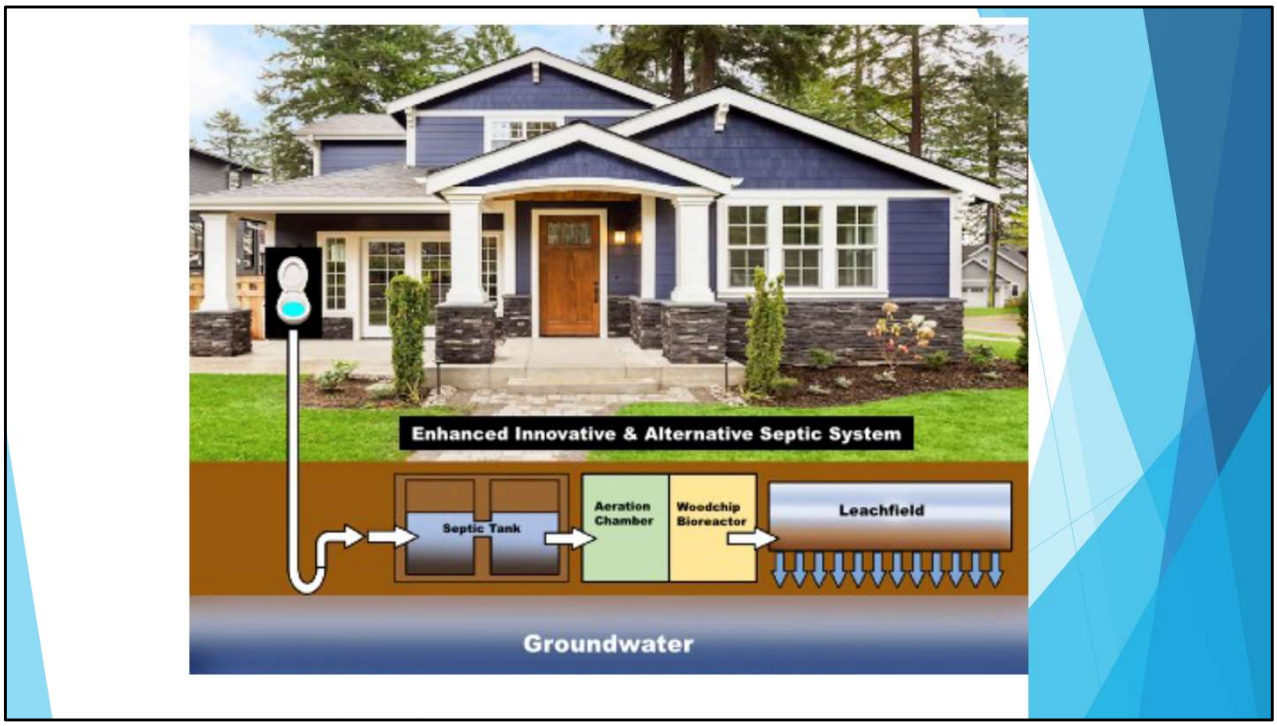
Bruce is a third-generation homeowner on the Cape and is a retired executive recruiter. He leads **NEWEA**'s (New England Water Environment Association) Innovative/Alternative Onsite Wastewater Treatment System **(I/A OWTS) Task Force** which consists of almost three dozen water professionals with individuals from engineering/consulting firms, vendors, towns/counties, NGOs, and academia. *We aim to convene productive collaboration between innovators, water utilities and regulators to enable viable solutions to be brought to market faster and more economically.*

This presentation discusses a **financial model to compare costs of EIAs vs Sewering**, using the **Town of Barnstable** as an example of a logic flow that could be applicable to other towns.

Refinements are expected as better data is developed, and these numbers will evolve.



This is just to review what is happening in an EIA and where the costs may be. This is not the only model, but it does describe the two current provisional permit systems.

In essence, a second tank is installed between the septic tank and the leach field.

Within that second tank is a two-step process. First, the influent is nitrified in an Aeration Chamber. Then it is denitrified and converted to nitrogen gas which is vented into the atmosphere. Nitrogen is 70% of what we breath, anyway, so it is non-toxic.

The Woodchip Bioreactor needs a carbon source which may simply be woodchips. Bugs do the work. Other included equipment includes pumps, tubing and a remote sensor to ensure the pumps are working; this enables remote monitoring via the RME.

When the carbon source is depleted, perhaps in 10-20 years, it is simply a matter of pumping-out, similarly to a septic tank, and replacing the wood chips.

