Cape Cod 208 Area Water Quality Planning
Waquoit Bay and Popponesset Bay Working Group

Meeting One
Wednesday, September 25, 2013
Mashpee Town Hall, 16 Great Neck Rd North, Mashpee, MA 02649

Meeting Agenda

1:00 pm Welcome – *Cape Cod Commission*

1:05 Introductions, confirm working group membership and participation – *Doug Thompson (Facilitator, Consensus Building Institute) and Working Group*

1:30 Review 208 goals and process and the goals of today's meeting – *Cape Cod Commission*

1:45 Local Progress to Date: Chronology of what has been done to protect the watersheds in your area – *Patty Daley (Area Manager, Cape Cod Commission)*

2:00 Review and add to chronology of work to date – *Working Group*

2:15 Discussion: drawing on past work to move forward – *Doug Thompson (Facilitator, Consensus Building Institute) and Working Group*

2:30 Baseline Conditions: Understanding Your Watershed and its Water Quality Problem – *Patty Daley (Area Manager, Cape Cod Commission)*

3:15 Break

3:30 Discussion of Baseline Conditions – *Doug Thompson (Facilitator, Consensus Building Institute) and Working Group*

4:00 Framework for Moving Forward: Preview Meetings 2 and 3 – *Patty Daley (Area Manager, Cape Cod Commission)*

4:20 Review/Discuss Process Protocols - *Doug Thompson (Facilitator, Consensus Building Institute) and Working Group*

4:40 pm Public Comments

5:00 Adjourn

Popponesset Bay & Waquoit Bay Group

Baseline Conditions & Needs Assessment

What is the 208 Plan?

Clean Water Act Section 208

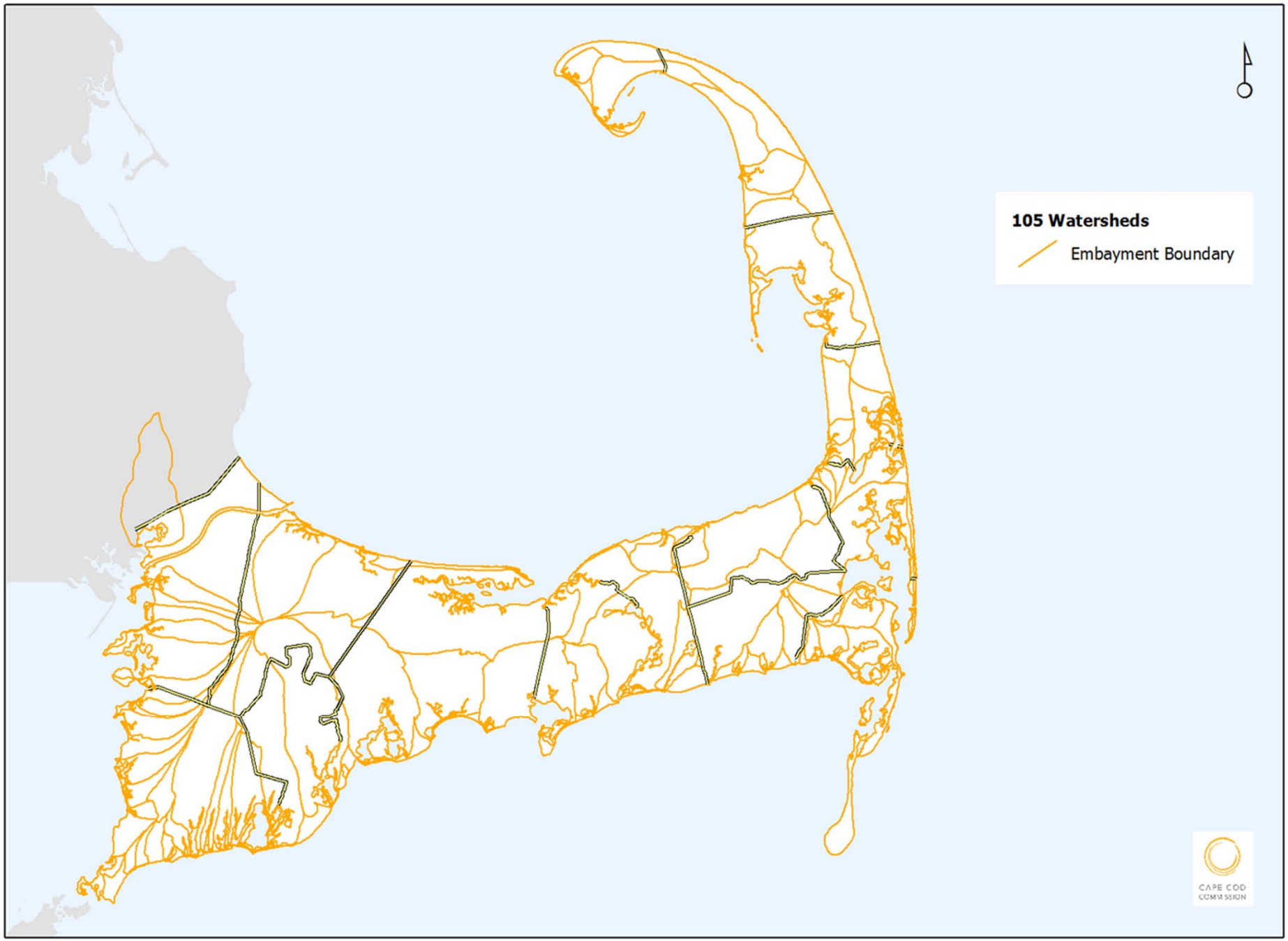
The Commission was directed to update the 1978 Plan

