



Joint with WSCAC

Minutes

October 7, 2022

*Remote via zoom*

**Attendees:**

**WAC Members:** **Wayne Chouinard** (Chair, Town of Arlington), Kannan Vembu (Vice Chair), **Adriana Cillo** (BWSC), **Craig Allen**, **Dan Winograd**, **George Atallah**, **James Guiod** (AB), Karen Lachmayr, Martin Pillsbury, **Mary Adelstein**, **Philip Ashcroft**, **Stephen Greene**, Taber Keally (NepRWA) (Members in attendance in **bold**)

**WSCAC Members:** **Paul Lauenstein**, **Jerry Eves** (Trout Unlimited), **Bill Kiley** (BWSC), **Bill Copithorne** (Town of Arlington), **Michael Baram**, **Janet Rothrock** (LWV), **James Guiod** (MWRA Adv. Bd.), Whitney Beals, Steve Daunais, Bruce Spencer, Martin Pillsbury, Martha Morgan, Bill Fadden (Members in attendance in **bold**)

**Guests:** Wendy Leo, Dave Duest, Christian Murphy, Sally Carroll, Katie Ronan, Doug Hersh, Steve Estes-Smargiassi (MWRA), Tom Fitzgerald (Newton), Cormac McCarthy (Practical Applications, Inc.), Sharon Lee (MassDEP), Vandana Rao (EEA), Juliet Simpson (MIT SEA Grant, OMSAP), Alison Field-Juma (OARS), David White (Arlington ConComm)

**Staff:** Andreae Downs (WAC), Lexi Dewey (WSCAC),

**WAC VOTE:** June minutes approved

**WSCAC VOTE:** June and September joint minutes approved

## **REPORTS:**

### **MWRA: Steve Estes-Smargiassi:**

- The drought continues but several regions have been downgraded to Level I due to recent rain events. MWRA remains in the normal operating range. They don't anticipate going below normal unless the drought continues over the next 6 months. Message to MWRA communities through their webpage is that MWRA is not in a drought, yet to use water efficiently.
- Fall sampling for lead and copper is ongoing. EPA's new requirements include that any community with homes above the action level of 15 ppb (parts per billion) must provide a 24-hour public notice similar to a confirmed E. Coli result. "Find and fix" is the MWRA message to towns with individual homes that have elevated lead levels. MWRA will complete additional sampling where high levels are found to ensure that the water has the proper alkalinity.

### **Wendy Leo:**

- Medium WWTP Group Permit issued & applies to Clinton. No changes between draft and final. PFAS testing included, NACWA is challenging. It was expected, but expensive. MWRA is doing PFAS testing in-house, so not as expensive. In effect Jan. 1. Lower limit for ammonia in certain seasons, but Clinton already meets that.
- CSO work continues on outfalls that didn't meet the goals in the Long-Term Control Plan. Reports coming out:
  - Annual Reports coming out: I&I, Demand Management, Pretreatment, and Operations
  - Sewage notifications are very few due to the drought. Somerville marginal was the only outfall to discharge.
- Oxygen in Mass Bay is lower than usual, continuing a long-term trend. Not outfall related; could be due to warming of Mass Bay.
- Clinton is replacing big pumps soon. Pump stations being upgraded. Braintree

Weymouth starts construction soon.

- Chelsea renovations continue and many staff are working remotely during the construction
- Steve Rhode & Biobot team were honored as Harbor Heroes by Save the Harbor/Save the Bay.

**Katie Ronan:**

- MWRA staff are preparing 3 reports on water system expansions: the Ipswich basin, the South Shore and several communities in the MetroWest area. The goal is to identify how much water MWRA can provide in these areas, the possible infrastructure that may be needed, its routing, and the cost. The reports should be ready in the next several weeks and will hopefully provide a starting point for discussing conceptual alternatives and costs for interested communities.
- The MWRA Board of Directors and the Advisory Board have both voted to approve an entrance fee waiver for the next five years.
- Environmental justice strategy to incorporate EJ principles to MWRA projects. A new webpage has been developed to share MWRA's EJ strategy.

[mwra.com/02.org/html/EJ.html](http://mwra.com/02.org/html/EJ.html)

The primary EJ focus is currently on the Metro Tunnel Program's DEIR, now under MEPA review, and a pipeline rehabilitation in the Quincy area. EJ efforts include expanded community outreach, interpretation at public meetings, available translation options, and evaluating project impacts to guard against inequities to communities located in project areas. This important work and these principles will be incorporated into all MWRA future projects.

