Cape Cod Commission

208 Area Wide Water Quality Management Plan Update Stakeholder Summit

February 6, 2013
8am - 2pm
Resort and Conference Center
Hyannis, MA

Agenda

7:15	*Registration*
8:00	Welcome & Introduction – Paul Niedzwiecki, Cape Cod Commission
8:30	Wendy Northcross, CEO, Cape Cod Chamber of Commerce
8:45	The Cost of Doing Nothing – EPA & Industrial Economics, Inc
9:15	Commissioner Ken Kimmell, MassDEP
9:30	Reflecting on the last 6 months of stakeholder engagement – CBI • What did we learn on both process and substance for addressing water quality issues on a watershed basis?
10:00	Breakout Sessions – 4 subregional groups with rotating presenters and discussion on the following topics: • scenario planning • triple bottom line analysis • regulatory, legal, & institutional issues • implementation (monitoring, adaptive management, financing) • stakeholder involvement over the next 6 months: self-organizing for subregional stakeholder groups
10:05	Breakout Session 1
10:40	Breakout Session 2
11:10	Break
11:20	Breakout Session 3
11:50	Breakout Session 4
12:20	Breakout Session 5
12:50	Return to Main Room and Lunch is Served
1:00	State Treasurer Steven Grossman
1:15	Watershed Governance – Ben Grumbles, President of U.S. Water Alliance
2:00	Adjourn

Breakout Sessions

Upper Cape: Cape Cod Room
Mid Cape: Hyannisport East
Lower Cape: Hyannis Port West
Outer Cape: Barnstable Room #2 (first floor)

- **Scenario Planning**
  - Schedule: 10:10-10:40 Upper Cape
    10:40-11:10 Mid Cape
    11:10-11:20 Break
    11:20-11:50 Lower Cape
    11:50-12:20 Outer Cape

- **Triple Bottom Line Analysis**
  - Schedule: 10:10-10:40 Mid Cape
    10:40-11:10 Lower Cape
    11:10-11:20 Break
    11:20-11:50 Outer Cape
    11:50-12:20 Upper Cape

- **Regulatory, Legal, and Institutional Discussion**
  - Schedule: 10:10-10:40 Lower Cape
    10:40-11:10 Outer Cape
    11:10-11:20 Break
    11:20-11:50 Upper Cape
    11:50-12:20 Mid Cape

- **Implementation**
  - Schedule: 10:10-10:40 Outer Cape
    10:40-11:10 Upper Cape
    11:10-11:20 Break
    11:20-11:50 Mid Cape
    11:50-12:20 Lower Cape

- **Stakeholder involvement over the next 6 months**
  - Schedule: Last session for every group

Speakers

Wendy Northcross

Commissioner Ken Kimmell

Treasurer Steve Grossman

Ben Grumbles

Wendy Northcross

"Water quality is not only a quality of life issue, it is an economic issue. It is critical that we find the best science to sustain Cape Cod's water, at the best price possible."

Wendy is Chief Executive Officer of the Cape Cod Chamber of Commerce and has been with the organization since 1997. She is a Certified Chamber Executive and in 2009 completed a Fellowship for Regional Sustainable Development from the Ford Foundation and the Association of Chamber of Commerce Executives (ACCE).

She has served on the transition teams for both Governors Cellucci and Patrick, and is chair of the Massachusetts Regional Tourism Councils.

A founder of the John F. Kennedy Hyannis Museum, Northcross continues to serve on its foundation board. She currently serves on the board of directors of The Cooperative Bank of Cape Cod, the Cape & Islands Workforce Investment Board, the Graduate Center of Cape Cod, Job Training & Employment Corp., and the Arts Foundation of Cape Cod. She is the immediate past chair of the New England Association of Chamber of Commerce Executives. In 2013 she joined the board of the national Association of Chamber of Commerce Executives.

Northcross grew up on Cape Cod and lives in West Barnstable with her husband, Van who is regional marketing director for Cape Cod Healthcare.

Commissioner Ken Kimmell

"It has become equally clear that the most effective and affordable approach to this problem is a regional effort. Nitrogen-loading is a Cape-wide problem, with estuaries and watersheds often crossing municipal boundaries."

Kenneth L. Kimmell was appointed in January 2011 as Commissioner of the MassDEP by Secretary of Energy and Environmental Affairs Richard K. Sullivan Jr. Since the time of his appointment, MassDEP has launched a clean energy results program to focus on the permitting and siting of clean energy facilities, such as anaerobic digesters, which tap the hidden energy value of organic waste; announced completion of a sustainable water management initiative framework to balance competing human needs for water and the long-term health of Massachusetts rivers and streams; completed a top-to-bottom review of all of MassDEP's permit programs and identified over twenty regulatory changes to streamline permitting; and commenced an overhaul of MassDEP's information technology systems to make the agency more efficient, transparent, and accessible to the regulated community and the public. Mr. Kimmell has been elected Chair of the Board of Directors of the Regional Greenhouse Gas Initiative, Inc., the nation's first mandatory greenhouse gas cap and trade program, and was instrumental in the recent nine-state agreement to strengthen RGGI by lowering the cap on carbon dioxide emissions. Mr. Kimmell is also active in efforts to promote RGGI as a national model for reducing greenhouse gases in a cost-effective manner.

Mr. Kimmell joined the Patrick Administration in January 2007 as general counsel of the Executive Office of Energy and Environmental Affairs. In that capacity, he focused on major legislative initiatives, such as the merger of energy and environmental agencies into one secretariat; the Green Communities Act, the Global Warming Solutions Act, and the Oceans Act; state and federal permitting of the Cape Wind project, the nation's first off-shore wind project; and development and early implementation of policy initiatives such as the MEPA Greenhouse Gas policy, a first-in-the-nation policy that requires developers of major projects to identify, avoid, and mitigate greenhouse gas emissions.

Prior to joining the Patrick Administration, Mr. Kimmell was in private practice and focused on environmental and land use law and litigation.Mr. Kimmell graduated from Wesleyan University and UCLA School of Law. He lives in Newton, where he has served on the Newton Community Preservation Act Committee. He is also a former Board Member of the Massachusetts Association of Conservation Commissions.

Treasurer Steve Grossman

"Maintaining and enhancing water quality is critical to Cape Cod and all its residents. Solving this problem will have a dramatic impact on the Cape's economy, tourism and property values for generations to come."

Steve Grossman brings to the office of Treasurer a family heritage of public service, a lifetime dedicated to helping others, and years of experience as a hard-working businessman with a sense of responsibility for the well-being of his colleagues and his community.

He is committed to using the full potential of the Treasurer's office to protect the public's money, help create jobs, boost small businesses, and bring new standards of transparency and disclosure to state government. Throughout his career, Grossman has had an unshakable commitment to recruiting and hiring the most qualified people to help him develop the most effective and cost-efficient ways of doing business. These principles have guided his administration as Treasurer.

By delivering on his promise to put all Treasury contracts out to competitive bid, Grossman has saved taxpayers over $11 million in reduced service fees and administrative costs. He has established the Small Business Banking Partnership, which has deposited over $250 million of Treasury cash reserve funds in community banks to help grow Massachusetts small businesses and promote job creation. And by reforming management practices and utilizing innovative marketing approaches, Grossman oversaw a record-breaking fiscal year in 2012, with the Massachusetts State Lottery earning an unprecedented $981 million in net profit for taxpayers and the Unclaimed Property Division returning over $93 million worth of cash, stock and mutual funds to their rightful owners.

Prior to being elected Treasurer in 2010, Grossman spent 35 years creating jobs, managing money, dealing with crises, and finding commonsense solutions to problems as CEO of Grossman Marketing Group in Somerville, a 102-year-old, fourth-generation family business. He also served as chairman of both the Massachusetts and national Democratic parties, where he established a track record as a reformer and builder, worked aggressively to implement effective management and financial controls, and empowered more activists to participate in political life.

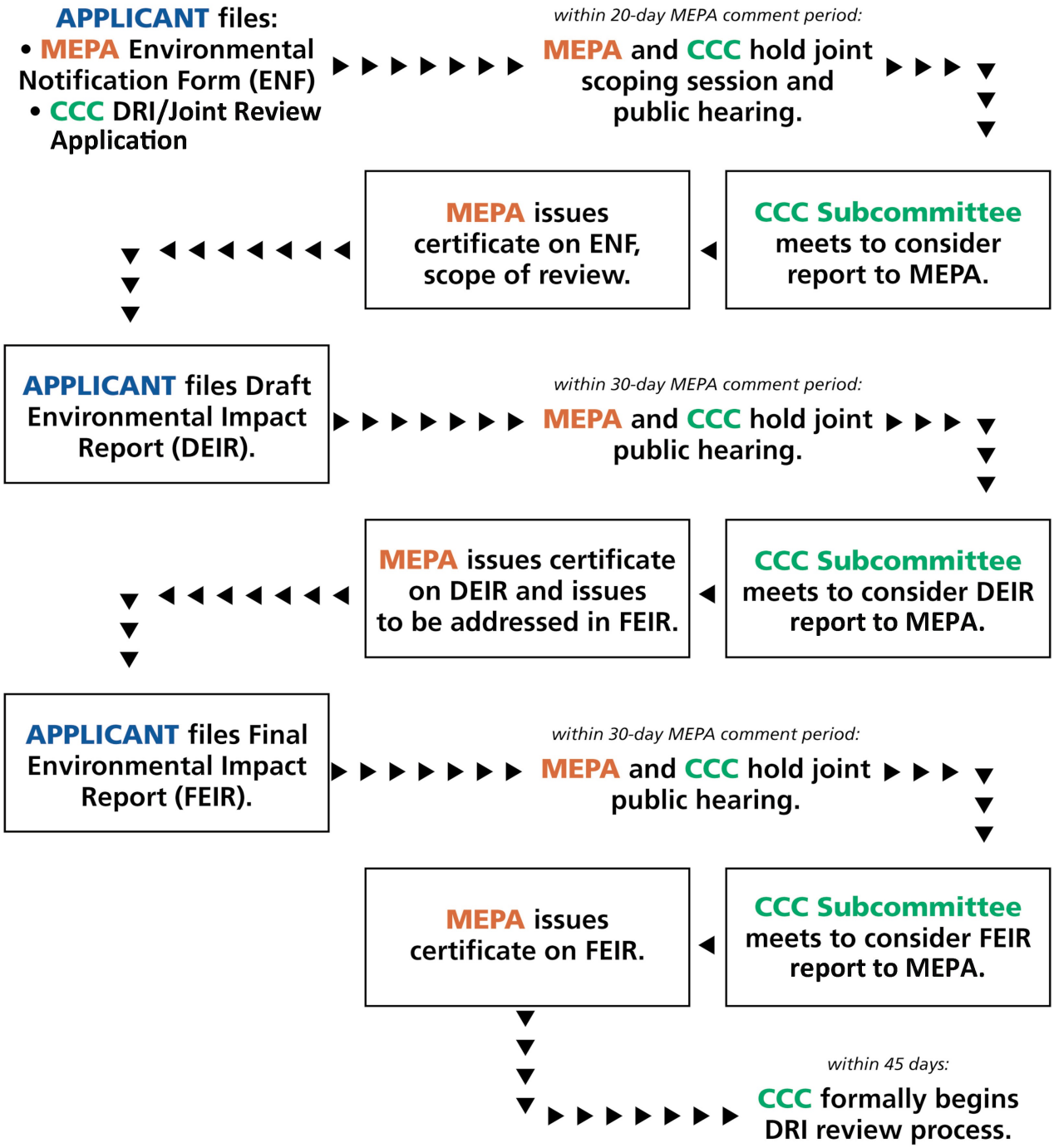
Grossman chairs the Advisory Board of Cambridge College and serves as an advisory board member of the Women's Lunch Place. He was a founding board member of Massachusetts Institute for a New Commonwealth (MassINC), a former campaign chair of Combined Jewish Philanthropies, and a founding board member of the Lenny Zakim Fund.

Treasurer Grossman is a graduate of Princeton University and Harvard Business School. His wife, Dr. Barbara Wallace Grossman, a theater historian, author, and director, is a professor at Tufts University and serves as Vice Chair of the Massachusetts Cultural Council. They have three sons, David, Ben, and Josh.

RLI

Regulatory, Legal and Institutional
Breakout Session

Joint MEPA/CCC Review:
Projects Requiring Environmental Impact Report (EIR)



Water Quality: Federal and State Laws

There are a number of Federal and State laws that apply to water quality issues. The following is a brief description of each.

Federal Clean Water Act

The US Environmental Protection Agency regulates water quality under the Federal Water Pollution Control Act of 1972 and its subsequent amendments in 1977, 1981, and 1987. Collectively these are known as the Clean Water Act. The objective of the act is to maintain and restore the chemical, physical, and biological integrity of US waters. The act requires states to establish ambient water quality standards for water bodies based on the need to protect the use(s) designated for that water body.

Massachusetts Surface Water Quality Standards

Following the Federal law, the Commonwealth of Massachusetts has adopted surface water standards for individual water bodies. The standards designate the most sensitive uses for which the water body must be "enhanced, maintained, and protected" (whether or not the designated use is currently attained); prescribe minimum water quality criteria necessary to sustain the designated uses; and contain the regulations necessary to achieve and maintain the designated use and, where appropriate, prohibit discharges.

Massachusetts has divided the coastal and marine surface waters into three classes: SA, SB, and SC, in descending order of the most sensitive uses that water body must attain. Additionally the state has special designations of Outstanding Resource Waters, Special Resource Waters, Shellfish (waters), and Warm Water. A brief description of these classes and special designations follows. For more information see M.G.L. c. 21, § 27. 314 CMR 4.00: Massachusetts Surface Water Standards.

Impaired Waters and Total Maximum Daily Loads

The Clean Water Act requires states to assess the quality of surface waters based on the intended uses on a regular basis and to develop a list of impaired waters—those waters that do not meet the intended uses. The most recent list for Cape Cod waters is the Cape Cod Coastal Drainage Areas 2004-2008 Surface Water Quality Assessment Report. Under Section 303(d) of the Clean Water Act, states are required to:

- Identify those water bodies that are not expected to meet the Surface Water Quality Standards from technology-based controls; and,
- Establish for those waters Total Maximum Daily Loads (TMDLs)—the maximum amount of a pollutant from any source and of any kind that a water body can have without violating water quality standards.

TMDLs are based on technical reports prepared by the Massachusetts Estuaries Project. TMDLs are formulated by the Massachusetts Department of Environmental Protection (MassDEP) and submitted to the US Environmental Protection Agency (US EPA) for approval after public comment. TMDLs are enforceable under the federal Clean Water Act.

Massachusetts submits a list of the conditions of surface waters to the US EPA every two years in compliance with the Clean Water Act. The "Integrated List of Waters" identifies

each water body or segment of a water body as supporting a designated use or as impaired. If there are not sufficient data, the use is noted as "not assessed." Many of the smaller and unnamed water bodies in Massachusetts have never been assessed and thus do not appear in the listing.

Each water body in the list is assigned to one of the following categories:

- Unimpaired and not threatened for all designated uses
- Unimpaired for some uses and not assessed for others
- Insufficient information to make assessments for any uses
- Impaired or threatened for one or more uses, but not requiring the calculation of a TMDL
- Impaired or threatened for one or more uses and requiring a TMDL

Safe Drinking Water Act

The Safe Drinking Water Act, administered by the U. S. EPA, is the main federal law that protects the quality of drinking water and the rivers, lakes, reservoirs, springs and ground water wells that are the source of drinking water. The Act authorizes the U.S. EPA to set standards for drinking water quality to protect against natural and human-caused contaminants and to oversee the implementation of those standards on the state, local and water supplier levels. At present there are standards that regulate 83 different contaminants. Cape Cod was designated a Sole-Source Aquifer under the Safe Drinking Water Act in 1982.

The Act applies to the more than 170,000 public drinking water systems in the country and requires their evaluation by third party analytical laboratories. The Act does not cover systems that service fewer than 25 individuals or apply to bottled water. There are 17 public water suppliers on Cape Cod.

The U.S. EPA Primacy Agent for the federal Safe Drinking Water Act is the Massachusetts Department of Environmental Protection, Division of Watershed Management's Drinking Water Program. The Program regulates water quality monitoring, new source approvals, water supply treatment, distribution protection and the reporting of water quality data.

Drinking Water and Zone II Wellhead Protection Areas

Massachusetts' drinking water regulations (310 CMR 22.00) are intended to protect public health by ensuring that all water used for public consumption is safe, fit and pure to drink. The regulations identify contaminants that must be controlled, establish limits on the allowable concentrations of these contaminants and mandate the type and frequency of monitoring required ensuring compliance with the regulations.

The regulations also define a Zone II as "that area of an aquifer that contributes water to a well under the most severe pumping and recharge conditions that can be realistically anticipated." Also known as wellhead protection areas, all Cape towns have protected Zone IIs through zoning and Board of Health bylaws. Municipalities identify areas as potential Zone IIs and submit them to the state.

The state regulations, the Cape Cod Regional Policy Plan's Minimum Performance Standards and numerous local zoning and general bylaws have been established to prohibit or limit land uses in Zone IIs that have the potential to degrade drinking water quality. State and Commission regulations do not specifically prohibit large wastewater treatment and disposal facilities in Zone II's but the State may require additional treatment and the Regional Policy Plan limits their use in Zone IIs for the restoration of water quality.

Commonwealth of Massachusetts Title 5 Regulations on Wastewater Flows

The Massachusetts Department of Environmental Protection (MassDEP) regulates wastewater flows less than 10,000 gallons per day under Title 5, the state Sanitary Code. Title 5 typically covers such uses as conventional on-site septic systems, alternative systems, such as denitrifying systems (often called "Innovative/Alternative," or I/A, systems), as well as composting toilets and other kinds of systems in use on individual properties or cluster developments. Title 5 presumes residential wastewater flows at 110 gallons per day per bedroom (e.g., Title 5 presumes that a four-bedroom house will generate 440 gallons per day). Non-residential wastewater generation is typically based on use and square footage, or the number of restaurant seats.

Title 5 Designation of Nitrogen Sensitive Areas

MassDEP may identify certain areas as particularly sensitive to pollution from on-site wastewater systems, therefore requiring the imposition of loading restrictions. These Nitrogen Sensitive Areas (NSAs) include:

- Interim Wellhead Protection Areas and department-approved Zone IIs of public water supplies
- Areas served by both on-site septic systems and private wells
- Nitrogen-sensitive embayments or other areas, which are designated as nitrogen sensitive under Title 5 based on appropriate scientific evidence

The design flow for wastewater is restricted to 440 gallons per day per acre (40,000 sq. ft.) in NSAs. There are exceptions for aggregate flows and systems with enhanced nitrogen removal. See 310 CMR 15.000: The State Environmental Code, Title 5: Standard Requirements for the Siting, Construction, Inspection, Upgrade and Expansion of On-Site Sewage Treatment and Disposal Systems and for the Transport and Disposal of Septage. See sections 15.216 (aggregate flows) and 310 CMR 15.217 (enhanced nitrogen removal) for additional information.

The nitrogen-loading restrictions in NSAs apply to new construction and increase in flow to existing systems only and do not affect existing Title 5 systems. Those systems are regulated through the time and transfer inspection process and the definition of "failing" systems in 310 CMR 15.303 and 15.304. Title 5 has special requirements for repairing failed systems and for the construction of new systems in NSAs.

MassDEP has not yet designated any area on Cape Cod as an NSA.

Groundwater Discharge Permits

Flows in excess of 10,000 gallons per day are regulated under the state Groundwater Discharge Permit Program. Systems requiring a groundwater discharge permit require a significant removal of nitrogen because the Cape Cod Aquifer is designated as a non-degradation resource. These regulations also require that a permit be issued where the discharge can cause or contribute to a violation of 314 CMR 4.00 and where there has been a TMDL issued. Groundwater discharge permits for Cape Cod require an effluent treatment level of at least 10 milligrams per liter of nitrate, which is almost a two-thirds reduction in the amount of nitrogen leaving a septic system. In the last 10 years, groundwater discharge permits for projects located in watersheds where there has been a technical report or a TMDL the project has been held to a "no-net nitrogen" standard by MassDEP. This means that any nitrogen released into the watershed must be "offset" by the removal of nitrogen from an existing source, typically by connecting a nearby existing development to remove nitrogen via wastewater treatment.

Water Pollution Abatement Districts

MassDEP may propose water pollution abatement districts consisting of one or more cities or towns, or designated parts thereof. If MassDEP deems that such a district is necessary for the prompt and efficient abatement of water pollution, it may, after a public hearing, mandate the formation of such a district. See Section D on Management Districts (page 15) for additional information about Water Pollution Abatement Districts and other management districts.

Comprehensive Wastewater Management Plans

Municipalities are typically required to file an Environmental Impact Report (EIR) with the Massachusetts Environmental Policy Act (MEPA) Unit for the development of Comprehensive Wastewater Management Plans (CWMPs). MEPA thresholds mandate review for construction and upgrades to wastewater treatment and disposal facilities (MEPA Regulations 301 CMR 11.03 Review Thresholds). The state also reviews CWMPs under MassDEP "Selection, Approval and Regulation of Water Pollution Abatement Projects Receiving Financial Assistance from the State Revolving Fund" (310 CMR 44.00).

The MassDEP Bureau of Municipal Facilities' Guide to Comprehensive Wastewater Management Planning outlines the process for development of a CWMP. According to the guidance, "The planning exercise requires a community to perform a needs analysis: identifying problem areas including areas with poor soils areas with failing septic systems and densely developed areas. Different wastewater treatment options including on-site septic systems, decentralized systems, or a centralized community-wide system are also analyzed for applicability in addressing the identified wastewater issues while considering environmental concerns (groundwater recharge, pollution prevention) and costs. Public input is sought throughout the CWMP process."

The Cape Cod Commission Act (Section 12(i)) requires that the Commission review, as a Development of Regional Impact (DRI), any proposed development project for which the Massachusetts Secretary of Energy and Environmental Affairs requires the preparation of an EIR. As a result, the Commission conducts a regulatory review, concluding with a written approval containing findings and conditions for all CWMPs proposed by Cape towns.

TBL

Triple Bottom Line
Breakout Session

Introduction to the Triple Bottom Line Decision-Making Support Tool for the Section 208 Wastewater Management Program

The Cape Cod Commission is developing a triple bottom line (TBL) assessment tool with the assistance of AECOM's Sustainable Economics Group and Water Engineering Practice. AECOM is building the model with the Cape Cod Commission as a decision-making support tool for selecting water quality improvement options on the Cape. Specifically, it will help Commission staff and community stakeholders see the differences in social, environmental and financial outcomes that Scenarios proposed for a particular watershed will generate. It will also consider the consequences of doing nothing.

Each Scenario will reduce the total controllable nitrogen load by the amount specified in the Nitrogen Total Maximum Daily Load (TMDL) published by the Massachusetts Department of Environmental Protection (MADEP) for each embayment system.. Each Scenario will be comprised of a combination of "Technology Options," examples of which include installing a sewer system, requiring upgrades of septic systems, and enacting a policy to reduce fertilizer runoff. These solutions could be installed throughout a watershed or only in selected neighborhoods.

In addition to improving water quality, Scenarios will impact many other aspects of life on Cape Cod, often called intended or unintended externalities The Commission worked with AECOM to select a number of criteria (i.e. positive or negative externalities) that the TBL Model will evaluate for each Scenario. These criteria, and a brief description of what each will be measuring, are listed below. Criteria will be assessed relative to today's conditions (i.e. our "baseline"). Model users will be able to set goals for some of the criteria, and a Scenario will be scored on those criteria relative to those goals. Development of each criterion is constrained by the availability of data and analytical methodologies that permit reasonable estimates of impacts that fall within a reasonable and useful margin of error.

Note that the TBL Model is <u>not</u> designed to find any one "perfect" Scenario. Rather, it is designed to make transparent the outcomes of each proposed Scenario along criteria that are important to the Cape Cod community and its future. It also the intention of the model to refine further the predicted outcomes as additional study is performed specific to the Cape.

Financial Criteria (Utilizing Lifecycle Cost Analysis)

1. *Impacts to average annual homeowner rates*
    - How much will each Scenario require increases to (or creation of) wastewater management fees to pay for the upgrades to the wastewater management system?

2. *Impacts to other homeowner costs for wastewater management*
    - How much will each Scenario change the average homeowner's wastewater management costs, separate from any new or increased fees, such as costs to comply with installing an upgraded septic tank?
        - The TBL Model will present this information in such a way as to be comparable to the homeowner rates in the previous criterion.

Social Criteria

3. *Employment resulting from Scenario implementation*
    - How many jobs will be created from the construction/installation and ongoing O&M of each Scenario's collection of Technology Options?
        - This criterion will take into account the reduction in jobs that will result from reduced disposable income of Cape Cod households who will be paying more in wastewater management fees.

2. *Tourism employment*

    To what extent will each Scenario benefit the tourism economy on Cape Cod (or prevent damage to it)?

3. *Property Values*
    - To what extent will each Scenario impact a watershed's aggregate property values? Different Technology Options will have different impacts on individual properties and on the overall watershed.

4. *Tax Revenues*
    - To what extent will each Scenario raise tax revenues, and how will changes affect the distribution of the tax burden by income group?

5. *Allocation of Costs to System Users*
    - To what extent will each Scenario's financial burden be felt by year-round residents?

6. *System Resilience*
    - To what extent will each Scenario improve the resilience and reduce the risk of failure of the wastewater management system and other important assets in the face of extreme natural events, such as sea level rise?

7. *Growth Compatibility*
    - To what extent will each Scenario encourage growth in villages and town centers, versus the extent to which each Scenario may encourage growth in sparsely populated areas.

Environmental Criteria

8. Habitat

- To what extent will each Scenario enhance and protect habitat areas that have been deemed important for local ecosystems?

9. Climate

- To what extent will each Scenario increase or decrease greenhouse gas emissions? The Model will assess both generated emissions (by pumping stations and treatment plants), captured emissions (methane for fuel), and sequestered emissions (in plant life).

10. Marine Water Quality

- How quickly will each Scenario deliver improvements in marine water quality to the watershed, with an emphasis on improving the more severely degraded marine water habitats?

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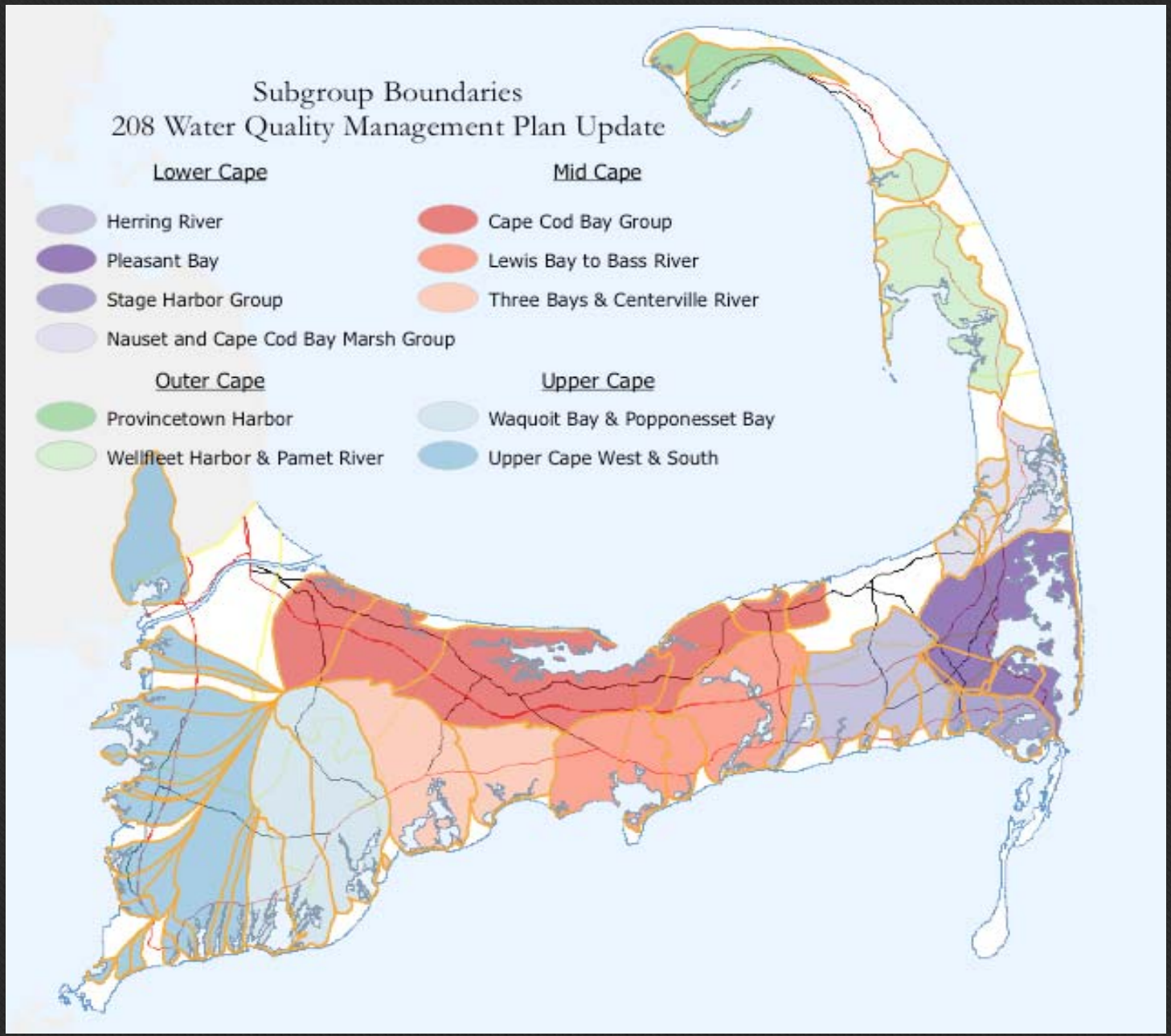
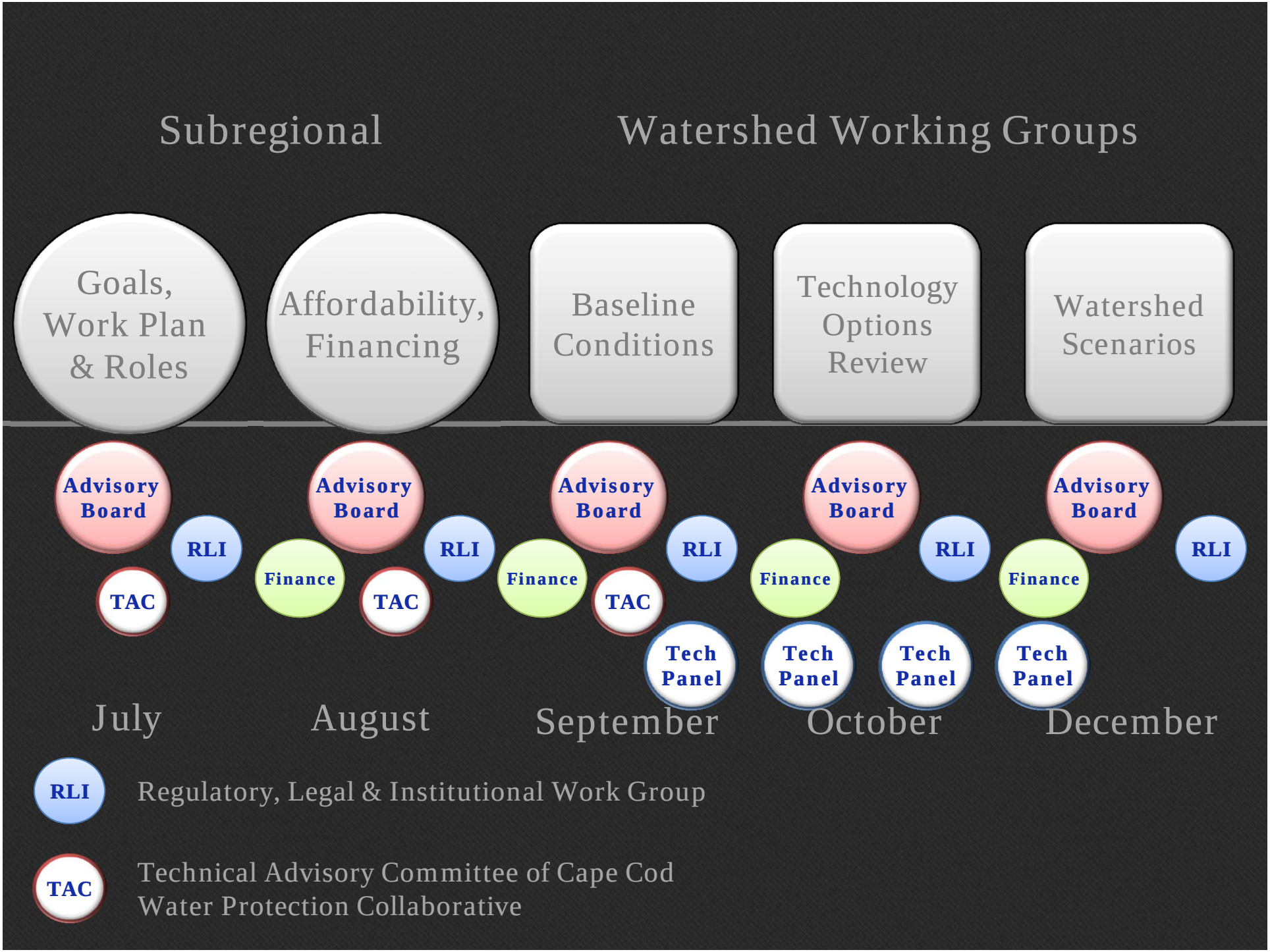
208 STAKEHOLDER SUMMIT

170 Stakeholders

WATERSHED SUBGROUPS




Subregional
Watershed Working Groups
Goals, Work Plan & Roles
Affordability, Financing
Baseline Conditions
Technology Options Review
Watershed Scenarios
Advisory Board
RLI
TAC
Finance
Tech Panel
July
August
September
October
December
RLI
Regulatory, Legal & Institutional Work Group
TAC
Technical Advisory Committee of Cape Cod Water Protection Collaborative

70 MEETINGS

11

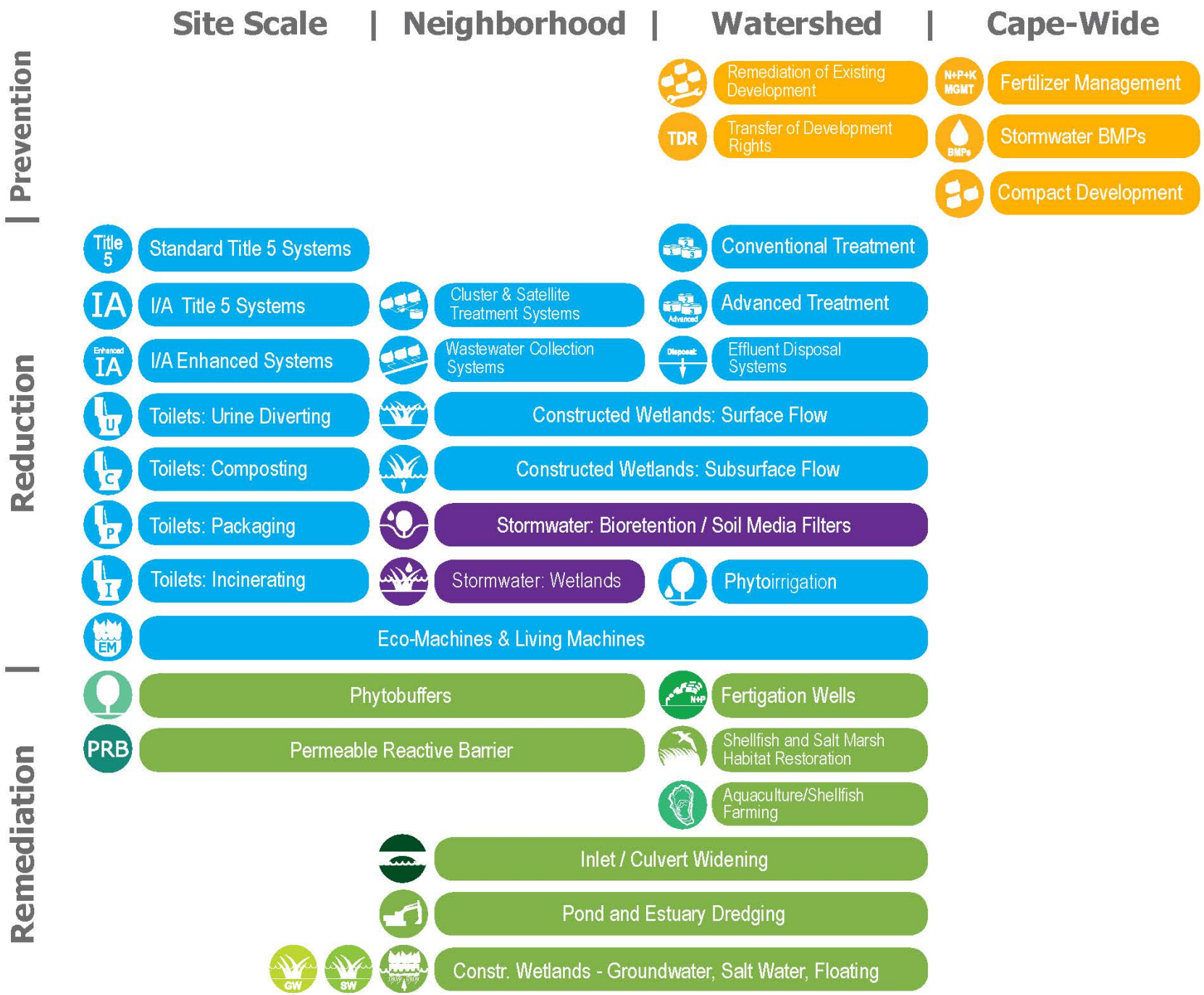
PUBLIC MEETINGS

27

COMMITTEE MEETINGS

32

WATERSHED MEETINGS

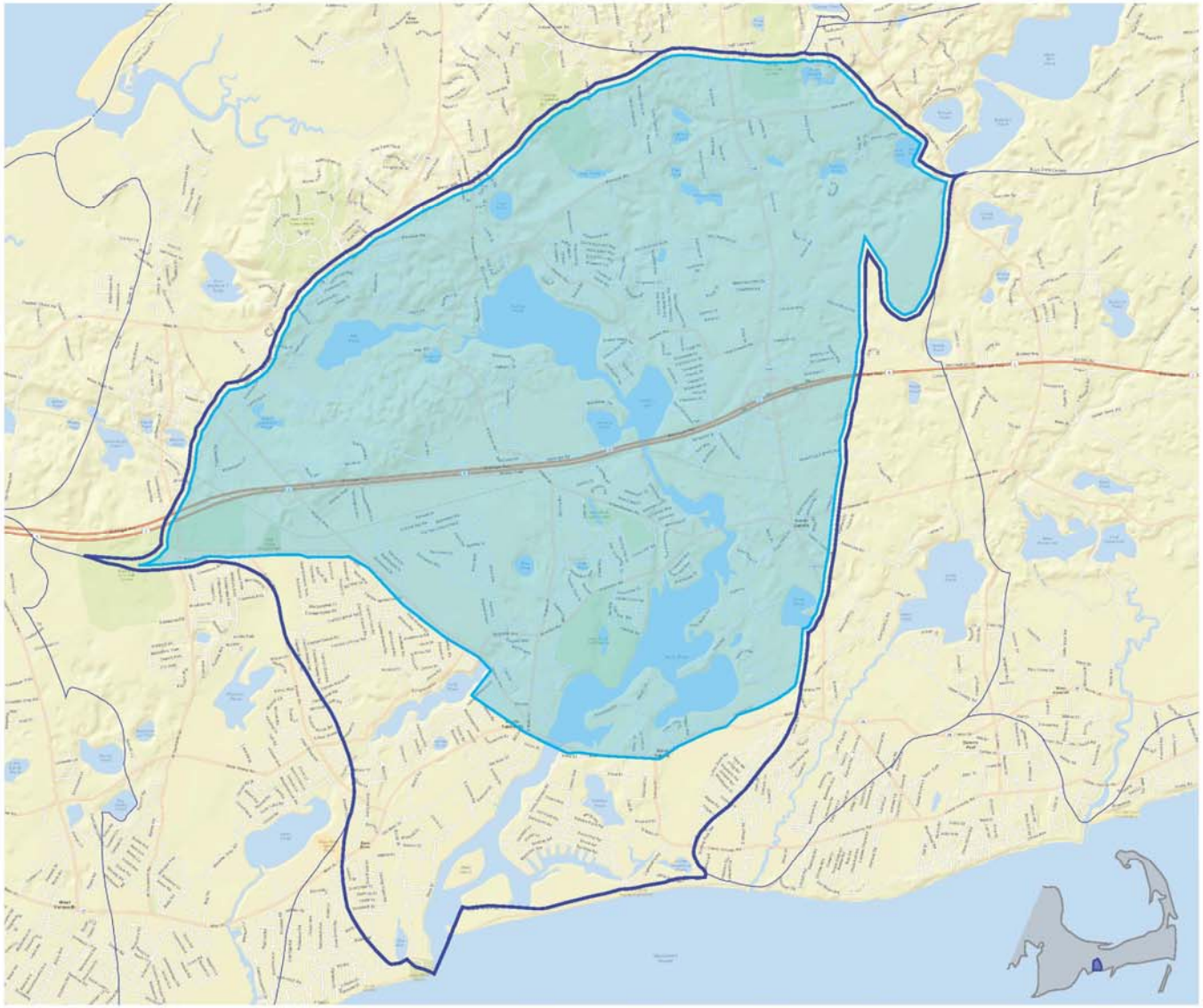

Site Scale | Neighborhood | Watershed | Cape-Wide
Prevention
Reduction
Remediation
Remediation of Existing Development
Transfer of Development Rights
Fertilizer Management
Stormwater BMPs
Compact Development
Standard Title 5 Systems
I/A Title 5 Systems
I/A Enhanced Systems
Toilets: Urine Diverting
Toilets: Composting
Toilets: Packaging
Toilets: Incinerating
Cluster & Satellite Treatment Systems
Wastewater Collection Systems
Conventional Treatment
Advanced Treatment
Effluent Disposal Systems
Constructed Wetlands: Surface Flow
Constructed Wetlands: Subsurface Flow
Stormwater: Bioretention / Soil Media Filters
Stormwater: Wetlands
Phytoirrigation
Eco-Machines & Living Machines
Phytobuffers
Permeable Reactive Barrier
Fertigation Wells
Shellfish and Salt Marsh Habitat Restoration
Aquaculture/Shellfish Farming
Inlet / Culvert Widening
Pond and Estuary Dredging
Constr. Wetlands - Groundwater, Salt Water, Floating