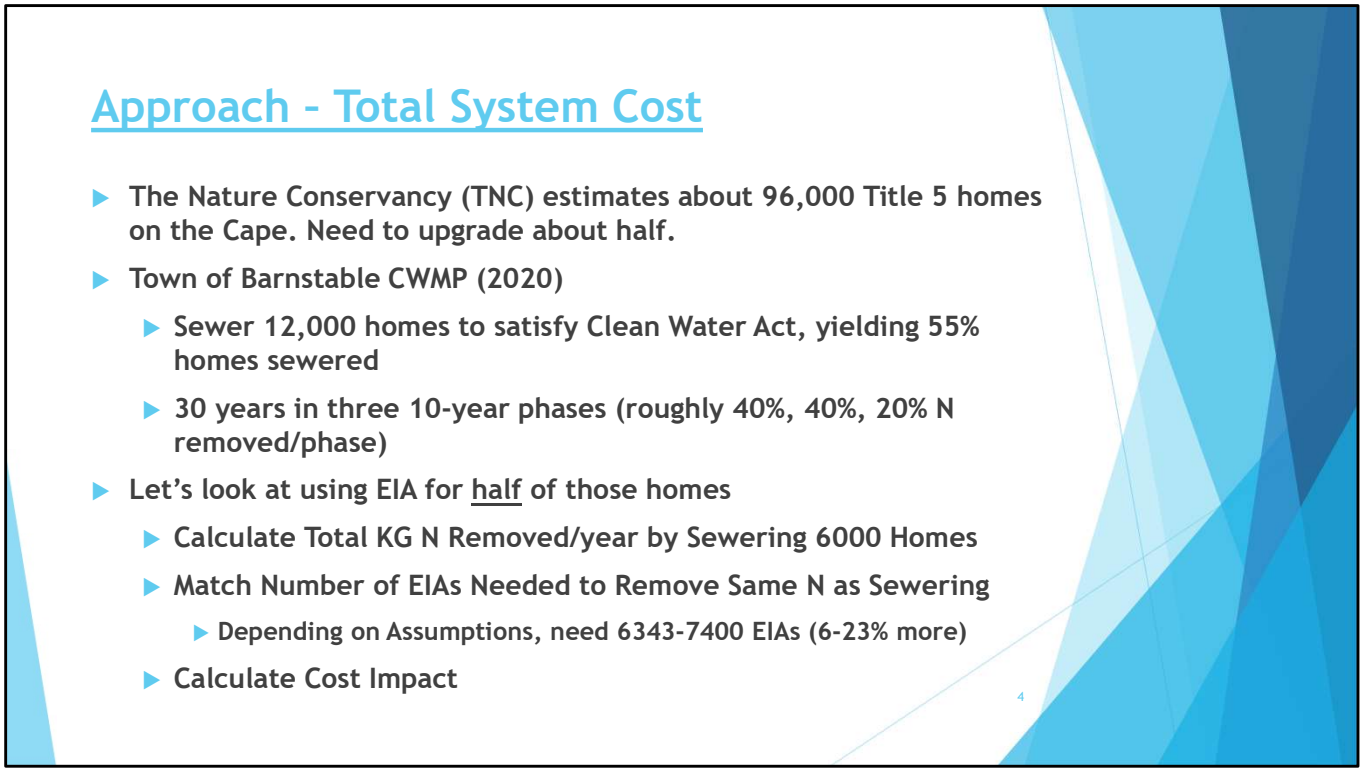
The leach fields in these systems may be slightly smaller than those in a normal Title 5 system.

We believe a **blended (hybrid) solution,** using all the tools in the toolbox, will be the best solution in most cases.

The full picture involves **location value, time value , performance and cost**. This presentation focuses on performance and cost.

Disclaimer: This analysis does NOT include the impacts of future inflation, financing costs and timing.

The objective here is to be generally right. We know these numbers are precisely wrong. If the logic holds, as we learn more we can change assumptions and update the numbers to get closer to reality.



The focus, here, is **total system cost**.

- Divvying up who pays for what is a political discussion.
- Trying to look at all costs except perhaps landscaping (although it may become a convenient plug to round off certain numbers).
- A total cost approach requires allocation assumptions for shared expenses like a treatment plant upgrade.

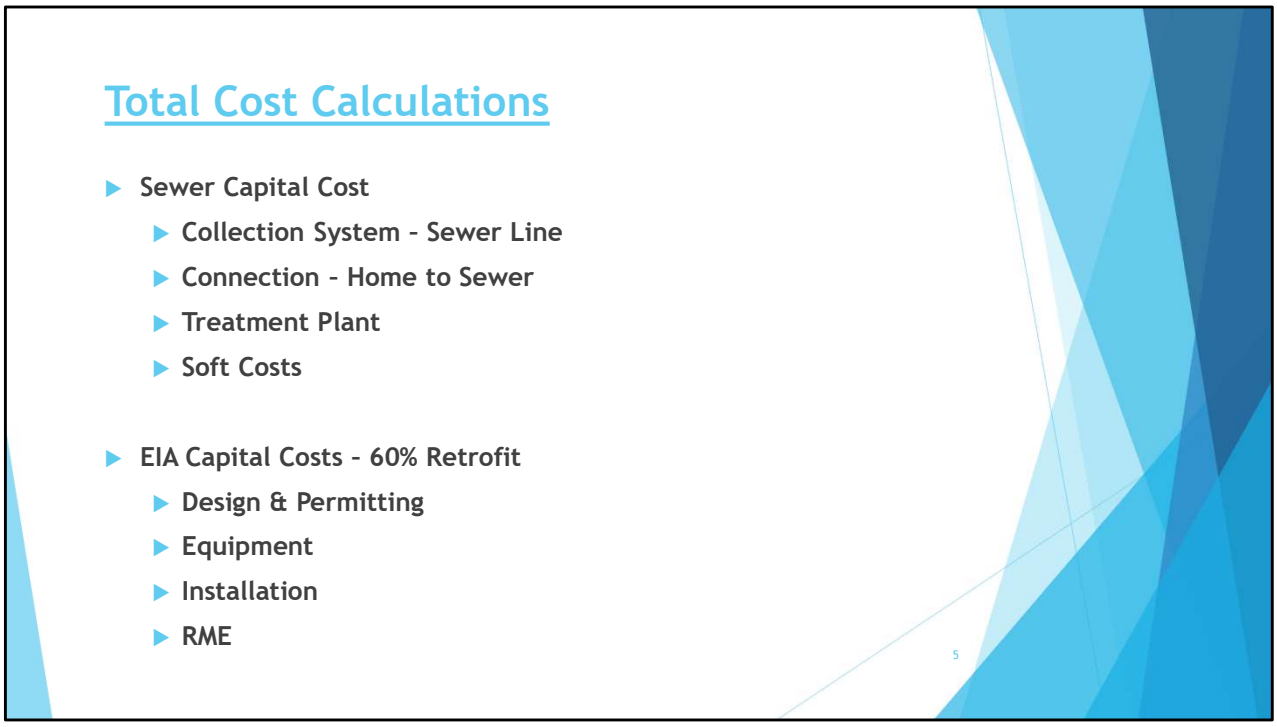
Market Scale per TNC research

- 208 Plan = reduce about ½ of Cape N load.
- About ½ "addressable" homes need upgrade.
- BHW calculation: Assuming a 50/50 split: sewer/EIA, the market opportunity would be about 24,000 EIAs. So a reasonable projection might be 10,000-25,000 EIAs over next 20 years.