Paul L: Sharon is faced with filtering PFAS from its drinking water or sourcing from MWRA. Sharon's Water Commissioners have not yet decided between funding a multi-million-dollar filtration plant or becoming an MWRA water customer. Katie noted that this is a familiar message from other communities at a drinking water

crossroads near the MWRA service area.

**MWRA Advisory Board: James Guidod:**

- Continue to look at NPDES permitting process in Region 1 and as previously noted, the Advisory Board has hired outside environmental counsel to look at co-permittee language in NPDES permits.
- The finance committee is looking further into the MWRA budgeting process including the challenges in evening out the differing increases in water and sewer rates.
- Staff continue to collect data for the annual Rate Survey. An update will be provided at the November meeting and the Survey will be available in January.
- System expansion is an ongoing hot topic due to the 5-year waiver of the MWRA entrance fee, and the upcoming studies on potential opportunities and costs for towns on the North and South Shore as well as several communities in the MetroWest area.

**PRESENTATION: Update on the Combined Heat and Power Project for the Deer Island Treatment Plant**

David Duest (Director of Wastewater Treatment @Deer Island, & Christian Murphy (Deer Island Program Manager, Engineering)

DI is one of the largest wastewater treatment plants in the country—2nd rel to max design capacity; 5th on average flow conditions. Similar in size to DC waters Blue Plains. Detroit is the largest based on maximum capacity. Chicago is the largest based on average flow conditions. MWRA has always wanted DI to be energy independent.

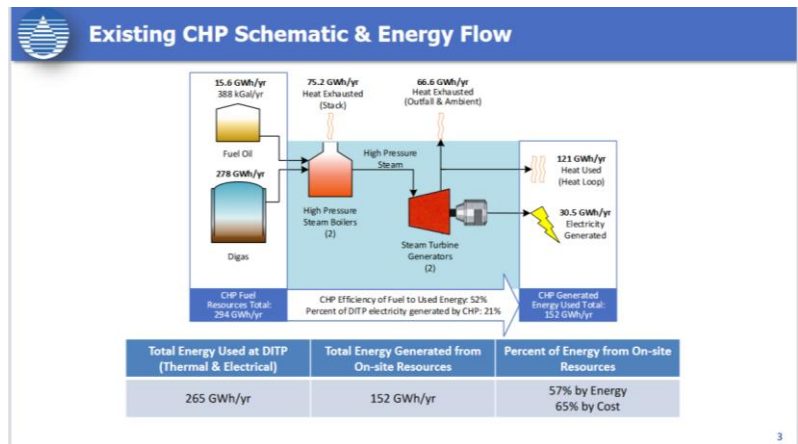
Digester gas is the core of Deer Island's green energy portfolio. As a result, DI avoids purchasing between 6-8 m gallons of fuel oil/year for heat and 26-32m KWH. That's about \$18-26m/year, at 65% self-generated. This green energy keeps rates down. DI budget is about \$60m/year. Without beneficial re-use of digester gas, it would be \$85m/yr.

The Combined Heat & Power plant is 25 years old. It is prudent to now evaluate this plant to decide the course of future capital projects, particularly with an eye to reliability and meeting energy needs economically, and to further maximize on-site energy generation.

Christian Murphy: Worked as consulting engineer before coming to MWRA. His experience included designing a CHP project. He is a licensed PE in MA.

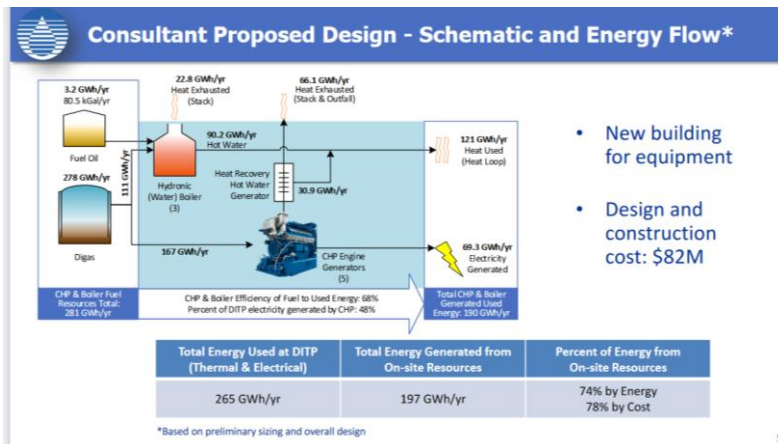
CHP is designed to capture and use as much energy as possible by generating both heat & power from one source. Below is an overview schematic of existing system:

On the left, primary fuel source is digester gas—also some supplemental fuel oil. This is burned to produce high pressure steam, which is put through steam turbine generators. They produce 30.5 gigawatt hours/year in electricity. There is also a lot of waste heat with some being used to heat DI, but much of it is also wasted.



