be getting the letter out soon. May want to change it up a bit.

Lead and copper sampling will happen in March—only those communities that had elevated levels in recent sampling.

Advisory Board will hold a half-day workshop in June on PFAS (June 18, Needham Town Hall). Will include NEBRA, CLF and MWRA.

Communities may be wanting to join MWRA because of PFAS in their water supply—looking at the requirements and the amount of supply available.

Watershed understaffing—admin & finance has set the limit, and DCR is seen as one limit. AB is sending a letter protesting.

Favaloro hoping to figure out a way to get funds from MassPort on the HEEC cable/Wiggins pump station.

Budget review: CIP transmitted, starting the briefing schedule. CEB will be transmitted in February. Presentation and public hearing in March.

Wastewater metering: hoping to be starting installing in spring.

NEWEA conference 1/27

PFAS workshop:

AECOM: Christopher Curran: chris.curran@aecom.com

PFAS in dyes, electronics, semiconductors, etc. Sources—refineries, emergency response, WWTP (not a source but a sink) & biosolids, metal plating, manufacturing where products made, landfills, airports.

>6,000 synthetic compounds, persistent, bioaccumulative, soluble, toxic at very low concentrations. Surfactant—likes to spread. Repels water and grease.

States starting to regulate in absence of EPA rule. EPA health advisory at 70ppt.

Controls: at water supply municipal (treatment); manage source waters; point of use treatment.

Source areas: primary use sites, spill sites, landfill leachate, industrial pretreatment facilities.

WWTP—influent reduction (TRAC), or treatment

Water supply treatment technologies: activated carbon, reverse osmosis, ion exchange (IXR)—but then have solid PFAS-contaminated waste.

Carbon in the filters needs to be changed out more frequently in water supply treatment.

WWTP—not source, but natural collection point. Occurrence affected by water supply, industries. Challenge is the biosolids—land applied or land filled? And if incinerated, in the gas—emitted back to environment.

MI WWTP study 90 plants. All plants had PFAS. Industrial sources included electroplating & Metal finishing—were able to reduce amounts in treatment plant with TRAC. MI focusing on 66 sites with PFAS, DoD, Airports, refineries, fuel suppliers, shoe manufacturing, landfills, plastic manufacturers...

Shorter chain compounds stay with effluent, longer chain stick to solids and residuals. Effluent can have more PFAS than Influent in part because of how compounds naturally degrade.

Industry in the sewer shed drives up the PFAS content of biosolids. TRAC can be highly effective.

Land application is now the focus of a study: water, soil, and uptake over time. Initial results show non-detect for applications with lower PFAS levels.

Combustion is a possibly leading candidate for complete destruction of PFAS. Using biosolids to fuel the furnace?

Emerging technology for destroying PFAS: electrochemical oxidation?—would be a side stream treatment after another treatment. In development, mostly bench testing. Not at scale.

Not sure of the cost per gallon yet.

Alexandria Hidrovo, UNH Grad student—removal of pharmaceutical and Personal care products (PCPs) in WWTP

PCPs are a Contaminant of emerging concern—not federally regulated.

Question of how well these compounds are removed in the WWTP processes. Looked at 15 pharmaceuticals and 6 personal care products (including DEET, caffeine, tobacco; antibiotics, acetaminophen, etc.

Biodegradation is one of the major pathways of removal. But not sure of fate or which of the processes that may work better.

Removal—means parent compound does not survive the process, but there are end-product compounds, or possible pathways to combine back to parent compound.

Primary/secondary treatment aren't removing as much of these compounds as other processes—eg ozonization.

Correlated with sludge retention time & nutrient removal. Some compounds need up to or more than 15 days retention, others degrade in 3 days. In nutrient removal, some compounds can combine with bacteria to create ammonia oxidizing bacteria.

Aim of her project to investigate the removal of these compounds in six WWTP in the NH area. Questions—what is being detected, how does design influence removal, what are the effects on the NH estuary.

Looked particularly at secondary treatment and disinfection.

Results—a lot of the compounds were detected in the facilities, influent & effluent. 15 of the compounds increased in the effluent. Biggest issue was matrix issues—dirtier influent may have masked the concentrations of compounds.

14 of the compounds were found in the bay—most of them personal care products, esp. caffeine.