Need roughly 10-20% more EIAs to achieve the same kg removal.

Town of Barnstable

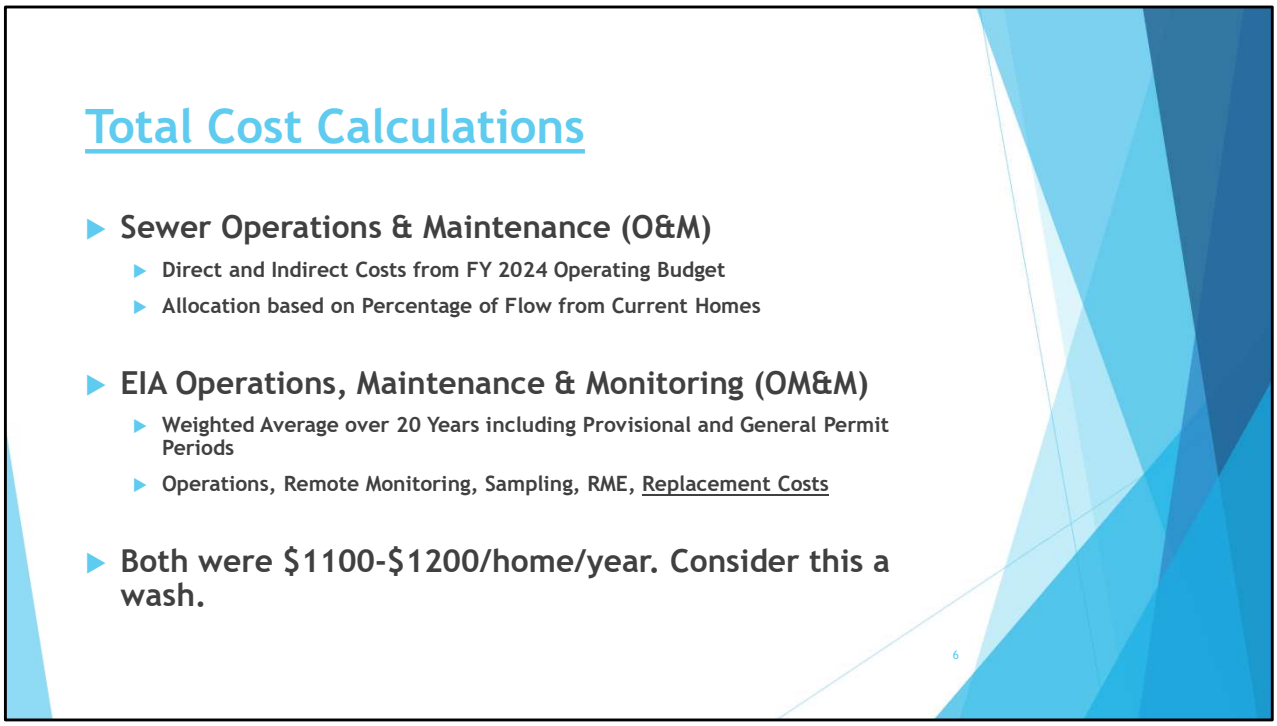
- About 3200 homes are already sewered.
- 61% of roads are private.



Collection system and treatment plant upgrades account for 50% and 25% respectively of sewer capital cost. Source was Barnstable CWMP and more recent financial statements posted to the town's website. The numbers were reviewed with the town CFO who had helpful inputs.