The plant currently generates about 21% of electricity used in DI. Current onsite energy produced is around 57%.

Several technologies were evaluated: combustion turbine (like a jet) and reciprocating spark-ignited engine (like a very large car engine). In the DI system, the reciprocating engines would produce significantly more electricity.



- New building for equipment
- Design and construction cost: \$82M

In this design, the steam is replaced by water boilers, as well as gas to five reciprocating engine generators Primary fuel remains digester gas, along with some fuel oil (less than the current system requires).

The boilers meet part of the plant's heating demand. The engines produce electricity—about 70 GWh/yr.—and exhaust

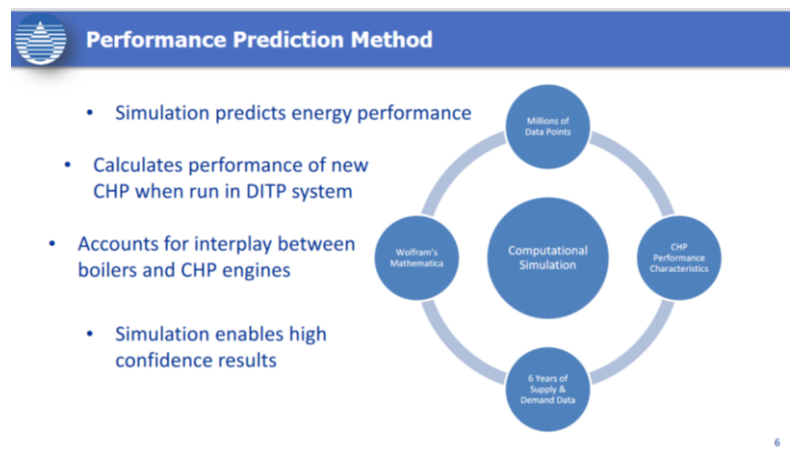
heat. Some of that heat will meet the remaining part of the plant's thermal demand. Will increase the efficiency of fuel to energy that can be used to 68% and increase electricity generated to 48%. It increases percent of energy generated on the island by 74% (78% by cost).

Oil consumption will be decreased as there will be increased onsite generation.

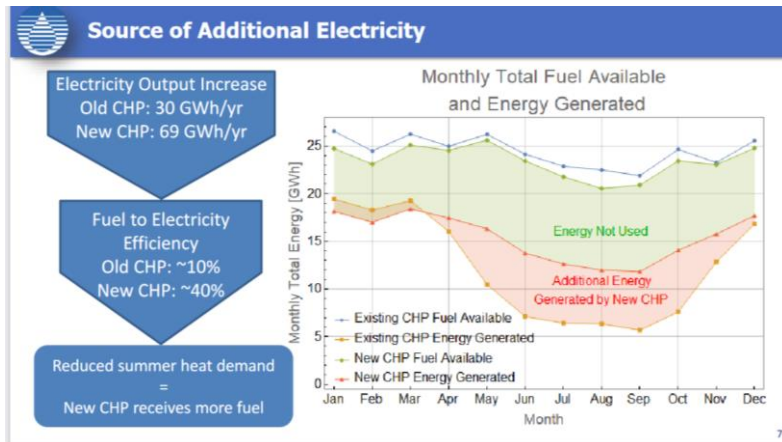
BUT a new building is required. Design and construction would cost an estimated \$82m.

Here is how the calculations of performance were done:

The data is already collected continuously on DI, which is combined with performance characteristics of the reciprocating engines. It considers the interplay of the boilers and engines because the need to keep the digesters warm is nearly constant. So where does this additional energy come from?