Problem Solving Approach
Wastewater
Existing Water Bodies
Regulatory
1
Identify Current N Removal Needs (Targets/Reduction Goals)
Present Load: X kg/day
Target: Y kg/day
Reduction Required: N kg/day
2
Additional N Removal Needs
A. Title 5 Problem Areas
B. Pond Recharge Areas
C. Growth Management
3
Low Barrier Technologies
A. Fertilizer Management
B. Stormwater Mitigation
N+P+K MGMT
BMPs
4
Watershed Alternative Technologies
A. Permeable Reactive Barriers
B. Inlet/Culvert Openings
C. Constructed Wetlands
D. Aquaculture
PRB
GW
SW
5
On-Site Alternative Technologies
A. Eco-toilets (UD & Compost)
B. I/A Technologies
C. Enhanced I/A Technologies
D. Shared Systems
IA
Title 5
Enhanced IA
6
Priority Collection/Sewer Areas
A. Greater Than 1 Dwelling Unit/acre
B. Village Centers
C. Economic Centers
D. Growth Incentive Zones
Advanced
Disposal
7
Supplemental Collection / Sewer Areas
Advanced


Fertilizer DCPC


The
Next
Six
Months


STAKEHOLDERS:
Generating Ideas
Reflecting on Ongoing Work
Shaping Recommendations
Building Collaborations
FOCUSED ON:
Shared Watersheds and Shared Planning
Monitoring and Adaptive Management
Financing and Affordability



1 **Sample Cape Cod Subwatershed**

TOWN OF YARMOUTH MASSACHUSETTS

MAP 1: TOTAL COLLECTION AREA NECESSARY TO MEET:
Current Nitrogen Removal Needs

NITROGEN CALCULATOR

1	Current N Removal Needs (TMDL)	+37,400 KG/YR	+100%
2	Additional N Removal Needs		
	Failed Title 5 Systems		
	Anticipated Growth Areas		
3	Low Barrier Technologies		
	Fertilizer Management		
	Stormwater BMPs		
4	Watershed Alternative Technologies		
	Const. Wetlands - GW		
	Const. Wetlands - SW		
	Phytobuffer		
	Perm. React. Barrier		
	Fertigation Wells		
	Shellfish Aquaculture		
	Inlet Widening		
5	On-Site Alternative Technologies		
	I/A Title 5 Systems		
	Alt. Toilet Systems		
6	Collection/Sewer	-37,400 KG/YR	-100%
	Remaining Nitrogen to Meet Goal	0 KG/YR	0%

Indicator Bar

100%
Collection

CAPE COD COMMISSION

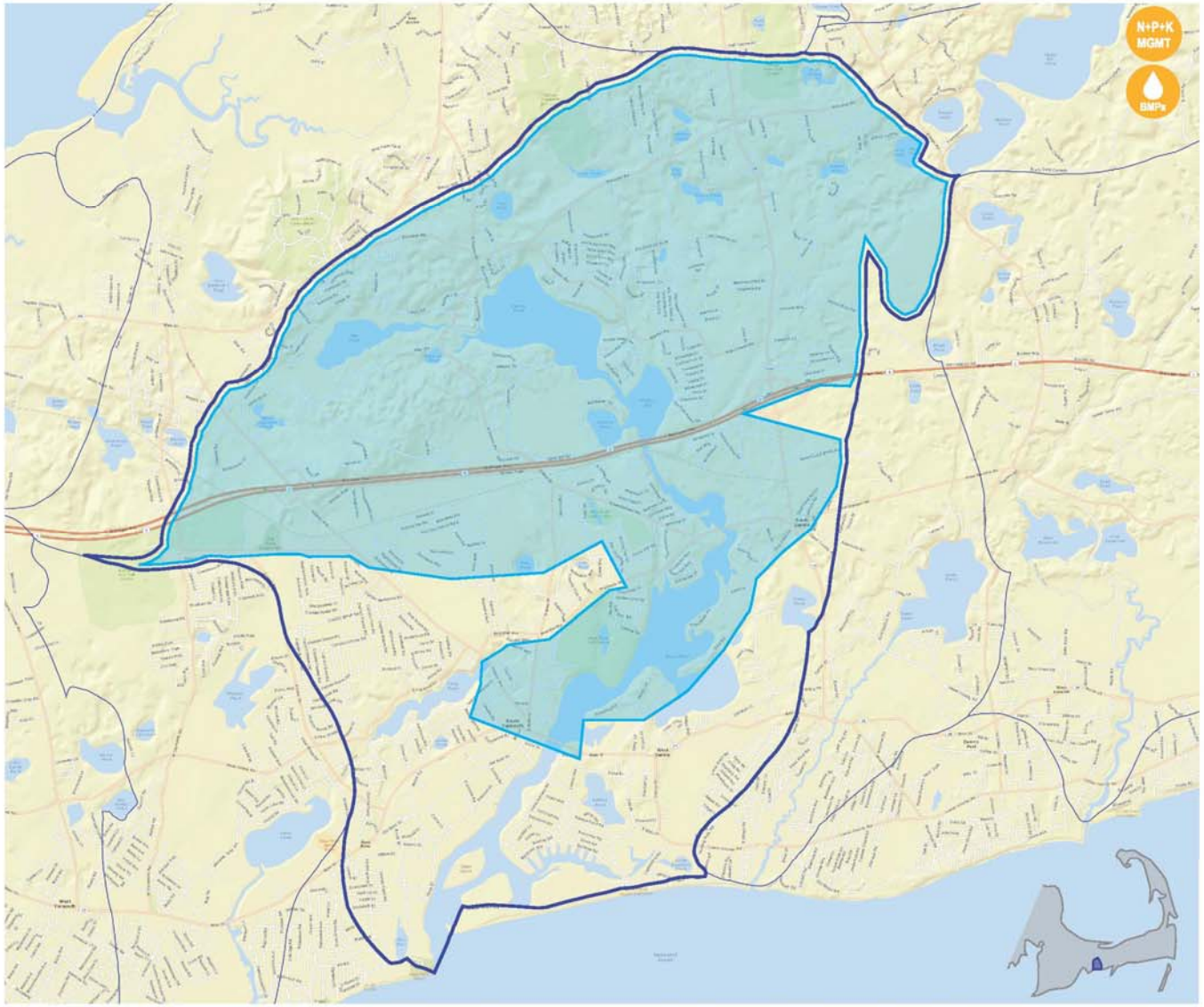
3225 Main Street - Barnstable, MA 02630
(508) 362-3828 - www.capecodcommission.org

DATE 02.04.14

N

Draft Watershed Concept Maps

SHEET NUMBER SC-1



3 Sample Cape Cod Subwatershed

TOWN OF YARMOUTH MASSACHUSETTS

MAP 3: TOTAL COLLECTION AREA NECESSARY TO MEET:
Current Nitrogen Removal Needs
+ Additional Future Nitrogen Removal Needs
- Low Barrier Technologies

NITROGEN CALCULATOR

1	Current N Removal Needs (TMDL)	+37,400 KG/YR	+93.5%
2	Additional N Removal Needs	+2,600 KG/YR	+6.5%
	Failed Title 5 Systems	+600 KG/YR	+1.5%
	Anticipated Growth Areas	+2000 KG/YR	+5%
3	Low Barrier Technologies	-10,000 KG/YR	-25%
	Fertilizer Management	-5,000 KG/YR	-12.5%
	Stormwater BMPs	-5,000 KG/YR	-12.5%
4	Watershed Alternative Technologies		
	Const. Wetlands - GW		
	Const. Wetlands - SW		
	Phytobuffer		
	Perm. React. Barrier		
	Fertigation Wells		
	Shellfish Aquaculture		
	Inlet Widening		
5	On-Site Alternative Technologies		
	I/A Title 5 Systems		
	Alt. Toilet Systems		
6	Collection/Sewer	-30,000 KG/YR	-75%
	Remaining Nitrogen to Meet Goal	0 KG/YR	0%

Indicator Bar

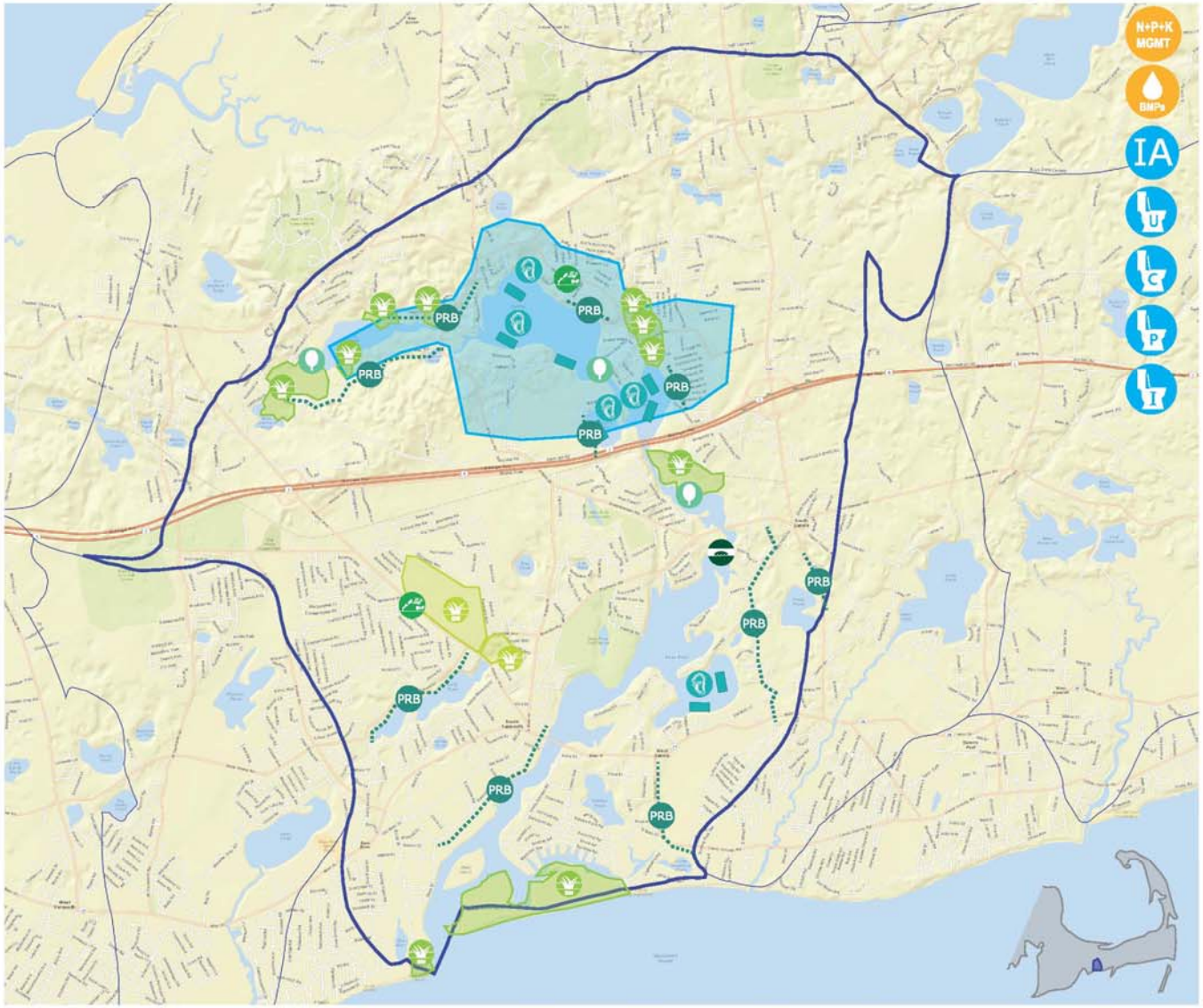
CAPE COD COMMISSION

3225 Main Street - Barnstable, MA 02630
(508) 362-3828 - www.capecodcommission.org

DATE 02.04.14

Draft Watershed Concept Maps

SHEET NUMBER SC-3



5 Sample Cape Cod Subwatershed

TOWN OF YARMOUTH MASSACHUSETTS

MAP 5: TOTAL COLLECTION AREA NECESSARY TO MEET:
Current Nitrogen Removal Needs
+ Additional Future Nitrogen Removal Needs
- Low Barrier Technologies
- Watershed Alternative Technologies
-On-Site Alternative Technologies

NITROGEN CALCULATOR

1	Current N Removal Needs (TMDL)	+37,400 KG/YR	+93.5%
2	Additional N Removal Needs	+2,600 KG/YR	+6.5%
	Failed Title 5 Systems	+600 KG/YR	+1.5%
	Anticipated Growth Areas	+2000 KG/YR	+5%
3	Low Barrier Technologies	-10,000 KG/YR	-25%
	Fertilizer Management	-5,000 KG/YR	-12.5%
	Stormwater BMPs	-5,000 KG/YR	-12.5%
4	Watershed Alternative Technologies	-22,100 KG/YR	-55.25%
	Const. Wetlands - GW	-3,000 KG/YR	-7.5%
	Const. Wetlands - SW	-4,000 KG/YR	-10%
	Phytobuffer	-100 KG/YR	-.25%
	Fertigation Wells	-600 KG/YR	-1.5%
	Shellfish Aquaculture	-10,000 KG/YR	-25%
	Perm. React. Barrier	-3,900 KG/YR	-9.75%
	Inlet Widening	-500 KG/YR	-1.25%
5	On-Site Alternative Technologies	-2,800 KG/YR	-7%
	I/A Title 5 Systems	-0 KG/YR	-0%
	Alt. Toilet Systems	-2,800 KG/YR	-7%
6	Collection/Sewer	-5,100 KG/YR	-12.75%
	Remaining Nitrogen to Meet Goal	0 KG/YR	0%

Indicator Bar

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N

Draft Watershed Concept Maps

SHEET NUMBER SC-5

208 STAKEHOLDER SUMMIT

Triple Bottom Line Model Workshop Breakout Session

Thursday, February 6, 2014

CAPE COD COMMISSION

Agenda

- Today's goals
- Criteria selection process
- Discussion of Criteria
- Understanding the TBL Model's Outputs
- Q&A

Today's Goals

For Workshop participants to come to a common understanding of the functionality of the Triple Bottom Line decision support tool, with a focus on the Criteria selected, and how to read the Model's outputs.

Scenario Evaluation Criteria

Social

- System Resilience
- Allocation of Costs to Users
- Employment – Direct Investment
- Employment – Tourism
- Tax Revenues
- Property Values
- Growth Compatibility

Environmental

- Habitat
- Climate
- Marine Water Quality
- Fresh Water Quality

Financial

- Municipal Costs, Passed on to Ratepayers
- Costs, Incurred Directly by Property Owners

Financial Category
Utilizing Lifecycle Cost Analysis

Financial Category

Impacts to average annual homeowner rates

How much will each Scenario require increases to (or creation of) wastewater management fees to pay for the upgrades to the wastewater management system?

Impacts to other homeowner costs

How much will each Scenario change the average homeowner's wastewater management costs, separate from any new or increased fees, such as costs to comply with installing an upgraded septic tank?

The TBL Model will present this information in such a way as to be comparable to the homeowner rates in the previous criterion.

Social Category

Social Category

Employment resulting from Scenario implementation

How many jobs will be created from the construction/installation and ongoing O&M of each Scenario's collection of Technology Options?

This criterion will take into account the reduction in jobs that will result from reduced disposable income of Cape Cod households who will be paying more in wastewater management fees.

Tourism employment

To what extent will each Scenario benefit the tourism economy on Cape Cod (or prevent damage to it)?

Property Values

To what extent will each Scenario impact a watershed's aggregate property values? Different Technology Options will have different impacts on individual properties and on the overall watershed.

Social Category

Tax Revenues

To what extent will each Scenario raise tax revenues, and how will changes affect the distribution of the tax burden by income group?

Allocation of Costs to System Users

To what extent will each Scenario's financial burden be felt by year-round residents?

System Resilience

To what extent will each Scenario improve the resilience and reduce the risk of failure of the wastewater management system and other important assets in the face of extreme natural events, such as sea level rise?

Growth Compatibility

To what extent will each Scenario encourage growth in villages and town centers, versus the extent to which each Scenario may encourage growth in sparsely populated areas.

Environmental Category

Environmental Category

Habitat

To what extent will each Scenario enhance and protect habitat areas that have been deemed important to local ecosystems?

Climate

To what extent will each Scenario increase or decrease greenhouse gas emissions? The Model will assess both generated emissions (by pumping stations and treatment plants), captured emissions (methane for fuel), and sequestered carbon (in plant life).

Marine Water Quality

How quickly will each Scenario deliver improvements in marine water quality to the watershed, with an emphasis on improving the more severely degraded marine water habitats?

Fresh Water Quality

To what extent will each Scenario deliver improvements to fresh water bodies (ponds, lakes) whose water quality is classified as impaired?

TBL Model – Process and Outputs

CCC TBL Model Workflow and Components

1 Select Watershed

2 Build New Scenario

3 Build Strategy Technology Stack

- Select Strategy / Technology from Pull-down
- Select Application Area on Map
- OR fill-in parameters on Technology Input Form
- View Technology Performance Screen

Iterative Process

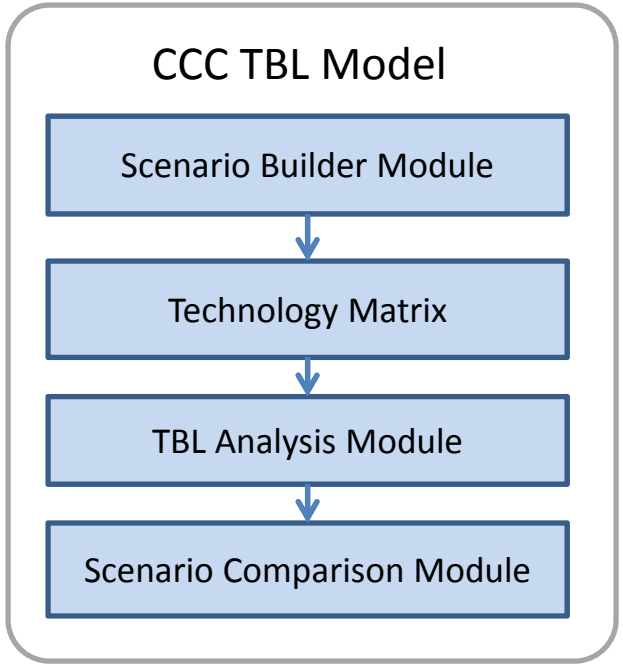
4 View Scenario Overview

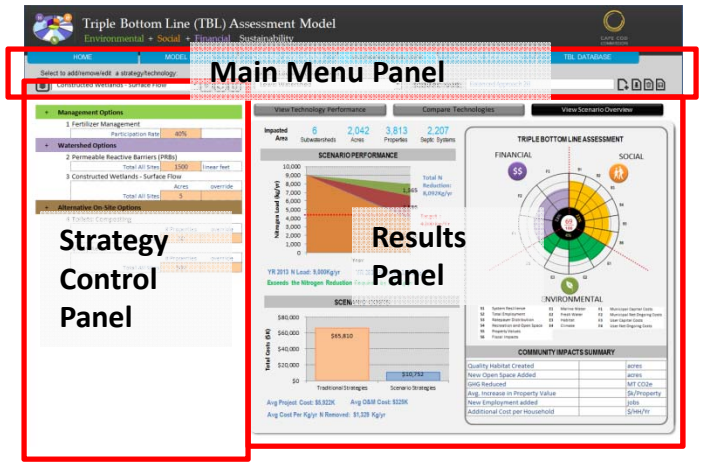
5 Revise Technology Selections and Parameters

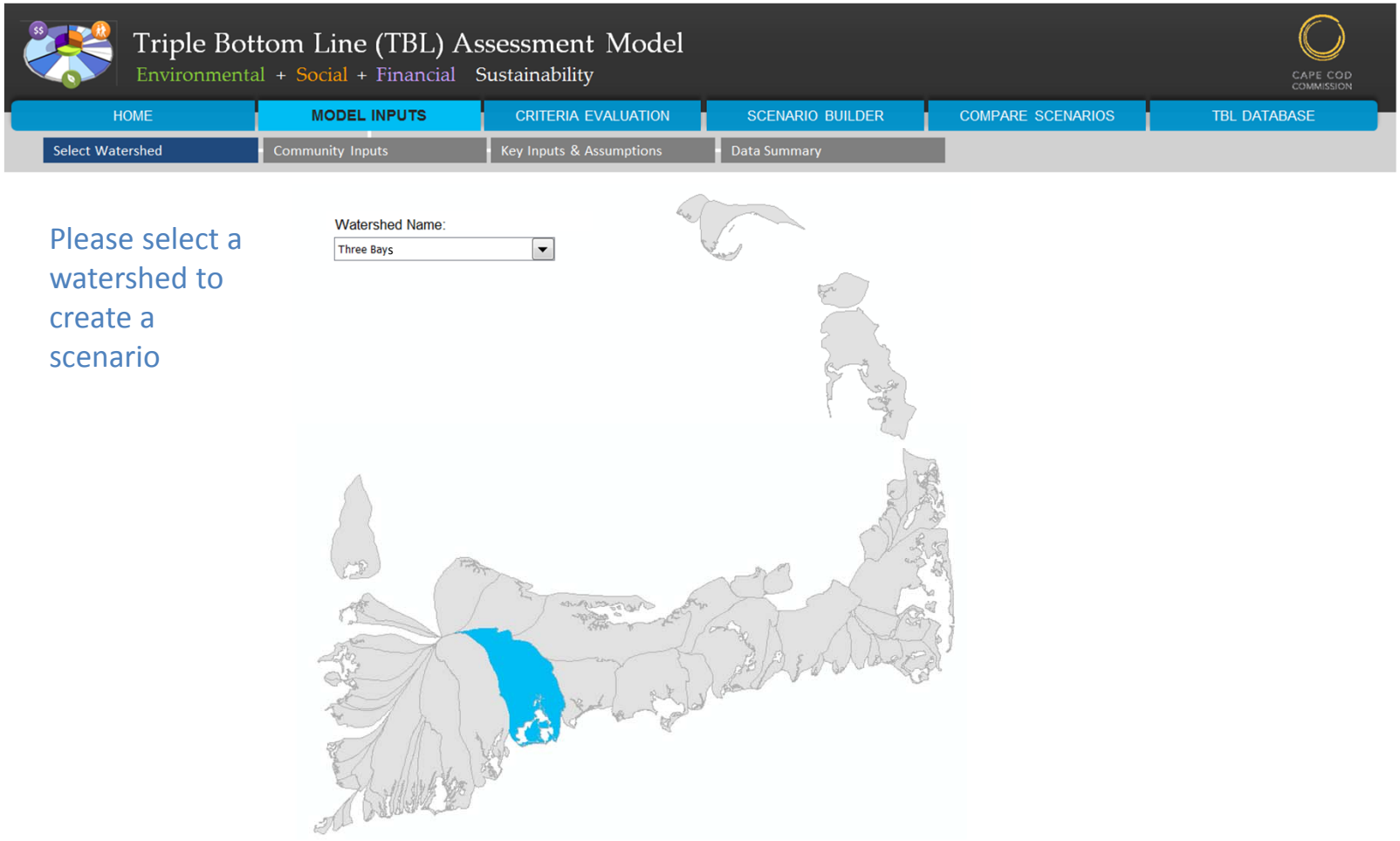
6 Save Scenario to Archive Database

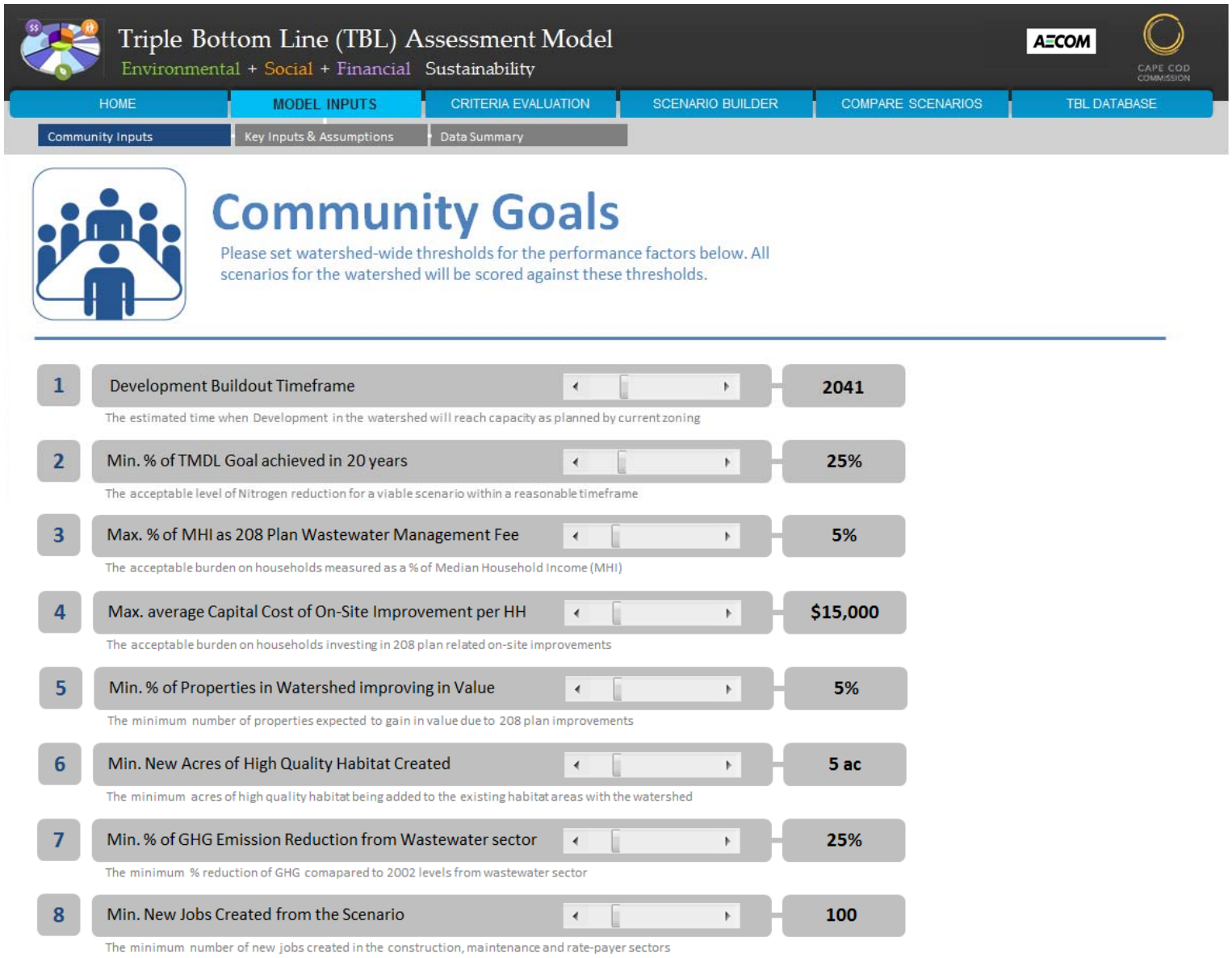
7 Compare Scenarios

- View TBL Outputs
- Adjust Criterion Weightages
- Flag favorable Scenario






Triple Bottom Line (TBL) Assessment Model
Environmental + Social + Financial Sustainability
CAPE COD COMMISSION
HOME
MODEL INPUTS
CRITERIA EVALUATION
SCENARIO BUILDER
COMPARE SCENARIOS
TBL DATABASE
Select Watershed
Community Inputs
Key Inputs & Assumptions
Data Summary
Please select a watershed to create a scenario
Watershed Name:
Three Bays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AECOM
CAPE COD COMMISSION
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SCENARIO BUILDER
COMPARE SCENARIOS
TBL DATABASE
Community Inputs
Key Inputs & Assumptions
Data Summary
Community Goals
Please set watershed-wide thresholds for the performance factors below. All scenarios for the watershed will be scored against these thresholds.
1 Development Buildout Timeframe 2041
The estimated time when Development in the watershed will reach capacity as planned by current zoning
2 Min. % of TMDL Goal achieved in 20 years 25%
The acceptable level of Nitrogen reduction for a viable scenario within a reasonable timeframe
3 Max. % of MHI as 208 Plan Wastewater Management Fee 5%
The acceptable burden on households measured as a % of Median Household Income (MHI)
4 Max. average Capital Cost of On-Site Improvement per HH $15,000
The acceptable burden on households investing in 208 plan related on-site improvements
5 Min. % of Properties in Watershed improving in Value 5%
The minimum number of properties expected to gain in value due to 208 plan improvements
6 Min. New Acres of High Quality Habitat Created 5 ac
The minimum acres of high quality habitat being added to the existing habitat areas with the watershed
7 Min. % of GHG Emission Reduction from Wastewater sector 25%
The minimum % reduction of GHG comapared to 2002 levels from wastewater sector
8 Min. New Jobs Created from the Scenario 100
The minimum number of new jobs created in the construction, maintenance and rate-payer sectors

Triple Bottom Line (TBL) Assessment Model

Environmental + Social + Financial Sustainability

AECOM CAPE COD COMMISSION

HOME | MODEL INPUTS | CRITERIA EVALUATION | SCENARIO BUILDER | COMPARE SCENARIOS | TBL DATABASE

Select to add/remove/edit a strategy/technology: A4. I/A Systems

Select a Location (Watershed): Three Bays Watershed

SCENARIO NAME: Balanced Approach 2B

Current Application Stack: 7 Strategies/Technologies

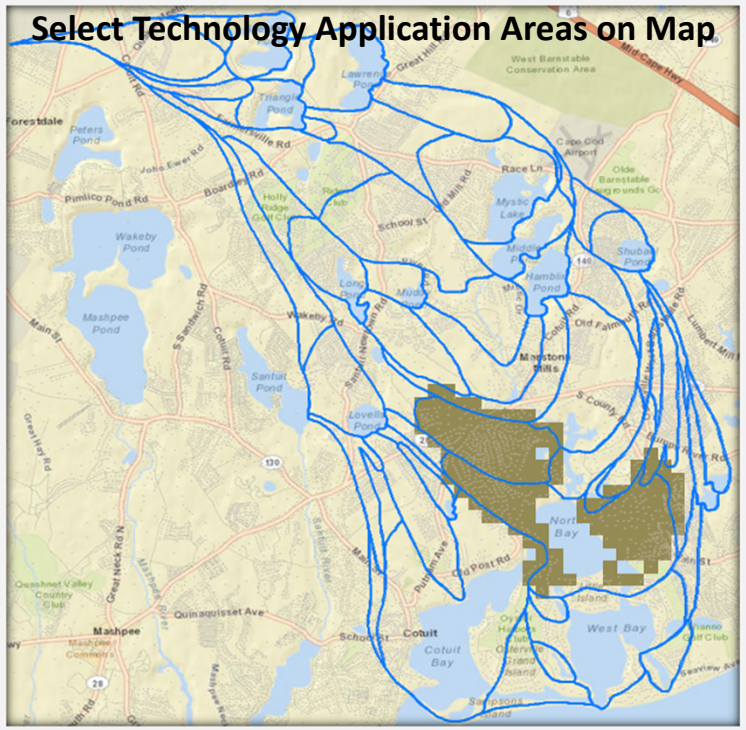
- **+ Management Options**
  - M1 Fertilizer Management
- **+ Watershed Options**
  - W1 Permeable Reactive Barriers (PRBs)
  - W3 Constructed Wetlands - Subsurface Flow
- **+ Alternative On-Site Options**
  - A1 Toilets: Composting
  - A4 **I/A Systems**

	from Selection
Total Number of Properties	900
Land Area (acres)	1157.6
Existing Nitrogen Load (Kg/yr)	7667.1
Future Nitrogen Load (Kg/yr)	8273.9
Properties Already Sewered	1
Application Suitability	899
% Selected	80%
Properties Impacted	719
Land Area Impacted	868.7
Future Nutrient Load Impacted	7,963.5 Kg/Yr

Clear Selection

- **+ Sewering Options**
  - S1 High-Density Areas Sewering
  - S2 Supplemental Sewering

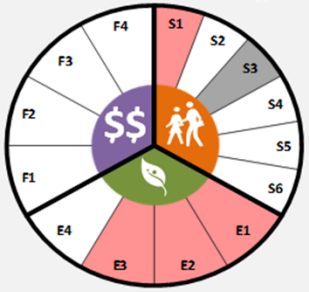
View Scenario Overview | View Technology Performance | Compare Technologies



STRATEGY/TECHNOLOGY:

A4. I/A Systems

TBL Assessment for Technology



Technology Applied to:

719 Properties 869 Acres

Technology Metrics

Applied Nitrogen	2,451 Kg/yr
Avg. Project	16,106K
Avg. O&M	989K
Avg Cost Per kg N	11,599 $/Kg N/yr

Triple Bottom Line (TBL) Assessment Model

Environmental + Social + Financial Sustainability

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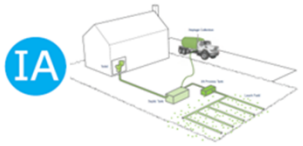

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Clear Selection

+ **Sewering Options**
  - S1 High-Density Areas Sewering
  - S2 Supplemental Sewering

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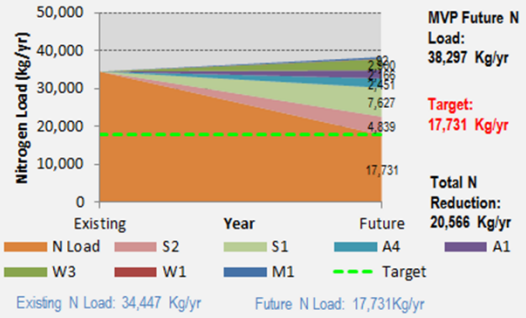
Impacted: 3,954 Acres; 2,976 Properties; 2,975 Septic Systems

SCENARIO PERFORMANCE



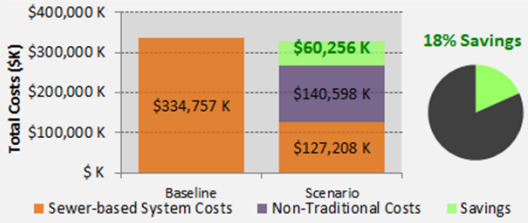
MVP Future N Load: 38,297 Kg/yr

Target: 17,731 Kg/yr

Total N Reduction: 20,566 Kg/yr

Existing N Load: 34,447 Kg/yr Future N Load: 17,731Kg/yr

SCENARIO COSTS

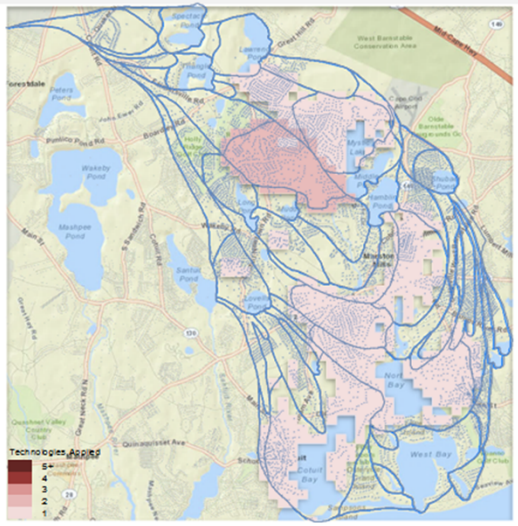


18% Savings

Avg Project Cost: $102,681K Avg O&M Cost: $4,181K

Avg Cost Per Kg/yr N Removed: $7,808 Kg/yr

TECHNOLOGY APPLICATION MAP



COMMUNITY IMPACTS SUMMARY

Quality Habitat Created		acres
New Open Space Added		acres
GHG Reduced		MT CO2e
Avg. Increase in Property Value		$k/Property
New Employment added		jobs
Additional Cost per Household		$/HH/Yr

Triple Bottom Line (TBL) Assessment Model

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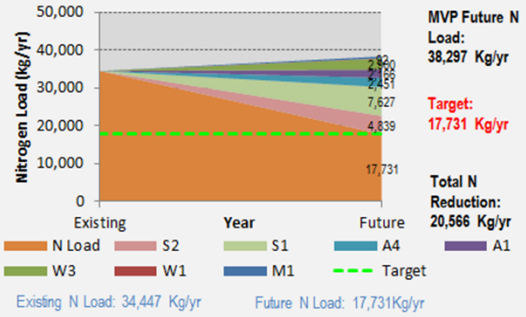

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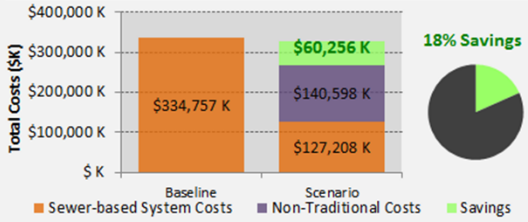

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TRIPLE BOTTOM LINE ASSESSMENT

S1 System Resilience
S2 Employment
S3 Ratepayer Distribution
S4 Tourism
S5 Property Values
S6 Tax Revenue
S7 Land Use Compatibility

E1 Marine Water Quality
E2 Fresh Water Quality
E3 Habitat
E4 Climate

F1 Municipal Costs
F2 Direct Costs to System Users

COMMUNITY IMPACTS SUMMARY

Quality Habitat Created		acres
New Open Space Added		acres
GHG Reduced		MT CO2e
Avg. Increase in Property Value		$k/Property
New Employment added		jobs
Additional Cost per Household		$/HH/Yr

Triple Bottom Line (TBL) Assessment Model

Environmental + Social + Financial Sustainability

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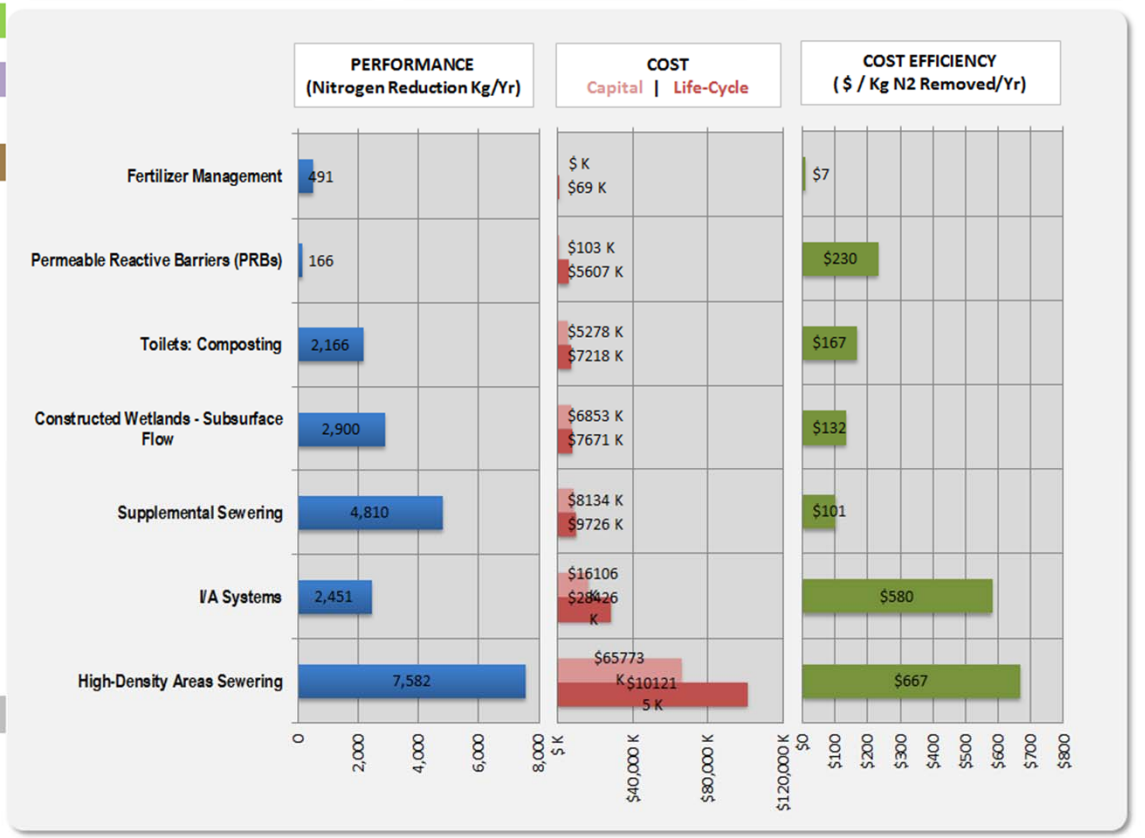
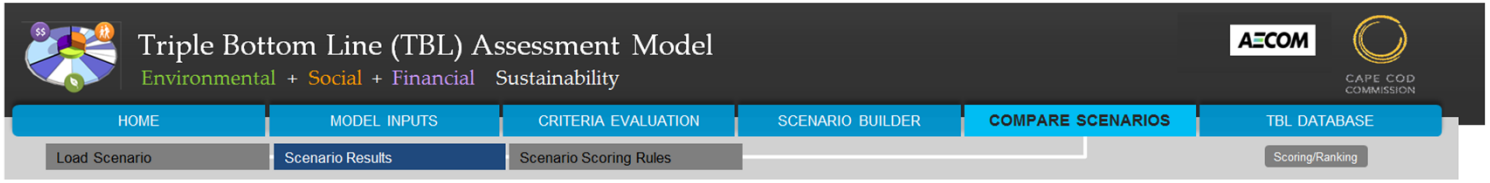


CCC TBL Model Scenario Comparison



Criterion	Scenario 1	Scenario 2	Scenario 3
	Minimum Cost	Cost Effective	Maximum Performance
SOCIAL			
System Resilience S1			
Employment S2			
Ratepayer Distribution S3			
Tourism S4			
Property Values S5			
Tax Revenue S6			
Land Use Compatibility S7			
ENVIRONMENTAL			
Marine Water Quality E1			
Fresh Water Quality E2			
Habitat E3			
Climate E4			
FINANCIAL			
Municipal Costs F1			
Direct Costs to System Users F2			
Strategy/Technology Distribution	Title 5	Title 5, Enhanced IA	Enhanced IA, N+P, LC
COST & PERFORMANCE			
Nitrogen Reduction %	46%	46%	46%
Time to Reduce (years)	35.1	29.5	27.3
Municipal O&M Cost ($K)	$325	$425	$610
Municipal Project Cost ($K)	$1,329	$1,600	$1,800
Property Owner O&M Cost ($K)	$98	$128	$183
Property Owner Project Cost ($K)	$397	$480	$540
COMMUNITY BENEFITS			
Quality Habitat (acres)	0.5	1.8	2.4
New Open Space Added (acres)	1.5	4.6	5.0
GHG Reduced (MT CO2e/yr)	2.1	3.1	3.3
Avg. Increase in Property Value ($/pty)	$200	$1,200	$2,000
New Employment Added (jobs)	4	5	7
Additional Cost per Household ($/HH/yr)	$20	$26	$37

Thank You . . .