The Commonwealth provided $3 million to fund the project

Focus on 21st Century Problems

- Nitrogen: Saline Waters
- Phosphorus: Fresh Waters
- Growth & Title 5 Limitations

"Watershed Working Group - Waquoit/Popponesset - Workshop 1"



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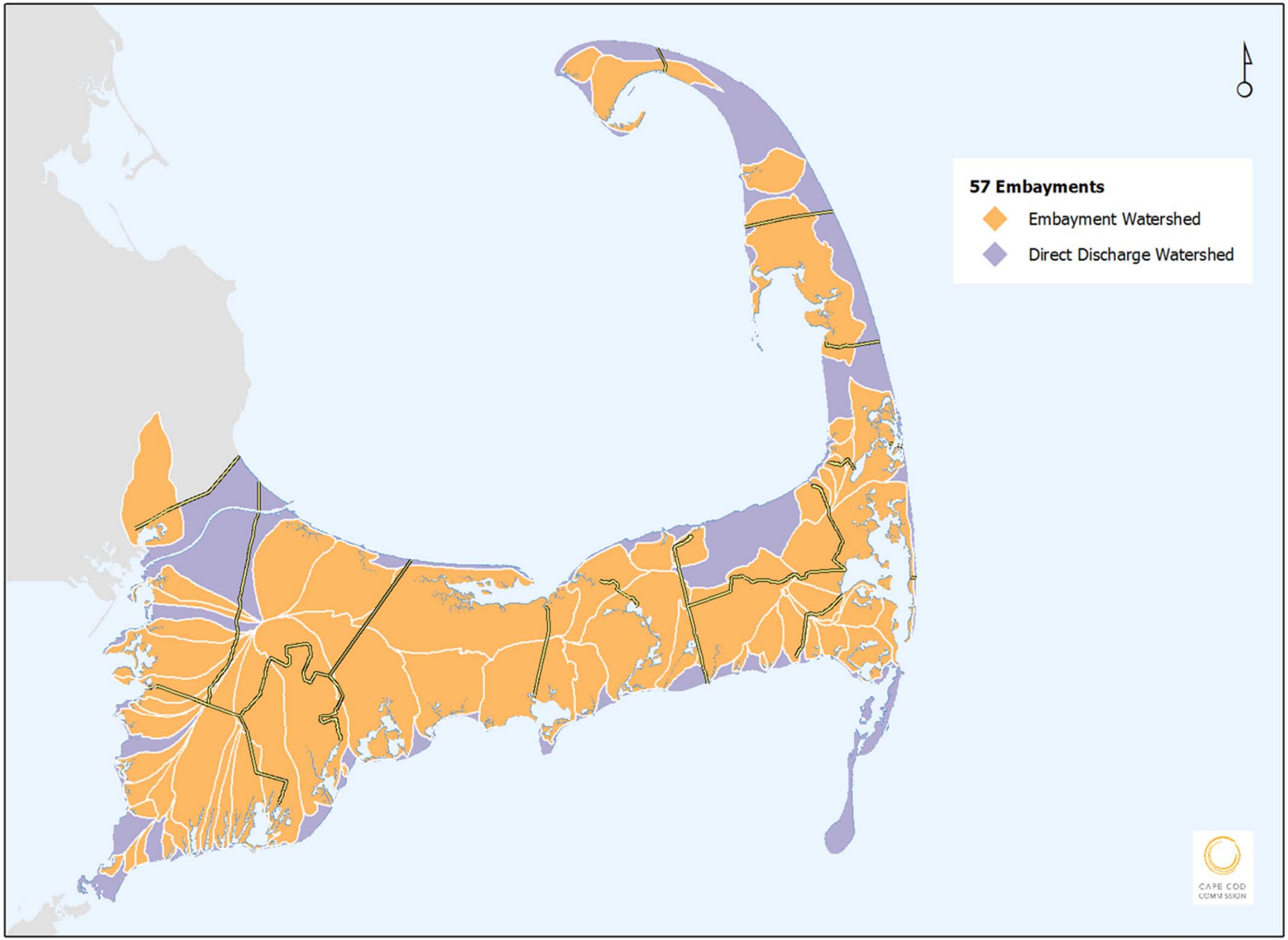
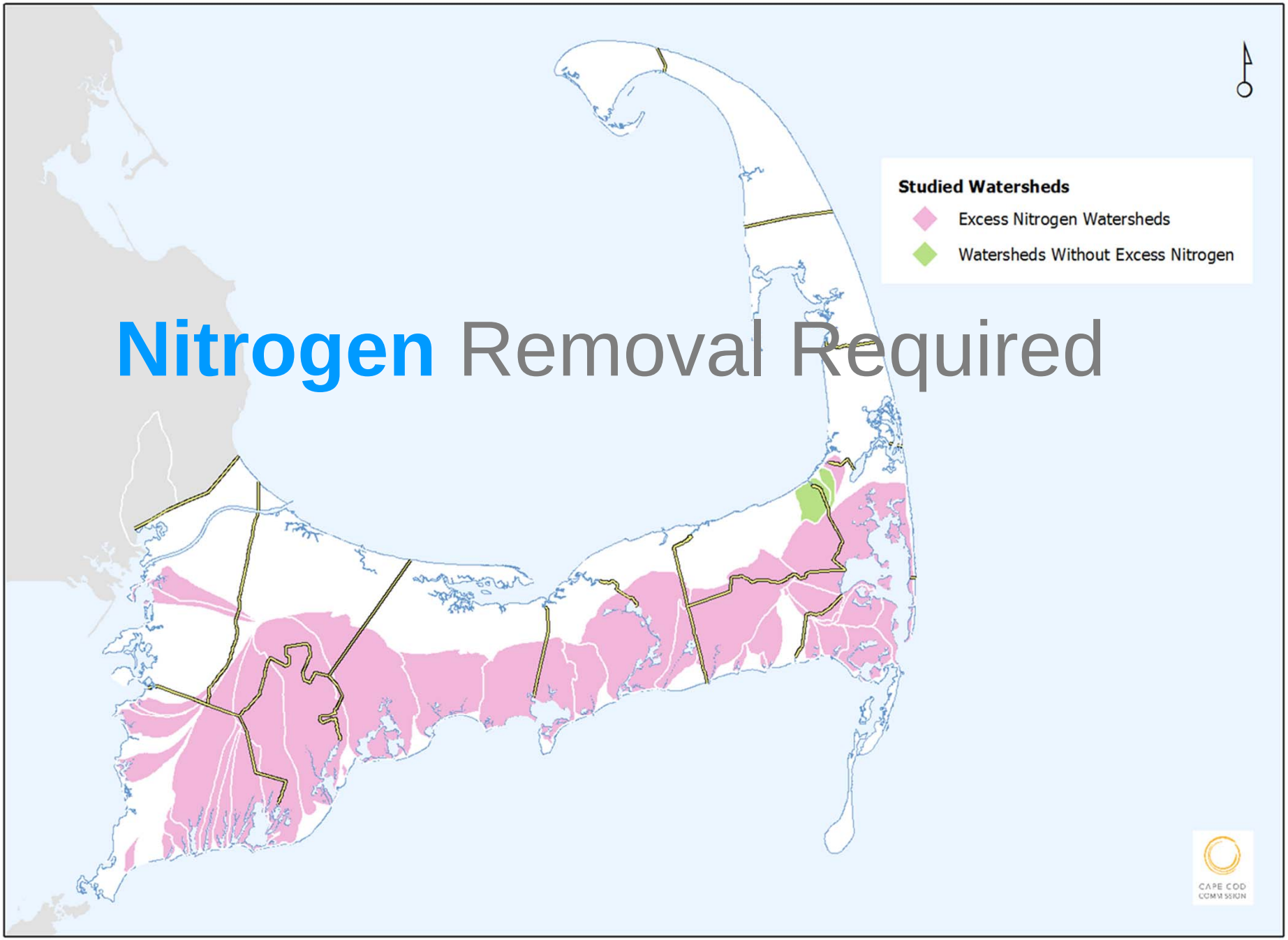
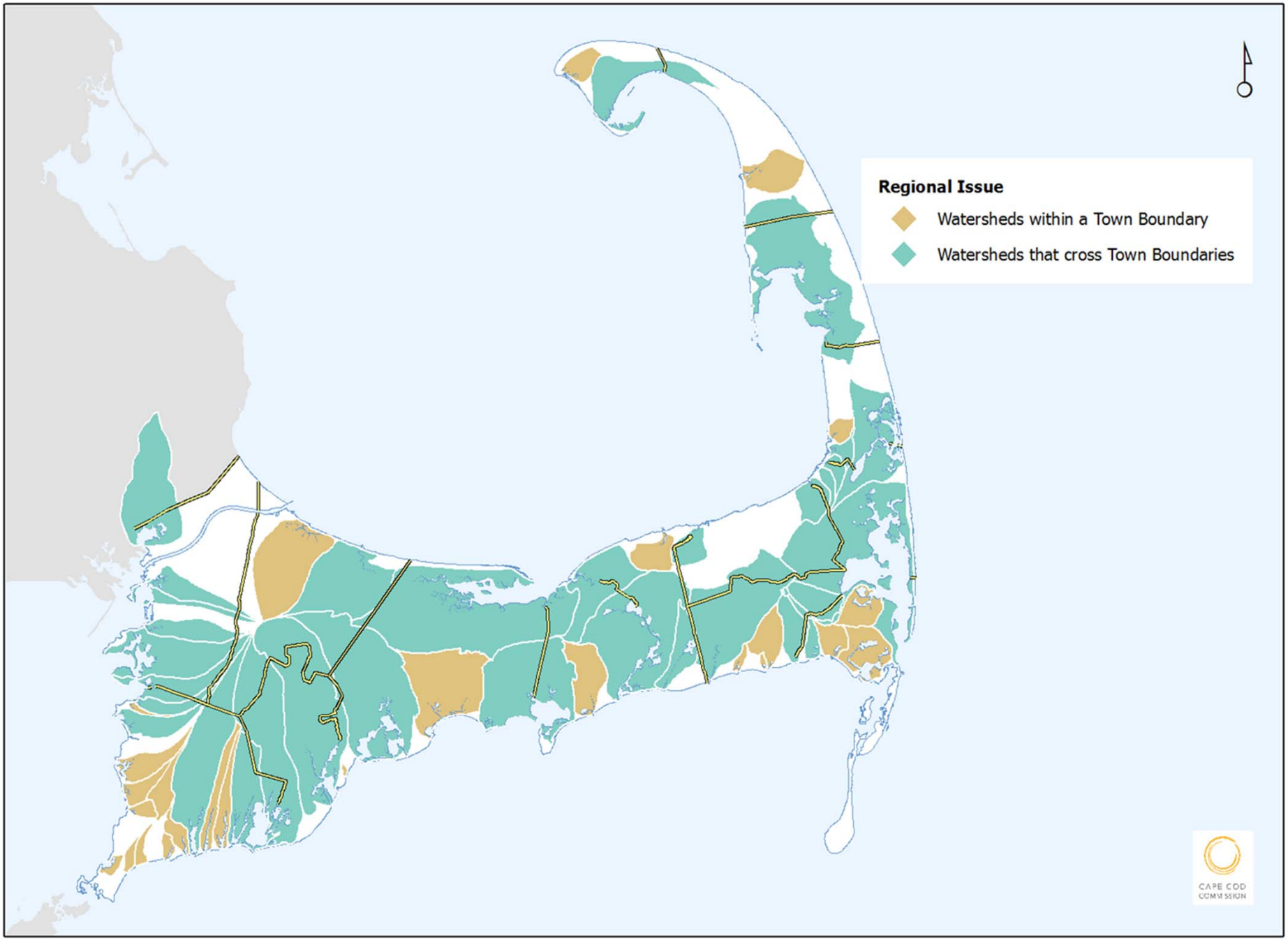