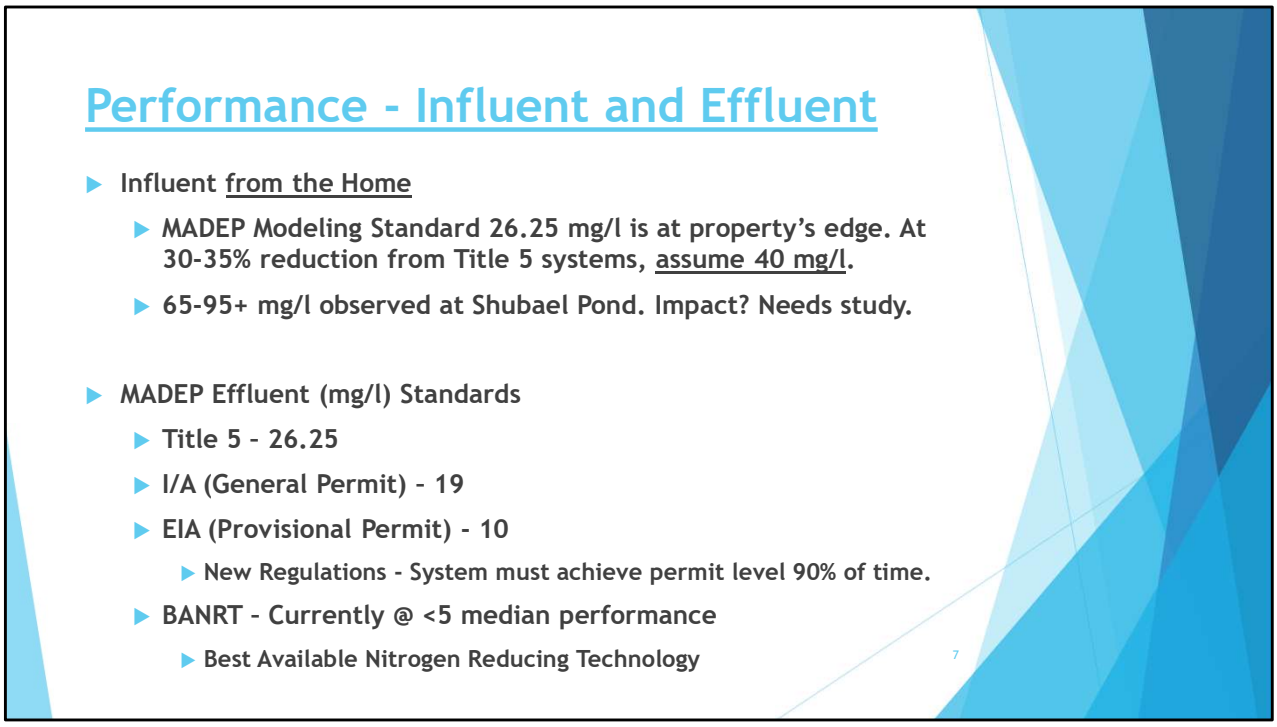
EIA capital costs include an allocation for the RME which is envisioned to assist "from cradle to grave" in managing an EIA installation or upgrade. Inputs included discussions with leaders of the two provisional permit level competitors, MASSTC and consultants to Long Island, NY water industry.

At Shubael Pond, where 13 systems have been installed with intensive measurement regimens dictated by EPA, USGS, etc., 60% of the installations were able to reuse at least some existing components such as the Title 5 tank or leaching field. This had an impact of about $10k on the average home total system cost.



EIA remote monitoring only includes identifying if the air blower or pump is operating. If there is a failure, a repair person would be dispatched. It does not include a nitrogen sensor which is currently under development.

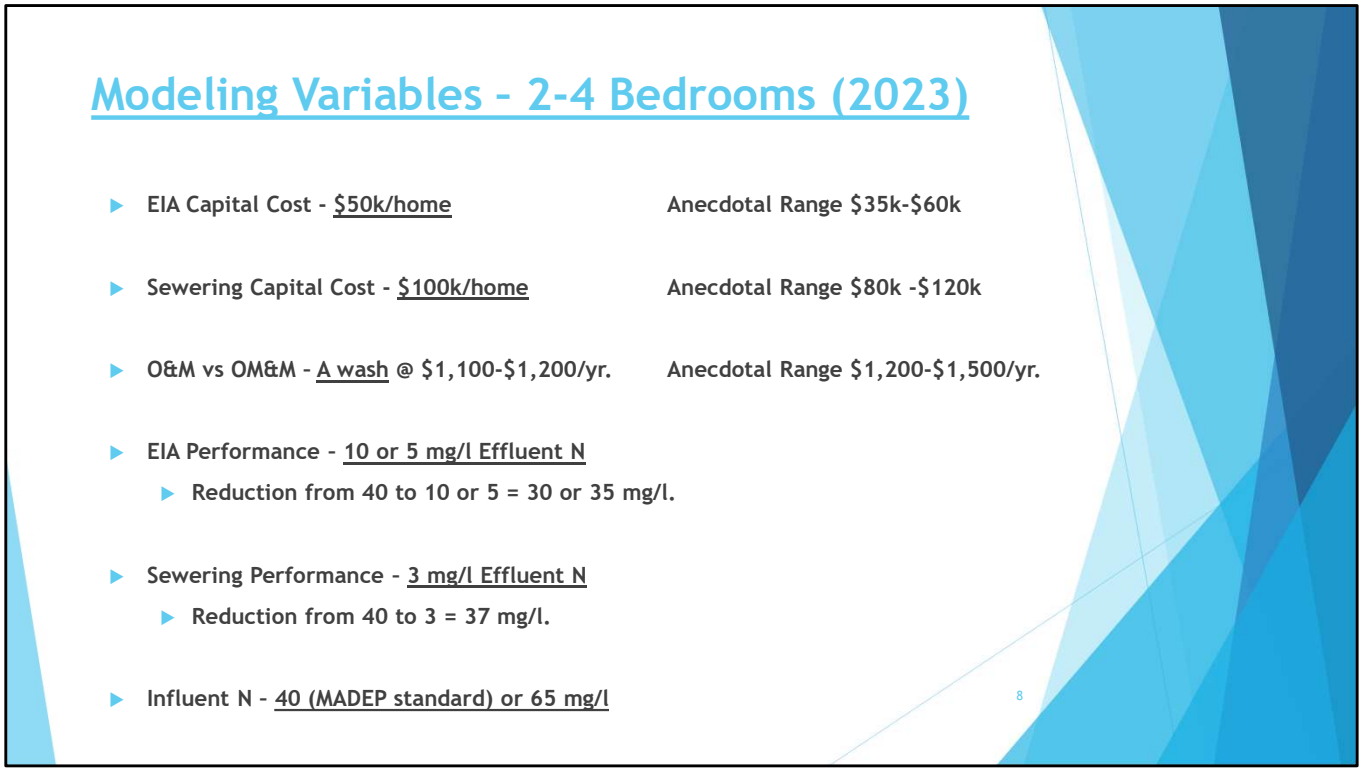
With OM&M/O&M a wash, the economic analysis can focus simply on capital cost.



We know there is more influent coming from homes based on Shubael Pond and other studies. It is not unusual to see influent > 100 mg/l N.