Two areas: Primarily, the efficiency of the engines—in the current system, the efficiency of fuel to electricity is about 10%. The new system should have an efficiency rating of

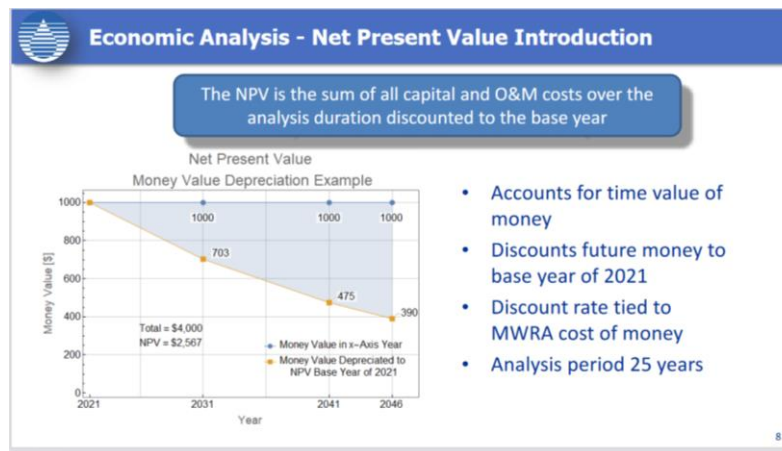


~40%

Why? This plot shows that in the summer, the digesters don't need as much heat (for the biological processes to work best). The energy generated and the useful energy are in the area between the orange and the red lines (shaded red). In the summer months, digester gas can be diverted to the reciprocating

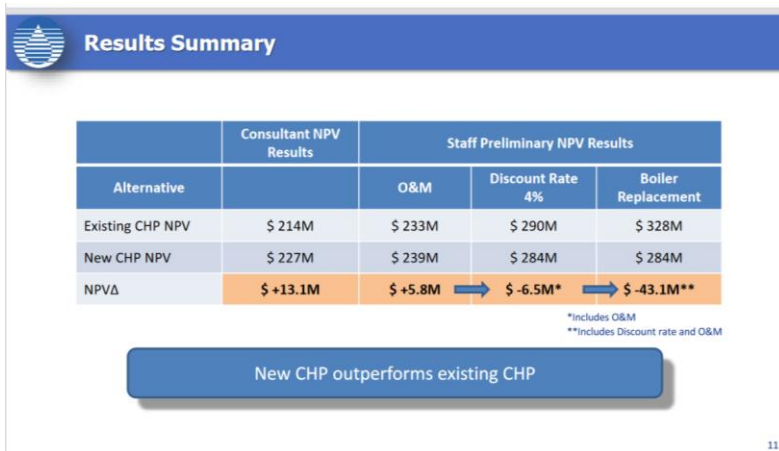
engines and can produce additional useful electricity.

The economics are another area of importance. This looks at the system over a 25-year analysis period, and figures in the value of money and how it depreciates in the future:



Initial net-present-value of new plant vs. old plant resulted in a 6% difference (more) that the new plant would cost (\$13.1m). Statistically, "noise." doesn't account for environmental benefits, which are important to the MWRA as an environmental organization.

Staff did in-house performance and economic simulation. They built upon the consultant's analysis by adjusting O&M costs, lowering the discount rate to 4% (which financial group said was defensible) and the need to change out the CHP at 40 years (not 55, as assumed by the consultant): MWRA staff analysis came out in positive territory.



(Negative numbers in this chart are net positive for MWRA)

Industry standard life of boilers in WWTP is about 40 years. Consultants used an extended life estimate of 55 years, with NO additional capital expenses estimated. That puts the end of the plant's useful life just outside of their

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analysis. Staff used the standard of 40-year life instead. Staff analysis puts the total benefit at \$43.1m.

Staff and the consultant assumed electricity will increase in cost by ~2%/year, based on federal government inflation estimates. If electricity in fact increases in price by more than 2%, the plant is additionally cost-beneficial.

But MWRA considers more than just economic benefits: A new plant will save 16,800 metric tons of greenhouse gasses annually—300k gallons/year of fuel oil and 40GW/year of electricity. Economic harm from each metric ton not emitted is about \$46/metric ton (very conservative) --so social benefit of about \$775,000/year.

A new plant also increases on-site power generation from 57%-74% (or by cost 65%-78%), moving the plant toward its goal of being Net Zero. It also eliminates 30 truck trips through Winthrop.

High pressure steam is also eliminated; this is a hazardous system—and it is difficult to hire qualified engineers. With a hot water system, the pool of new hires that can help MWRA repair and maintain this system is larger—also cheaper.