Good removal of analgesics, antibiotics, stimulants and fire retardants. Biodegradation is the primary way they are removed. Caffeine did not get removed well. Antibiotics, anticonvulsants and fire retardants remained in effluents. But after chlorination, less of them (but may have changed to other compounds).

Sludge: antibiotics, DEET, SSRI and fire retardants were in every sludge sample, but overall, anoxic and oxidation treatment removed more of them—there was reduction in concentrations in all treatment plant. Possible that advanced biological treatment would further reduce compounds.

Amy Hunter, Tufts School of Engineering PhD Candidate: Pharma biotransformation by Denitrifiers

Pharmaceutically active compounds—CECs. Better detection. Research on endocrine disruptors of aquatic species. Come from excretion, hospitals, topical pharmaceuticals (washing), flushing down the toilet. Also agriculture, industry, aquaculture. No regulations if in non-potable water. Compounds can degrade, but also biotransform and recombine.

Nitrification and denitrification remove these compounds.

Focused research on beta blockers—how are they removed, in which phase of the treatment?

Denitrification removed one of her compounds, but not the other two. Did not have the proper carbon compounds to explore nitrification process effect on the compounds.

Fortuitous metabolism of these compounds had about 40% removal, independent of carbon availability. Operational conditions may impact—so may need research to determine if wwtp should consider adjustments to treatment process to enhance the removal of these compounds, should they be regulated in future.

Ethan Tavosoli, PFAS in wastewater treatment Plants UNH

PFAS are differentiated between polymer & non-polymer. The latter Per and Polyflorinated. Perfluorinated include PFOS and PFOA—fully fluoridated, hydrophobic—or caroxylic or sulfonic acids, hydrophilic, degradable.

Polyflorinated: partially fluoridated, include non-fourteen atoms attached to at least one carbon atom. Ex. FTOH. Can degrade.

Polymers—large molecules formed by many identical smaller ones in repeating pattern hydrophobic.

Measured 18 terminal end compounds and 6 precursors (although more in the environment). Four of the 18 have limits in drinking water between 11-18 ppt.

PFAS can cause elevated cholesterol, obesity. Don't know about effect of other PFAS constituents and lack toxicity values.

Have limits for some PFAS in drinking water, but not for others and not for different environments, like soil and surface water

PFAS can be removed (see above), but don't understand the mechanism, don't get complete degradation, and waste brines remain an issue—what to do with them?

Some PFAS can degrade during WWTreatment, but not sure what happens during secondary treatment.

WWTP are the main source of PFAS in water bodies, but needs more investigation.

Asked what portion of PFAS are detected within WWTP. How does design & operation influence PFAS, is there seasonal variation, and what is the distribution in receiving waters.

Looked at Great Bay in NH. Sampled influent after primary treatment, after secondary, right after disinfection, at effluent pipe, and in sludge.

PFAS-related terminal compounds increased in all treatment plants in both seasons. Measured only 6 precursors, maybe others were in the influent and transformed to the 18 resulting terminal compounds they measured. In the great bay detected 5 terminal compounds, same as in surface water and WWTP. Concentrations increased in July, perhaps because of higher temperature (more microbial activity). The lower concentrations in influent may be due to the noise of the dirtier water masking the incidence of PFAS.

Longer chain compounds tend to go to sludge since hydrophobic. Shorter chain in effluent—hydrophilic. Different wwtp designs and treatment did not affect concentrations.

Opening Session

President: Raymond Vermette. NEWEA has merged with NEWIN—means an innovation council, pitch nights,

Lynn Broaddus, president-elect WEF—sustainable development goals. Resource recovery—water utility of the future program? Identifying recovery of several elements-water, energy, nitrogen phosphorus, biosolids. Workforce challenge—need educated, skilled and diverse workforce. Have a diversity task force. Inflow project—reaches out to historically black colleges.

Kit Krugman - consultant for creative organization changes. Also ED at Women in Innovation (WIN).

- Energy efficiency and innovation

Designing Energy Efficiency & Nitrogen Removal @ Southington CT—Tighe & Bond—

Castellon, PE— Southington rebuilding almost every building in its WWTP, also adding P removal. 15.9 peak hourly flow about 15.9. Built 1957, but updated for increased capacity, sludge handling & removing more stuff.

Upgrading for new phosphorus effluent limits of .2 or less, but also upgrading the original 1957 infrastructure. Increasing energy efficiency as part of the upgrades. Using state water grants & loans.