We do not know what that means regarding the impact on watersheds and what that in turn means for how to repair them. This needs study and will take years to sort out. In the meantime, our primary calculations will be based on MADEP standards, because that is the permitting authority.

Many towns will act aggressively only with Generally Permitted solutions, although the regs allow Provisional and Pilot permitted solutions. MADEP feels that multiple EIA entrants should be achieving General Permit status at about the time towns will start implementing watershed permits. MADEP is now soliciting information from out-of-state sources, as long as they are from climates that generally match MA's (ie. freezing winters).



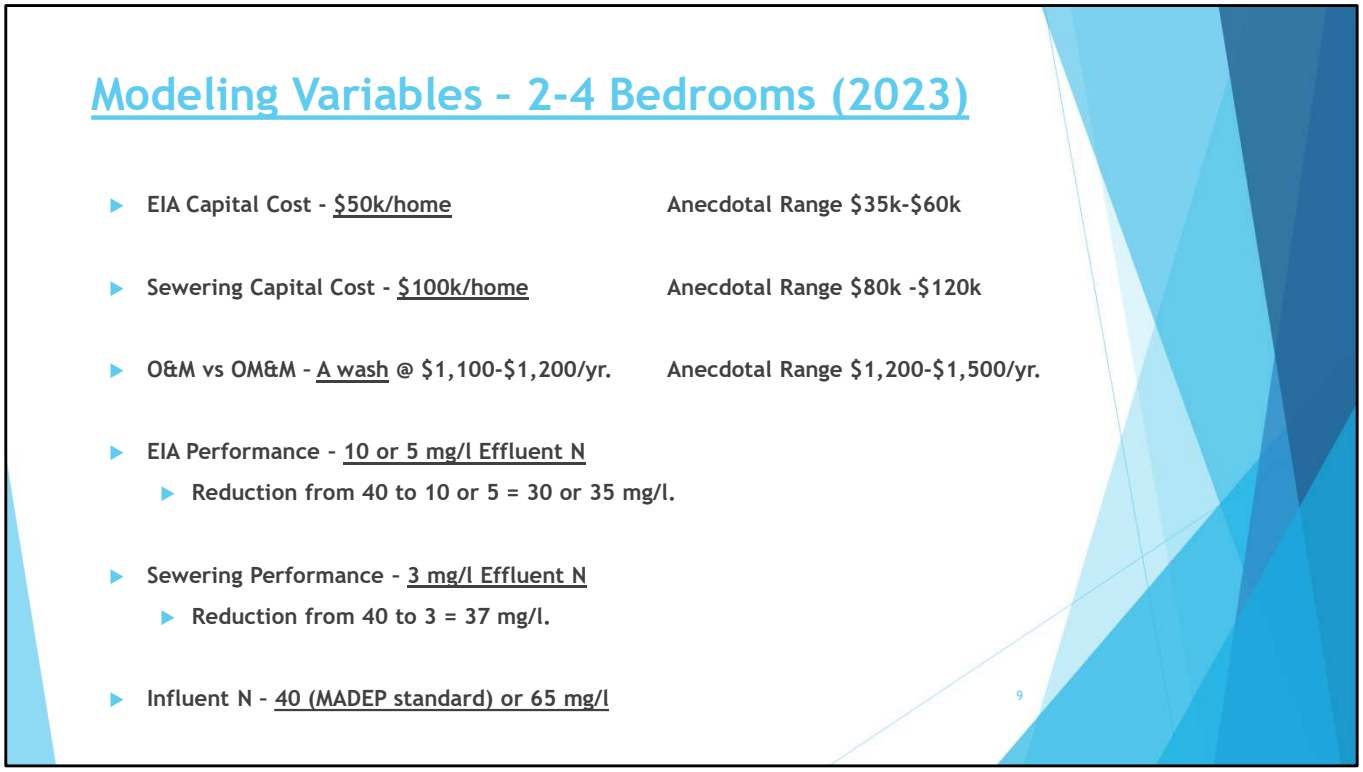
Objective – Apples-to-Apples comparison. 2023 dollars.

EIA Capital Cost –

- Based largely on MASSTC current findings, amplified by conversations with interested parties.
- Last Cape Cod Commission study was 2014.

Sewering Capital Cost

- Comprehensive Wastewater Management Plan (CWMP) Phase 1 basics in 2017 dollars: 4613 parcels, $244m sewers, $94m treatment plant upgrade. $ brought forward to 2023 at the ENR multiple.
- $80-120k range – Ian Dombroski, EPA Region 1, has heard this range anecdotally, as well.