IEc

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EPA

Nitrogen Loading and Water Quality on Cape Cod: Modeling the Costs of Inaction

Presentation by
Industrial Economics, Incorporated

February 6, 2013

INDUSTRIAL ECONOMICS, INCORPORATED

Systems Thinking as a Sustainability Tool

"Triple Value" Framework

Economy

economic value

Society

tourism, fishing, land values, and aquaculture

runoff and wastewater

recreation, cultural values, quality of life

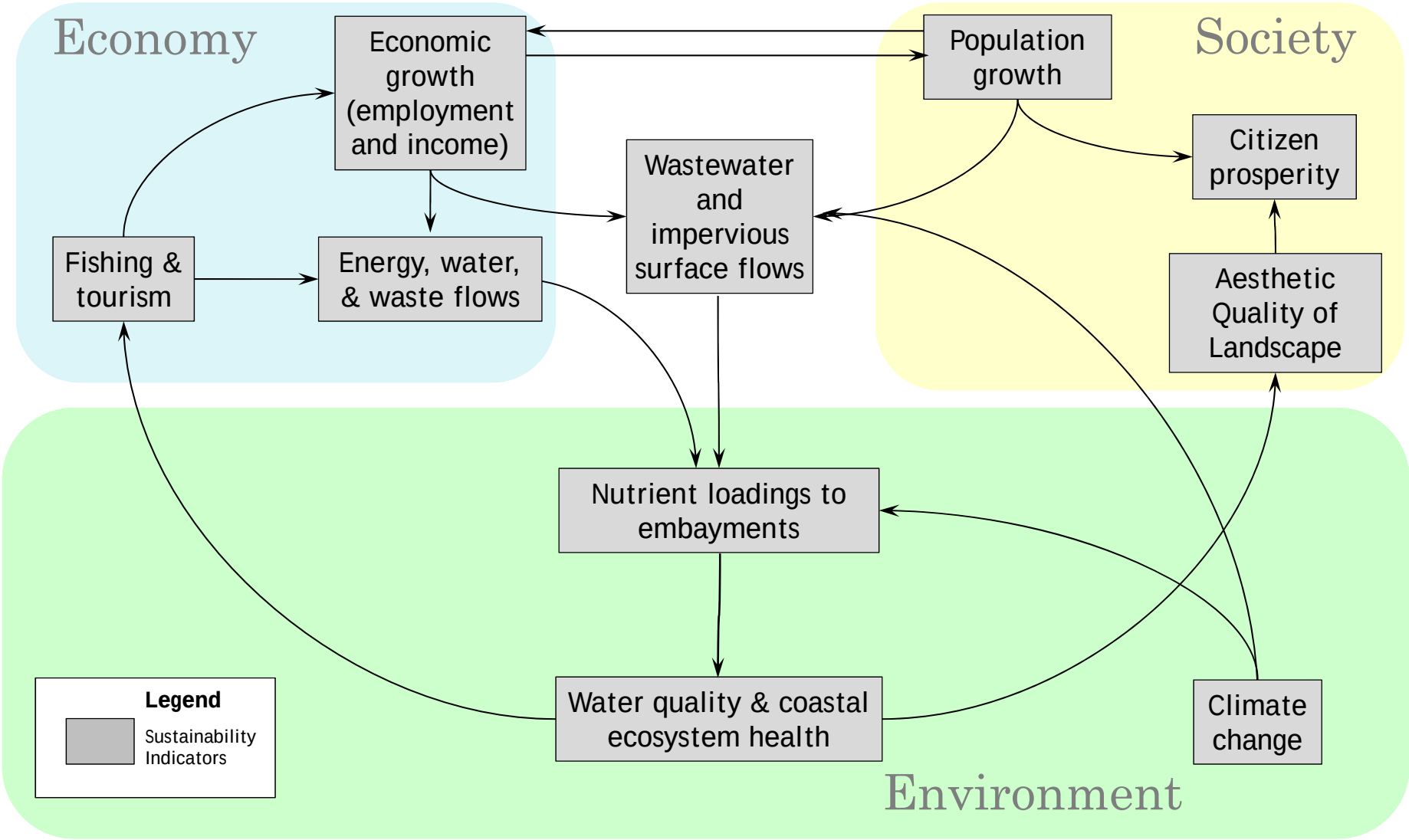
Environment

ecological resource base

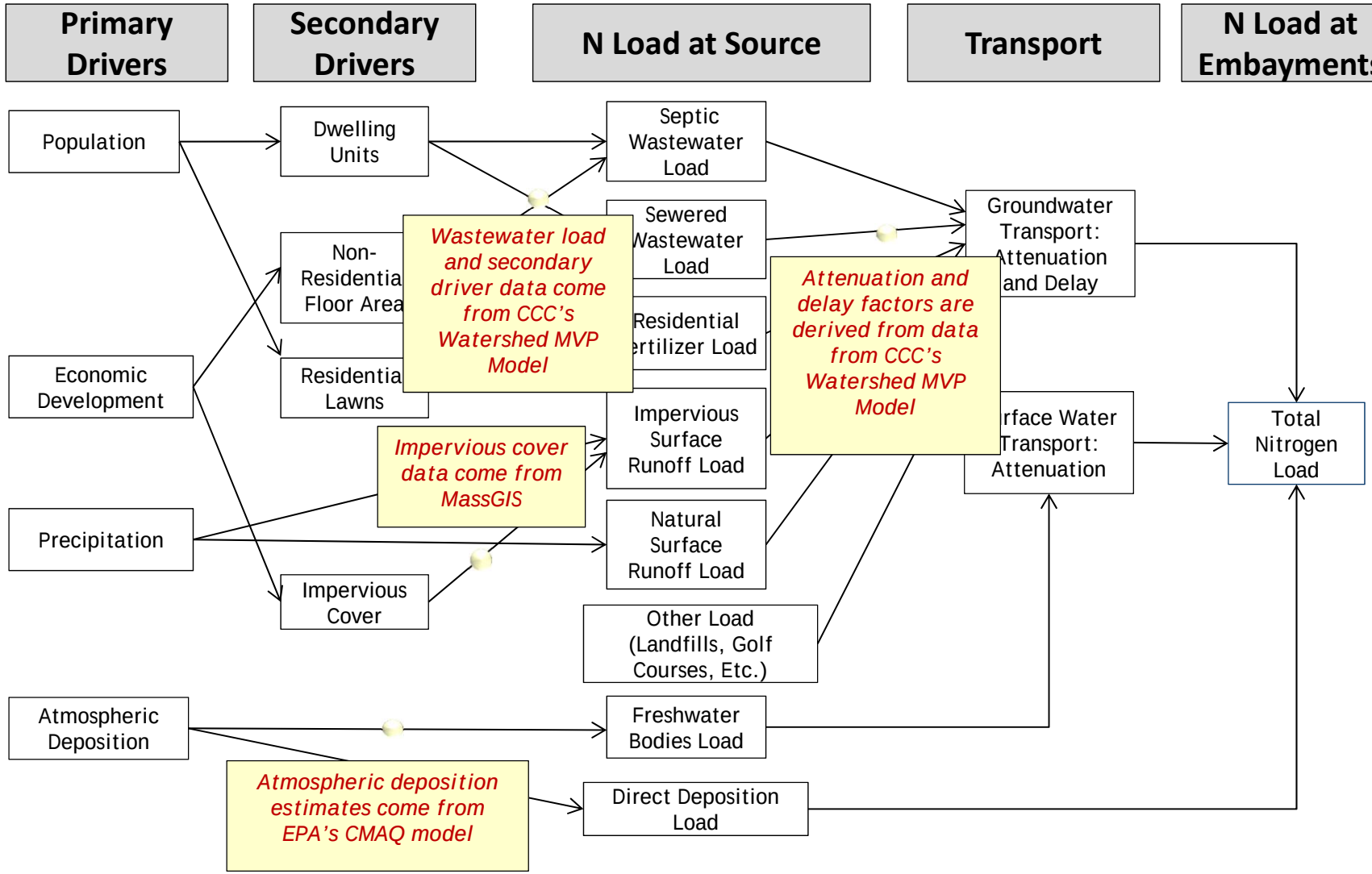
Introduction to 3VS Modeling

- Systems dynamics models evaluate the implications of large-scale environmental changes, making explicit interactions between the **environment, communities**, and the **economy**.
- Users can define scenarios in the model, selecting different combinations of policy alternatives (including No Action).
- The 3VS model will simulate the scenario and project results 30 years into the future.

Generalized Framework of 3VS model



Cape Cod Model –Nitrogen Loading



Cape Cod Model – Economic Indicators of Concern

Stakeholder outreach conducted by Adem Delibas (M.I.T.) identified key concerns with respect to increased nitrogen loading across the Cape:

Property Values (Primary Concern)

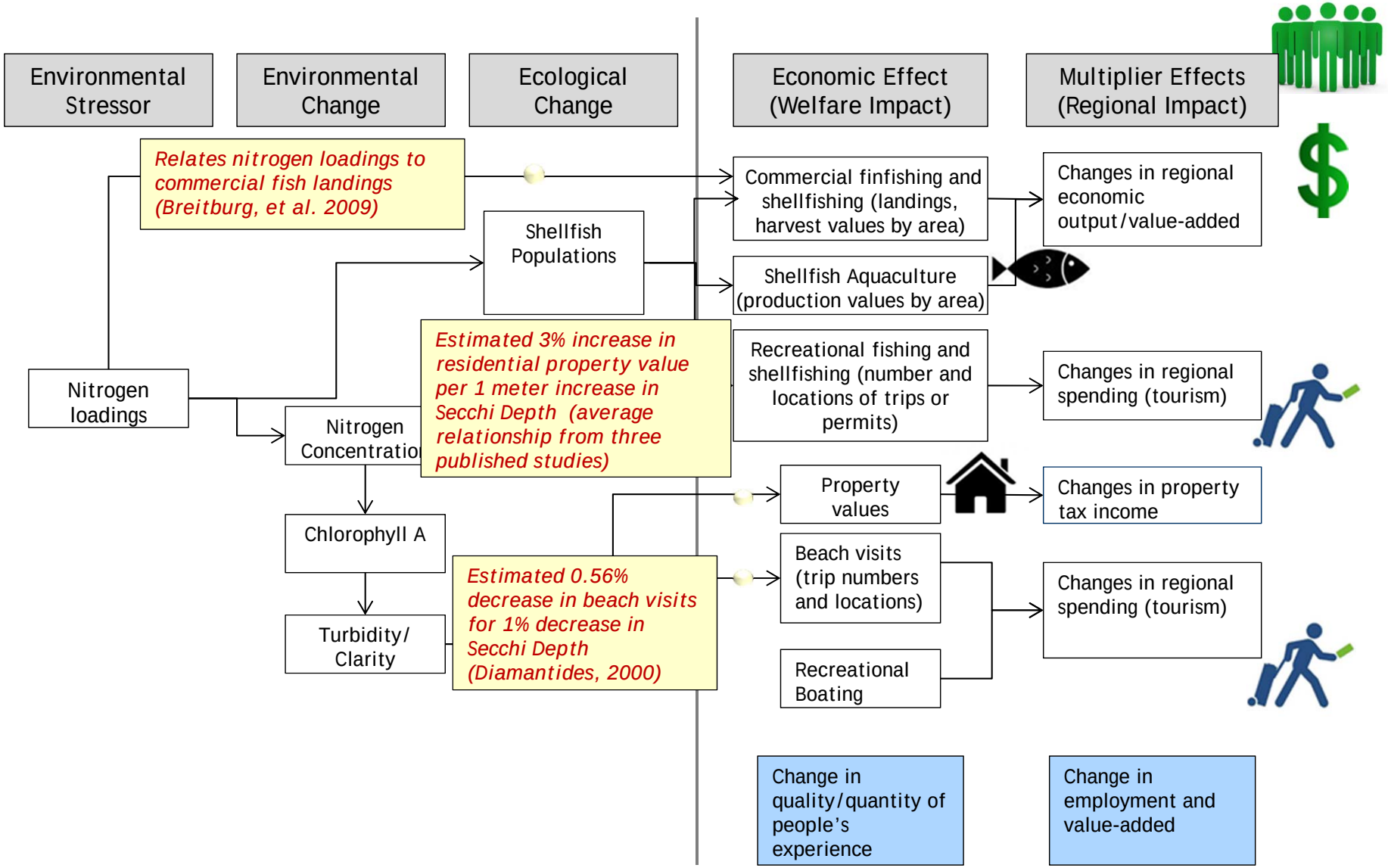
Tourism spending

Household income

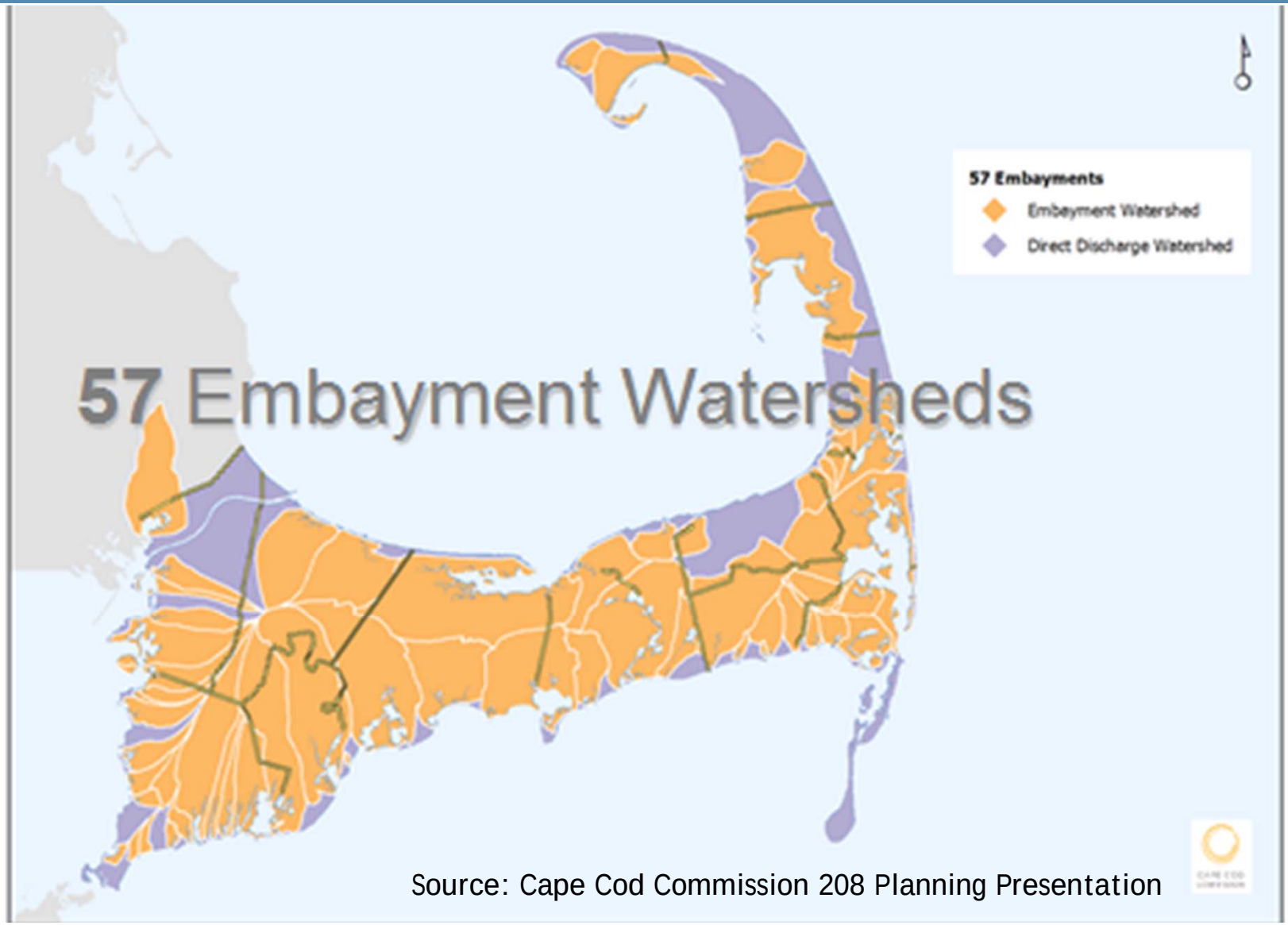
Employment

Natural resource revenue

Cape Cod Model – Economic Indicators

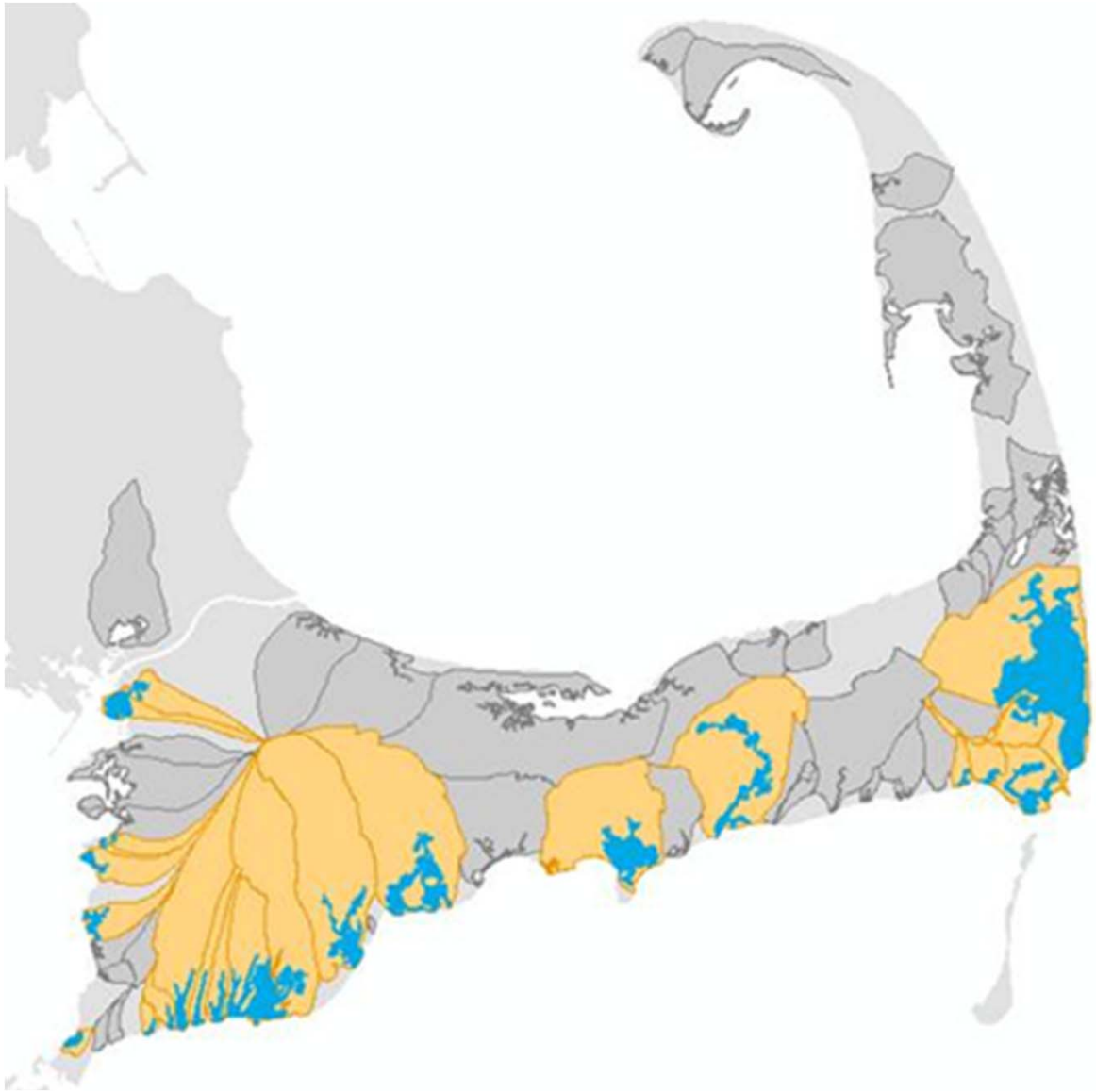


Watersheds Flowing into Embayments



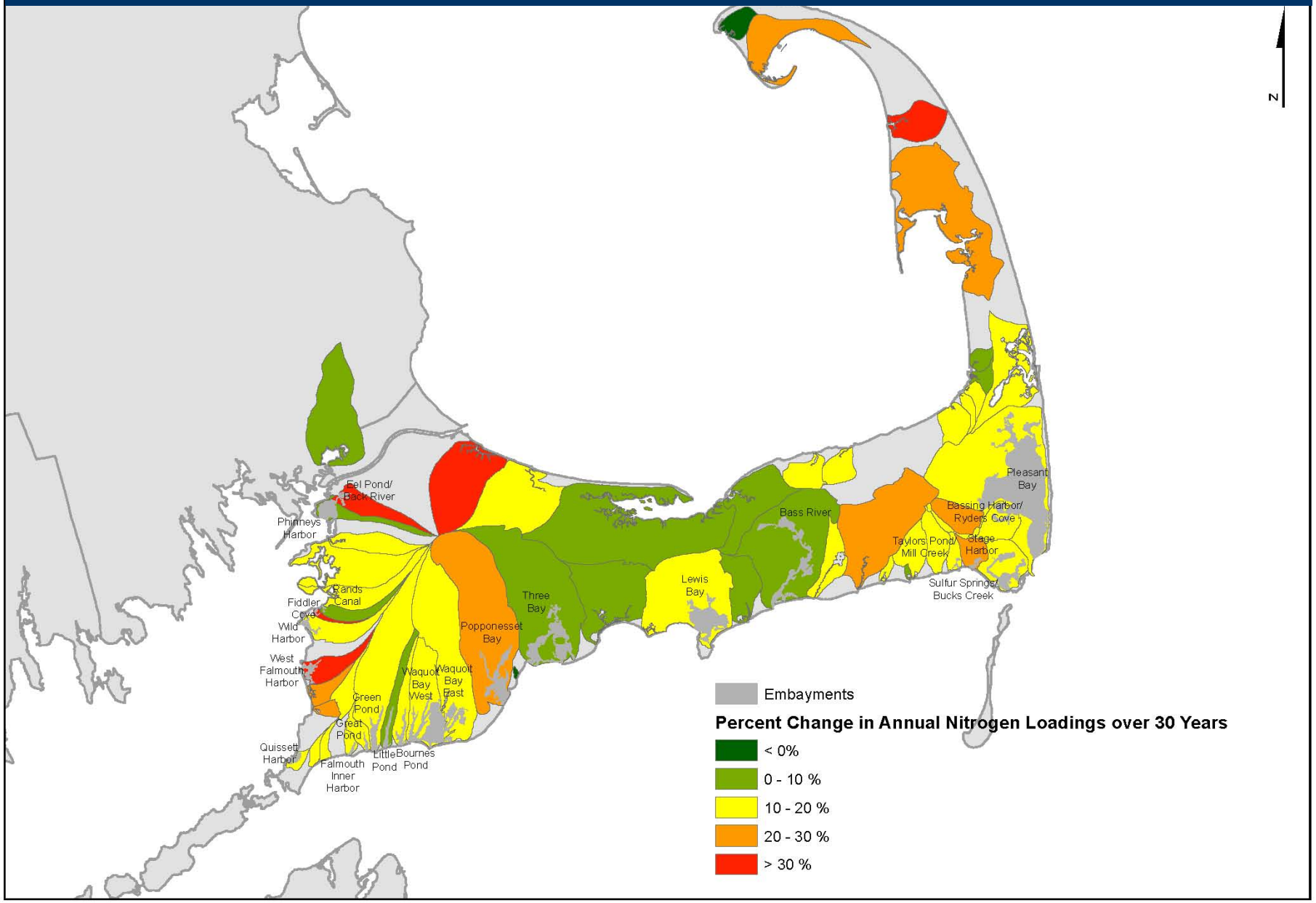
Source: Cape Cod Commission 208 Planning Presentation

Watersheds Containing Embayments



- Of the 57 watersheds that flow into embayments, **23** contain embayments and were the subject of MEP reports, allowing us to project effects of N loading on water quality indicators.
- 3VS model quantifies and reports effects of N loading by watershed.
- Model focuses on marine systems and not freshwater systems, which may also be impaired by N loading.

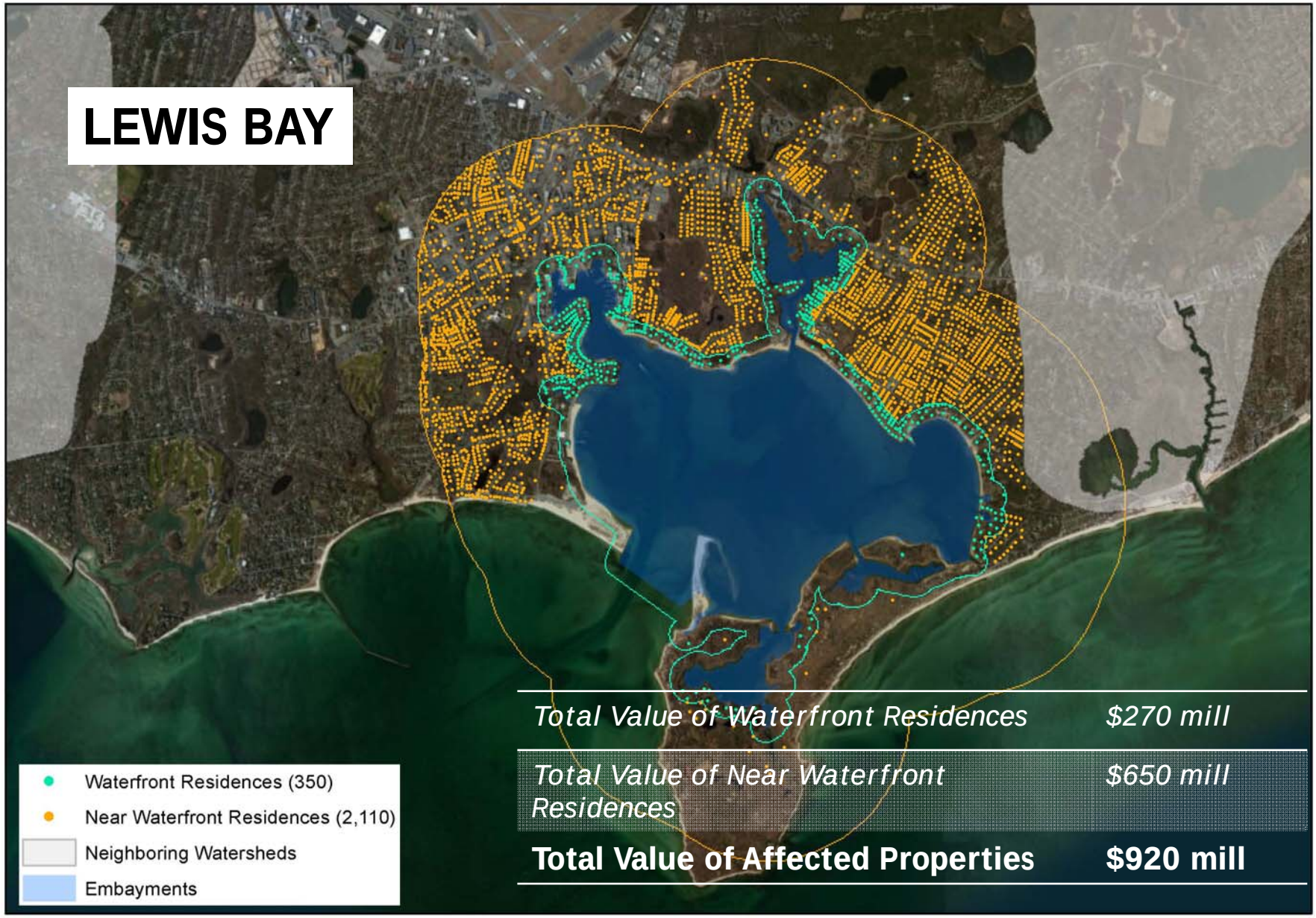
Effects of No Action – Map of Forecast Change in N Loading



IEc
INDUSTRIAL ECONOMICS, INCORPORATED

0 5 10 Miles

Sources:
USGS HUC Watersheds
Embayments created from USGS Watersheds



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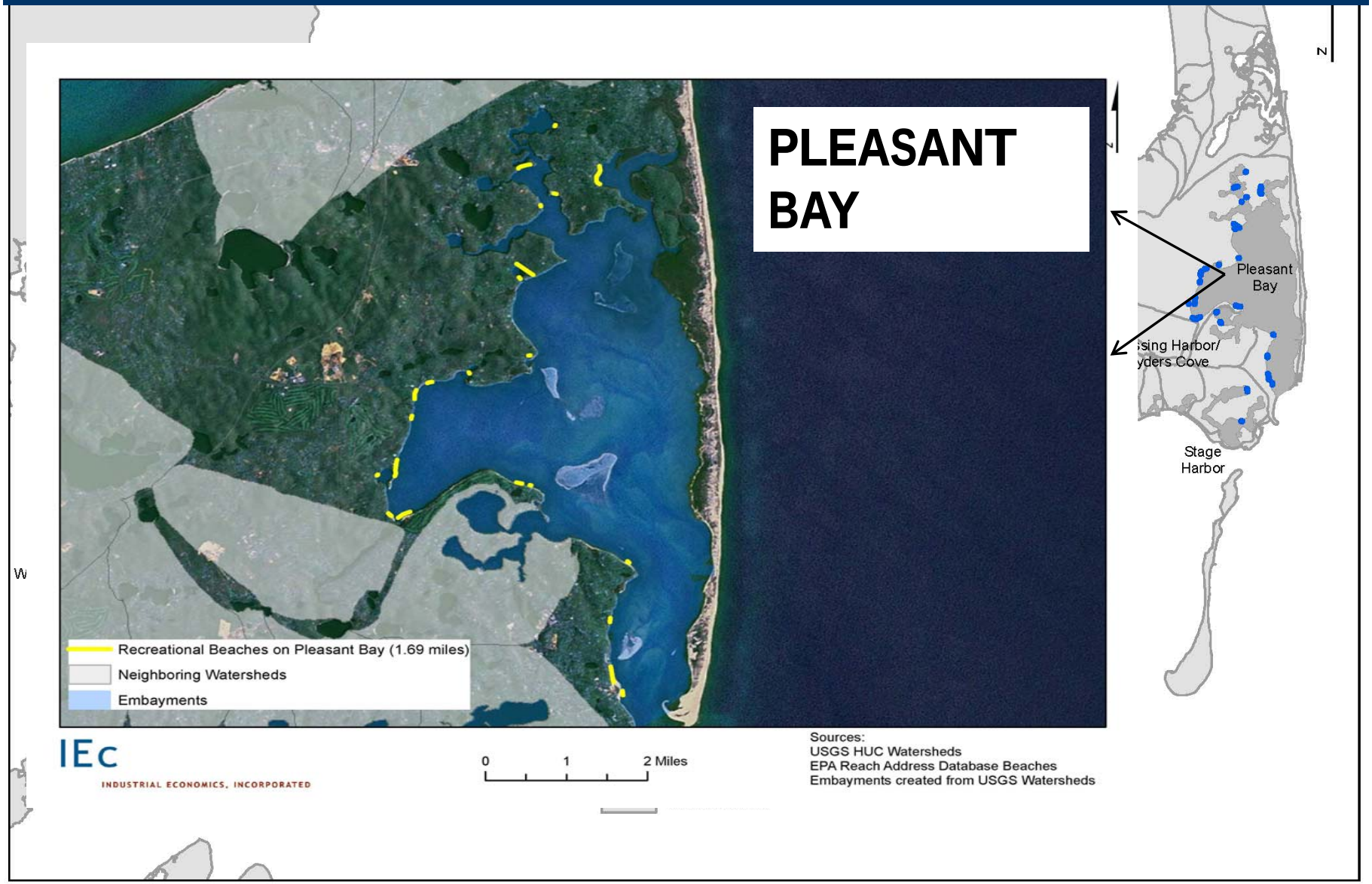
Effects of No Action – Nitrogen and Property Value Effects

- As N loading is projected to increase in multiple embayments, including Lewis Bay, property value reductions are expected.
- With baseline property values for waterfront and near waterfront residences in our example watershed totaling approximately $920 million, **even small percentage changes (e.g., 0.5 percent effect on value over 30 years) generate an embayment-level effect on the order of millions of dollars**.
- Furthermore, the reduction in property values likewise reduces the property tax base for the municipality. For Lewis Bay, **property value reductions in the millions means tens of thousands less in annual property tax revenue**.
- Calculating these impacts Cape-wide, N loadings increasing under the No Action scenario can measurably effect indicators of community well-being.