The combined benefits, economic & environmental, led the MWRA to continue to the design phase of this project.

**Questions:**

Are all 53 buildings on DI heated centrally? Yes, including the digesters—which take



most of the heat.

What's the timeline for this project to completion?

The analysis had the new CHP to be operational in year 5. Next step is detailed design. Completion in 6-7 years. Lead time is needed for the engines.

Will the boilers be offline at any point? No, there will be no downtime because the digesters require heat 24/7. That's the advantage of a new building.

Waste heat going out the stack in the new process—22.8GWh/yr. from the boilers, plus from stack & outfall—can that be captured & beneficially used?

The new (water or hydronic) boilers are 80% efficient; can't capture that heat. They just have to exhaust—not high enough quality to be recaptured, but haven't looked into that yet in any detail.

CHP generator waste heat—stack heat is after the best technology out there for capturing heat already applied. In the reciprocating engines—lower-quality heat. Oil coolers, thermal charging coolers, etc. Lower temperatures, but opportunity there. MWRA will consider recapturing additional energy in the design phase.

Would heat pump technology be useful in this concept?

Heat pumps can't be used for very high temps yet. But may be able to concentrate some waste heat. Currently, the water running around the plant is about 220 degrees.

Steve:

The pressure is on Dave and Christian to keep this project moving.

MWRA is looking at heat pumps in several MWRA locations, including campuses where old oil or diesel boilers are being replaced, just to reduce GHG.

Are there financial savings to be had also in heat pump installations? Not right now—but as they get more efficient, probably. New incentives, gradually reducing the costs of heat pumps, are beginning to help.

Will more hot water be entering the outfall as a result of the new plant? No—actually less. The water leaving the outfall will have less thermal energy than with the current

plant because more of it is being used.

In the design, did you assume all 5 engines run at the same time?

We assume that MWRA will ramp up engines based on digester gas available, and if there's not enough, then the hot water boiler is engaged. All 5 engines will run only a small time during the whole year. The engines do not have full redundancy. It is an economic system, not a critical system. The boiler is critical, so will have redundancy.

Can MWRA take advantage of the 30% refund for energy efficiency?

MWRA expects to reap some. They will pursue every avenue to reduce the overall cost to ratepayers. Staff have met with the Dept. of Energy, EPA, and Eversource to discuss possible funding opportunities.

Are these rebates and incentives factored into the analysis?

No—not the new ones. Just the \$6m, longstanding Eversource incentive. The other ones came on later—this is a very conservative, worst-case scenario.

## Director's Report October 2022

# EBC webinar--Microplastics, the next little big thing 9/20

### Gary Hunt--Microplastics Defined, sources & environmental/health effects

Def: solid polymer particles greater than 1 nm and less than 5 millimeters

These are beads, films, fibers, fragment, foams, tire wear particles.

Properties: hydrophobic, variable densities and compositions, sizes, shapes and additives (these includes BPA, Phthalates, Alkylphenols)



### Polymer Production Data

(Source: Plastics Europe 2018)

- Polypropylene- 19.3 %
- Low Density Polyethylene - 17.5%
- High Density Polyethylene - 12.3%
- Polyvinyl Chloride-10.2%
- Polyurethane-7.7%
- Polyester- 7.4%
- Polystyrene- 6.6%

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Plastics break down, enter water--various pathways, including WWTP  
Ubiquitous--in the global atmosphere, which is an important pathway--deposited with precipitation & otherwise. The smaller the particle, the further it can travel.

Found in Arctic snow. Highest concentrations are off the coast of cities.

Toxicity--affected by polymer size, shape type  
MP readily attract organic chemicals; can transfer between tissues and cells, including lungs

Vectors for metals, pollutants like PAHs, PCBs, PFAS, DDT & other pesticides  
Retained in WWTP and can concentrate bacteria


Human health routes are inhalation of airborne particles and ingestion of food--dust in soils and indoor, personal care products, clothing fibers.

In the body--may cause adverse effects by lodging in organs with toxins or biota. Can be ingested and enter the gut, liver, spleen and kidneys. Affect immune systems, inflame lungs.

Found in human feces--related to inflammatory bowel disease. Infant exposure is higher. Found in human blood.

In a London case study 92% of particles were from "wear down" of plastic textiles, clothing, carpets, upholstery.

Can be ingested by organisms and accumulate up the food chain. Aquatic effects--relatively new. Filter feeders may be most susceptible.