Nitrification (removing nitrogen) and energy efficiency. Currently not variable speed aerators. Considered fine bubble diffusers with variable frequency as well as surface aerators

Fine bubble: lower operating costs (3%), higher oxygen transfer efficiency. May overaerate, in some cases may need blower building. Potential need for new baffles in each basin. Also need to protect them from ice and sunlight

Surface aerators: lower operating costs (33%), ability to decrease speeds in low flow, no short-circuiting, replace in kind. But less energy efficient. Went with the surface aerators. Upgrade alternatives were controlling using ammonia or dissolved oxygen. Controls are faster for ammonia. But a more complex system, and more expensive to install. Annual costs and energy costs, preventative maintenance, spare parts, etc. Ammonia trigger system had a lower annual cost. Looked also at life cycle costs, and the ammonia system had lower overall life cycle costs.

Tom Renaud Wachusett Pump Station Energy Optimization

Part of the redundancy work of MWRA water supply. Allows Carroll water treatment plant to access water from the Wachusett Aqueduct when the Cosgrove tunnel is taken out of service.

7 pumps, one meant to be back up. Also a surge tank. Completed Feb. 2019. The building is typically unoccupied, used for emergencies and monthly to ensure reliability, testing and training.

Energy: aimed for a zero net energy—using clean energy at or less than the total produced on site.

Building systems and envelop are optimized to minimize energy consumption (to the extent practical) first. Energy has to be generated on site. Have solar panels on the roof. Emergency generators use fossil fuels.

After optimization, develop an energy budget and try to meet it with renewables.

Methods: lower ceiling and insulate heavily. Lighting optimization, smart controls—motion and daylight sensors. Continuous air gap (cold roof), reduces ice dam potential, minimizes heat transfer. Geothermal heating & cooling.

Pumps more than double the energy budget of the facility (67K to 200K kWh).

To meet the energy budget, put PV cells on roof and ground. Produce 84K kWh. Offsets some of the pump costs.

During construction, found ways to improve efficiencies— better solar technology, so with same footprint, getting more energy. So eventually got a 115K kWh solar capacity.

Revenue through energy savings and generation Jk Muir

Focus recently mostly on saving kWh. Question—how to get \$ back from energy projects. One way is energy savings. Another \$ coming in. Additional \$/energy sources.

Get Paid to Upgrade—incentives from state programs

- energy audit—and how to create immediate savings from current equipment. (Pumps)
- billing at on- and off-peak hours. Demand charges.

Generating revenue

- demand response
- Solar—esco to keep from distracting from main functions
- Combined heat and power—using digester gas or just fossil fuel gas. Incentives available.
- Hydro power — becoming more cost effective and applicable in smaller pipes. .7 mgd and 4ft drops now possible financially.
- Net metering, also virtual net metering.

Saving energy in the Uppr Blackstone WWTP

Energy a high percentage of costs. Highest users are aeration and thermal oxydizer

48% of energy consumption is aeration in the bioreactors. First was to change valves to something more efficient (variable) also added fine bubble aeration—saved a significant (10% and more during cold weather) amount of energy and oxygen. Better denitrification.

Also automation resulted in better controls of dissolved oxygen, better nutrient removal.

Thermal Oxydizer upgrade (burning sludge & scrubbing the resulting gases). With a new unit, got more carbon monoxide out more consistently. Gas usage also went down.

1/29 NEWEA—stormwater education & outreach

Cambridge Stormwater management: Outfalls & Outreach. Andrew Goldberg, Kleinfelder

Capital projects—public presentation, website, monthly “coffee talks” for community members impacted by construction. Youth outreach & education. Still hard to catch the public’s attention. Identifying best practices that individual members can take & why they matter.

Debbie (Cambridge staff). Started with The Who what how questions

Who: everyone, all ages;

what

- What is stormwater
- What are the challenges
- What is the city doing
- What can you do

Where do we go—to the people, not just to annual meetings at city hall. Went to events & festivals Cambridge already does

How do we present, convey and share the information

Visually attractive, stand alone product, multi-year use, lightweight, easy assembly

10-year drain infrastructure plan—what projects are planned and why do we need them

- **Cambridge arts river festival**—was not about stormwater—have a large board or double-sided sign and handouts for a booth.
- **Port preparedness** meeting. In both these, had longer stormwater conversations.
- **Fresh Pond** day, put on by the water department—water supply, also had a canine pledge to scoop & throw out.
- **Parking Day**—brought plants that were eventually planted in the stormwater wetland. Created an interactive stormwater model demonstrating (with water to pour in) to show the difference between separated and combined sewers. Highly effective conversation starter.
- **Bow Tie Ride** (cyclists)—showing the riders another way to make an environmental impact
- **City PSA**

Tips—don’t have to reinvent the wheel. Borrow from MWRA materials (Dwayne the Storm Drain). Use city events.