Effects of No Action – Potentially Affected Beaches



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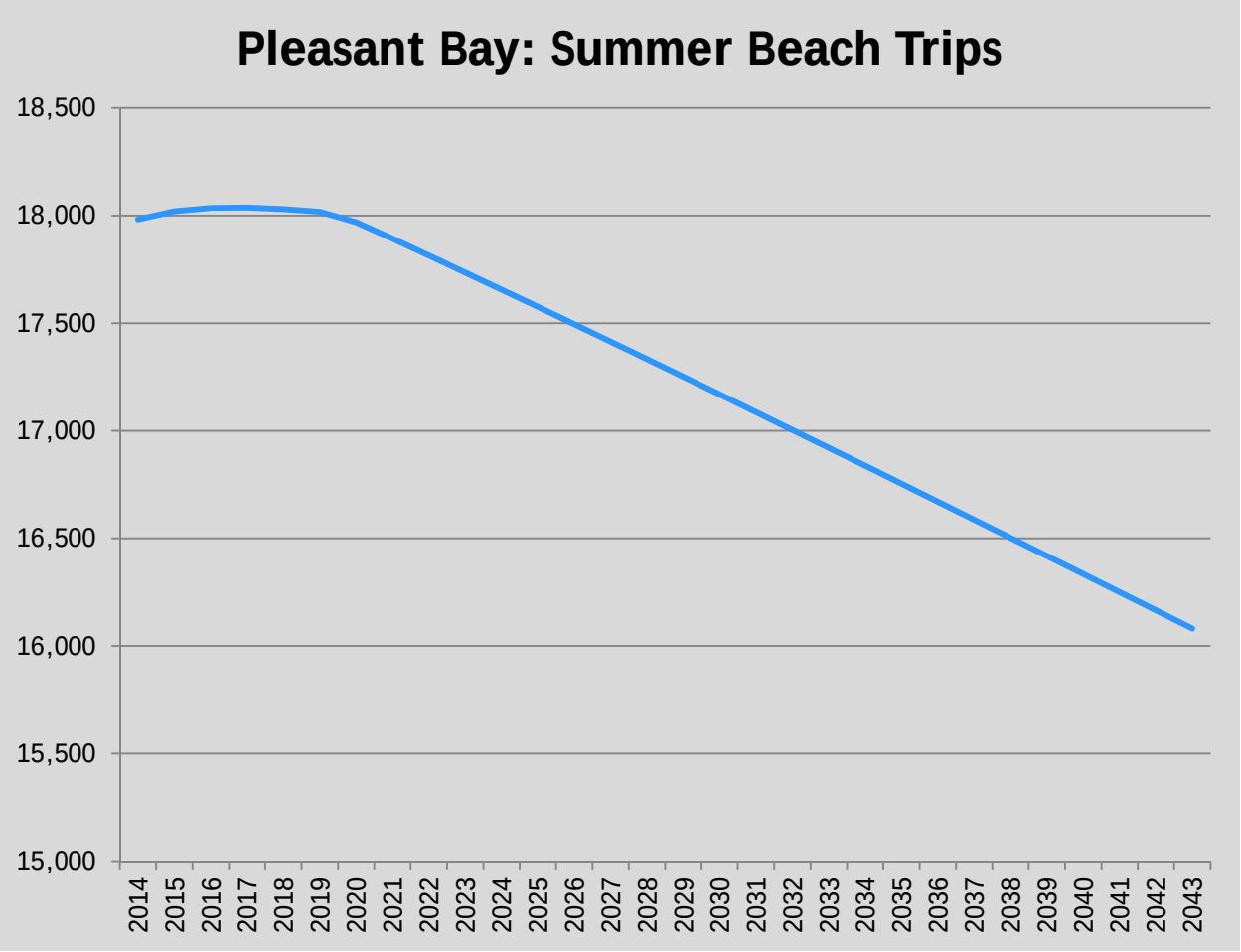
0 5 10 Miles

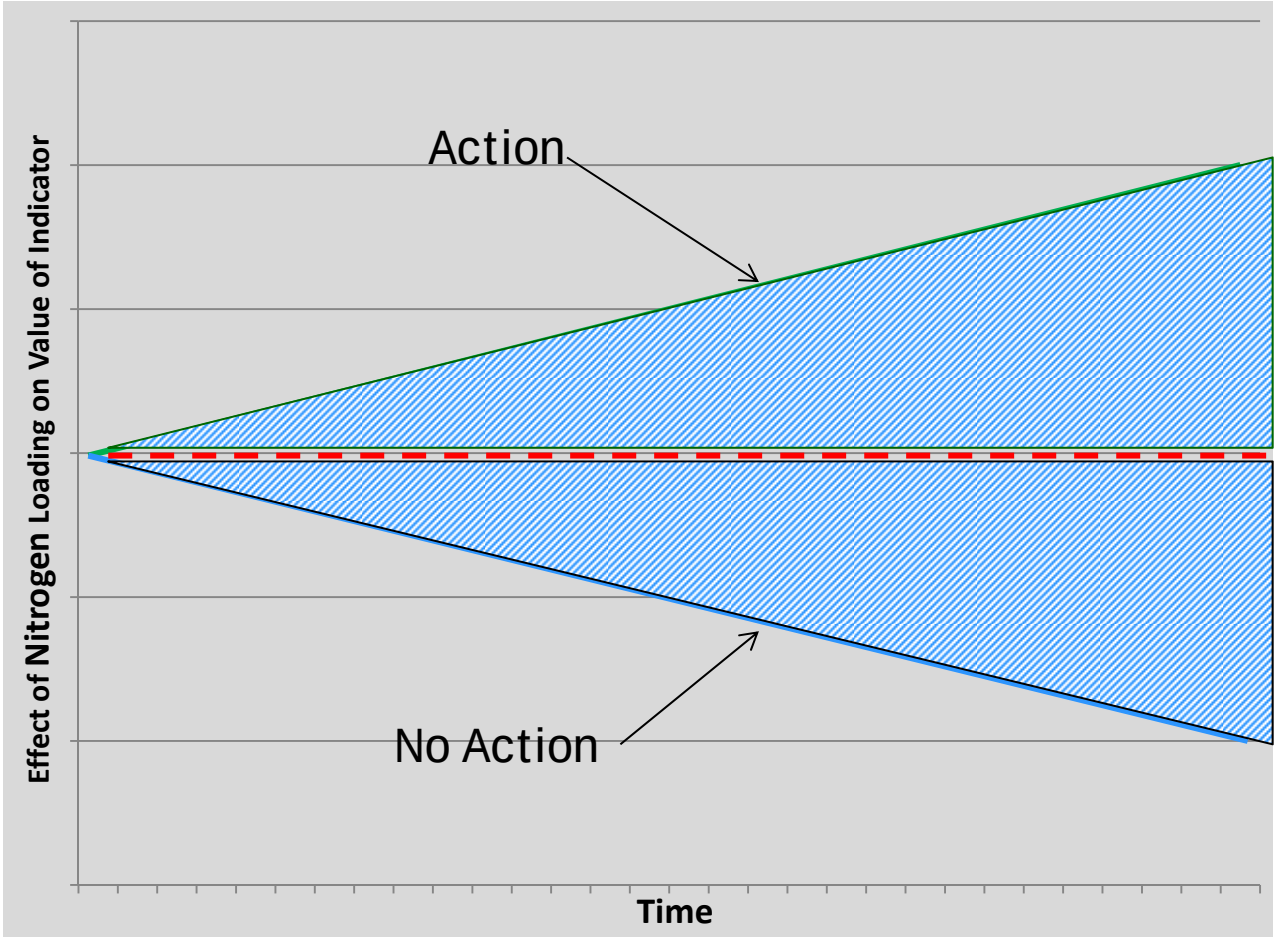
Sources:
USGS HUC Watersheds
EPA Reach Address Database Beaches
Embayments created from USGS Watersheds

Effects of No Action – Nitrogen and Beach Visits Effects



- Approximate 16% reduction in annual summer beach trips (May-Sept) at Pleasant Bay beaches over 30 years.
- Associated reduction in regional beach recreation-related spending (food, gas, lodging, entertainment).
- Multiplier effects on regional employment opportunities and economic output.

Benefits of Taking Action



- Taking action to reduce N loading can improve water quality above and beyond baseline levels.
- In addition to improving the ecological, social, and economic indicators directly affected by water quality improvements, innovative interventions to control N can generate co-benefits.

Next Steps– Complete Phase I

Phase I of the modeling effort involves evaluating the ecological and economic implications of the "No Action" scenario:

- Increase geographic scope of model by integrating additional watersheds, as needed.
- Integrate costs in no action scenario (e.g., for maintaining septic systems).
- Incorporate additional categories of ecological and economic impacts (e.g., commercial and recreational finfishing and shellfishing, wildlife viewing, eelgrass communities, macroeconomic effects).

Next Steps– Phase II

Phase II of the model development focuses on modeling the costs and benefits of interventions to mitigate nitrogen loading:

- Scenario-based approach.
- Explores traditional and alternative interventions.
- Considers co-benefits of interventions (beyond reducing nitrogen loading- e.g., increased open space, carbon sequestration).
- Integrates intuitive user interface to allow stakeholders to run different scenarios by altering assumptions and parameters.

Breakout Sessions

Upper Cape: Cape Cod Room
Mid Cape: Hyannisport East
Lower Cape: Hyannis Port West
Lower Cape: Barnstable Room #2 (first floor)

Coffee Breaks: 2nd floor lobby and outside of Barnstable Room

Scenario Planning

10:10-10:40 Upper Cape
10:40-11:10 Mid Cape
11:10-11:20 Coffee Break
11:20-11:50 Lower Cape
11:50-12:20 Outer Cape

Triple Bottom Line Analysis

10:10-10:40 Mid Cape:
10:40-11:10 Lower Cape
11:10-11:20 Coffee Break
11:20-11:50 Outer Cape
1:50-12:20 Upper Cape

Regulatory, Legal, and Institutional Issues

10:10-10:40 Lower Cape
10:40-11:10 Outer Cape
11:10-11:20 Coffee Break
11:20-11:50 Upper Cape
11:50-12:20 Mid Cape

Implementation

(monitoring, adaptive management, financing)
10:10-10:40 Outer Cape
10:40-11:10 Upper Cape
11:10-11:20 Coffee Break
11:20-11:50 Mid Cape
11:50-12:20 Lower Cape

Stakeholder involvement over the next 6 months

12:50 for all sub-groups

Monitoring, Adaptive Management, & Financing

IMPLEMENTATION

MONITORING

Establish monitoring protocols for technologies

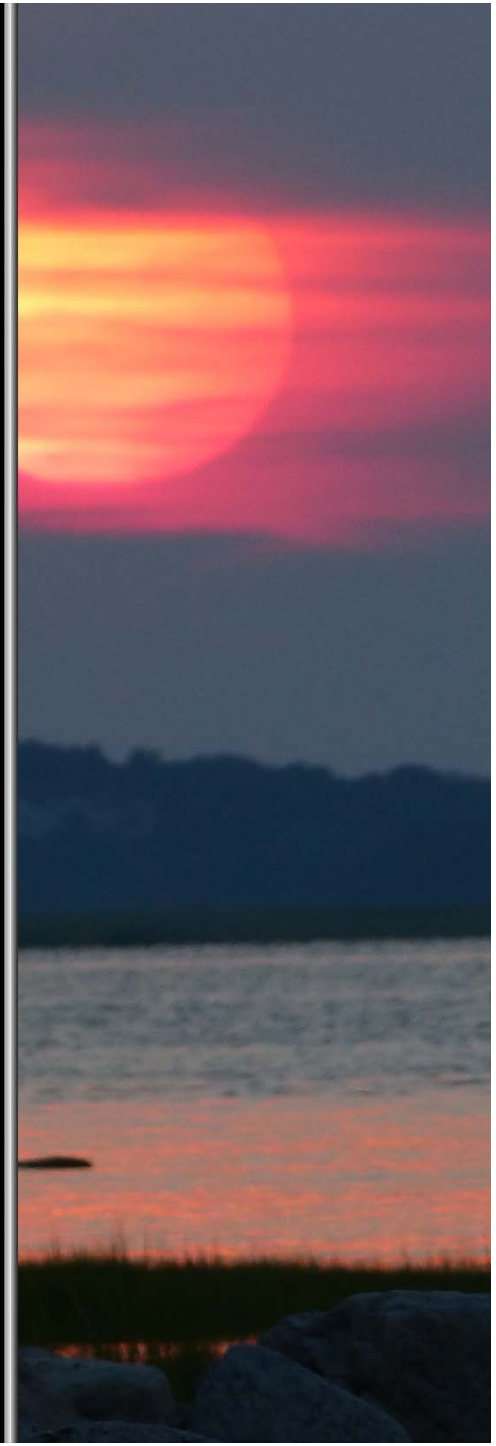
Establish monitoring protocols for meeting total maximum daily loads (TMDLs) in Cape Cod water bodies

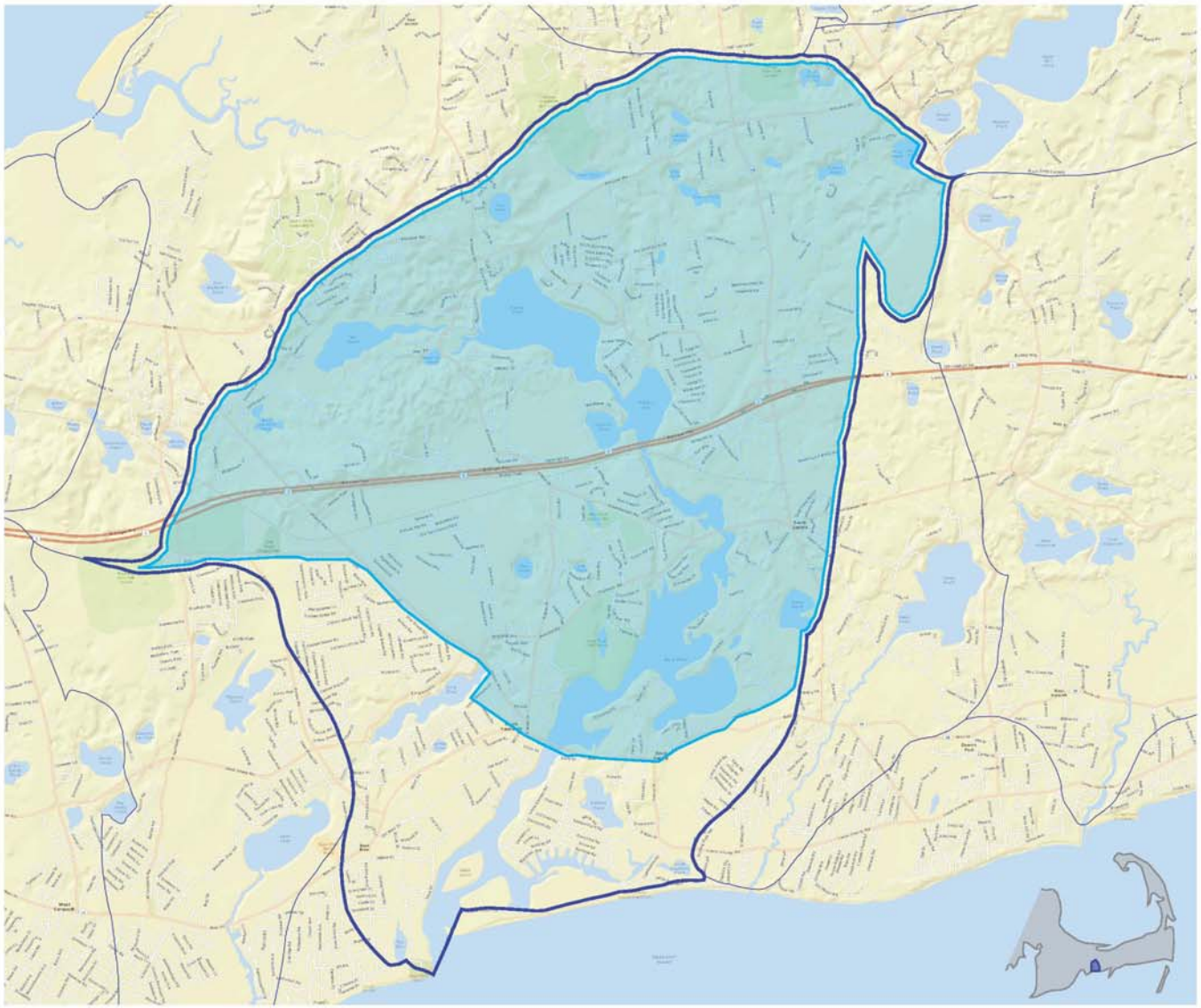
Establish a process and structure for consolidating existing monitoring programs and data in to a centralized location

Identify region-wide monitoring needs

ADAPTIVE MANAGEMENT

A structured approach for meeting water quality goals that monitors outcomes, assesses progress over time, and requires recalibration of plans and projects, as necessary, based on review and evaluation of monitoring.





1 **Sample Cape Cod Subwatershed**

TOWN OF YARMOUTH MASSACHUSETTS

MAP 1: TOTAL COLLECTION AREA NECESSARY TO MEET: Current Nitrogen Removal Needs

NITROGEN CALCULATOR

1	Current N Removal Needs (TMDL)	+37,400 KG/YR	+100%
2	Additional N Removal Needs		
	Failed Title 5 Systems		
	Anticipated Growth Areas		
3	Low Barrier Technologies		
	Fertilizer Management		
	Stormwater BMPs		
4	Watershed Alternative Technologies		
	Const. Wetlands - GW		
	Const. Wetlands - SW		
	Phytobuffer		
	Perm. React. Barrier		
	Fertigation Wells		
	Shellfish Aquaculture		
	Inlet Widening		
5	On-Site Alternative Technologies		
	I/A Title 5 Systems		
	Alt. Toilet Systems		
6	Collection/Sewer	-37,400 KG/YR	-100%
	Remaining Nitrogen to Meet Goal	0 KG/YR	0%

Indicator Bar

100%
Collection

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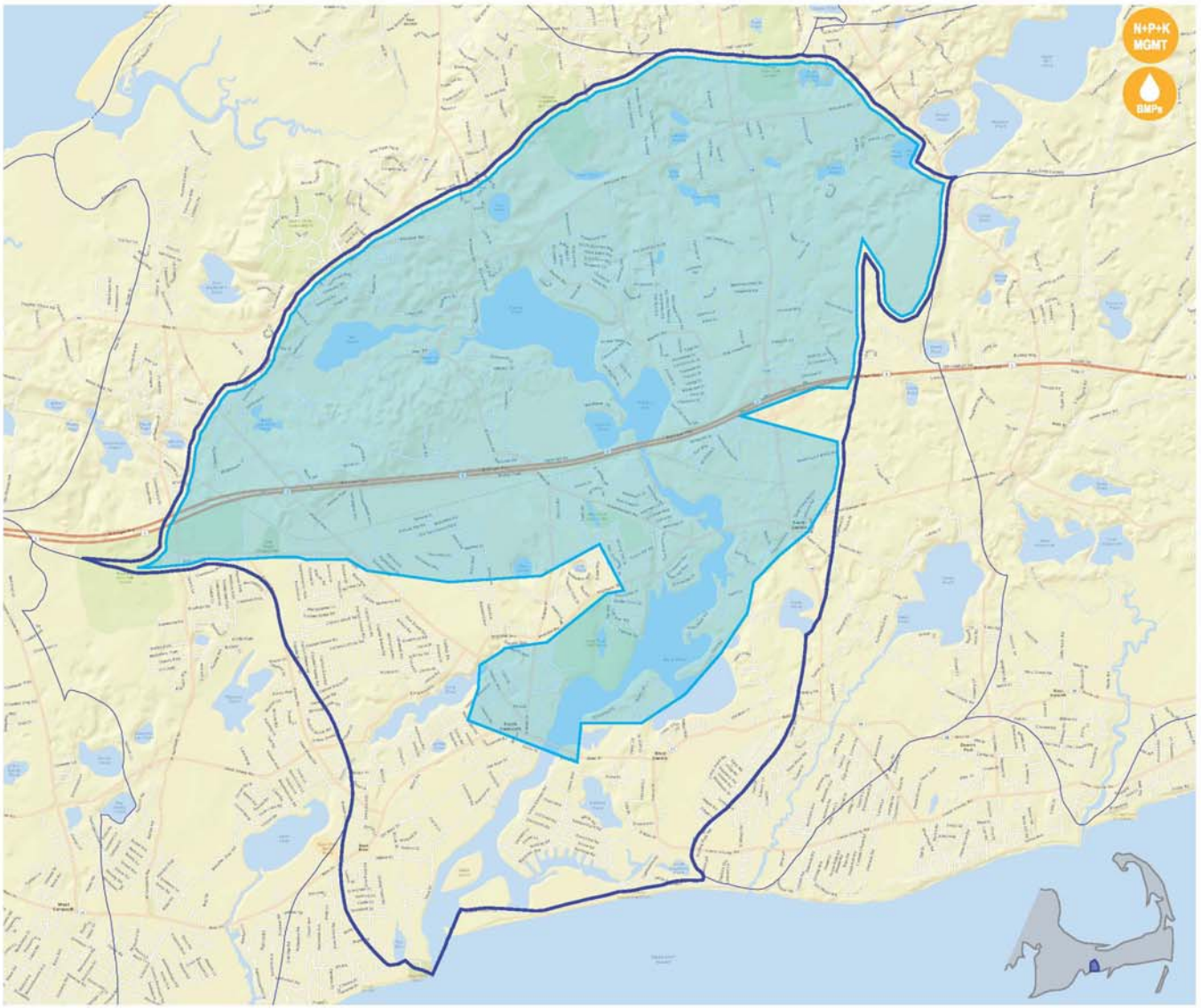
DATE 02.04.14

N

Draft Watershed Concept Maps

SHEET NUMBER SC-1



3 Sample Cape Cod Subwatershed

TOWN OF YARMOUTH MASSACHUSETTS

MAP 3: TOTAL COLLECTION AREA NECESSARY TO MEET:
Current Nitrogen Removal Needs
+ Additional Future Nitrogen Removal Needs
- Low Barrier Technologies

NITROGEN CALCULATOR

1	Current N Removal Needs (TMDL)	+37,400 KG/YR	+93.5%
2	Additional N Removal Needs	+2,600 KG/YR	+6.5%
	Failed Title 5 Systems	+600 KG/YR	+1.5%
	Anticipated Growth Areas	+2000 KG/YR	+5%
3	Low Barrier Technologies	-10,000 KG/YR	-25%
	Fertilizer Management	-5,000 KG/YR	-12.5%
	Stormwater BMPs	-5,000 KG/YR	-12.5%
4	Watershed Alternative Technologies		
	Const. Wetlands - GW		
	Const. Wetlands - SW		
	Phytobuffer		
PRB	Perm. React. Barrier		
	Fertigation Wells		
	Shellfish Aquaculture		
	Inlet Widening		
5	On-Site Alternative Technologies		
IA	I/A Title 5 Systems		
	Alt. Toilet Systems		
6	Collection/Sewer	-30,000 KG/YR	-75%
	Remaining Nitrogen to Meet Goal	0 KG/YR	0%

Indicator Bar

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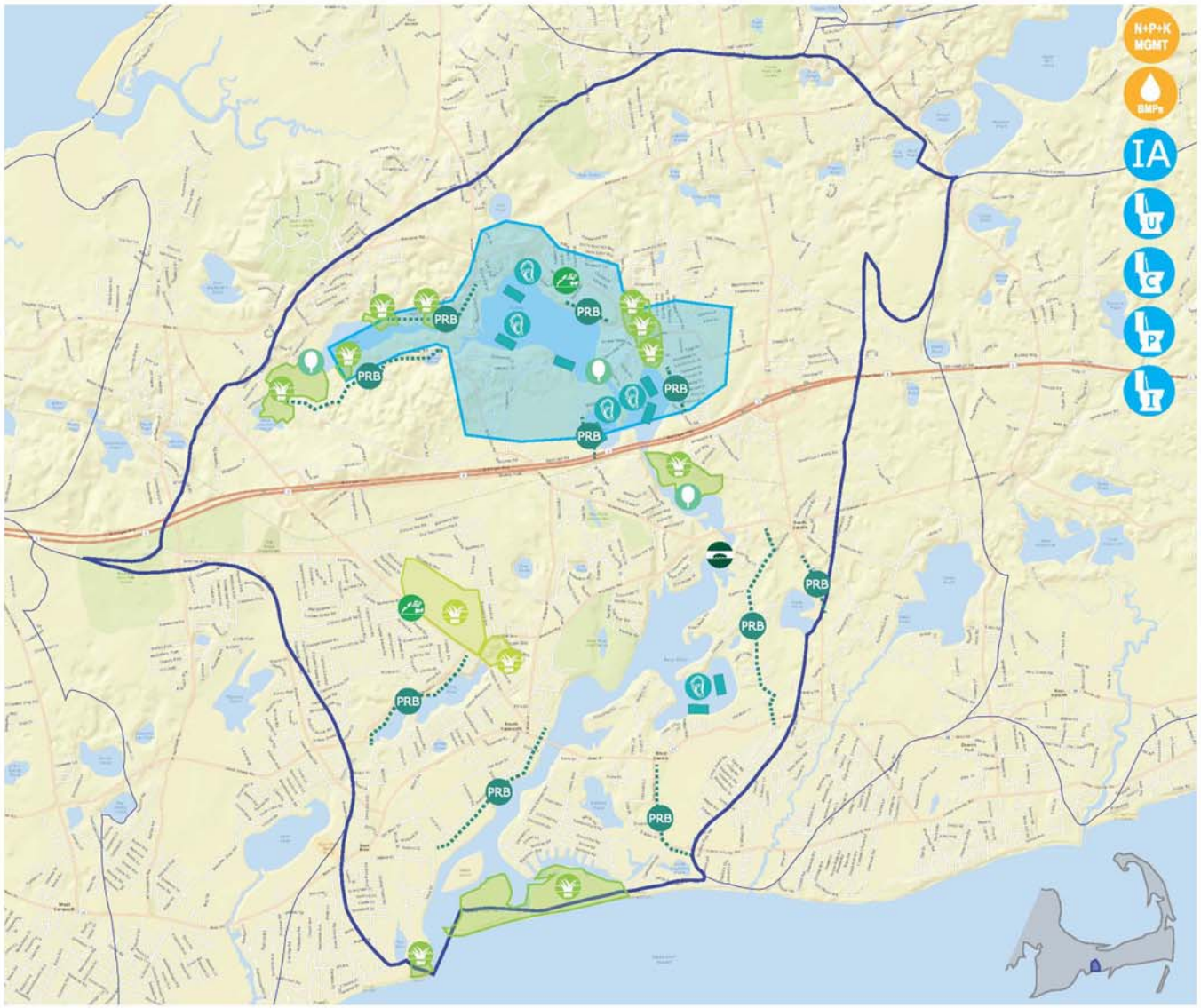
SHEET NUMBER SC-3



5

Sample Cape Cod Subwatershed

TOWN OF YARMOUTH MASSACHUSETTS

MAP 5: TOTAL COLLECTION AREA NECESSARY TO MEET:
Current Nitrogen Removal Needs
+ Additional Future Nitrogen Removal Needs
- Low Barrier Technologies
- Watershed Alternative Technologies
-On-Site Alternative Technologies

NITROGEN CALCULATOR

1	Current N Removal Needs (TMDL)	+37,400 KG/YR	+93.5%
2	Additional N Removal Needs	+2,600 KG/YR	+6.5%
	Failed Title 5 Systems	+600 KG/YR	+1.5%
	Anticipated Growth Areas	+2000 KG/YR	+5%
3	Low Barrier Technologies	-10,000 KG/YR	-25%
	Fertilizer Management	-5,000 KG/YR	-12.5%
	Stormwater BMPs	-5,000 KG/YR	-12.5%
4	Watershed Alternative Technologies	-22,100 KG/YR	-55.25%
	Const. Wetlands - GW	-3,000 KG/YR	-7.5%
	Const. Wetlands - SW	-4,000 KG/YR	-10%
	Phytobuffer	-100 KG/YR	-.25%
	Fertigation Wells	-600 KG/YR	-1.5%
	Shellfish Aquaculture	-10,000 KG/YR	-25%
	Perm. React. Barrier	-3,900 KG/YR	-9.75%
	Inlet Widening	-500 KG/YR	-1.25%
5	On-Site Alternative Technologies	-2,800 KG/YR	-7%
	I/A Title 5 Systems	-0 KG/YR	-0%
	Alt. Toilet Systems	-2,800 KG/YR	-7%
6	Collection/Sewer	-5,100 KG/YR	-12.75%
	Remaining Nitrogen to Meet Goal	0 KG/YR	0%

Indicator Bar

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Draft Watershed Concept Maps

SHEET NUMBER SC-5

FINANCING

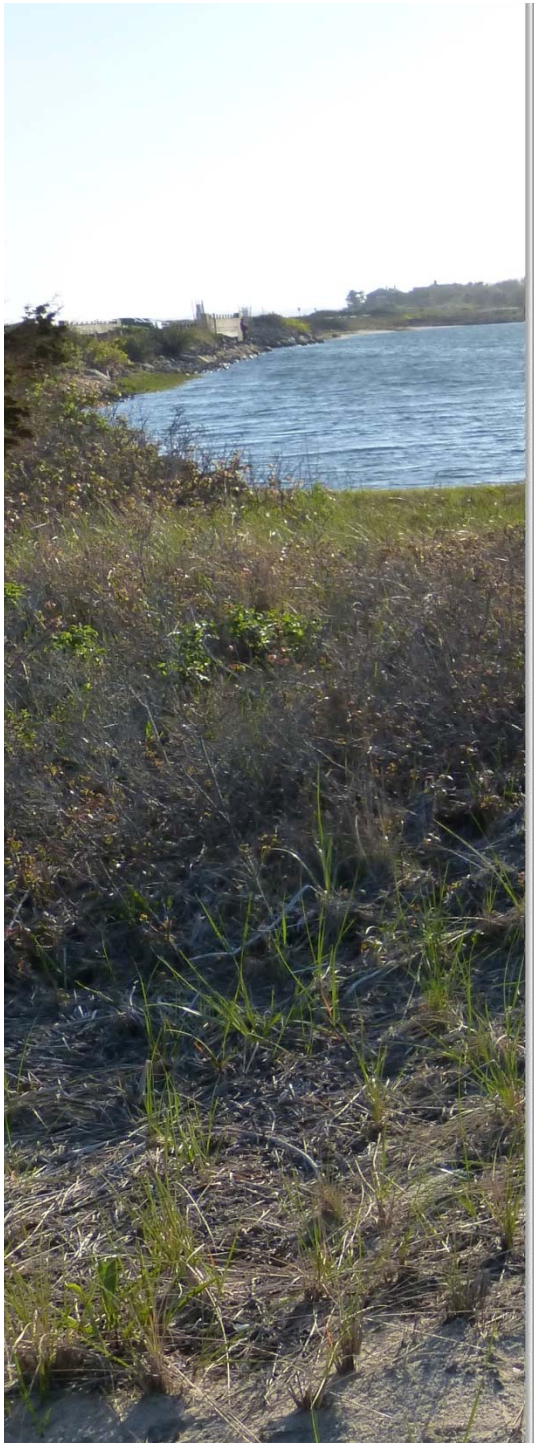
FINANCING MODEL – A TOOL FOR COMMUNITIES TO EVALUATE DIFFERENT FINANCING OPTIONS

Starting with existing costs

Include new costs in **COST MODULE**

Identify options in **REVENUE MODULE**

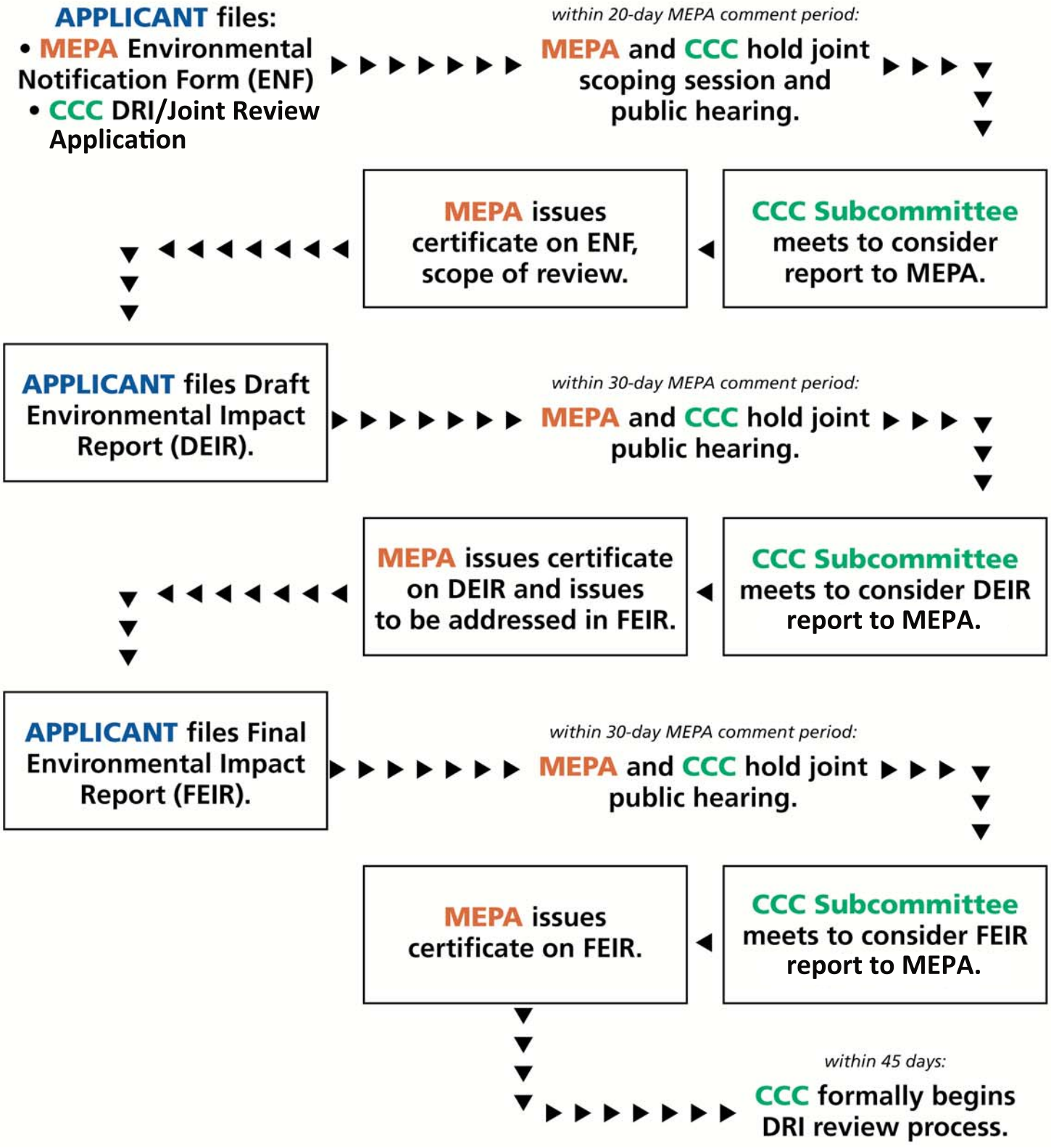
Calculate impact in **AFFORDABILITY MODULE**



SUB-REGIONAL MEETINGS

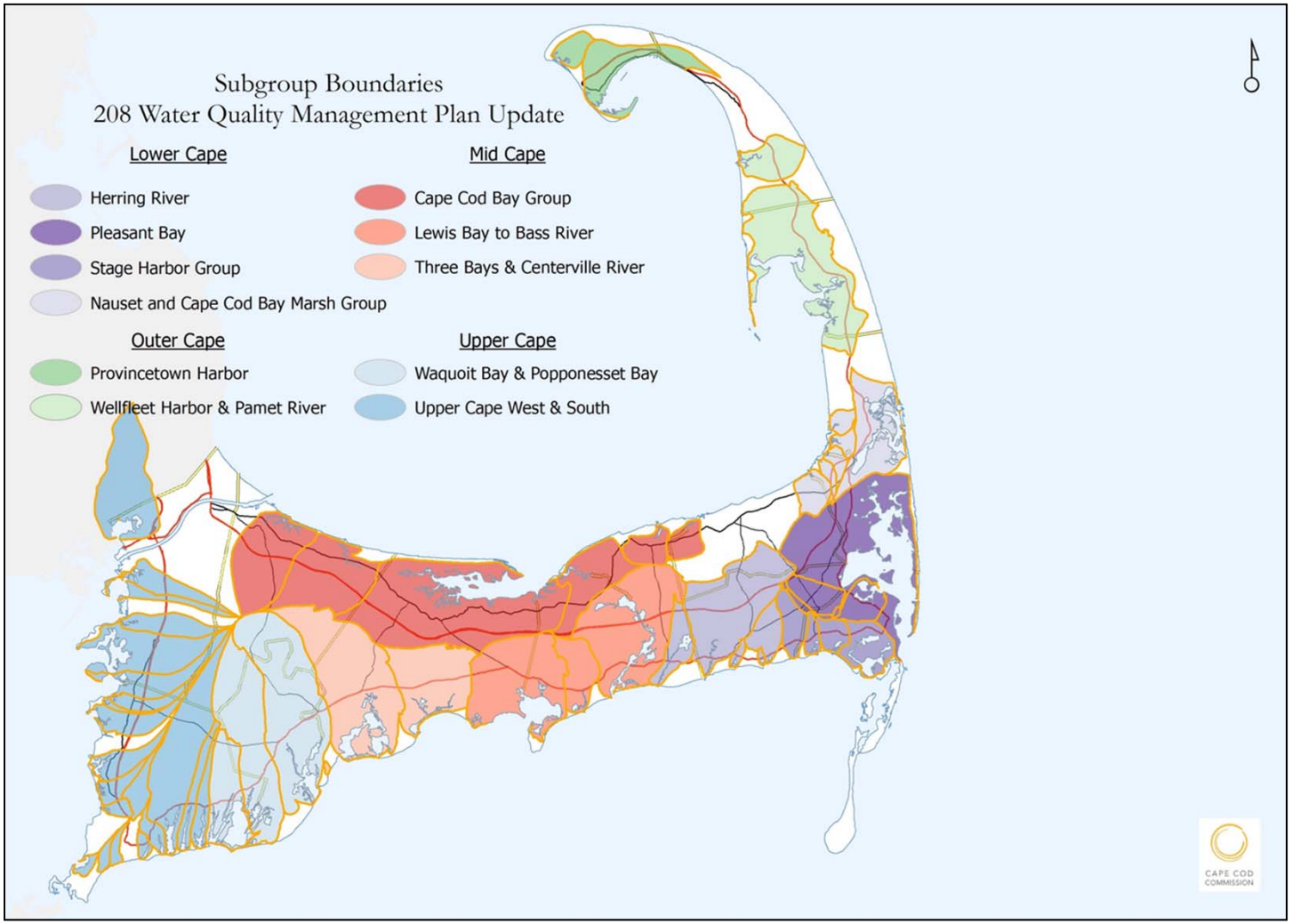
What are the key questions or considerations that the sub-regional groups should examine or explore regarding the topics of monitoring, adaptive management and financing/affordability?