EIA Performance

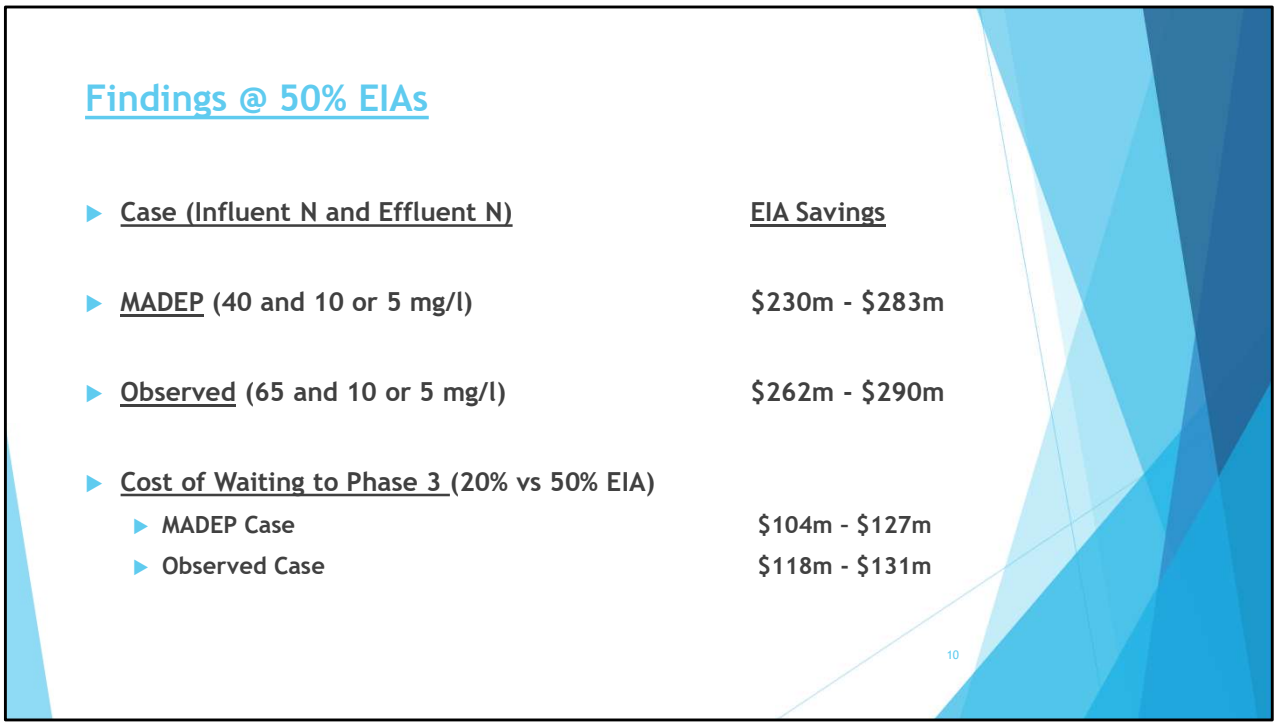
- MADEP: Most watersheds need 10 mg/l, some need 7-8 mg/l.
- New Regulation EIA standard is 10 mg/l starting 1/7/24.
- Current standard for I/A is 19 mg/l. That won't fix problem but is interim "finger in the dike" until new technologies come online.
- <5 mg/l median effluent N is estimated BANRT (Best Available Nitrogen Reducing Technology) performance, currently.

Sewering Performance

- Average Barnstable treatment plant performance has been about 6 mg/l. In-plan investments should yield 3 mg/l, so that is the target.

In comparing performance levels, the key is the kg N reduction.

- Note that the EIA reduction is closer to sewering performance than might be assumed simply by cutting the effluent performance numbers in half.



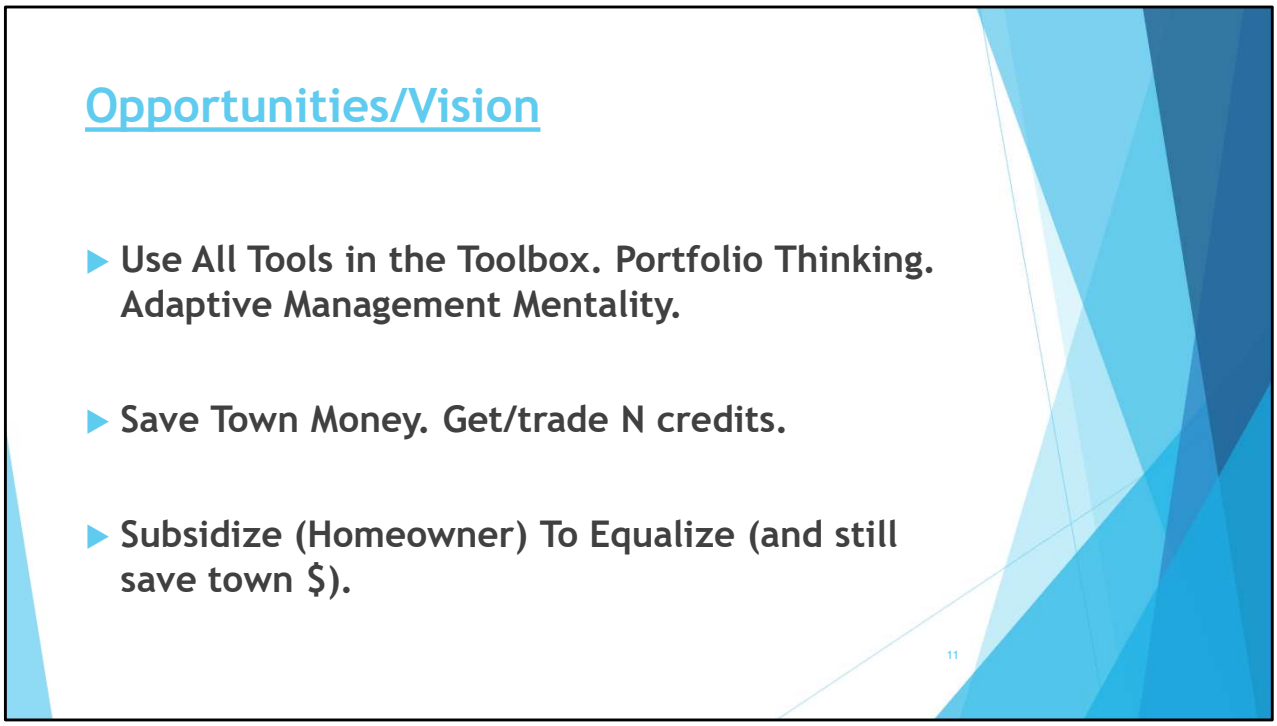
EIAs require functioning **RME** (Responsible Management Entity) to achieve modeled results. **Manage EIAs as infrastructure.**

Observed

- Modeling this environment at the higher (observed, conservatively) influent N levels appears to mean more savings, but the environment is more complex and the results are not linear. So this is at least directional. Is the problem bigger, too?