	
<b>Annual Uptake - MP Total</b>	
Mollusks	0-27,825
Crustaceans	206-17,716
Fish	31-8323
<b>Levels - MP/gram</b>	
Mollusks	1-10.5
Crustaceans	0.1-8.6
Fish	0-2.9

Not enough evidence to determine risks.

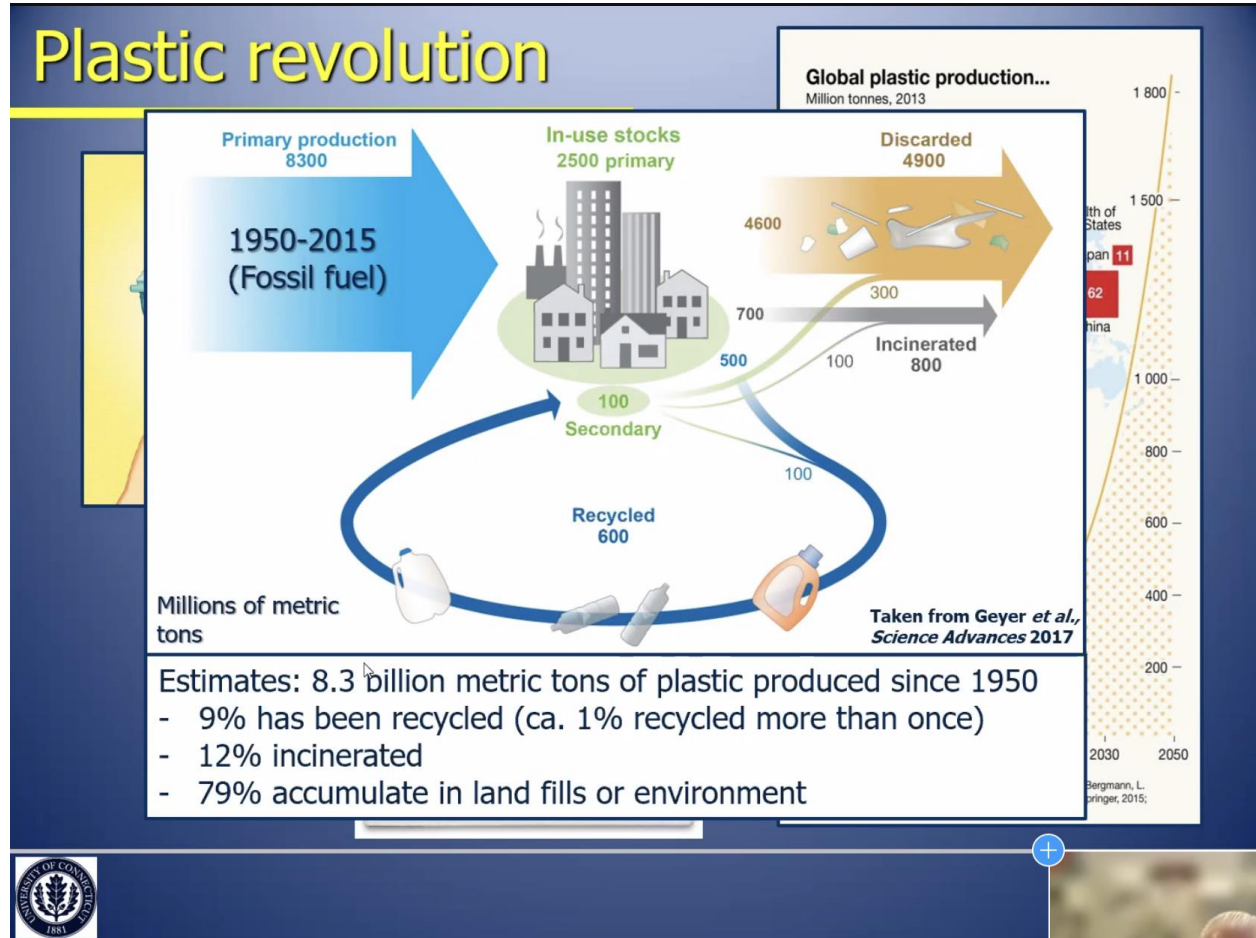
**Charles Neslund--Analytical Considerations for Microplastics.**

2 groups of microplastics--those directly created and those from degradation of larger items  
They contain on average 4% of additives, and can adsorb other contaminants.