Joint MEPA/CCC Review:
Projects Requiring Environmental Impact Report (EIR)

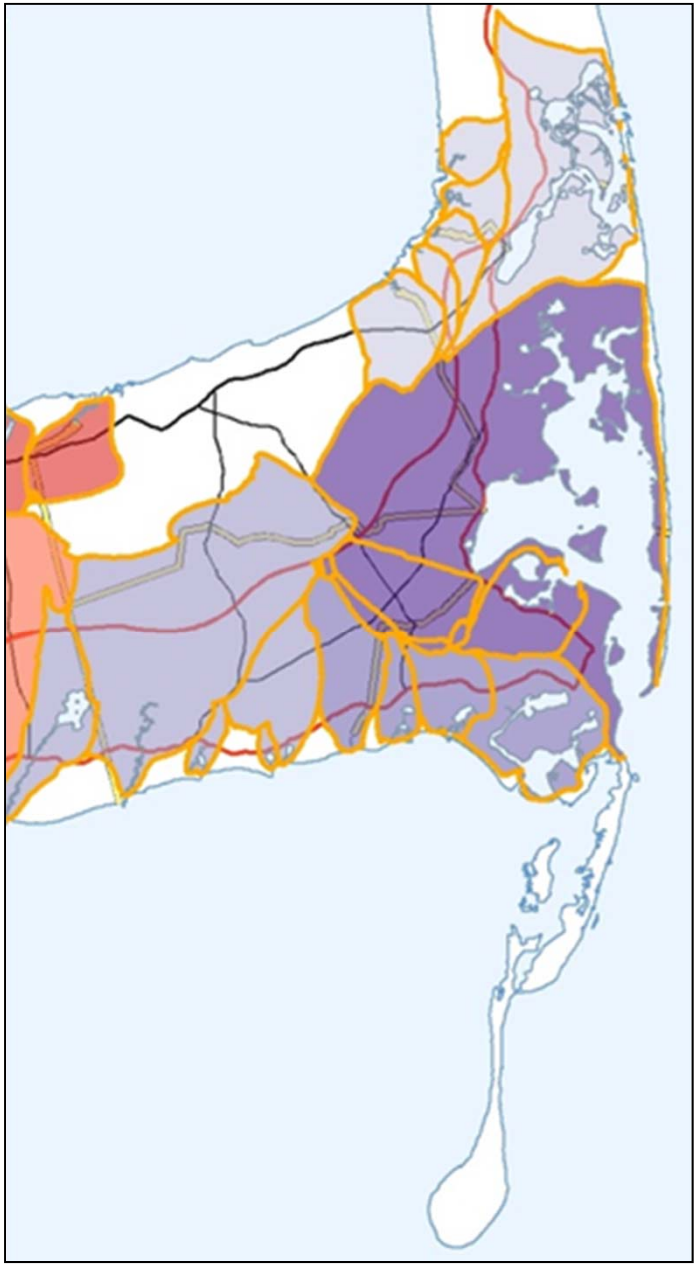


208 Plan Update Stakeholder Summit

Watershed Scenarios
Summarized by Subregion

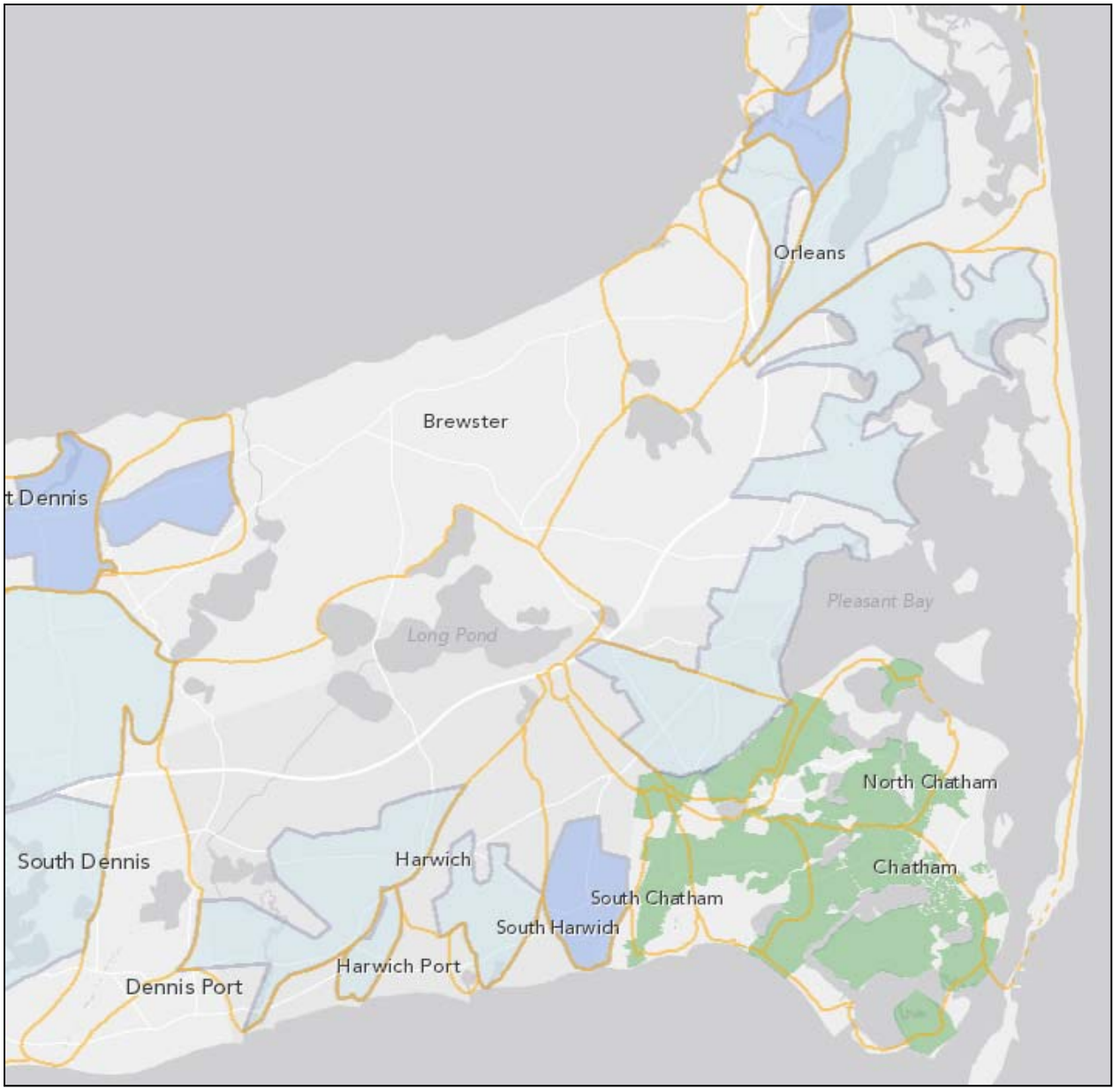


Lower Cape Watershed Groups



Lower Cape Watershed Groups

MEP Centralized Plus Non-MEP 50% Reduction

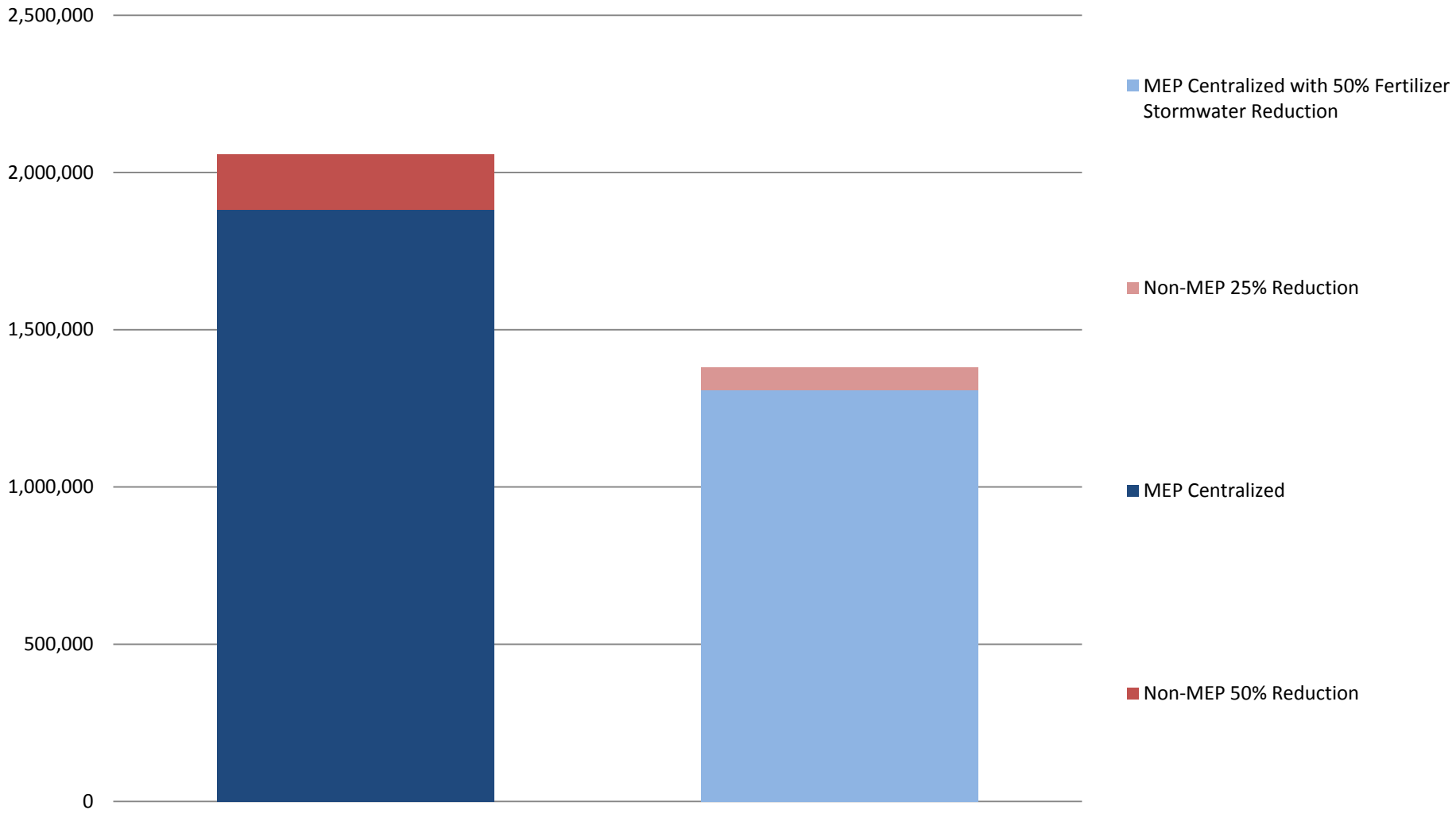


Lower Cape Watershed Groups

50% Reduction in Watershed Wide Fertilizer Stormwater Load with MEP Centralized Plus Non-MEP 25% Reduction

Lower Cape Watershed Group

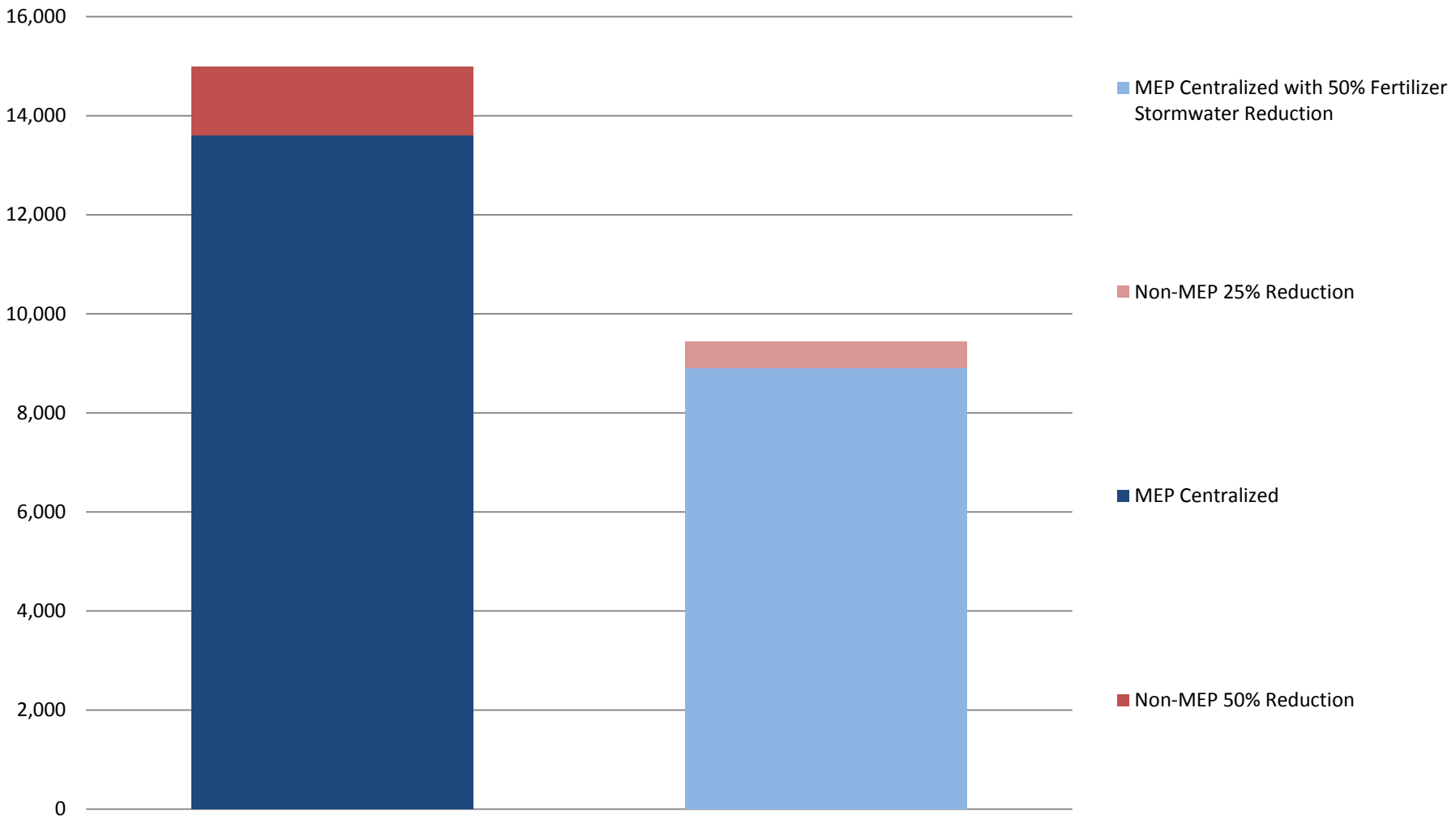
Centralized Inside Treatment: Captured Wastewater Flow (gpd)



-All MEP Watersheds Sewered to TMDL Compliance
-All Non-MEP Watersheds Sewered for a Reduction in Existing Septic Load

Lower Cape Watershed Group

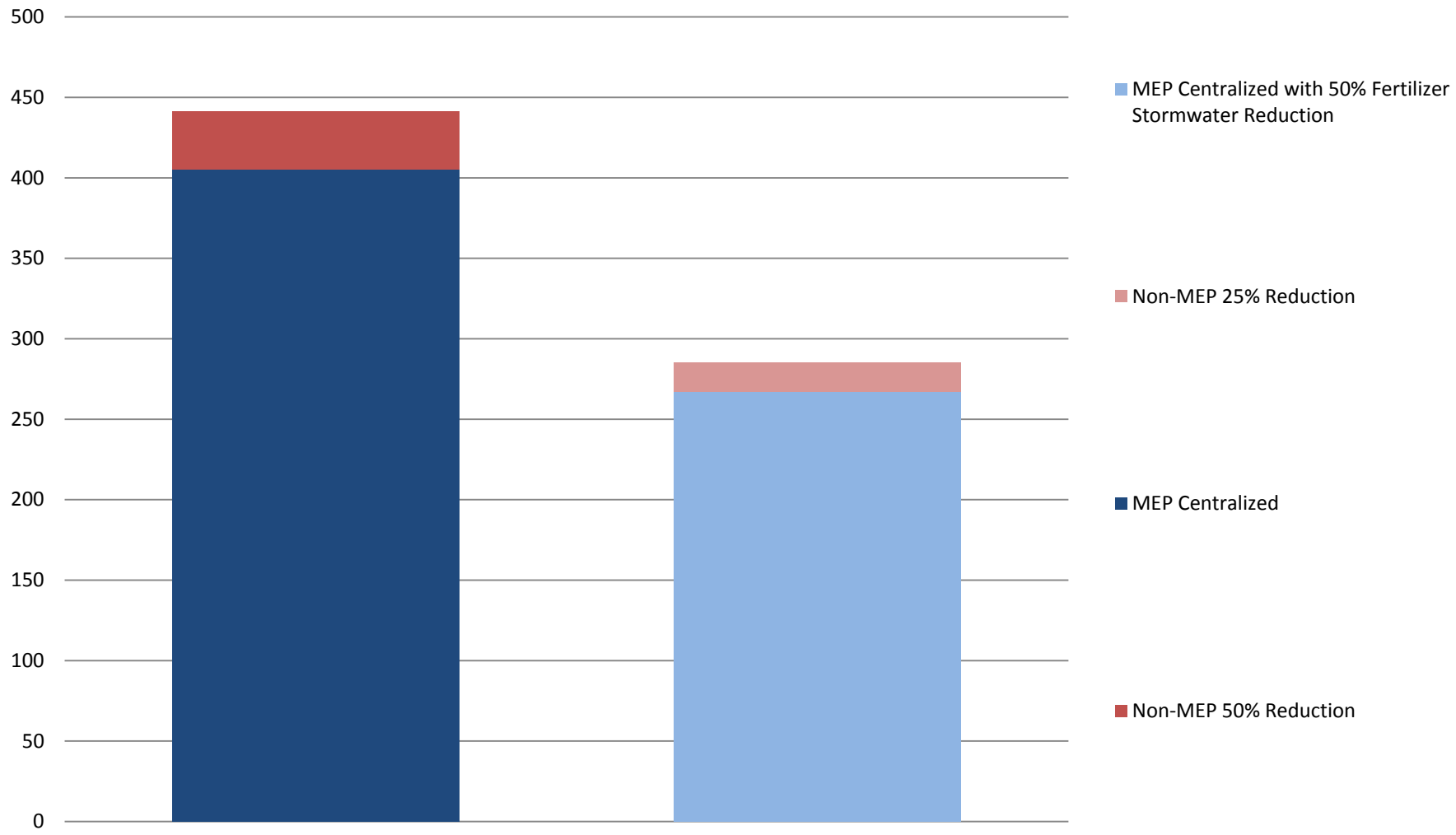
Centralized Inside Treatment: Sewered Parcels



-All MEP Watersheds Sewered to TMDL Compliance
-All Non-MEP Watersheds Sewered for a Reduction in Existing Septic Load

Lower Cape Watershed Group

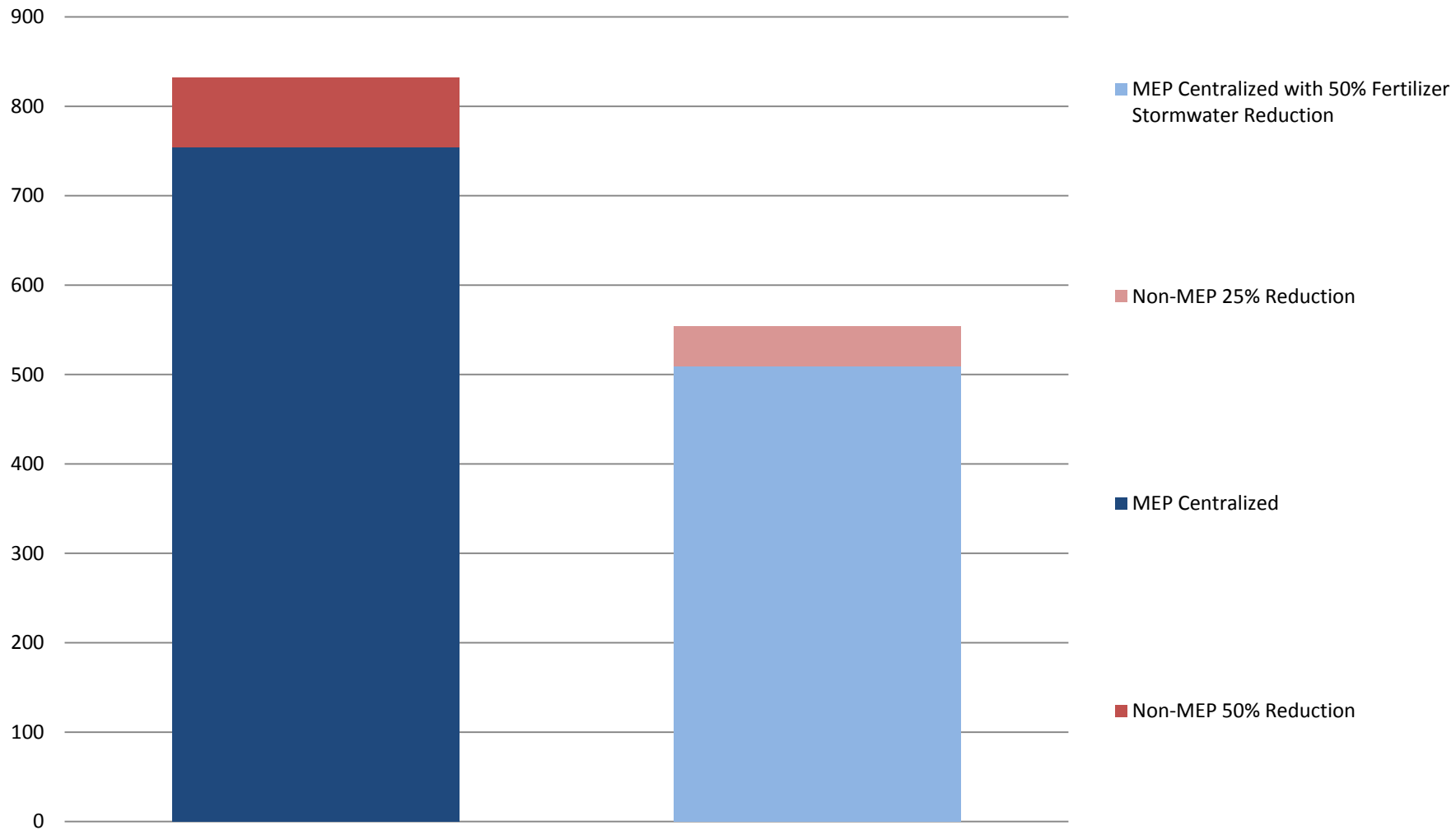
Centralized Inside Treatment: Miles of Sewer



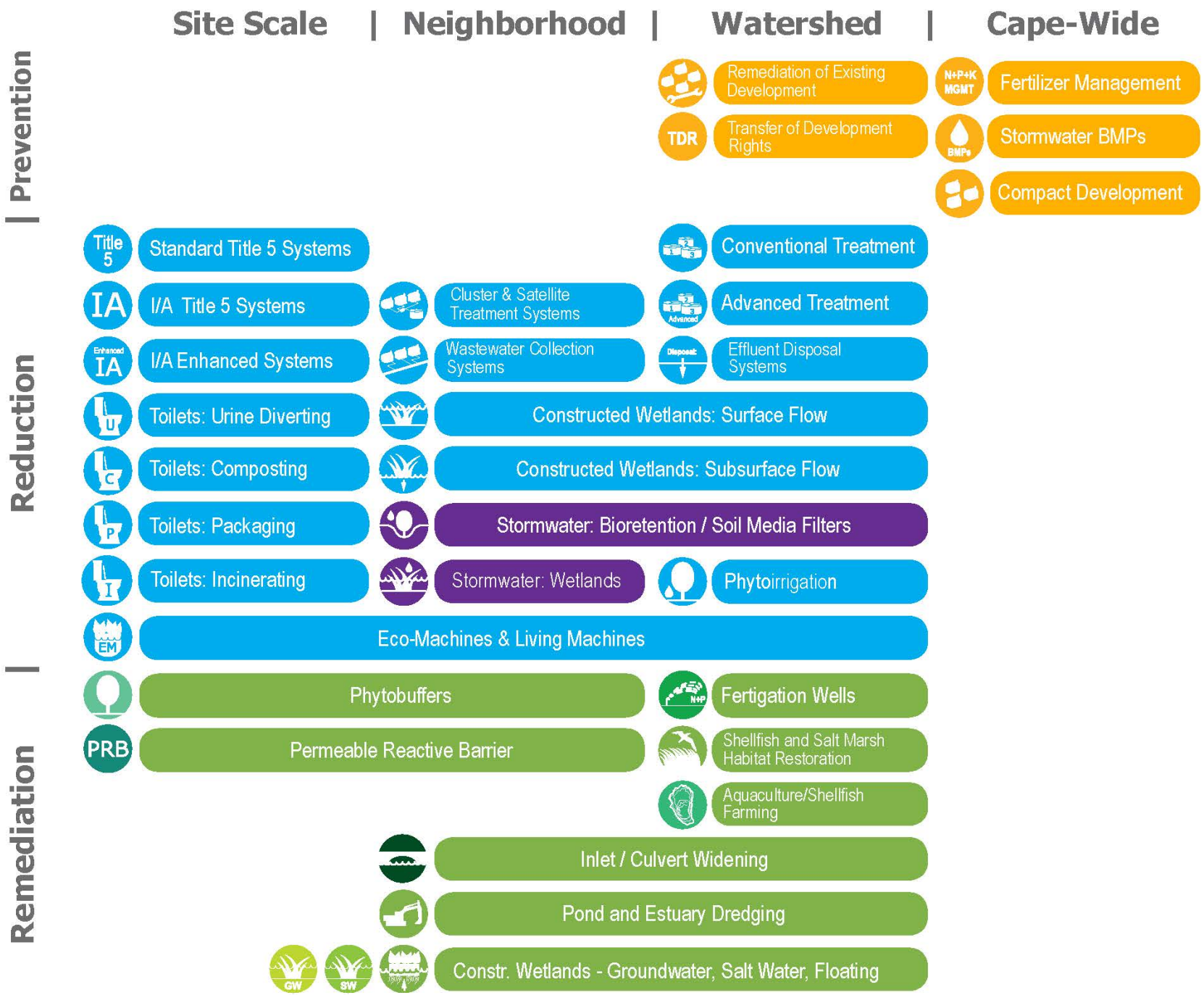
-All MEP Watersheds Sewered to TMDL Compliance
-All Non-MEP Watersheds Sewered for a Reduction in Existing Septic Load

Lower Cape Watershed Group

Centralized Inside Treatment: Capital Cost (Millions)



-All MEP Watersheds Sewered to TMDL Compliance
-All Non-MEP Watersheds Sewered for a Reduction in Existing Septic Load


Site Scale | Neighborhood | Watershed | Cape-Wide
Prevention
Reduction
Remediation
Remediation of Existing Development
Transfer of Development Rights
Fertilizer Management
Stormwater BMPs
Compact Development
Standard Title 5 Systems
I/A Title 5 Systems
I/A Enhanced Systems
Toilets: Urine Diverting
Toilets: Composting
Toilets: Packaging
Toilets: Incinerating
Cluster & Satellite Treatment Systems
Wastewater Collection Systems
Conventional Treatment
Advanced Treatment
Effluent Disposal Systems
Constructed Wetlands: Surface Flow
Constructed Wetlands: Subsurface Flow
Stormwater: Bioretention / Soil Media Filters
Stormwater: Wetlands
Phytoirrigation
Eco-Machines & Living Machines
Phytobuffers
Permeable Reactive Barrier
Fertigation Wells
Shellfish and Salt Marsh Habitat Restoration
Aquaculture/Shellfish Farming
Inlet / Culvert Widening
Pond and Estuary Dredging
Constr. Wetlands - Groundwater, Salt Water, Floating


Problem Solving Approach
Wastewater
Existing Water Bodies
Regulatory
1
Identify Current N Removal Needs (Targets/Reduction Goals)
Present Load: X kg/day
Target: Y kg/day
Reduction Required: N kg/day
2
Additional N Removal Needs
A. Title 5 Problem Areas
B. Pond Recharge Areas
C. Growth Management
3
Low Barrier Technologies
A. Fertilizer Management
B. Stormwater Mitigation
N+P+K MGMT
BMPs
4
Watershed Alternative Technologies
A. Permeable Reactive Barriers
B. Inlet/Culvert Openings
C. Constructed Wetlands
D. Aquaculture
PRB
GW
SW
5
On-Site Alternative Technologies
A. Eco-toilets (UD & Compost)
B. I/A Technologies
C. Enhanced I/A Technologies
D. Shared Systems
IA
Title 5
Enhanced IA
6
Priority Collection/Sewer Areas
A. Greater Than 1 Dwelling Unit/acre
B. Village Centers
C. Economic Centers
D. Growth Incentive Zones
Advanced
Disposal
7
Supplemental Collection / Sewer Areas
Advanced

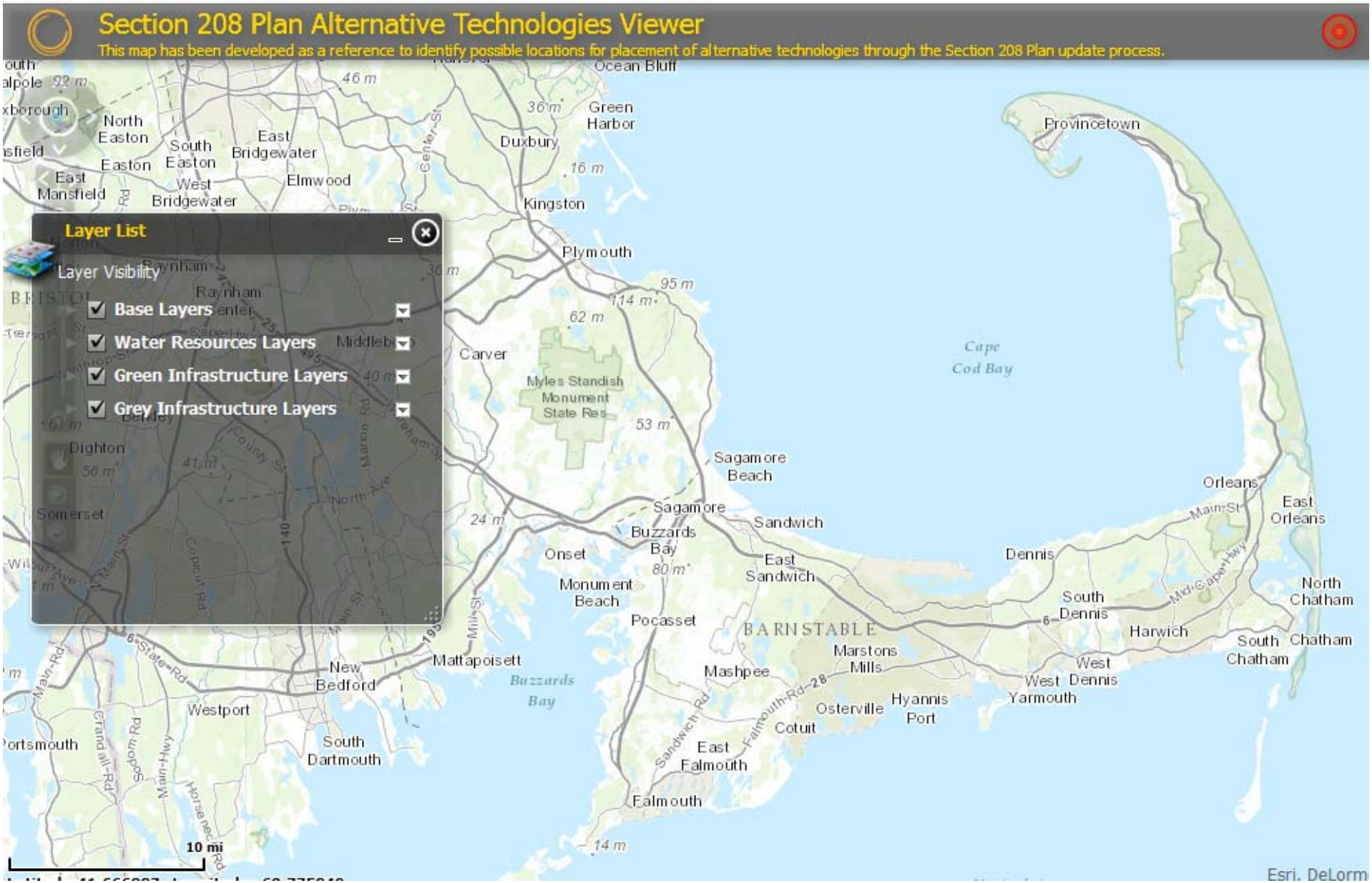
Summary Table

MEP Targets and Goals		kg/year	kg/day	kg/day	Nitrogen (kg/yr)
Present Total Nitrogen Load				1934.9	706,222
	Controllable Nitrogen Load				
	Wastewater	501,866	1375.0		
	Fertilizer	100,494	275.3		
	Stormwater	89,912	246.3		
Target Nitrogen Load				1072.7	391,545
Nitrogen Removal Required				**862.1**	**314,677**
Total Number of Properties	113,303				

Low Barrier to Implementation	Percent of Total Removed	Reduction by Technology (Kg/yr)	Remaining to Meet Target (Kg/yr)
A) Fertilizer Management	50	50,247	264,430
B) Stormwater Mitigation	50	44,956	219,474

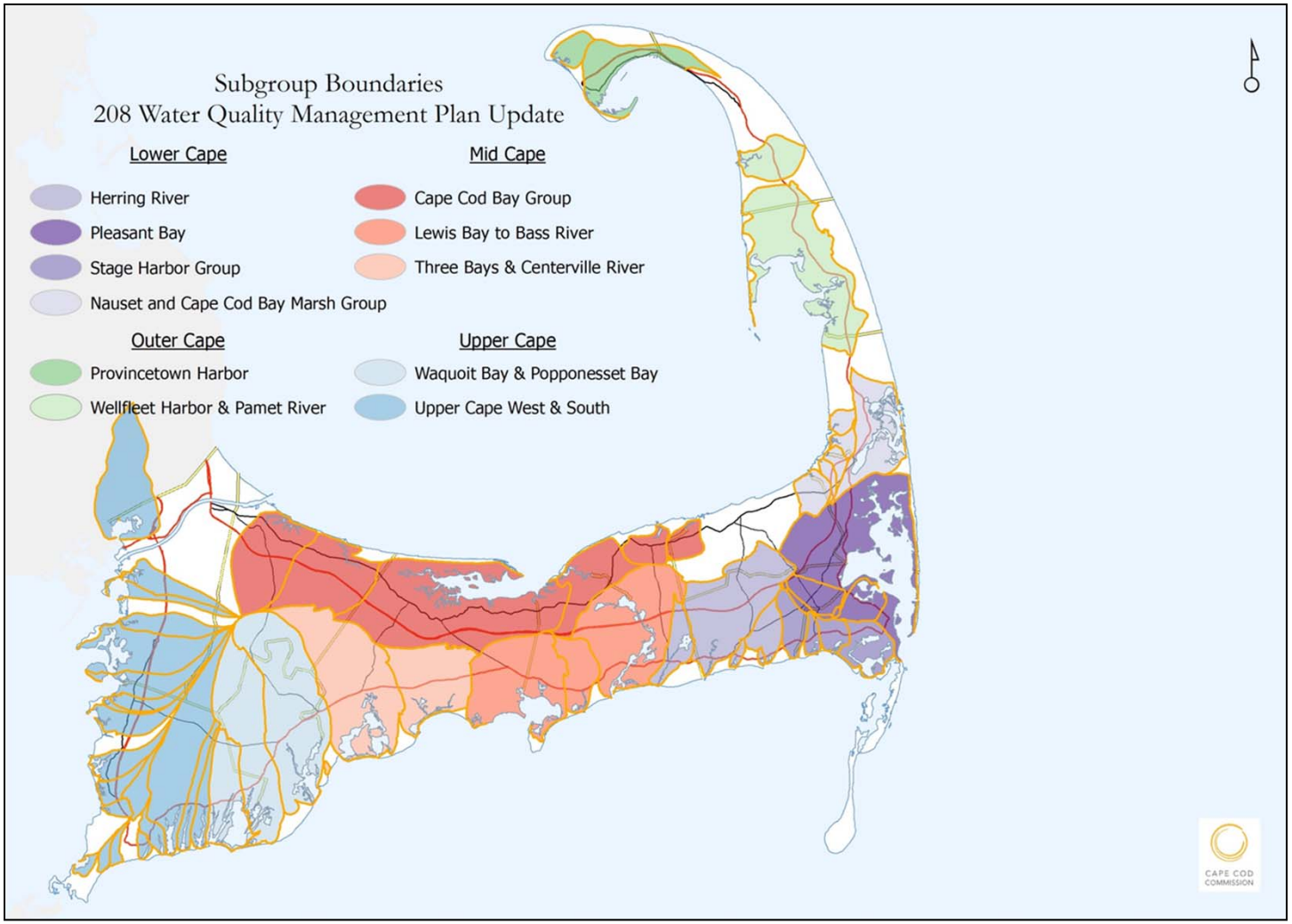
Watershed/Embayment Options	Quantity	Reduction by Technology (Kg/yr)	Remaining to Meet Target (Kg/yr)
A) Permeable Reactive Barrier (PRB)	23,569 homes	75,185	144,289
B) Constructed Wetlands (No Collection System)	57 acres	28,250	116,039
C) Constructed Wetlands (With Collection System)	23 acres	11,250	104,789
D) Phytoirrigation	1 acres	6	104,783
E) Phytobuffers	15 acres	330	104,453
F) Fertigation Wells	1,898 acres	7,590	96,863
G) Surface Water Remediation Wetland	4 acres	112	96,751
H) Dredging/Inlet Widening	66,000 cu. yard	0	96,751
I) Phytoremediation	0 acres	0	96,751
J) Aquaculture/Oyster Beds	185 acres	46,250	50,501
K) Coastal Habitat Restoration	29 acres	3,393	47,108
L) Floating Constructed Wetlands	71,500 cu feet	28,600	18,508

Alternative On-Site Options	Quantity	Reduction by Technology (Kg/yr)	Remaining to Meet Target (Kg/yr)
A) Ecotoilets (UD & Compost)	3,343 homes	20,060	-1,552
B) UD School or Public Facility	6,700 people	9,648	-11,200
C) I & A Systems	3,485 homes	17,425	-28,625
D) Enhanced I & A Systems	2,742 homes	16,452	-45,077

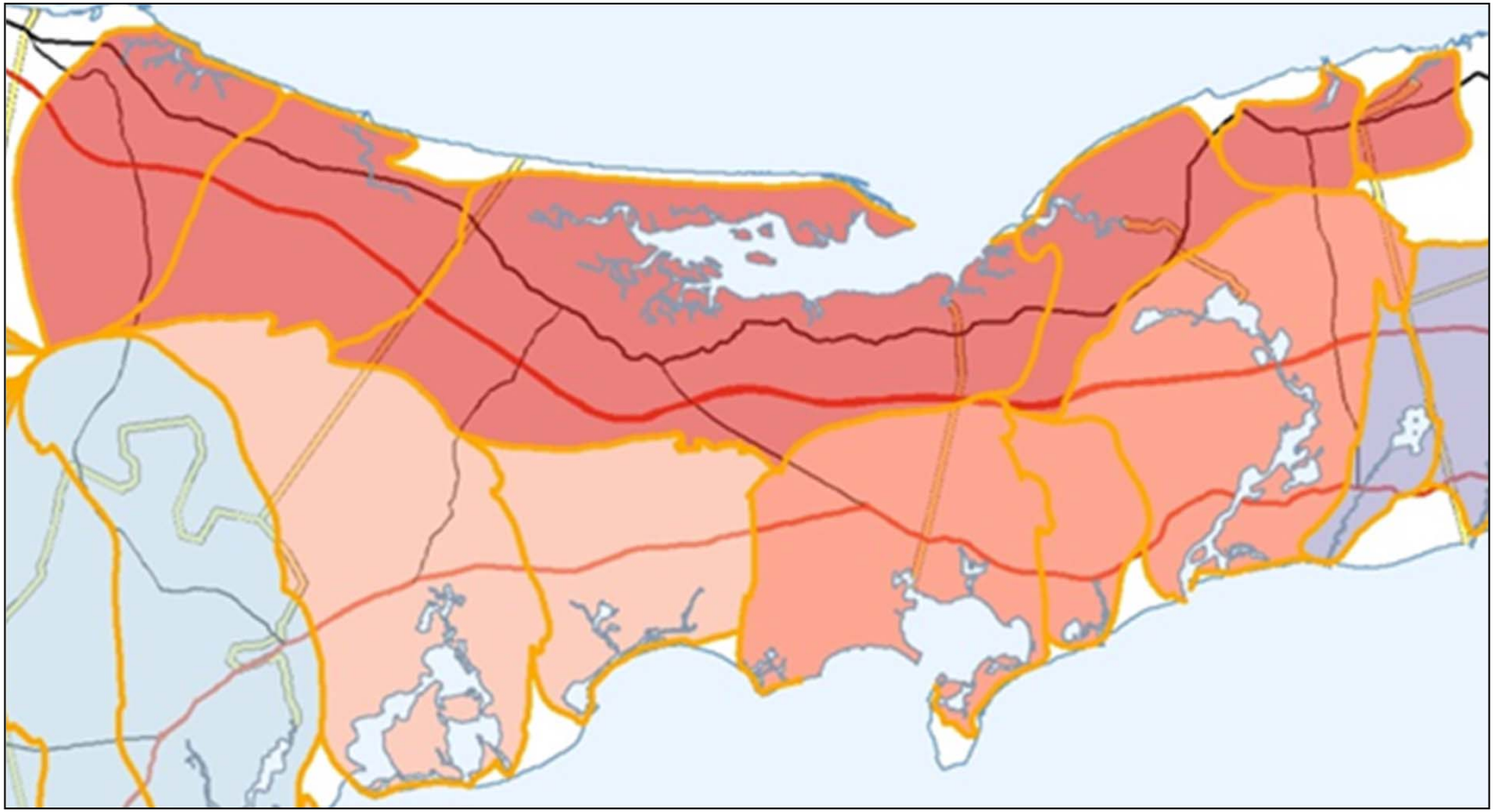

Section 208 Plan Alternative Technologies Viewer
This map has been developed as a reference to identify possible locations for placement of alternative technologies through the Section 208 Plan update process.
Layer List
Layer Visibility
Base Layers
Water Resources Layers
Green Infrastructure Layers
Grey Infrastructure Layers
Ocean Bluff
Green Harbor
Provincetown
Duxbury
Kingston
Plymouth
Carver
Myles Standish Monument State Res
Cape Cod Bay
Sagamore Beach
Sagamore
Sandwich
Buzzards Bay
Onset
East Sandwich
Monument Beach
Pocasset
Mattapoisett
New Bedford
Westport
South Dartmouth
Buzzards Bay
Mashpee
Marstons Mills
Osterville
Hyannis Port
Cotuit
West Yarmouth
West Dennis
Dennis
South Dennis
Harwich
Orleans
East Orleans
North Chatham
South Chatham
East Falmouth
Falmouth
BARNSTABLE
Somerset
Dighton
North Easton
South Easton
East Bridgewater
West Bridgewater
East Mansfield
Elmwood
10 mi
Esri, DeLorm