Waiting until Phase 3 (2040) for EIAs

- Under the Barnstable plan, EIAs would be considered in Phase 3, addressing only 20% of the N load. The cost of waiting could be significant.



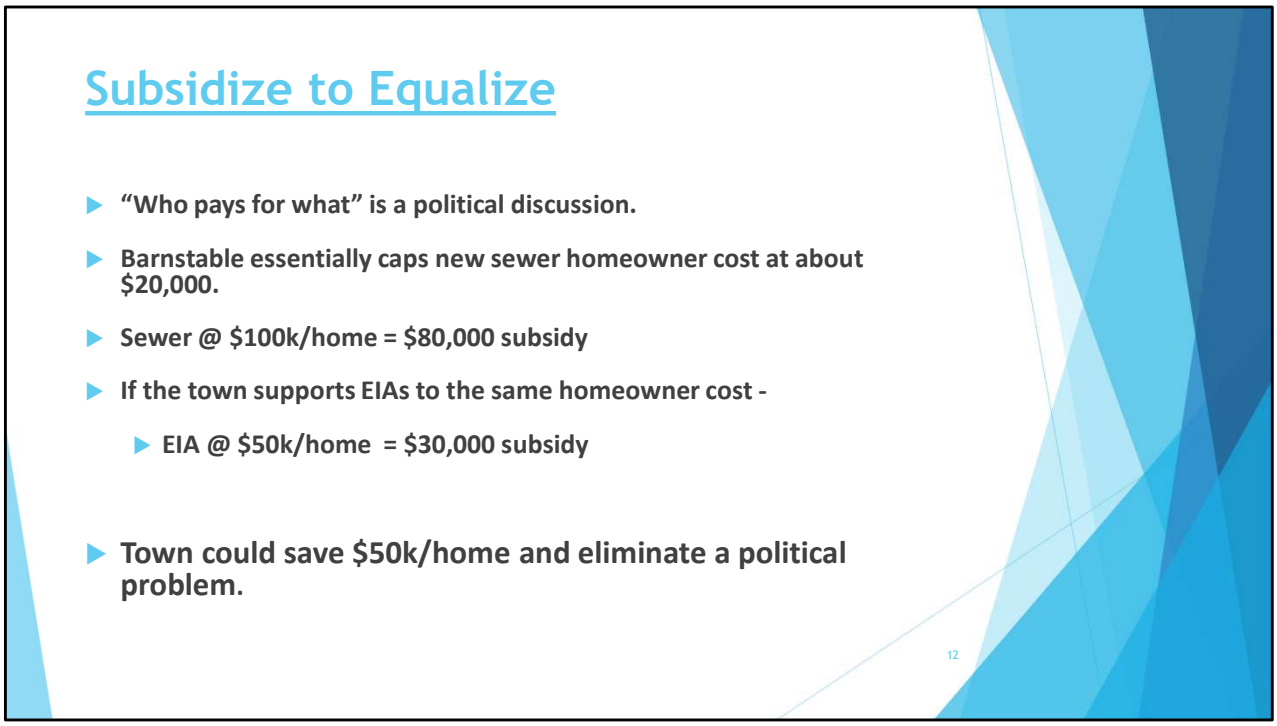
Towns need every tool in the toolbox. There is no single solution that solves the problem in a timely way.

Sewering works north to south from the spine of the Cape. EIAs can work from south to north, impacting highest need zones first. Ultimate solution will be a hybrid.

EIAs have both **location and time value**, and they cost less than sewering, so they need to be part of the solution ASAP, not in 20 years.

Disposal is a wild card, here. Towns across the Cape are having trouble getting disposal permits for **the concentrated volume** of treatment plant effluent. EIAs eliminate that problem.

Under the current paradigm in Barnstable (and most towns), homeowners who install EIAs pay full freight, while homeowners who connect to sewer are heavily subsidized. If we can save cost and get N credits, the town should **subsidize homeowners for EIAs to equalize their cost** and become indifferent to which technology they use. Let's look at that in more detail – next slide.