Developing stormwater curricula for 5th graders WPI students

Worked into science standards for 5th graders.

Objectives: find out science standards, lesson plans, curriculum. Use watershed curriculum WPI already developed, but make it shorter to fit MCAS schedule. Finally, create a curriculum & share.

Focused on hands-on activities to keep the students engaged. Shortened to six lessons. MCAS questions don’t align with stormwater and water cycle information. Teachers really enjoy having guest speakers, but hard to get connections to get it done.

Bio retention in Dover, NH Kat Rosa, Kleinfelder; Danielle DiRuzza, MWRA; Gretchen Young, Dover DPW

NEWEA young professionals project—2018 in RI—community rain garden; in 2019 Dover. Wanted a project that had multiple benefits, took advantage of opportunities, and was practical. Berry Brook watershed was regularly flooding neighborhoods, and were willing to overlay nutrient removal.

Highly impervious area. Also have aging water infrastructure, potholes, and have to deal with those. Nutrient removal doesn't excite city council members.

DPW can mow grass, sweep streets and suck up stuff from catch basins really well. Filtering catch basin requires no special maintenance and isn't that complicated to install. Looking to add BMPs as standard practice—getting infiltration where possible.

YP's took an overgrown rain garden, cleaned it out & made it more grassy to allow for better maintenance. Outreach to neighbors to events, to explain what doing, kids goodies and a water testing activity. Toured the brook and water treatment plant. Will be doing more youth education and community connectors involved in future projects.

Dover DPW is taking opportunities with marginal costs to gain extensive phosphorus removal all over the city.

Stormwater education in and out of the classroom Meg Tabacsko, Danielle DiRuzza, MWRA; Revere's Don Ciaramella, Kori O'Hara

MWRA school education program goes to communities, but what's online is available to everyone in New England. Meg does teacher trainings in the summer.

Demonstrates toilet prop. Bottle agitation of toilet paper. Then a tissue. Then 'flushable' wipe. Some teachers keep the latter two for a year and have the kids shake the bottles every day!

Don Ciaramella of Revere—lot of his residents don't know difference between a storm drain and a sewer. Needs to be part of the curriculum. In Revere, like many communities, the storm drains were in poor repair and undersized. Also not cleaned out regularly. Noticed lots of trash in the catch basins and streams. Thought best way to keep it from filling up again with trash was to reach the kids—stumbled on Meg's program. Started meeting principals around town. Then sent them a GIS map of where the stormwater system was near the school—easy to find stuff that needs some work (pickup, etc.). Do some preparation—the heavy work has to be done before the kids get there. Stops the trucks before kids get there. Pop catch basin covers & see what is there. Demonstrate rebuilding a catch basin; CCTV truck (let the kids run the remote control truck); hand out little plastic hard hats; Hopes that the children tell their parents. Encourages staff to participate at the schools. Wants to do "adopt a catch basin" program.

No longer dealing with SSOs, but gets stormwater flooding complaints all the time.
Meg: get a teacher champion & they will promote.

1/31 Merrimack River Watershed Council workshop: State of the Waters

Welcome remarks by Dan Graovac, president of Merrimack River Watershed Council Board of Directors

Federal legislative update, U.S. Rep. Lori Trahan

CSOs down about 600mg. Why?

1. Less intense rain storms
2. Manchester infrastructure improvements

Rep. Trahan: went to screening of Troubled Waters on the Merrimack.

Clean water & recreation on the Merrimack. Met last year with the Army Corps and constituents at Lowell WWTP. Looking for wastewater infrastructure aid from Feds—now only loans, but no grants. Wants to bring back grants. Billion dollar problems. Filed “stop sewerage overflow act” with republican colleague. Would increase funding for sewer grants, means-tested. Got some funding in the FY20 budget. Infrastructure package before the house includes CWSRF funding increase and grants. Also drinking water infrastructure \$, and PFAS testing.