208 Plan Update Stakeholder Summit

Watershed Scenarios
Summarized by Subregion

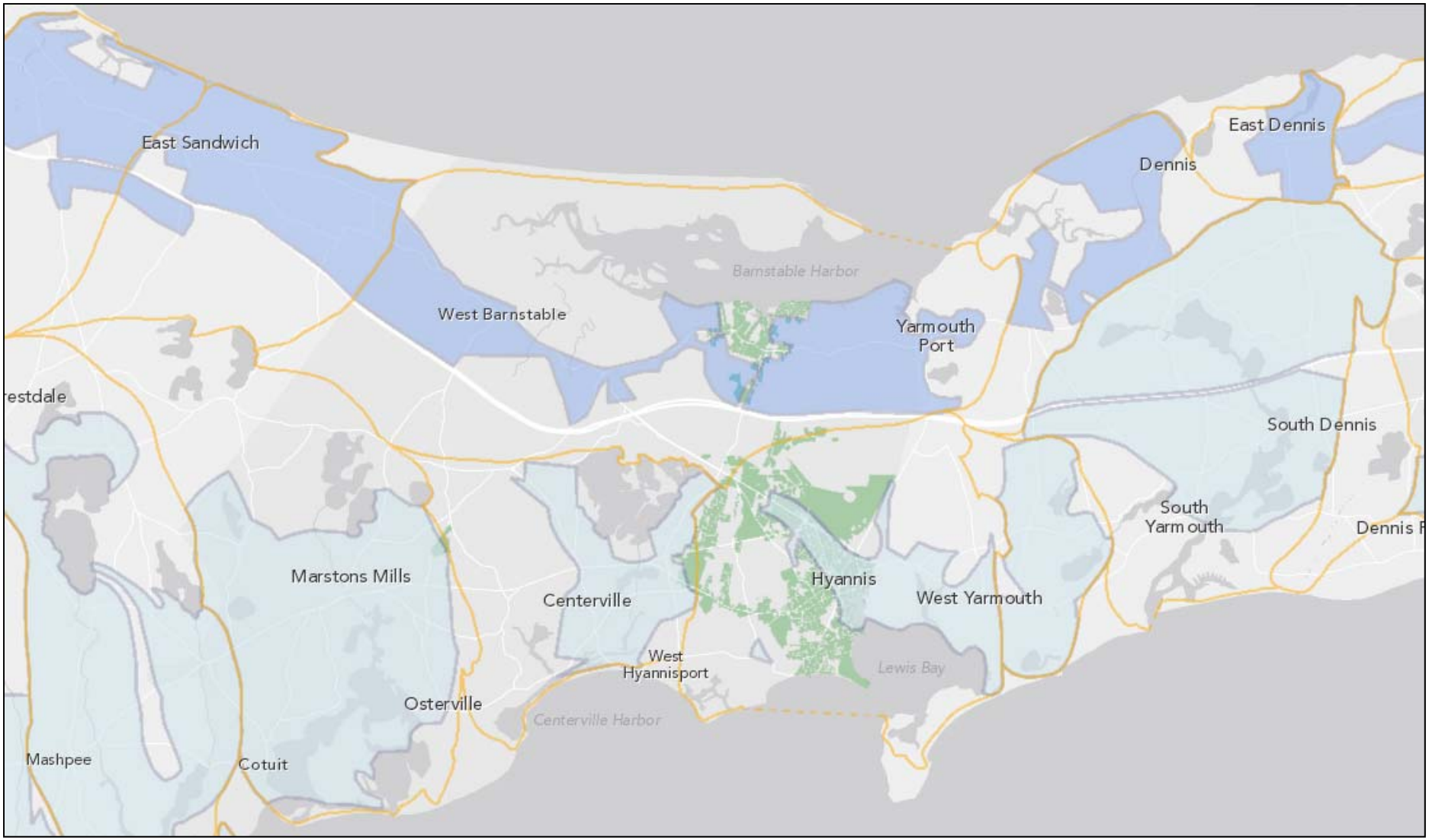


Mid Cape Watershed Groups



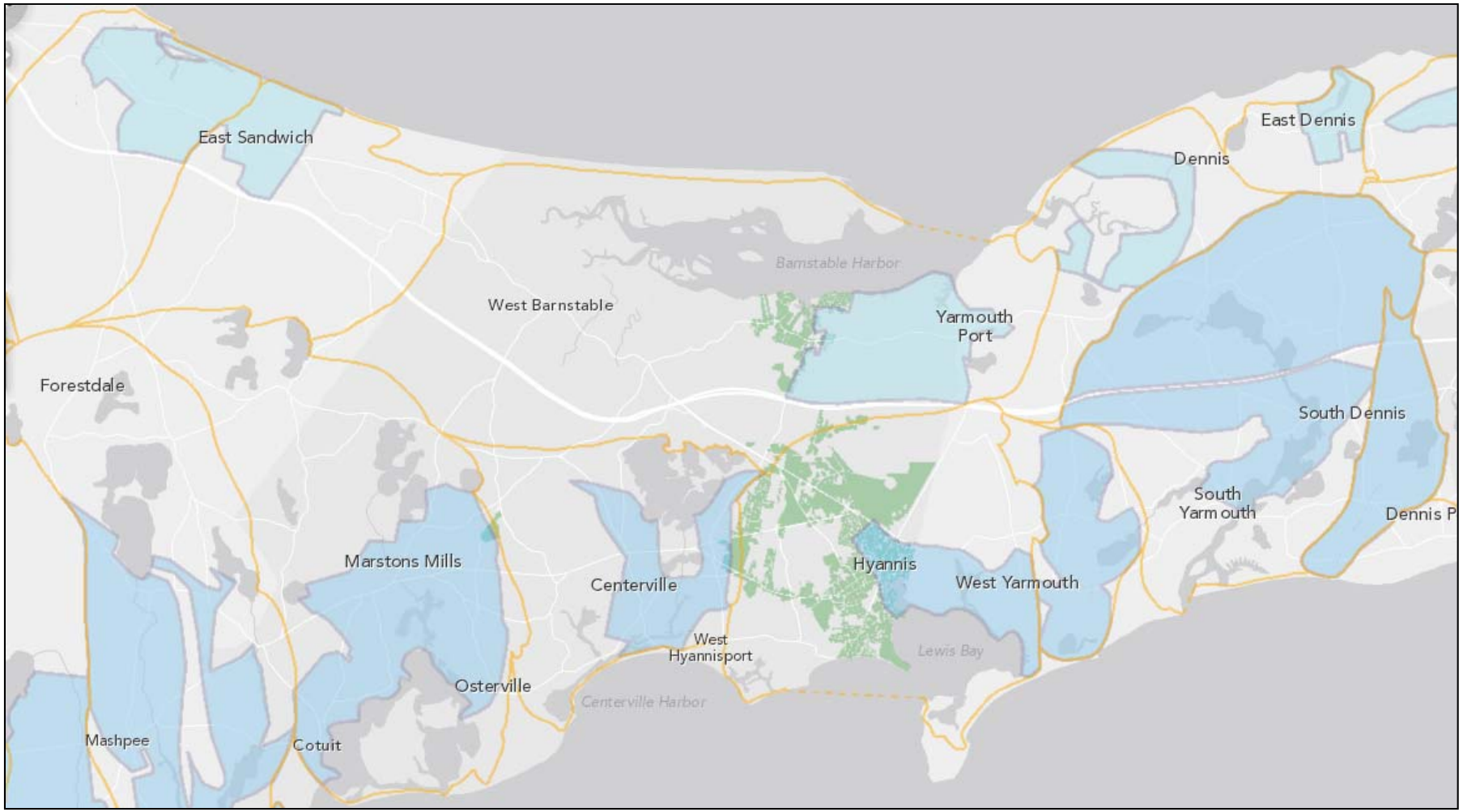
Mid Cape Watershed Groups

MEP Centralized Plus Non-MEP 50% Reduction



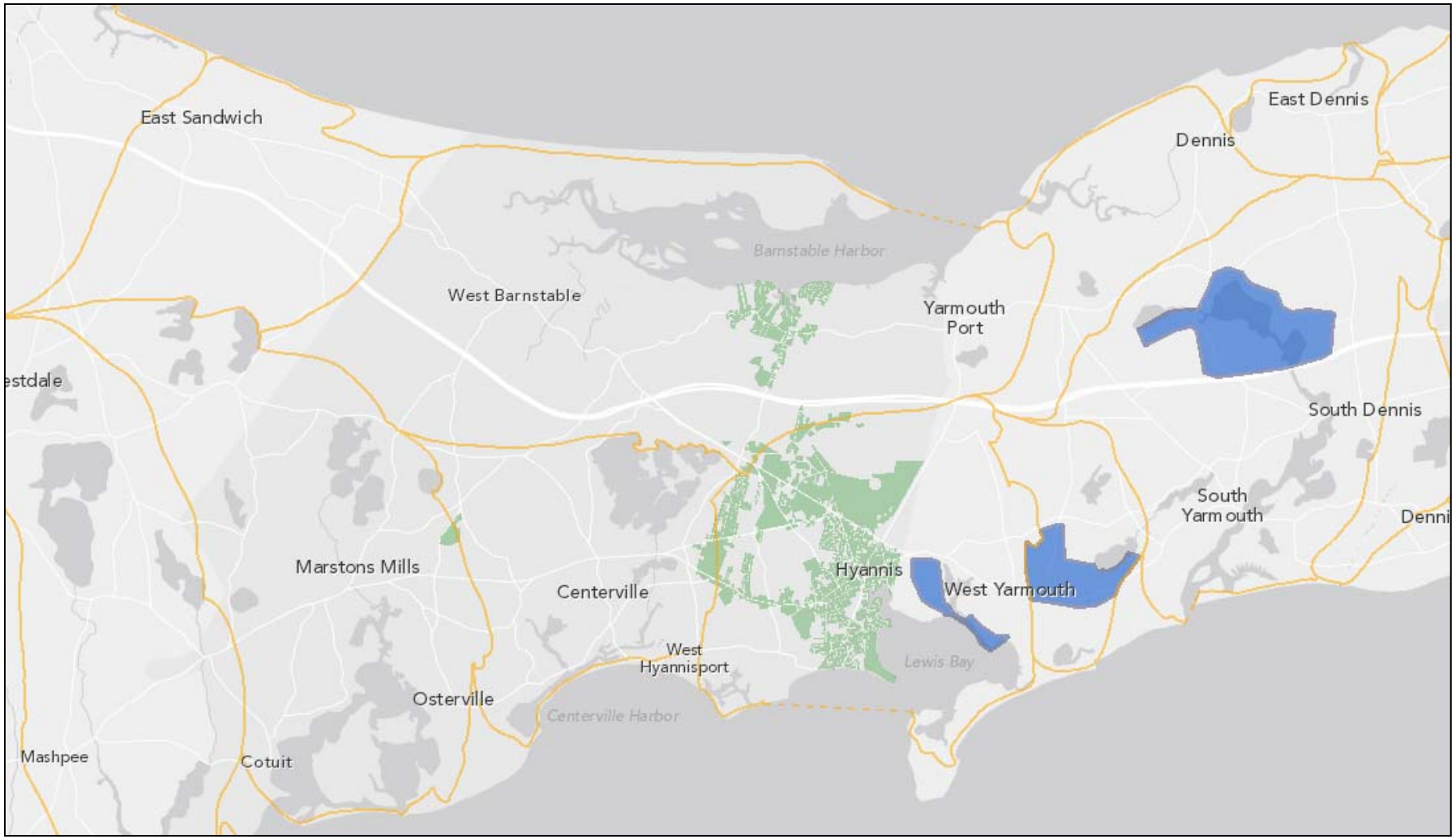
Mid Cape Watershed Groups

50% Reduction in Watershed Wide Fertilizer Stormwater Load with MEP Centralized Plus Non-MEP 25% Reduction



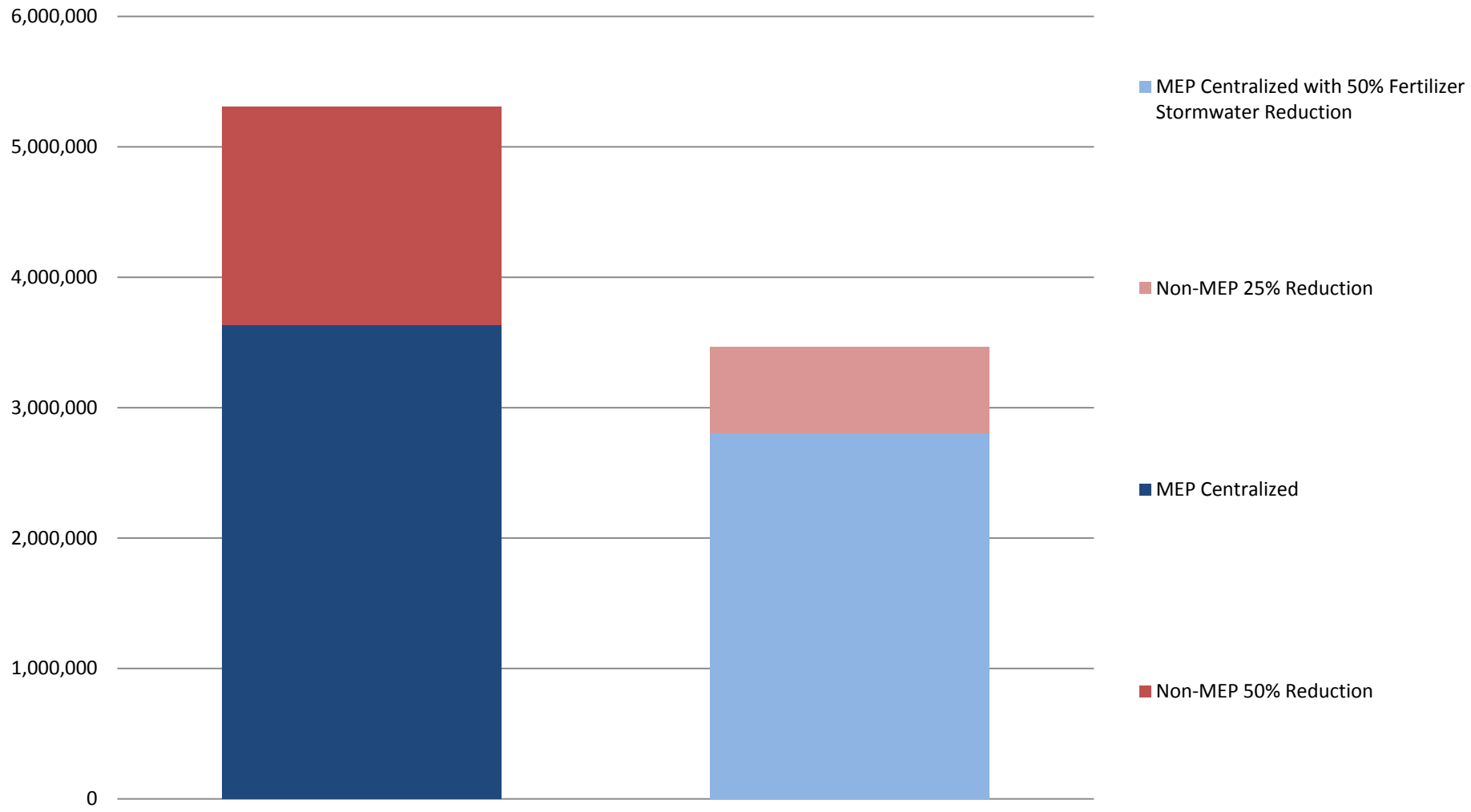
Mid Cape Watershed Groups

Non-Traditional Remainder



Mid Cape Watershed Group

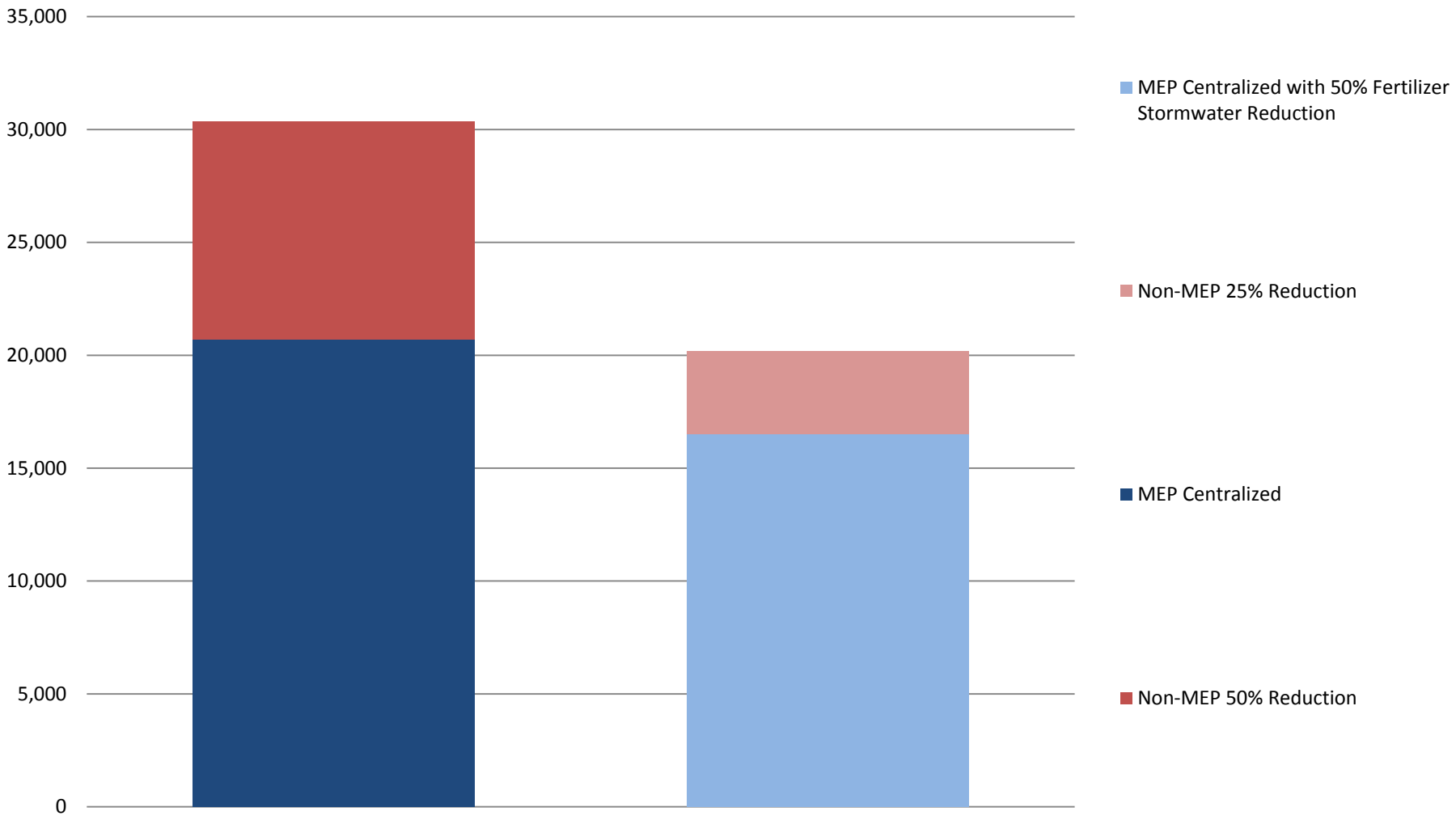
Centralized Inside Treatment: Captured Wastewater Flow (gpd)



-All MEP Watersheds Sewered to TMDL Compliance
-All Non-MEP Watersheds Sewered for a Reduction in Existing Septic Load

Mid Cape Watershed Group

Centralized Inside Treatment: Sewered Parcels



-All MEP Watersheds Sewered to TMDL Compliance
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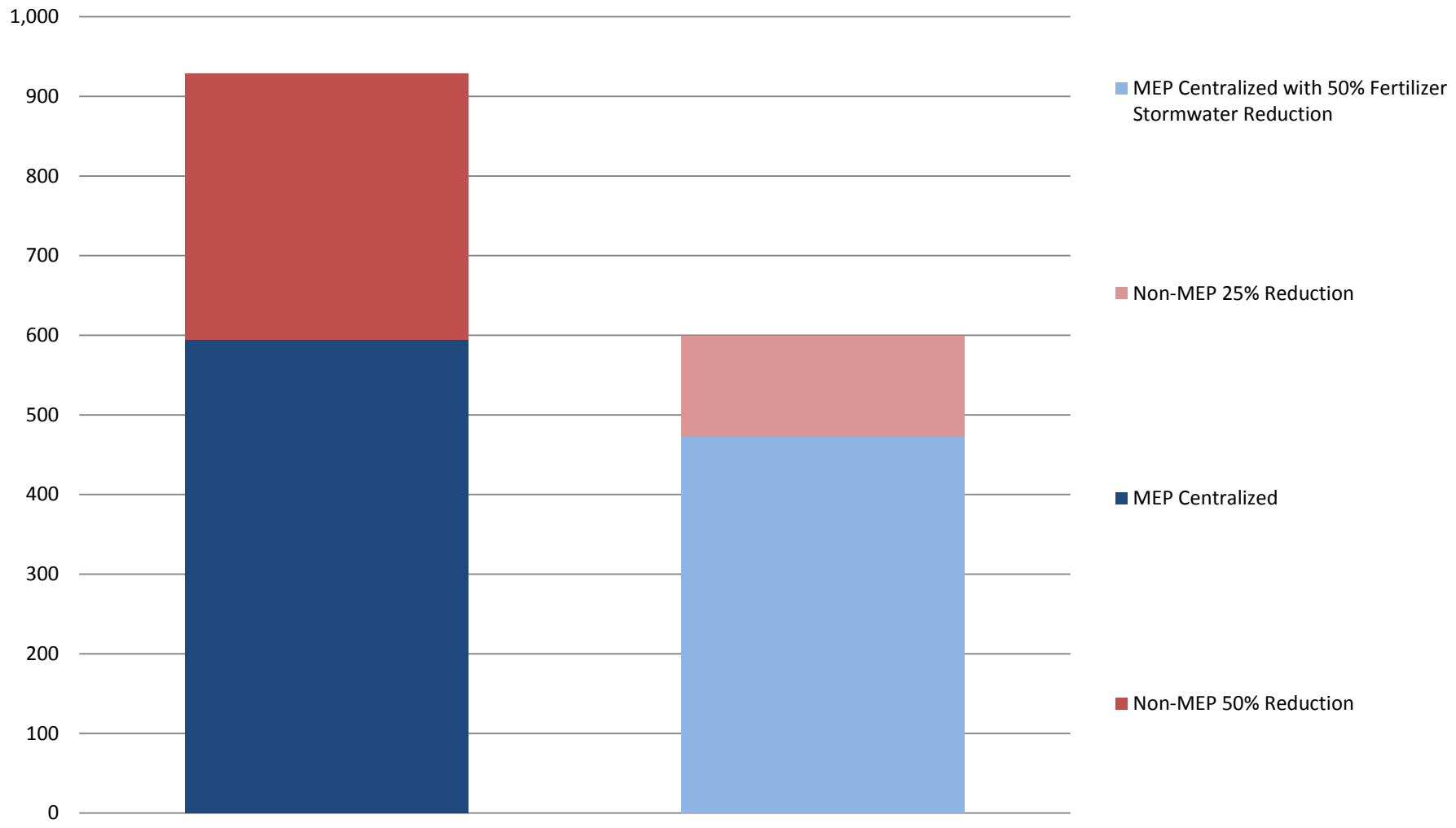
Mid Cape Watershed Group

Centralized Inside Treatment:Miles of Sewer



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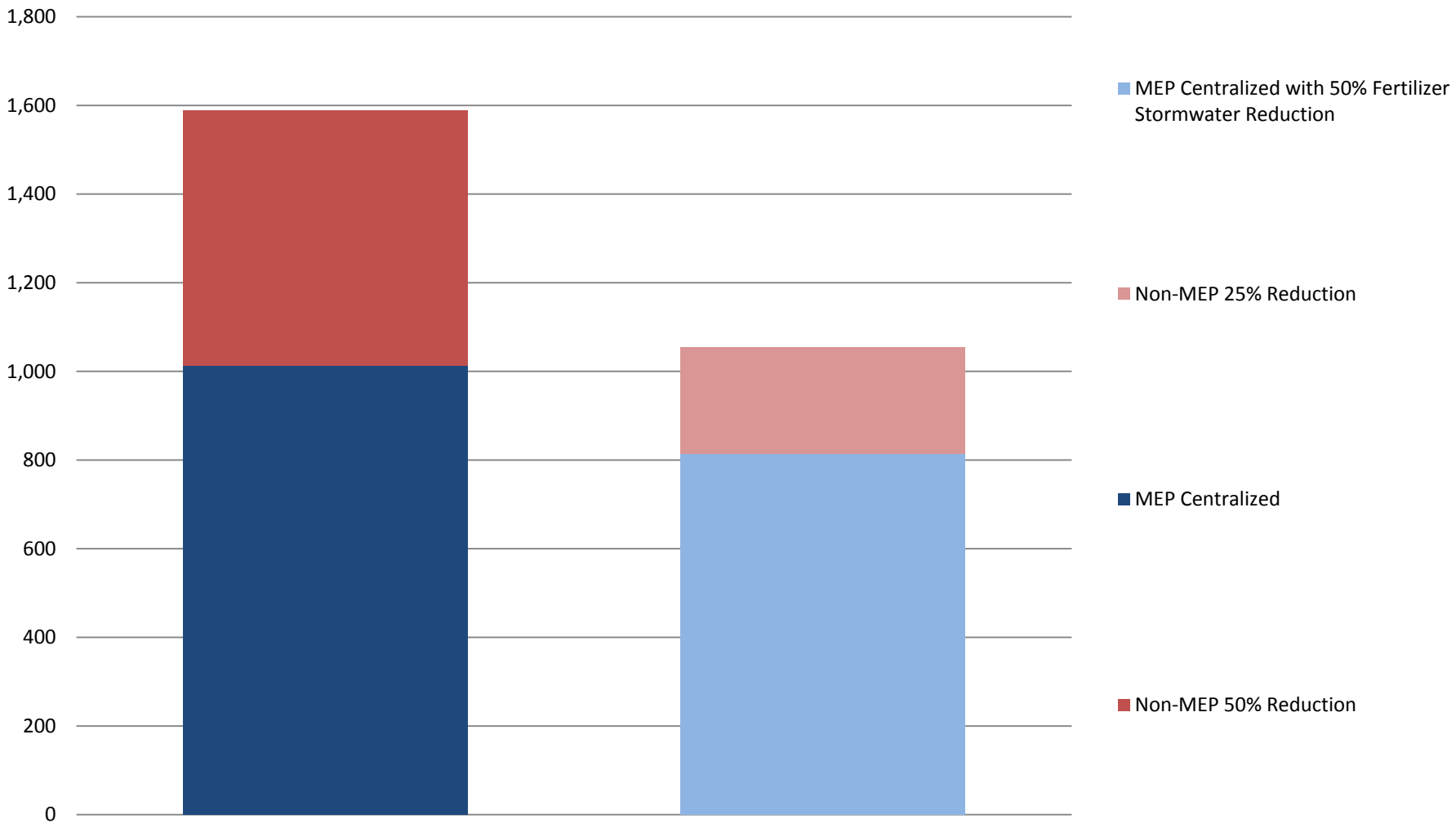
Mid Cape Watershed Group

Centralized Inside Treatment: Capital Cost (Millions)



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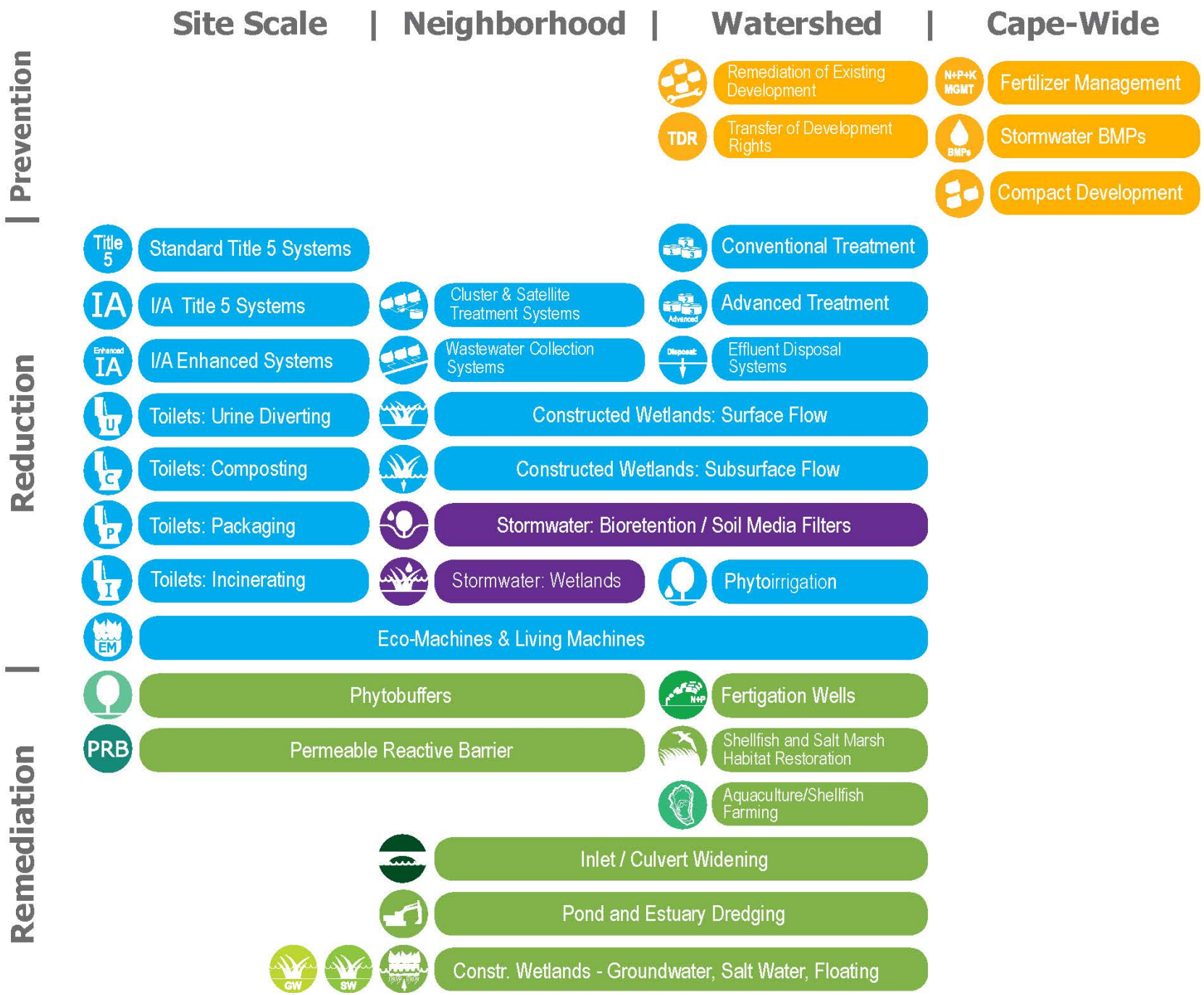
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	Stormwater	89,912	246.3		
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Nitrogen Removal Required				**862.1**	**314,677**
Total Number of Properties	113,303				

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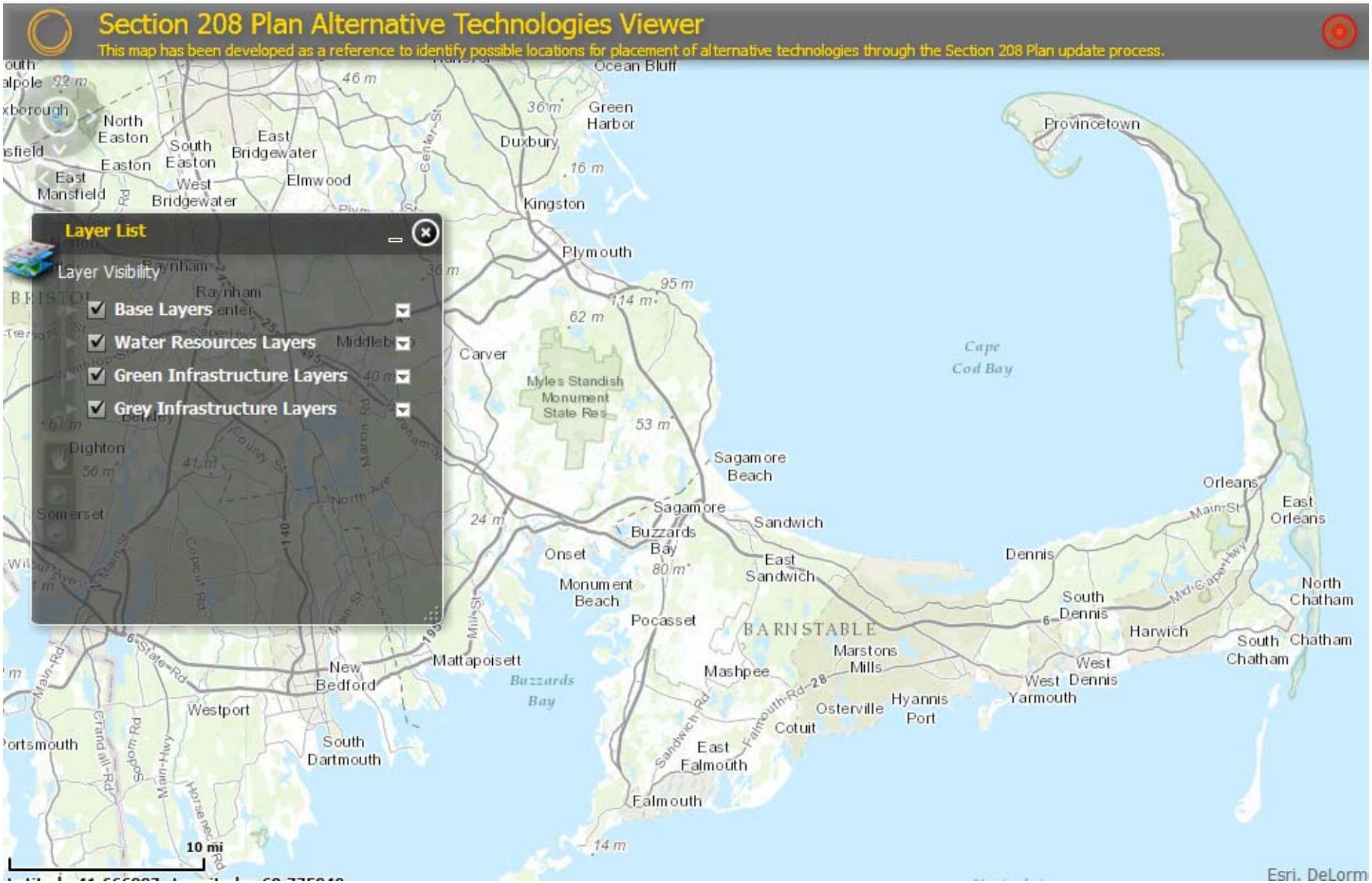
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Buzzards Bay
Onset
East Sandwich
Monument Beach
Pocasset
Mattapoisett
New Bedford
Westport
South Dartmouth
Buzzards Bay
Mashpee
Marstons Mills
Osterville
Hyannis Port
Cotuit
West Yarmouth
West Dennis
Dennis
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Orleans
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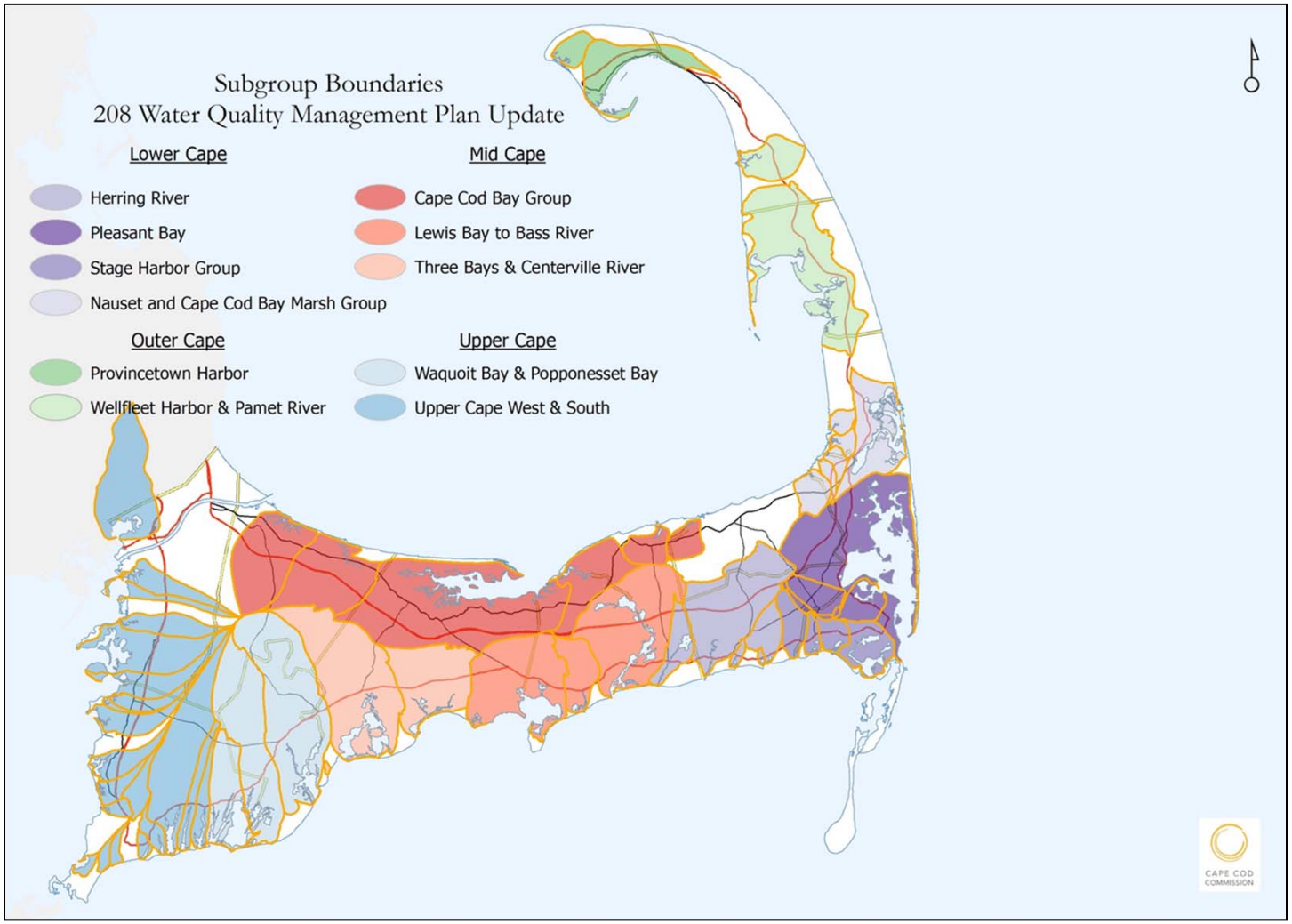