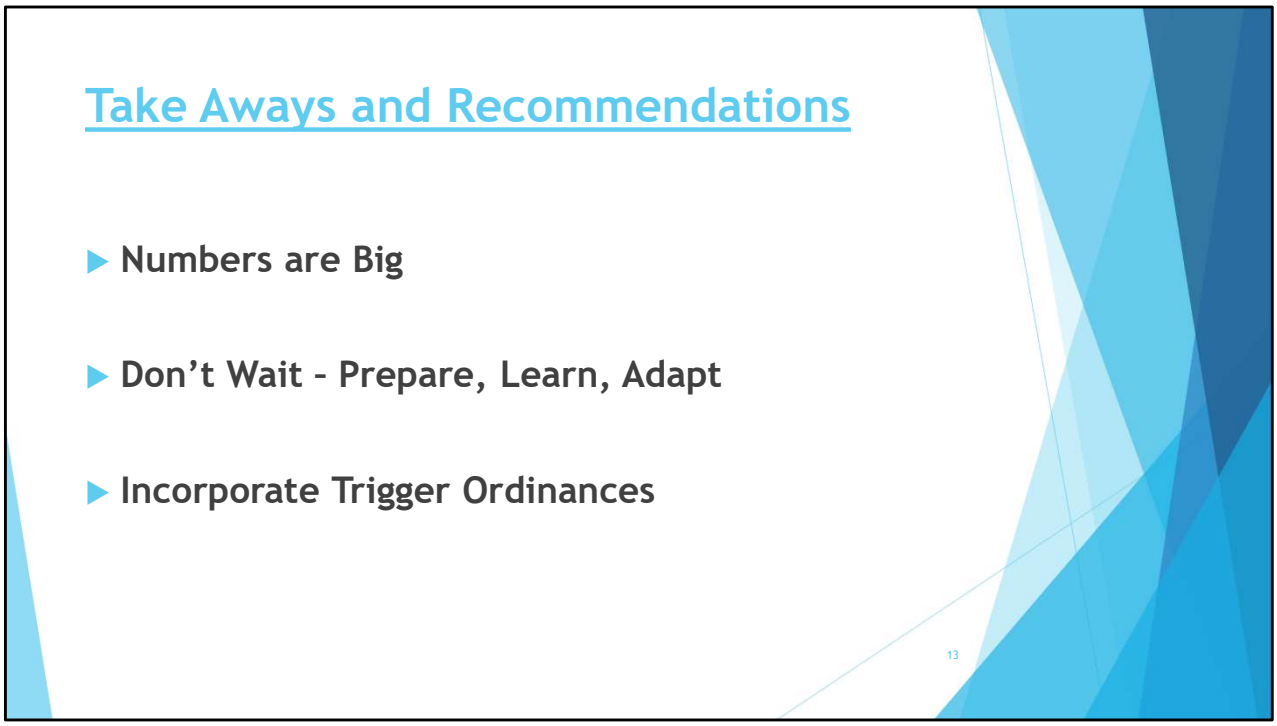
The **political problem is how to share the costs**. The benefits are town-wide, so the whole town pays some share of the solution through taxes, fees, borrowing costs, etc.

But let's not penalize homeowners who happen to live away from the proposed sewer lines.

The other key advantage is that **EIAs allow focus on places with high location and time value.**

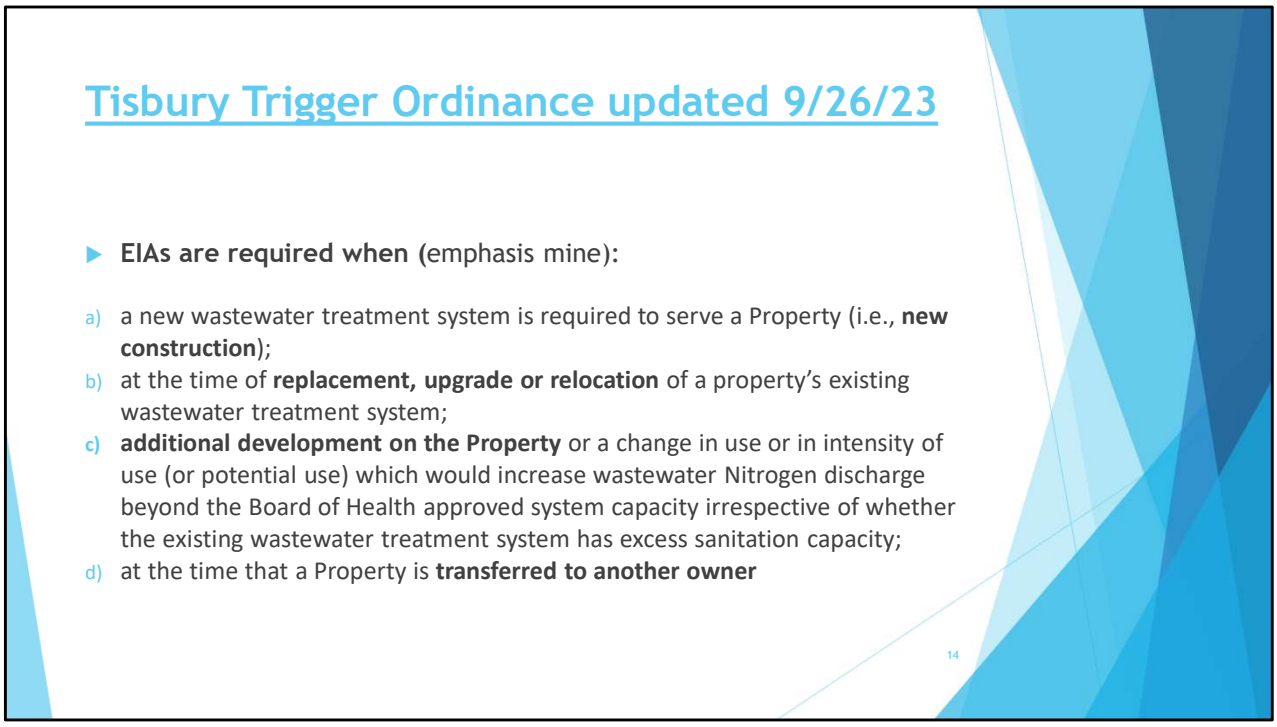
And to be clear, the town should not stop requiring upgraded systems when they hit the 208 Plan threshold. Eventually, say in 50 years, most of the town's septic systems should have been upgraded. Title 5 systems will be a thing of the past.

So how do we start?



Adaptive Management, which is incorporated into MADEP regulations, essentially says, "Stick you head up every five years and look around to see if there are new, better ways to do things." Solutions will evolve and need to be incorporated along the way.

Tisbury has been using **Trigger ordinances** for a few years. They were expanded in 9/2023. Details on next slide.



Trigger regulations are an easy way to put the town's toe in the water and start moving the needle.

Tisbury is already seeing the reemergence of eel grass in Lake Tashmoo.

Glad to discuss all this with anyone.

Please visit the task force website. It is designed to help self-education and has over 40 links.