Rep. Linda Dean Campbell sponsor of the CSO notification bill with Provost and Jehlen. Currently in House Ways & Means and anticipates it will pass this session. Will require a lot of data collection. Encourages everyone to write representatives to get the bill passed.

First session: Next gen pollution

Dr. Wendy Heiger-Bernays, Clinical Professor of Environmental Health Boston University, **What's in the Merrimack?**

Perspective of human health is the key to motivate action. Drinking water source for over 550,000 people; recreational resource, food supply—irrigation and shellfish. But also an avenue for “waste removal”. +/- 176mgd heads into Merrimack. Not just CSOs.

- What's in the Merrimack that's harmful to health? 1891–typhoid fever in Lowell vs. Manchester. Sources: WWTP, CSOs, Industrial discharges, stormwater & runoff.
 - Bacteria
 - Chemicals
 - Pharmaceuticals
 - PFAS
 - Nanoparticles, microplastics
 - Nutrients
- Don't know exactly what's in the water.
 - Test for a handful of microbials and handful of toxic chemicals, but a gap between testing and what's already in the water.
 - What else may be in the water?
 - Viruses, some other bacteria
 - Physical contaminants—microplastics, nanoparticles, radioactivity
 - Metals, salts—some tested, not all
 - Toxic chemicals—pesticides, PFAS, petroleum, industrial chemicals, triclosan, pharmaceuticals—not all tested.
- How might people be impacted?
 - Pharmaceutical use is increasing over time. Over 45% uses one or more prescription drugs, and over-the-counter not measured. Older populations as high as 85%. Often excreted.
 - Commonly detected: high blood pressure meds, antidepressants, ulcer meds, cholesterol lowering drugs, antibiotics, epileptic drugs, Tylenol, caffeine, sucralose.
- What data are needed to prioritize problems & solutions?
 - Need to get good data. Testing needs to be comprehensive and reflect what's going in to the water.
 - May need better wastewater treatment—but expensive. May also need to focus on what is going in to the pipes.

Weile Yan, Associate Professor Associate Professor, University of Massachusetts Lowell,
microplastics in water sources

Plastic leakage in production—>use—>recycling—>production.

Over 90% of microplastic to oceans—much from East Asia, but then US, Brazil, North Africa, South Africa.

Packaging 40%—followed by textiles and construction. Waste since 1950–6.3 billion tons. Close to 80% is land filled. 12% incinerated. 9% recycled. Ocean: 10 million tons/year. 5/25 trillion pieces floating. 100,000 pieces per meter of shoreline.

Why do microplastics matter? More abundant; more easily ingested; higher surface areas for toxins and pathogens.

Sources, significant: tires & city dust, personal care products (microbeads), synthetic textiles (35%). Textile plastic fibers—broken down in the washing machine—most pass through sewage treatment plants.

Looking at freshwater concentrations (great lakes) —less known. Common sources: sewage, urban runoff, industry discharge, litter. 90% sinks to the bottom. Tend to stay close to shore. Issue for the Midwest cities—this is also where the drinking water intake is. Moves with water—dynamic.

Impact of wastewater treatment and management: Predominantly fiber (synthetic textiles)—not designed to remove microplastics, but do a pretty good job of removing microplastics. Average over 90% of microplastics are captured in the solids. Less than 2% in effluent. Issue is the sheer volume of effluent. Removal is most efficient when have membrane bio-reactors. Tertiary is slightly less good. Traditional to secondary treatment leaves more micro fibers in the effluent.

Many gaps in knowledge about impacts, identification of microplastics in the Merrimack. Need more data before move to actions.

- Standardized sampling and ID protocols
- Transport mechanisms and modeling
- Effects of weathering and degradation
- Interaction with biota

Greg Coyle, Staff Engineer, City of Lowell, bacteria in the Merrimack

First job of Lowell water is to keep everything running. Need protocols to start addressing microcontaminants.