Outer Cape Watershed Groups

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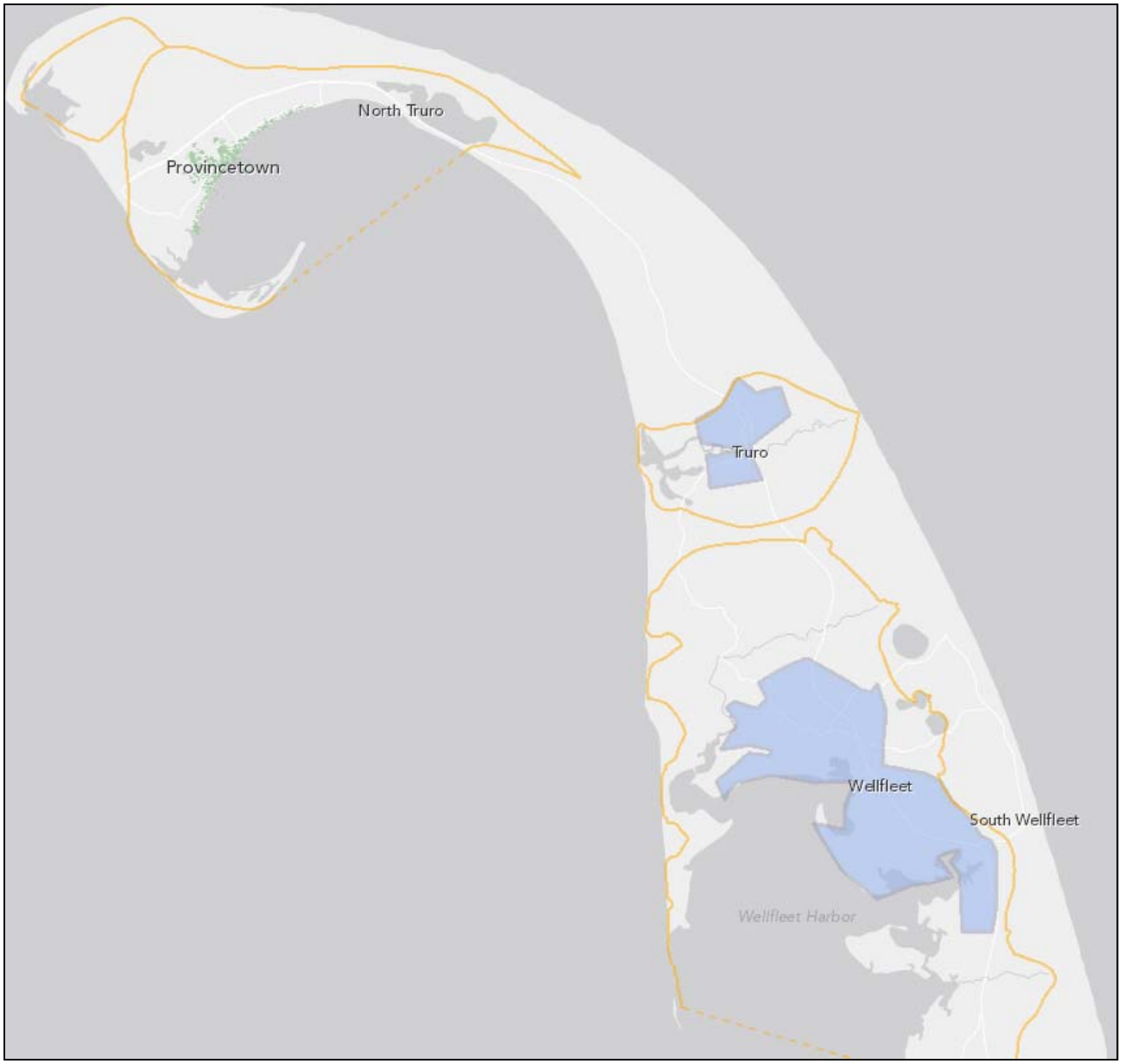
MEP Centralized Plus Non-MEP 50% Reduction



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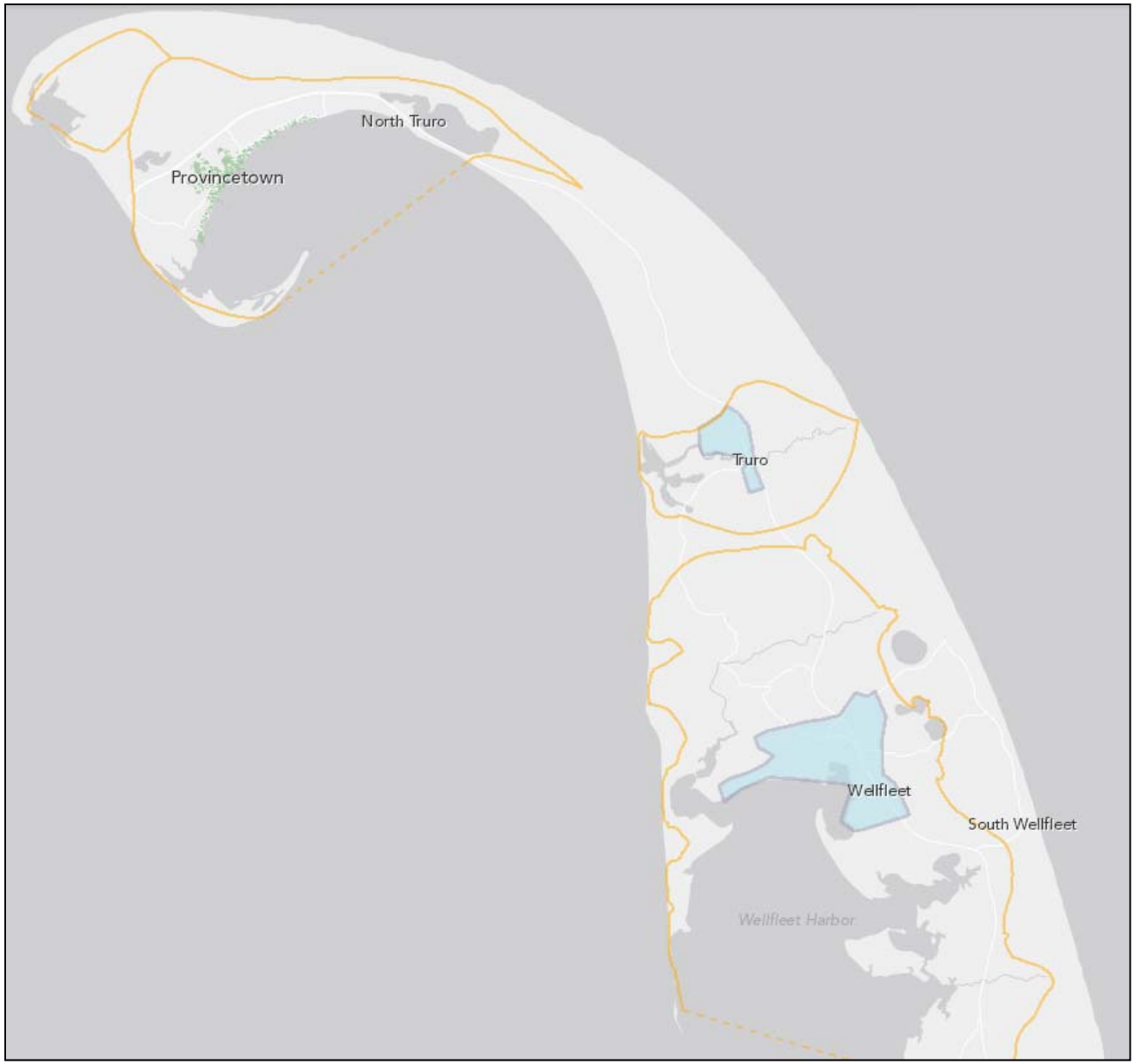

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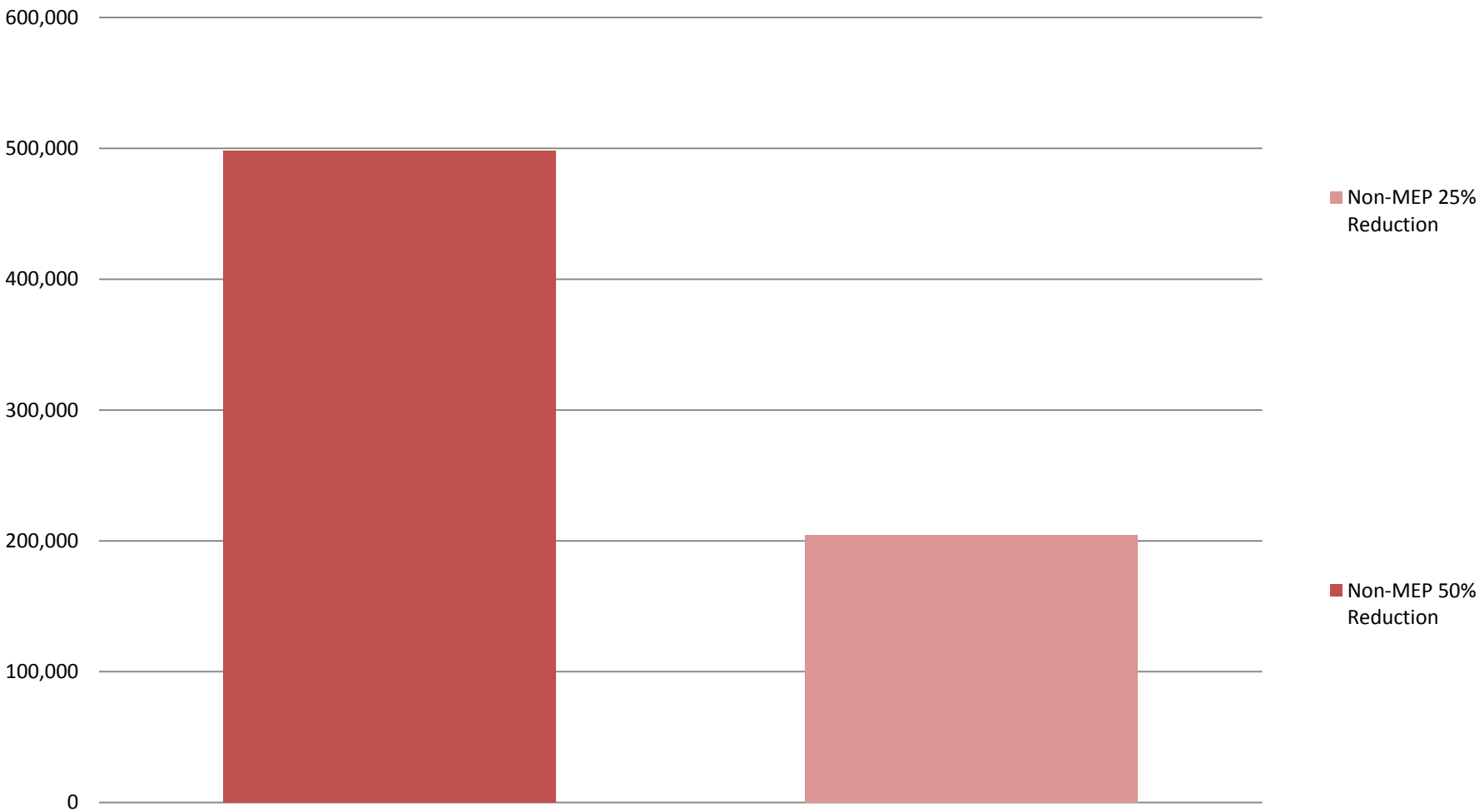
Centralized Inside Treatment: Captured Wastewater Flow (gpd)



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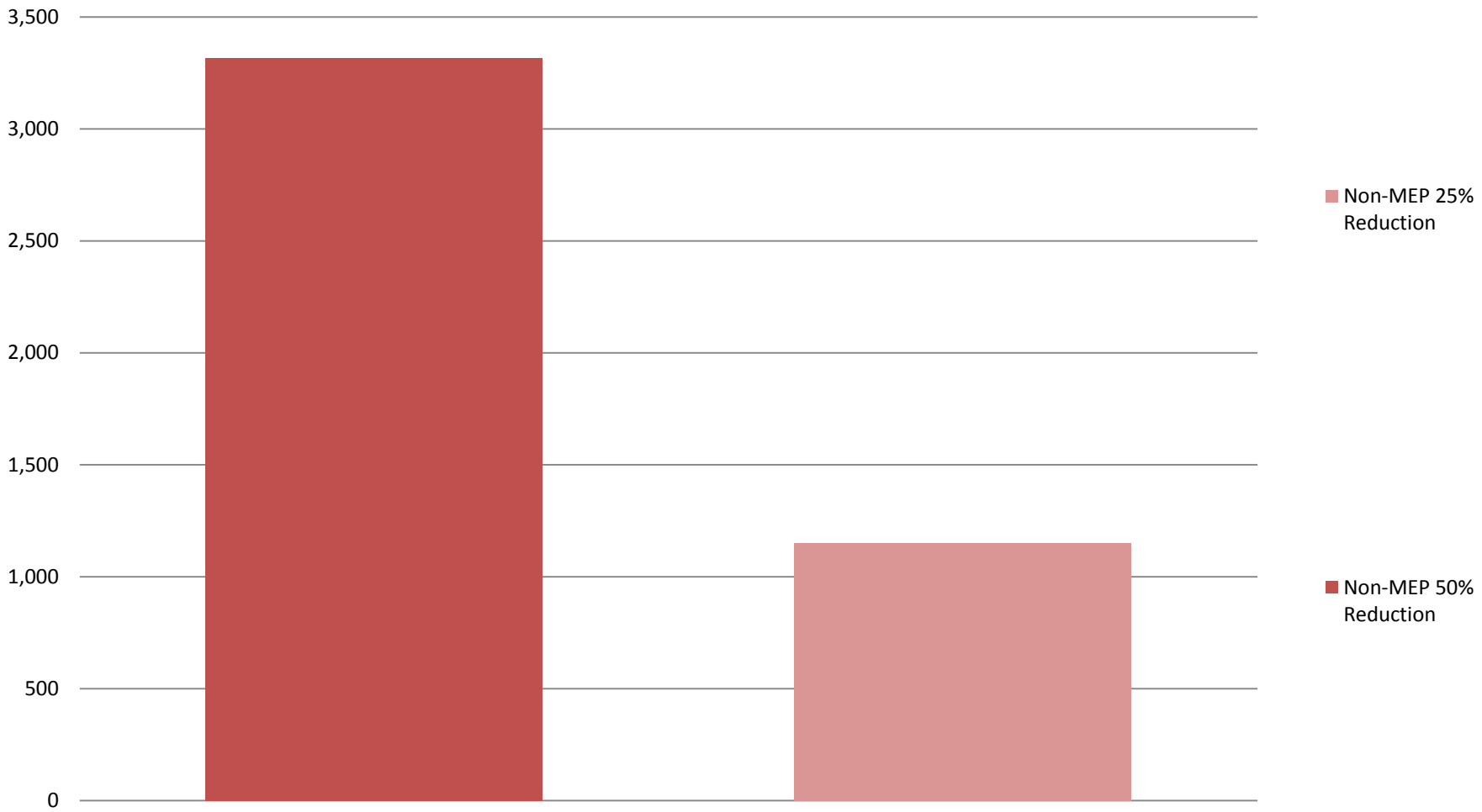

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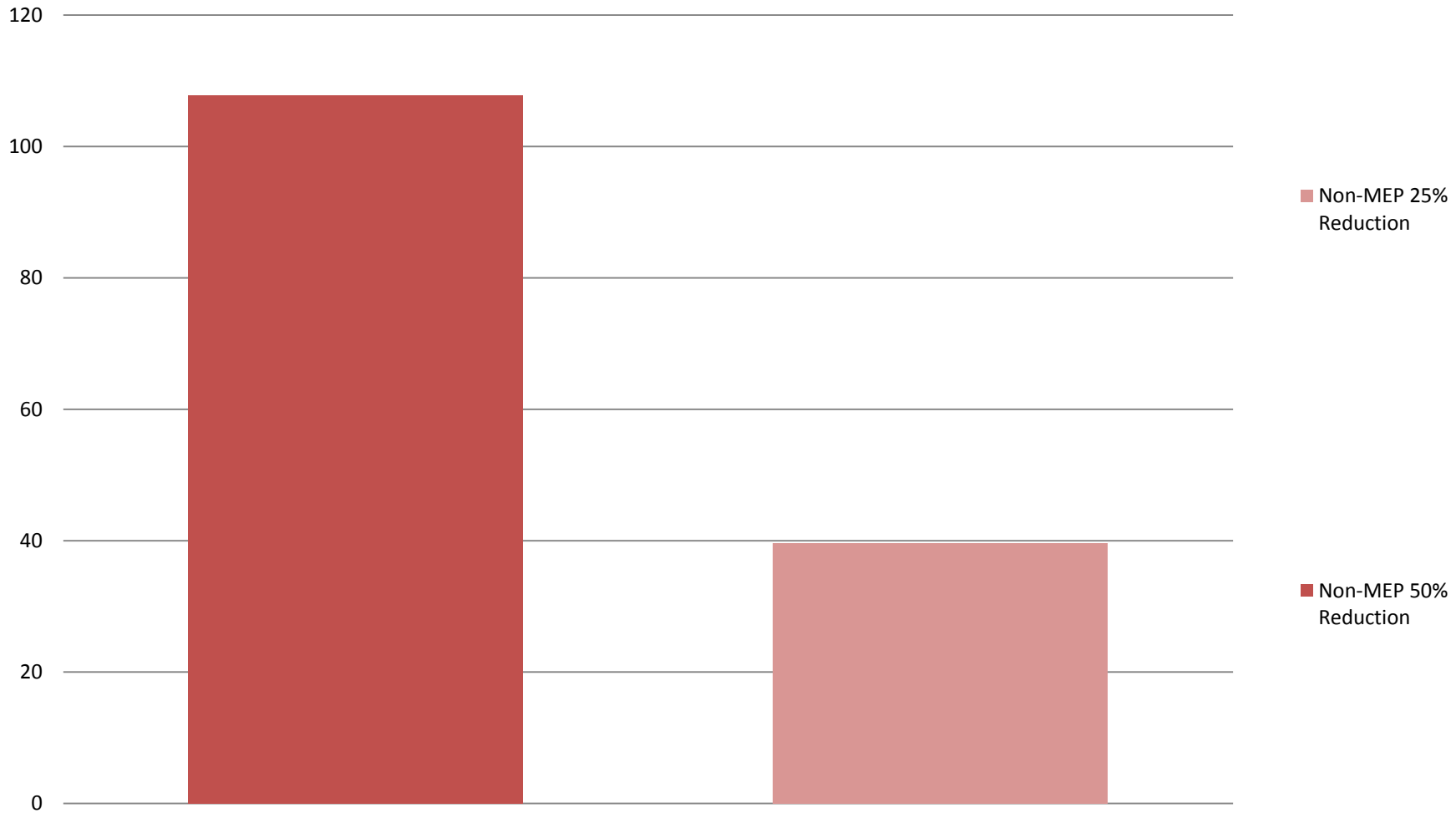

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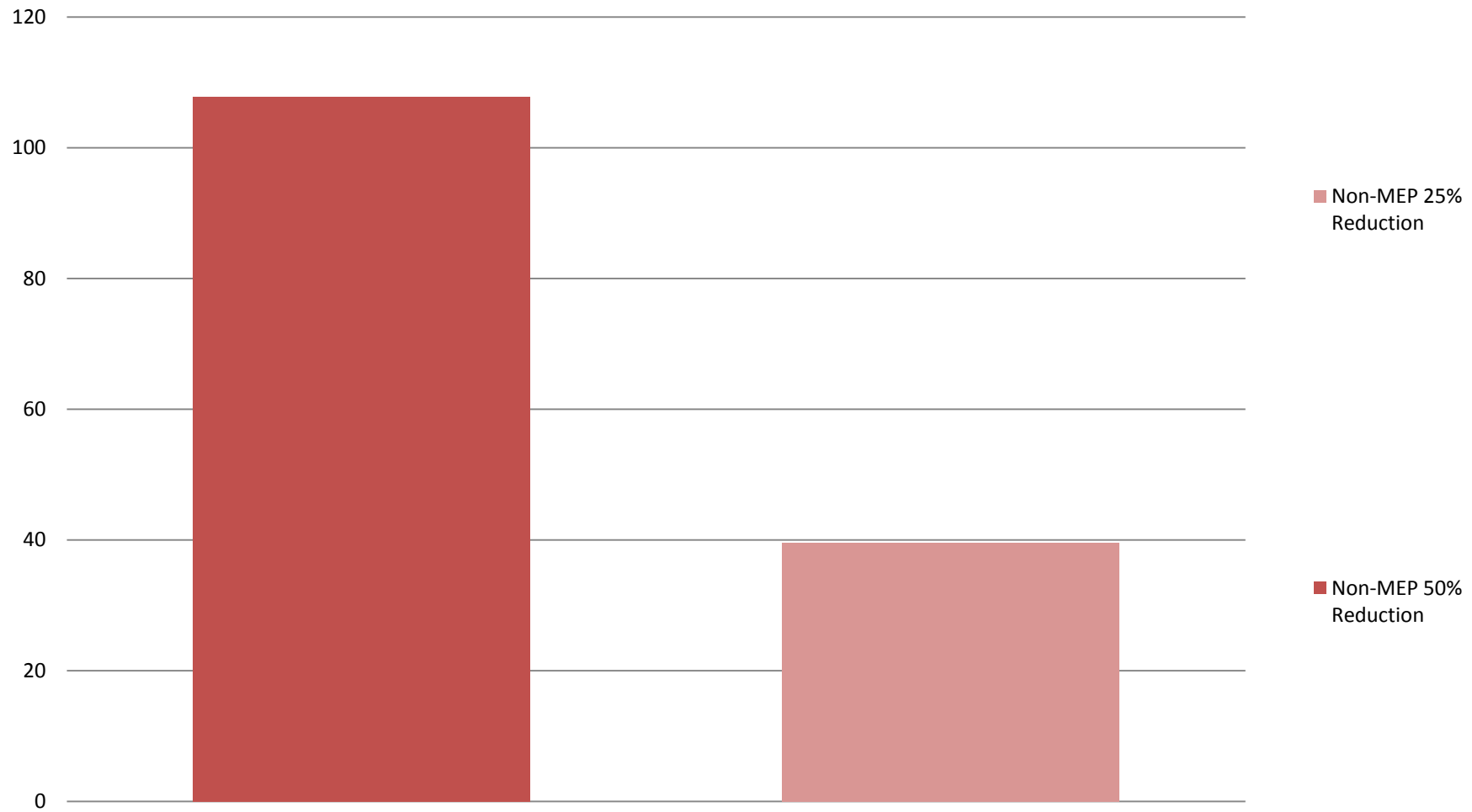
Centralized Inside Treatment: Capital Cost (Millions)



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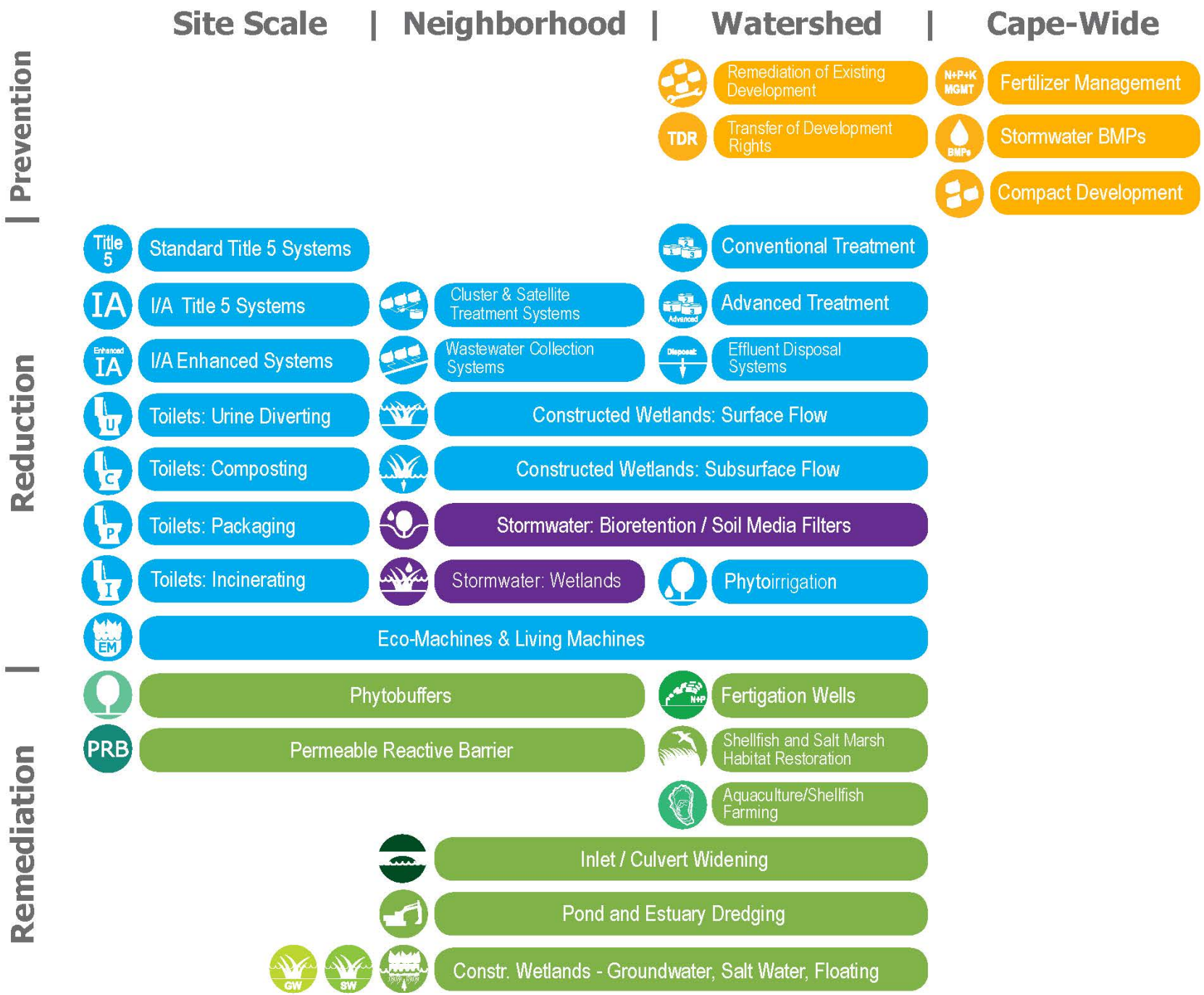
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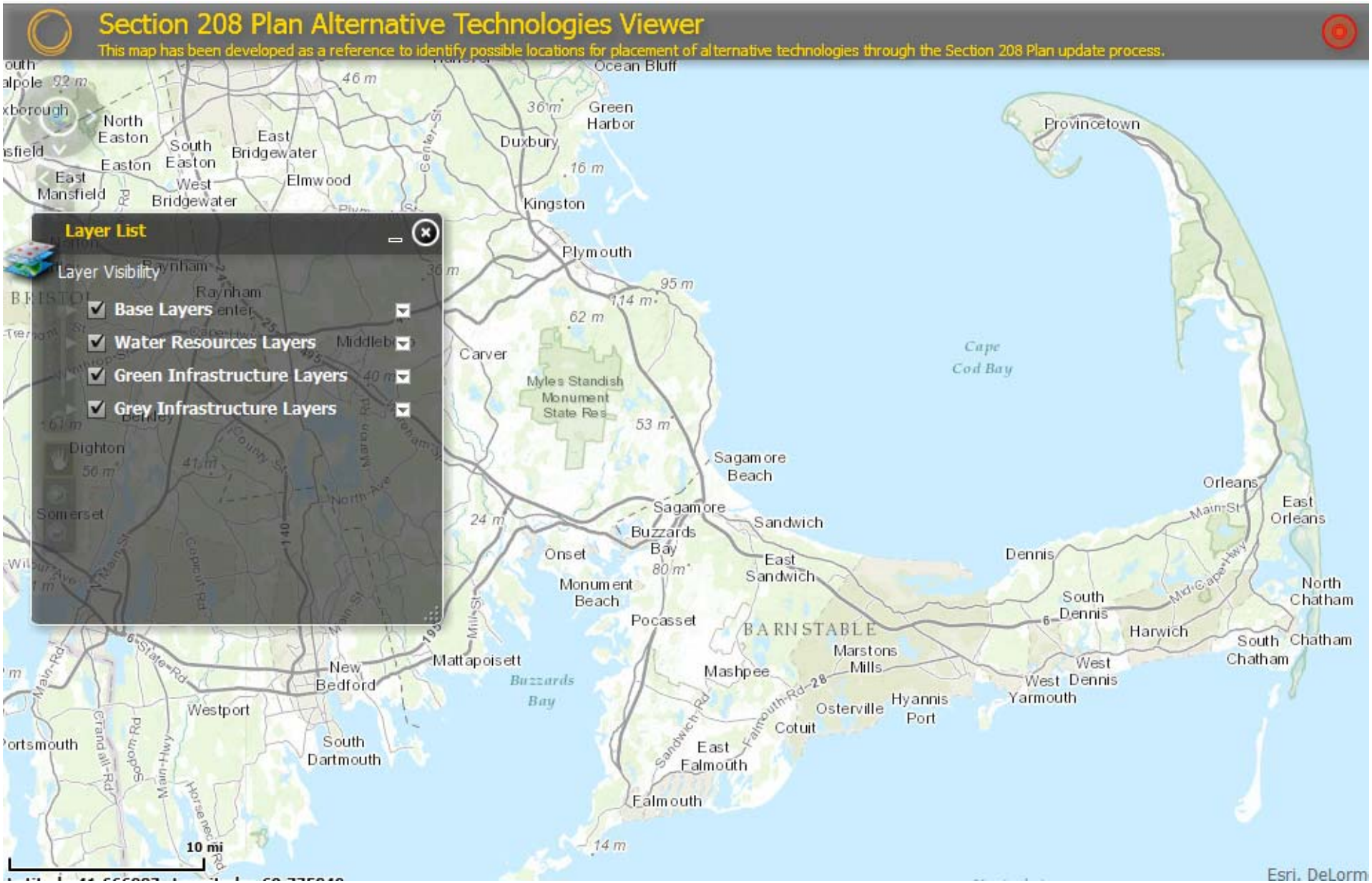
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West Yarmouth
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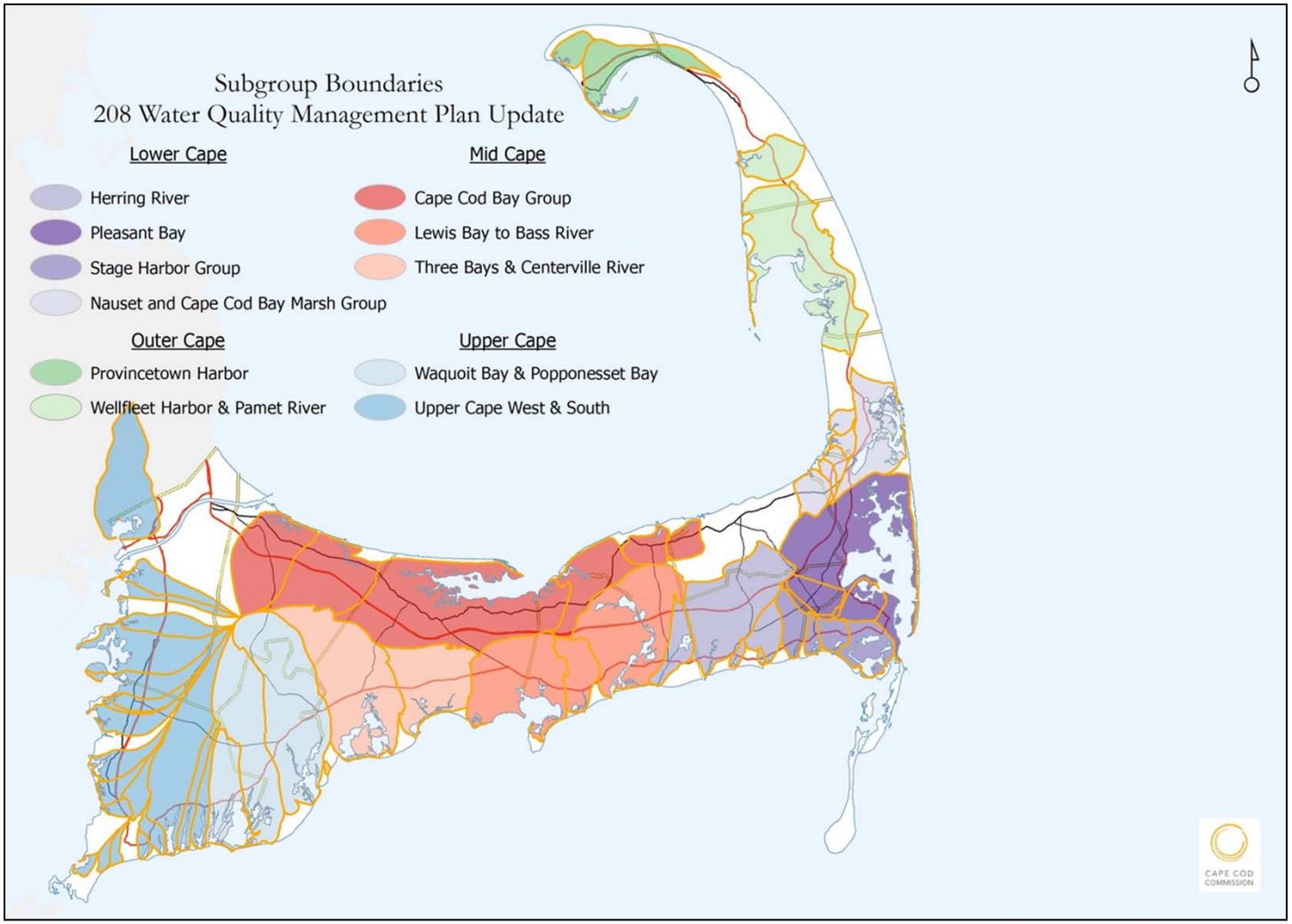
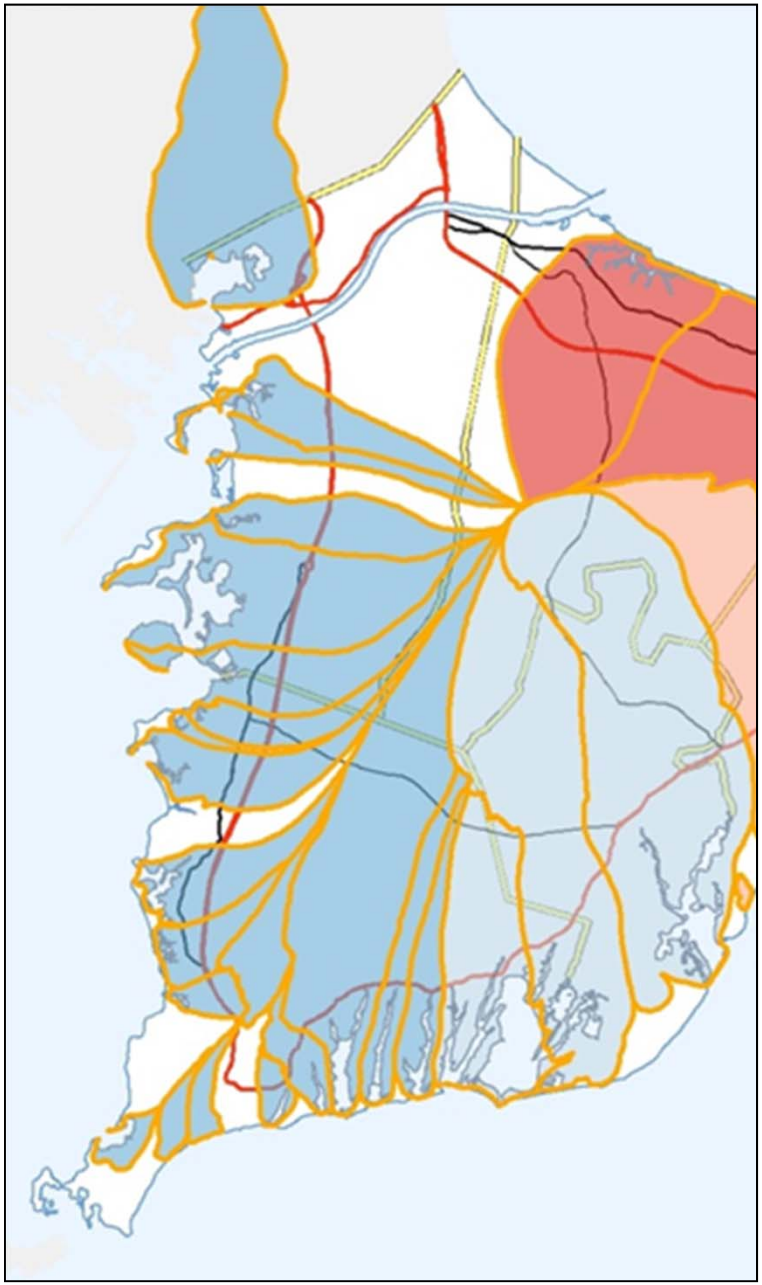


Upper Cape Watershed Groups



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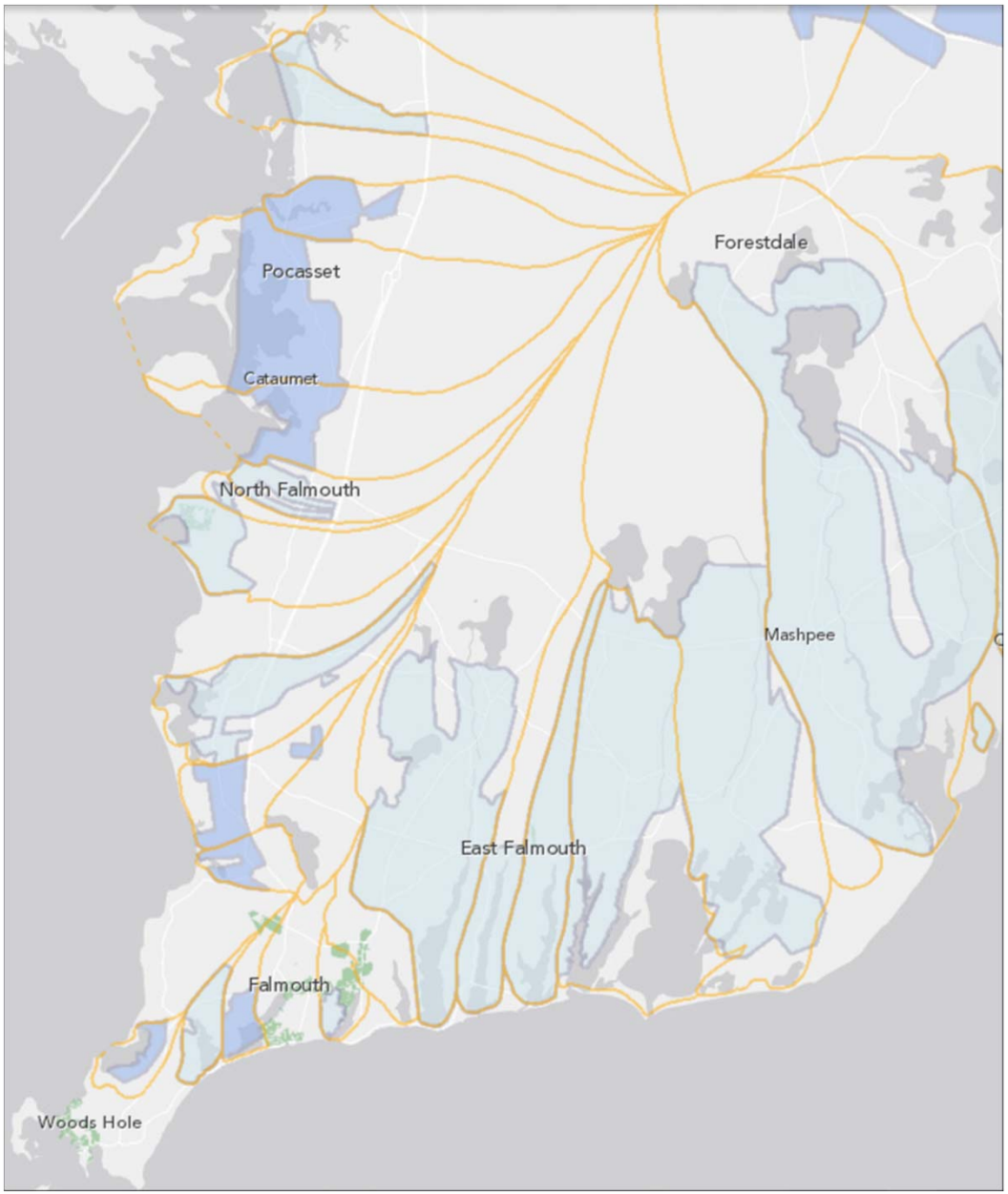
MEP Centralized Plus Non-MEP 50% Reduction