One challenge--MPs are so ubiquitous it's difficult to establish a plastic-free environment.

Different detection techniques allow for more data. Details are specialized, and I can share the slides to those interested.

J. Evan Ward--Microplastics in the Marine Environment



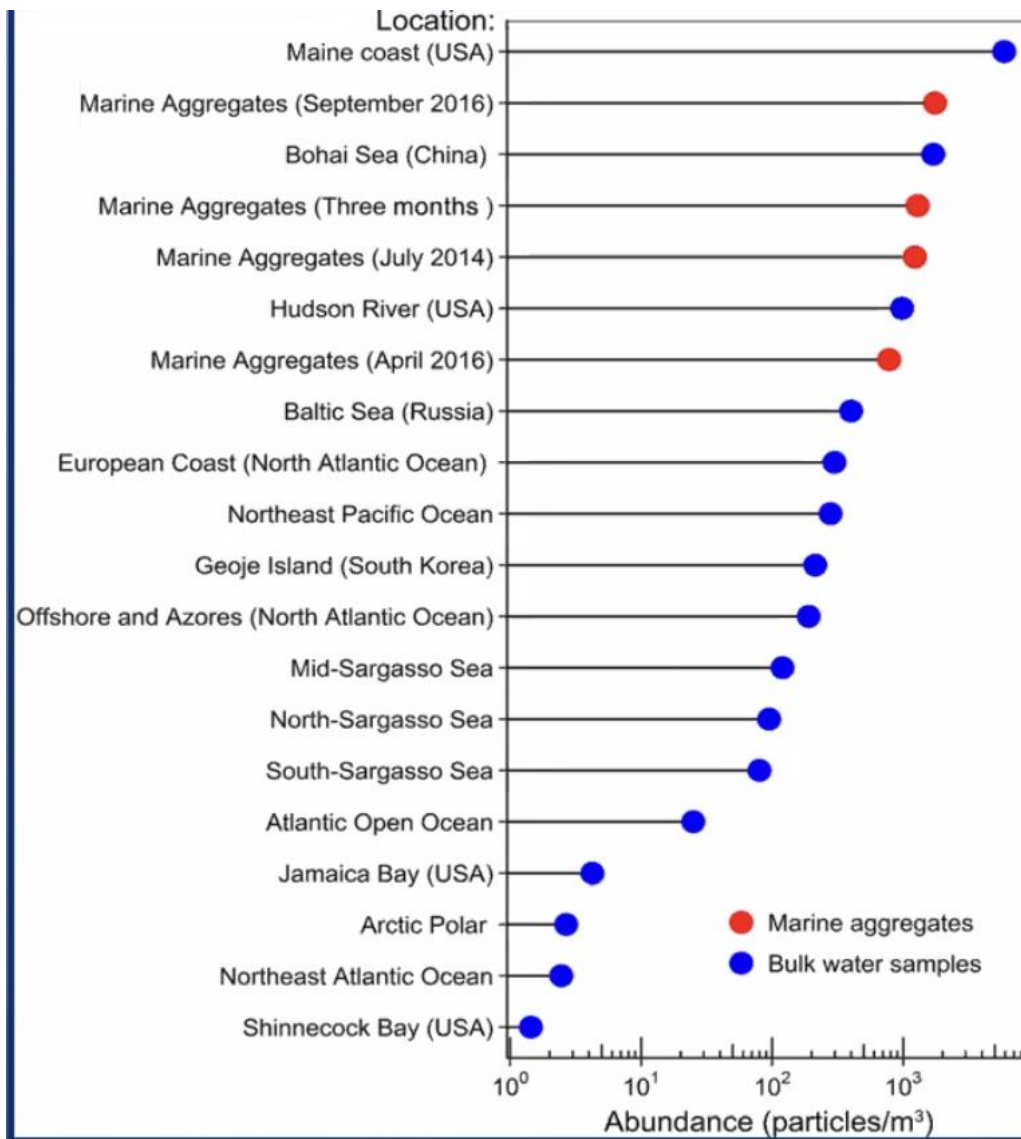
Rest--dumped into the ocean, 8 million MT of plastic waste. 2022 110 million MT

Macroplastics--entangle megafauna, esp. Turtles (think they are jellyfish), birds, seals, crabs, fish--physically obstruct animal guts.

Microplastics--beads have mostly been banned from personal care products, so major category left is fragmented macroplastics.