1. Which bacteria? Pathogens—cholera, typhoid, polio, dysentery, giardiasis, cryptosporidiosis. Why WWT was created. Indicated species are associated with pathogens, but easier to identify—cold forms and E.Coli
 - a. Water born outbreaks since 2009—three in MA
 - b. Sources: CSOs, stormwater, livestock & pet waste, wildlife, septic systems
 - c. Where does it go? Ocean, sediments—can decay.
2. When is the river safe to use?
 - . 24-72 hours
 - a. But dynamic, depends on temperature, turbidity, sunlight
 - b. Not all risks are CSO-related, need robust monitoring
3. Monitoring 2018-19 Lowell to Lawrence—wet & dry, before, during & after CSO, 20 locations...
 - . Exceedances mostly wet weather related.

- a. For the most part, river is low in indicator bacteria.
 - b. Even during wet weather, Lowell WWTP is under the maximum reference for a single sample.
 - c. On Lowell-Dracut line, just below the Lowell WWTP, higher wet weather —some exceedances.
 - d. Newar Tewksbury WWTP, higher levels in wet weather. Return quickly to safe. Is captured at the Essex Dam later.
4. Plea for help in continuously monitoring the river. Sampling manually is expensive, difficult when wet. Takes 18 hours minimum to get a result—often get results 30 days later. Need new technology to inform public—found a French in-situ testing device. Lowell Water is deploying this spring.

Mindi Messmer, founder of New Hampshire Safe Water Alliance, PFAS contamination in New Hampshire

Rare cancers in her community 2014—cluster. Ran for NH state house. NH has the highest rate of pediatric, bladder, esophageal and breast cancer in the nation. Got 15 bills passed to determine source of the issue—arsenic, etc.

PFAS—contamination in drinking water perhaps most common exposure. Mostly manufacturing, fire fighting foams, WWTP and landfills. 98% of people over age of 12 have PFAS. Superfund site in center of cancer cluster—DoD dump site, and foam residue in streams at coastal area. Air emissions/drinking water contaminated near Bedford, Litchfield manufacturing. Landfill leachate can be put in rivers via WWTP. Many landfills in NH doing similar things.

Passing medical monitoring bill, registry of fire fighting foam, more MCLs for PFAS, blood testing, bottled water labeling for PFAS, BTBE and arsenic, shellfish PFAS consumption standards, wellhead protection areas & funding.

Second session: Water quality solutions

Trevor Smith, Lead Designer at Land Escapes, green engineering alternatives

Rebuild water cycle and carbon cycle to best respond to climate change. Water that took 3 weeks to reach the river is now getting there within 3 hours. Flooding is a symptom of an infiltration problem. Stormwater is the biggest source of ocean pollution. Velocity in a hilly community (Arlington) tears up the pavement.

Combined sewers—takes stormwater & treats before heads into receiving water. But the older systems and higher amounts of water lead to CSOs

Green Stormwater Infrastructure—restore the water cycle. Treat water where it falls.

- Trees
- Need for more GI professionals—opportunity for job training and increasing skilled workforce National Green Infrastructure Certification Program (ngicp)—on par with LEED
- Argues for signage to educate on what the system is doing.

Heather McMann, Executive Director at Groundwork Lawrence, community and volunteer engagement

Groundwork Lawrence—how to get engagement and buy-in. Changing systems, places, lives. Mostly asphalt in Lawrence—now adding parks. 20 groundwork organizations, focused on youth, green jobs, creating green spaces.

Spicket river confluence with Merrimack — trashed. Question of how to make it an asset for the community, drinking, recreation & health. Learn what's there, listen to the people there—need resident volunteers to do the work—and celebrate any successes. Created a spicket river greenway—momentum now for a rail trail. Living rooms, churches, community centers. Talked about the greenway as if it already existed. Created a clean spicket campaign—got funding for “no dumping” signage. Annual cleanup every spring, mostly youth. Created youth jobs to clean up in summer, building and maintaining green infra. Took vacant lot—brown field—created a park, playground, community garden & the greenway in it. (2006). Then a skate park, eighth graders requested. Covanta site—state wanted an incinerator there. Brown field. Now greenway, playground—celebrate annually. Methuen rail trail connects. Merrimack River Trail is next. Bring people to river, make safe for them. Make sure politicians are at the annual clean-ups and see the youth. Turning liabilities into assets. Also do a walk/run, which shows people where the new parks are. Bring in schools, and kids create & maintain the GI.

Diana DiZoglio, State Senator First Essex District (Haverhill), legislative initiatives

Got \$150K to create Merrimack River District Commission and a colored flagging system for the river. Modeled on the CRWA system. Piloting this summer.