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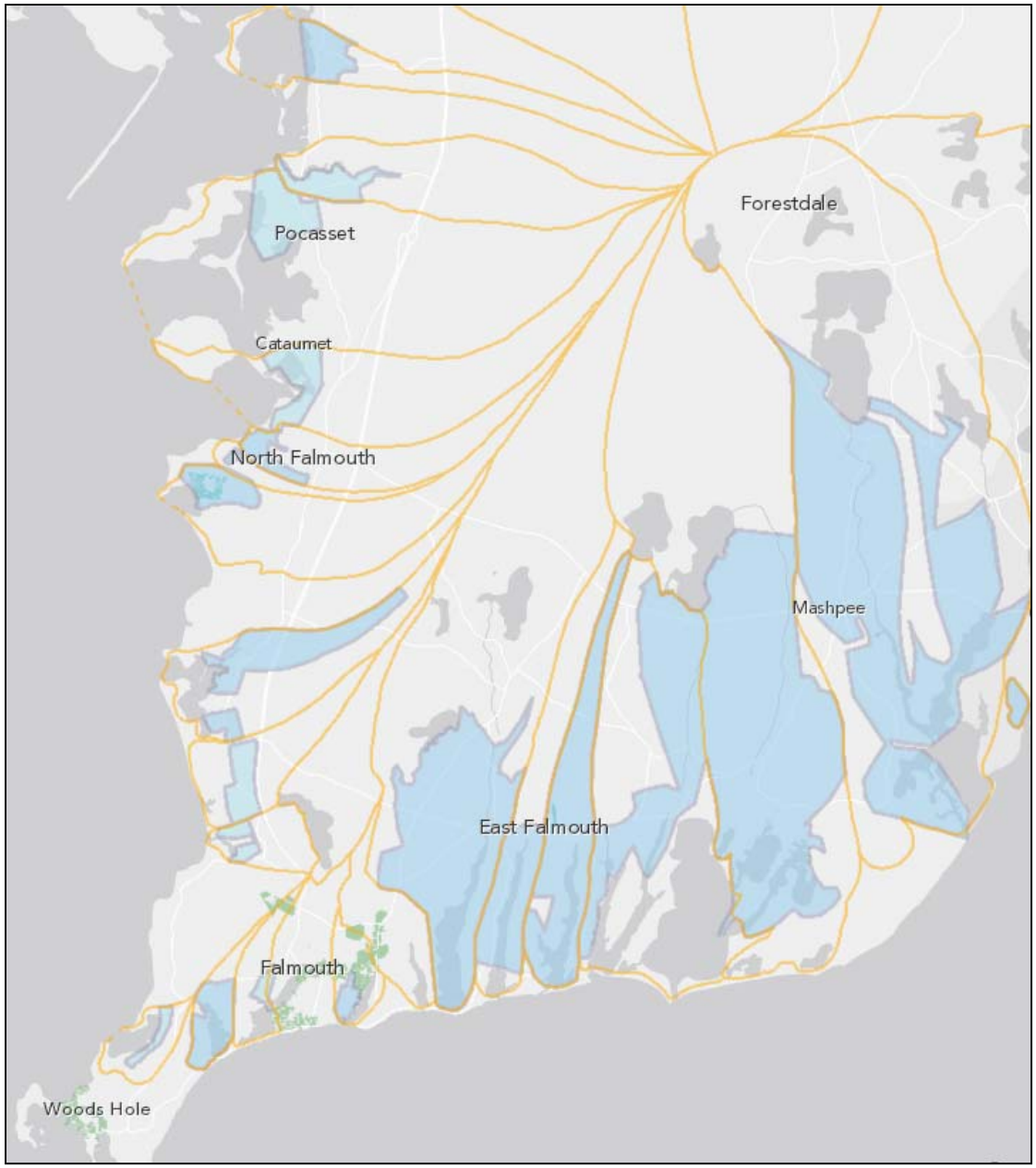

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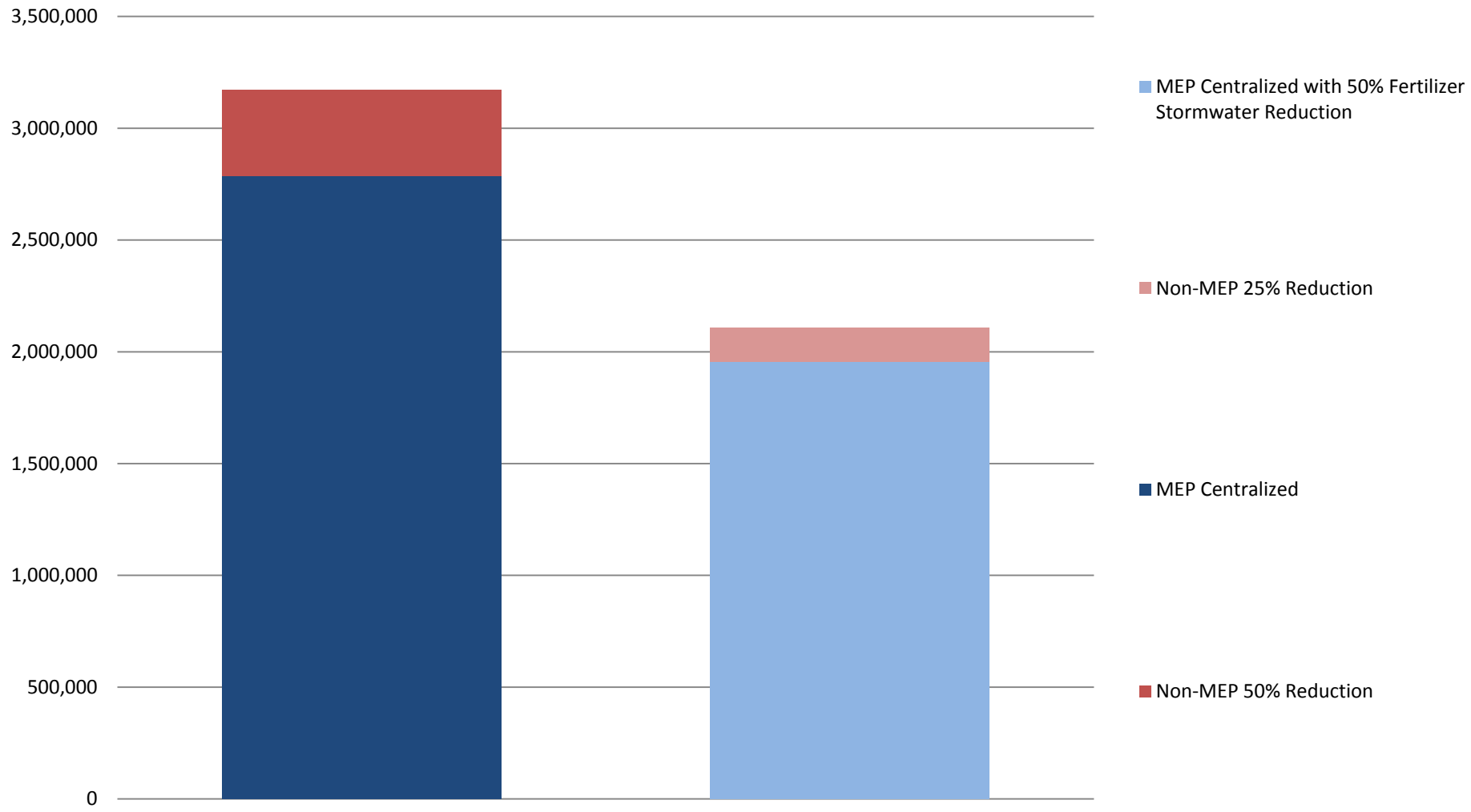

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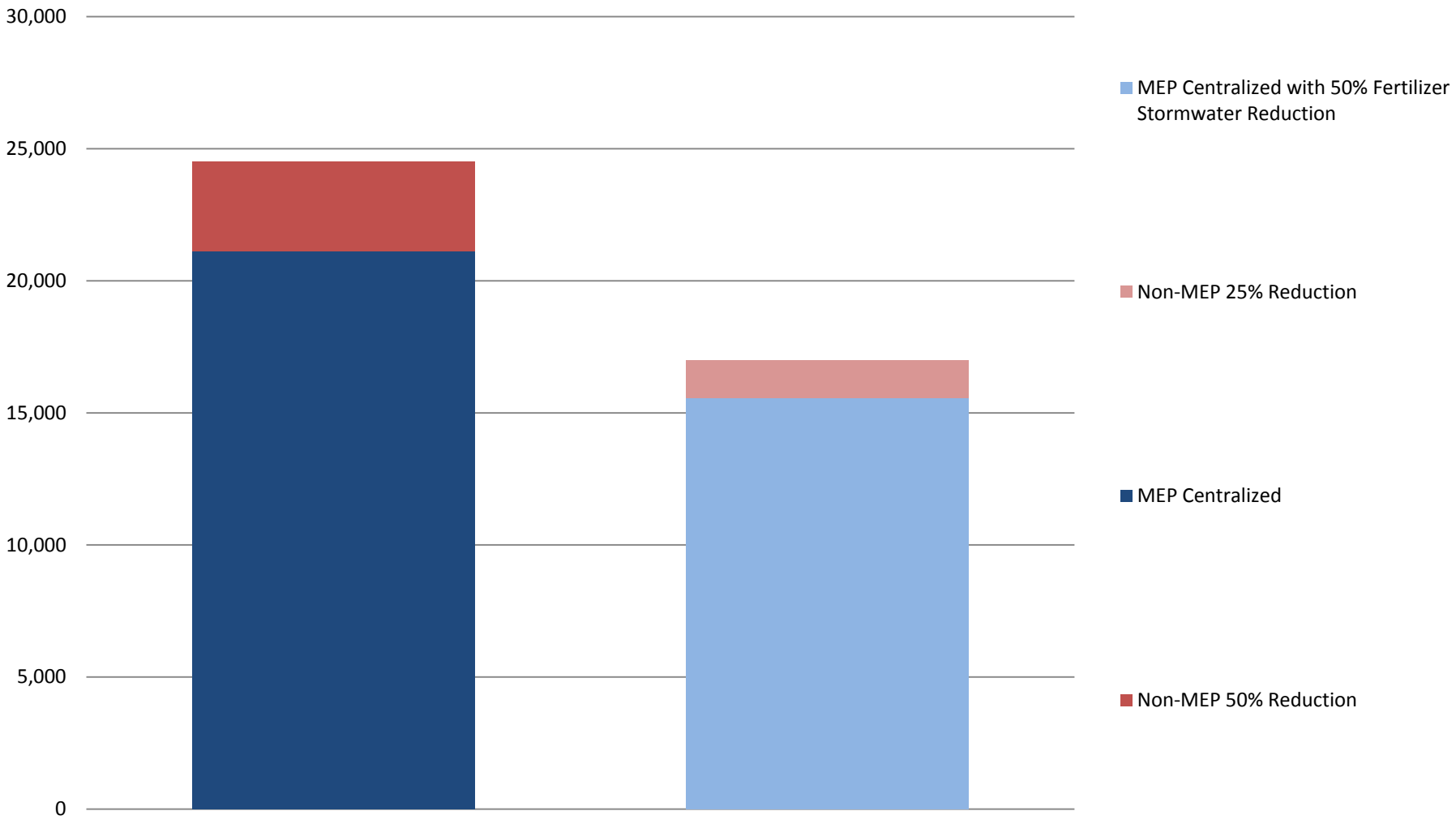

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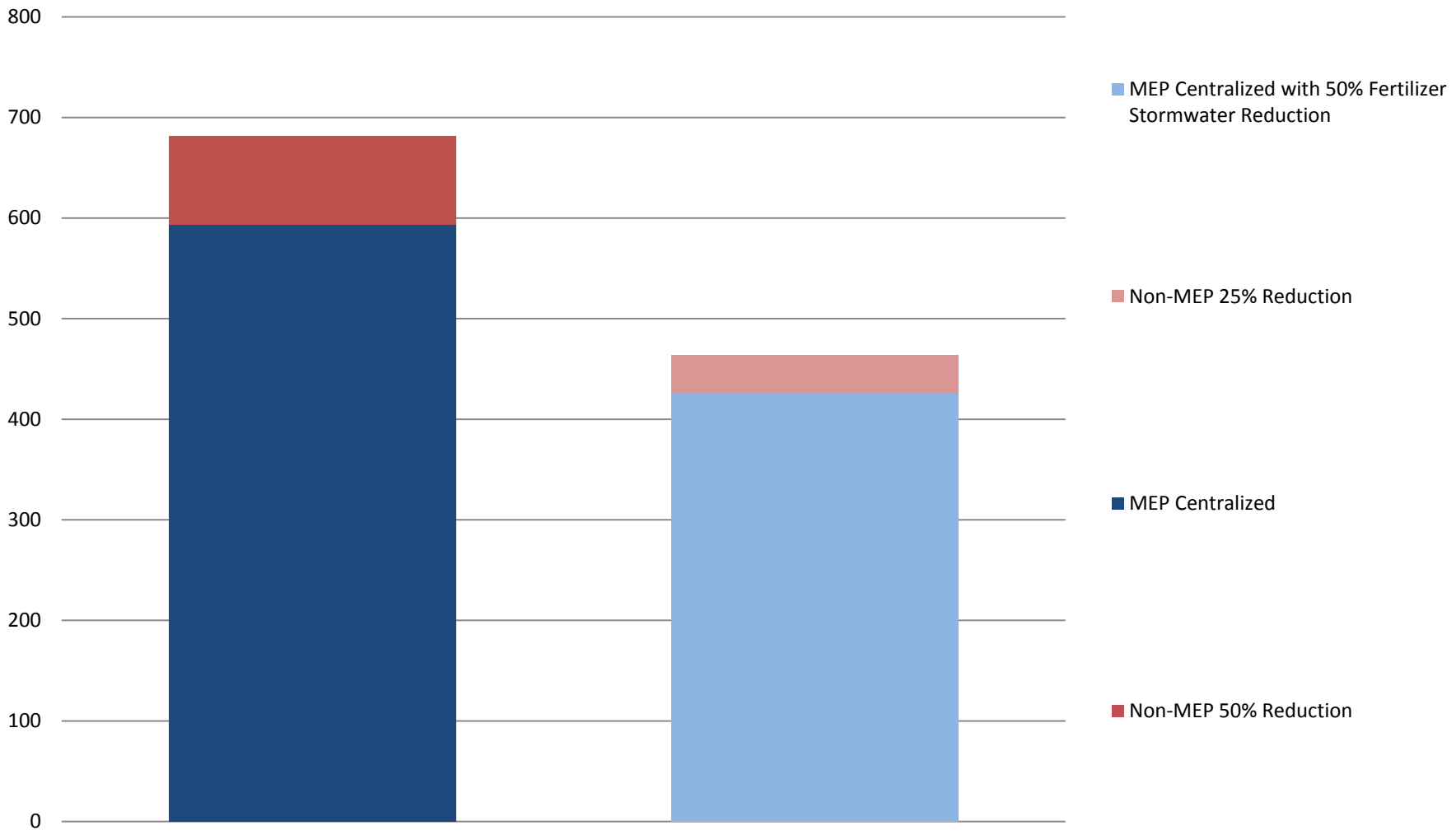

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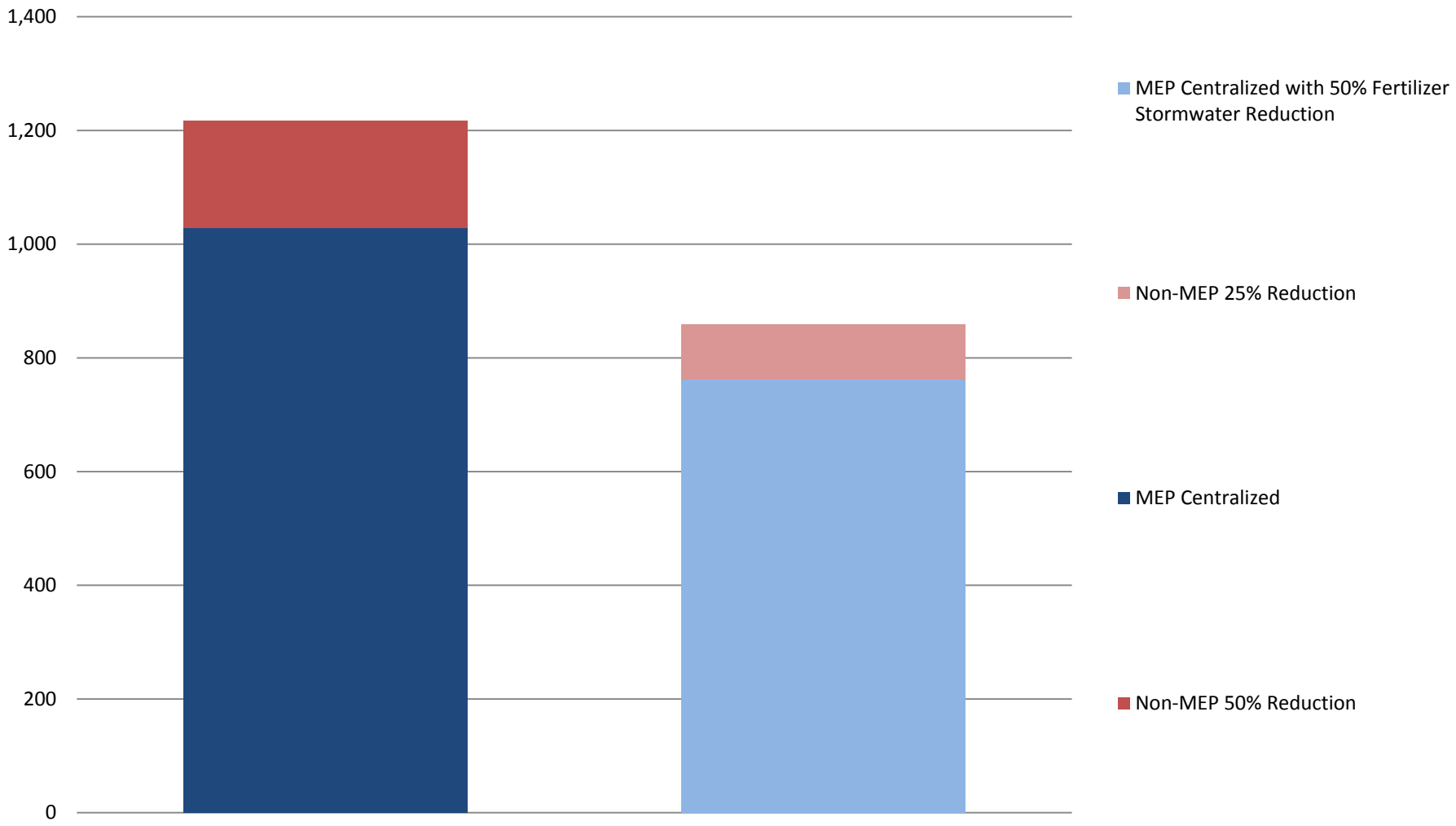

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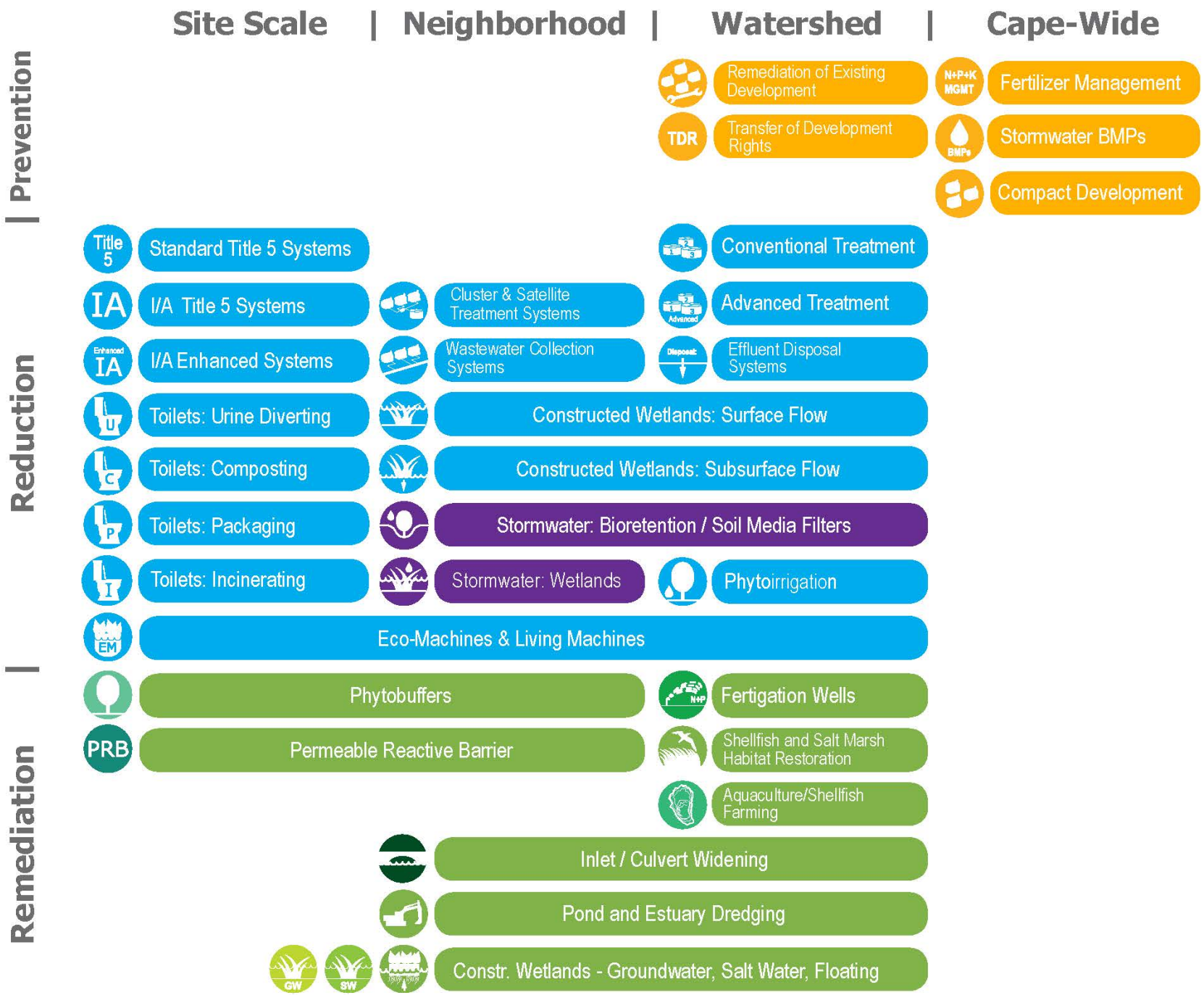
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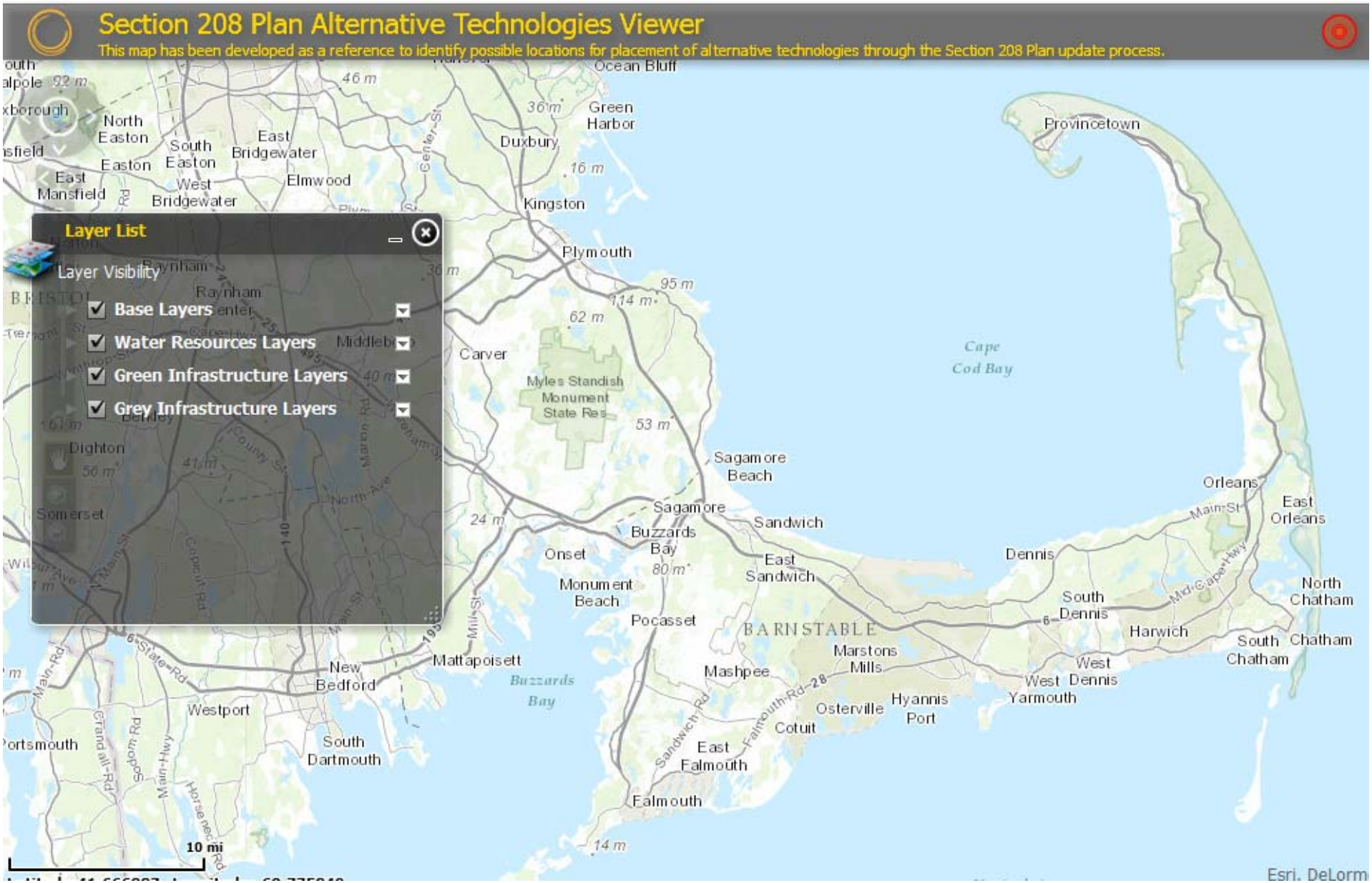
Alternative On-Site Options	Quantity	Reduction by Technology (Kg/yr)	Remaining to Meet Target (Kg/yr)
A) Ecotoilets (UD & Compost)	3,343 homes	20,060	-1,552
B) UD School or Public Facility	6,700 people	9,648	-11,200
C) I & A Systems	3,485 homes	17,425	-28,625
D) Enhanced I & A Systems	2,742 homes	16,452	-45,077


Section 208 Plan Alternative Technologies Viewer
This map has been developed as a reference to identify possible locations for placement of alternative technologies through the Section 208 Plan update process.
Layer List
Layer Visibility
Base Layers
Water Resources Layers
Green Infrastructure Layers
Grey Infrastructure Layers
Ocean Bluff
Green Harbor
Provincetown
Duxbury
Kingston
Plymouth
Carver
Myles Standish Monument State Res
Cape Cod Bay
Sagamore Beach
Sagamore
Sandwich
Buzzards Bay
Onset
East Sandwich
Monument Beach
Pocasset
Mattapoisett
New Bedford
Westport
South Dartmouth
Buzzards Bay
Mashpee
Marstons Mills
Osterville
Hyannis Port
Cotuit
West Yarmouth
West Dennis
Dennis
South Dennis
Harwich
Orleans
East Orleans
North Chatham
South Chatham
East Falmouth
Falmouth
BARNSTABLE
Somerset
Dighton
North Easton
South Easton
East Bridgewater
West Bridgewater
East Mansfield
Elmwood
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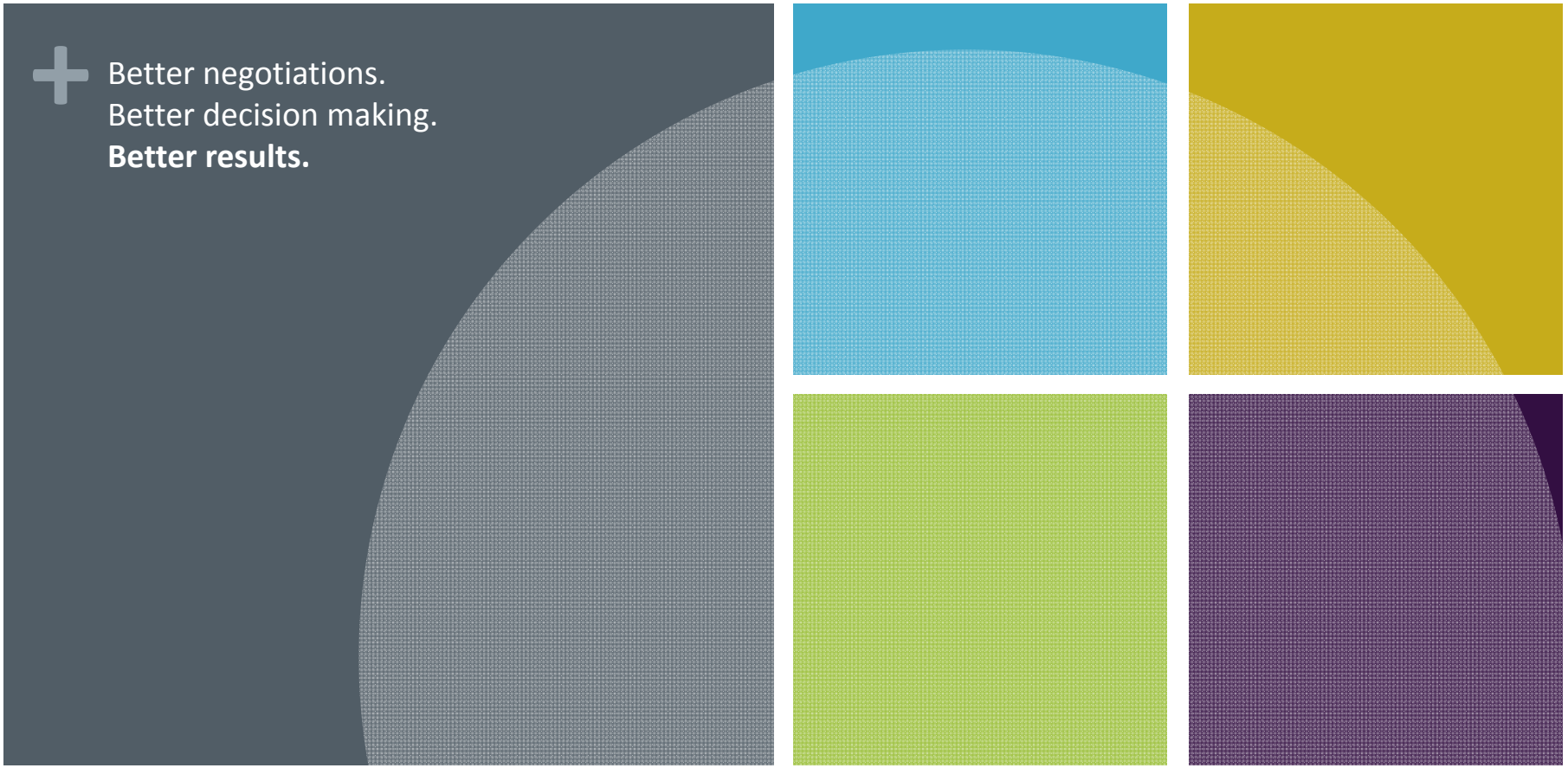
Esri, DeLorm



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Reflecting on the Watershed Working Groups Stakeholder Engagement

Phase 1: 11 Watershed Working Groups

Diverse participants from all included Towns and constituencies participated in 3 Meetings, in order to:

- Review and improve Baseline Condition information
- Overview and discuss a full range of Technology Options
- Explore a set of Approaches to building Watershed Scenarios that meet water quality goals

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Outcomes from the Watershed Working Groups: Scenario Planning Findings and Principles

- There are a range of ways to meet TMDLs and water quality goals, which will draw on a mix of different technologies, both conventional and alternative, with different scales (from site to cape-wide), different targets (wastewater, stormwater), and different impacts (prevention, reduction, remediation).
- Selections among these options should be locally-determined, drawing from broadly-shared information about the technologies (the technology matrix, pilot information) as well as detailed information about local sites for implementation, and should respect local progress to date and local priorities regarding cost-sharing, risk tolerance, and willingness to pay.
- In general, solutions should be incremental, using adaptive management to integrate new information, while continuing forward momentum towards reaching water quality outcomes.

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CRITERIA TO WEIGH TECHNOLOGY OPTIONS WITHIN AND ACROSS WATERSHEDS

- Prioritize Low-Hanging Fruit
- Minimize financial expenditure
- Maximize Effectiveness
- Maximize co-benefits
- Minimize secondary costs
- Maximize economies of scale
- Include benefits to Ponds
- Seek Adaptability
- Manage Risk
- Maximize Robustness
- Consider Ease of implementation
- Consider Timing of implementation

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Outcomes from the Watershed Working Groups: Regulatory, Legal, and Institutional Findings and Principles

- Towns and the region should move forward to incentivize and implement cost-effective stormwater and fertilizer management options.
- Solutions should draw on other regulatory mechanisms, such land use regulations, codes, growth and build-out goals, and comprehensive planning, and make sure that these are aligned with wastewater planning.
- Towns and the region should seek and maximize opportunities to work with or through state or federal partners to fund and implement shared priorities that support to water quality goals (e.g. MassDOT, USDA, US Army Corps of Engineers, NOAA, etc.)
- There are significant potential benefits to scoping solutions at the watershed level rather than town-by-town.
- The regulatory process for giving credit for new technologies needs to be more agile to respond to changing technology, while still ensuring effectiveness.

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Outcomes from the Watershed Working Groups: Implementation Findings and Principles

- Broad-based effective public information/education will need to accompany any next steps to finalize and implement watershed planning.
- While solutions should not rely on voluntary homeowner-level behavior or technology changes, especially for on-going maintenance, incentives should be used to help promote homeowner actions.
- Monitoring protocols to establish the effectiveness of different solutions will need to be developed and implemented. Each solution should come with a defined feedback loop that includes the type of results we expect, clear monitoring, and a clear timeframe of expected information.
- Financing should be equitable. Costs should be spread fairly across direct users, homeowners, towns, and watersheds. Creative methods should be available to allow collaboration across towns for maximized solutions. Consider variations in ability to pay across residents.

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Questions for Discussions at Tables

- Is there anything we missed?

- Are there any of these principles that you strongly disagree with?

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Summary of Key Findings/Principles Derived from Watershed Stakeholder Process

Compiled by the Consensus Building Institute (CBI)

Scenario Planning Findings and Principles

CORE FINDINGS

- There are a range of ways to meet TMDLs and water quality goals, which will draw on a mix of different technologies, both conventional and alternative, with different scales (from site to cape-wide), different targets (wastewater, stormwater), and different impacts (prevention, reduction, remediation).
- Selections among these options should be locally-determined, drawing from broadly-shared information about the technologies (the technology matrix, pilot information) as well as from detailed information about local sites for implementation, and should respect local progress to date and local priorities regarding cost-sharing, risk tolerance, and willingness to pay.
- In general, solutions should be incremental, using adaptive management to integrate new information, while continuing forward momentum towards reaching water quality outcomes.

CRITERIA TO WEIGH TECHNOLOGY OPTIONS WITHIN AND ACROSS WATERSHEDS

- *Prioritize Low-Hanging Fruit:* move first with solutions that have high levels of consensus - simple, visible, and high-impact.
- *Minimize financial expenditure:* consider both capital and life-cycle costs, as well as "soft-costs" (risk and vulnerability, education and public buy-in). Be efficient in terms of cost, impact, lifespan, and resources used and look for cost-savings – look for lower costs per unit of nitrogen removed.
- *Effectiveness:* promote technologies which are proven (or likely) to be highly successful at removing nitrogen. Consider impacts of seasonal variation. Solutions should not rely on on-going homeowner maintenance for effectiveness.
- *Maximize co-benefits*: create useful secondary benefits for communities, such as additional recreational space or conservation areas, habitat, restored wetlands and estuaries, jobs, revenue generation, carbon reduction, etc.
- *Minimize secondary costs*: weigh and minimize the costs of economic, environmental and aesthetic downsides, such as increased energy use, odors, displacement of other uses, reduced property values, etc.
- *Maximize economies of scale*: investigate ways to reduce costs by ensuring that solutions are at a scale which makes them cost-effective and tap into opportunities for regional oversight and partnership among multiple towns.
- *Ponds*: ponds are extremely important to economic and social value on the Cape – solutions should include nitrogen reduction in ponds.
- *Adaptability*: solutions should be amenable to a range of potential changes, including population, occupancy, and emerging contaminants of concern. Maximize opportunities to benefit from future technological advancement or start small and

scale up as needed.
- *Risk:* weigh economic, regulatory, and environmental risks and side effects of new technologies. Ensure additional solutions are ready if riskier approaches underperform. Consider flood zones and potential impacts from climate change.
- *Robustness:* promote solutions that are less vulnerable to failure and are self-sustaining.
- *Ease of implementation:* promote solutions that can be easily implemented, and weigh the costs of political, social, regulatory, and technological feasibility.
- *Timing of implementation:* consider how quickly solutions will achieve results, and seek to balance immediate mitigation and long-term reduction. Consider soil percolation and nitrogen travel time.

Regulatory, Legal, and Institutional Findings and Principles

- Towns and the region should move forward to incentivize and implement cost-effective stormwater and fertilizer management options.
- Solutions should draw on other regulatory mechanisms, such land use regulations, codes, growth and buildout goals, and comprehensive planning, and make sure that these are aligned with wastewater planning.
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Implementation Findings and Principles:

- Broad-based effective public information/education will need to accompany any next steps to finalize and implement watershed planning.
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