In the ocean, methods are varied and not yet standardized.

Verified concentrations:



From: Zhao et al. 2018 (ES&T)

Suspended concentrations are low, but this is likely an underestimate, because you can only test down to 1/1000 inch.

Ingestion/uptake: Filter feeders, fishes, even deep-sea animals.

Lab studies of microplastics show negative effects--on feeding, energy reserves, inflammation, toxicity

But studies used virgin, not aged, plastics. Used higher levels than are in environment, but for short periods.

Bivalves--filter feeders--potential to accumulate microplastics. Consumed whole by humans (and other animals)

Study of bivalve feeding--clams and oysters spit out some microplastic particles.

### **Dianne Phillips--Evolving Legal Issues for microplastics**

Internationally, 27 countries are banning single-use plastics, particularly plastic bags, and enacting extended producer responsibility (43 countries for plastic bags), and 65 have extended producer responsibility in 63 countries (bottle bills, take-backs)

Save Our Seas Act 2020 (US)

Creates mechanisms for research, requires federal agencies to collaborate on reports, codifies international cooperation on marine debris. EPA news to develop a strategy to improve post-consumer materials management (recycling). Includes grants for wastewater.

## U.S. Federal Initiatives

- Policies & Studies

- [National Recycling Strategy](#): A circular economy reduces material use, redesigns materials to be less resource intensive, and recaptures “waste” as a resource to manufacture new materials and products. The National Recycling Strategy is the first in a series of strategies to support EPA’s vision of a circular economy for all.
- EPA’s [Sustainable Materials Management Programs](#): Encourages partners; prior “[WasteWise](#)” to promote the use and reuse of materials more productively over their entire life cycles (1994-2020)
- EPA’s [Trash Free Waters](#) program ([Save Our Seas 2.0 Act of 2020](#))
  - Coordination with NOAA’s [Marine Debris Program](#) (2006)
  - Prevention, Removal, Research
  - Voluntary Partnerships
  - Section 132: [Report on Microfiber Pollution \(Comments Due October 17, 2022\)](#)

Other statutes: Microbead-Free Waters Act of 2015. Now in effect. Applies to toothpaste, cosmetics, exfoliators, etc.

Also, federal regulation by petition (Center for Biological Diversity vs. EPA) --only really works if EPA or federal agency has a non-discretionary duty. This one requires EPA to classify PVC as a hazardous waste. Was settled, and EPA will decide in Jan. 2023



State actions--CA leads the way:

- Microbeads nuisance prevention
- Ocean microplastics strategy by Dec. 2025
- Requires definition and addition of microplastics in state drinking water regulations, including a standard testing method.
- Plastic pollution prevention and packaging producer responsibility:
  - fees/regulations on certain manufacturers/importers of plastic consumer goods
  - Must take back materials

Citizen suits--

- Any citizen can provide notice that intend to sue (can use Clean Water Act, Resource Conservation & Recovery Act) --for any pollutant.

Class Actions:

- Borrows methods used in climate change litigation
- Earth Island Institute v Crystal Geyser Water Co.
  - Vs 10 well-known companies linked to 14% of global ocean plastic pollution
  - Failure to warn, design defect, negligence
  - Alleges defendants knew for decades that plastic is not biodegradable or recyclable & harms aquatic & human life
  - No substantive developments since filing
- Litigation on “greenwashing”
- Nestle was able to get a water bottle case dismissed in CA (because should have been federal)

## Conclusions

- Discussions about Microplastics will become more frequent and will follow the path of GHGs and PFAS
- Similar to PFAS, states and private litigants are moving more quickly than federal regulators, including U.S. EPA
- The U.N.'s timeline (binding treaty by 2024) does not appear achievable to me and/or the resultant treaty will involve prolonged timelines for achieving meaningful action
- Similar to PFAS, science & technology advancements must accelerate before comprehensive policy (regulatory) solutions will emerge
- California will continue to lead the way in policy developments, regulation, and litigation



## **Q&A**

Will litigation curb increase in plastic production?

--will take time. Challenging. Source reduction seems to be the resolution.

Do we have removal techniques yet?

--water filters are plastic; most likely method is reverse osmosis. Maybe a bivalve reef. Some bivalves have bacteria in their microbiome that degrades and converts plastic to CO<sub>2</sub>.

Are there microplastics in digested depackaged food waste biosolids?

Studies ongoing.