Studied Watersheds
Excess Nitrogen Watersheds
Watersheds Without Excess Nitrogen
Nitrogen Removal Required
CAPE COD COMMISSION

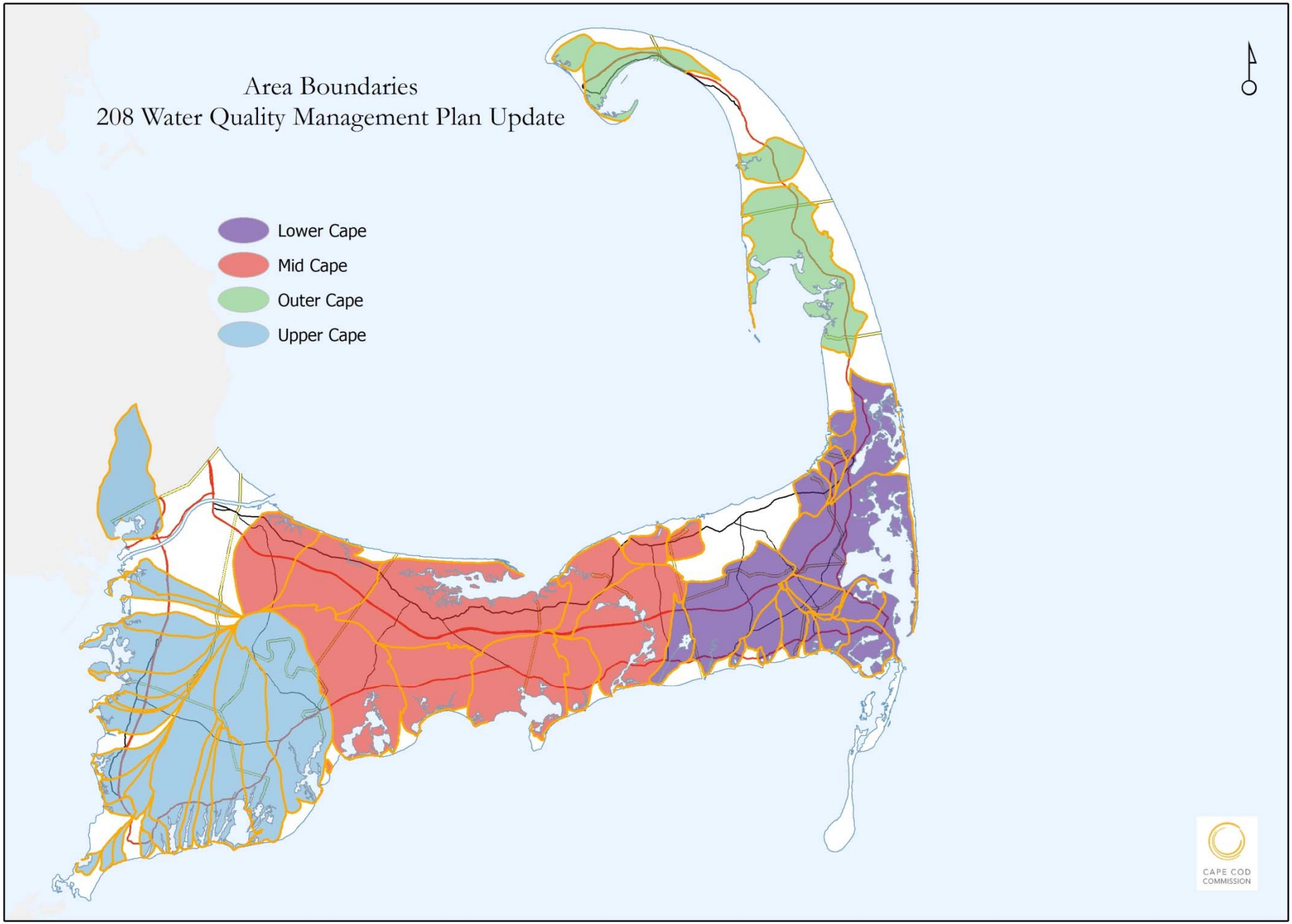
"Watershed Working Group - Waquoit/Popponesset - Workshop 1"

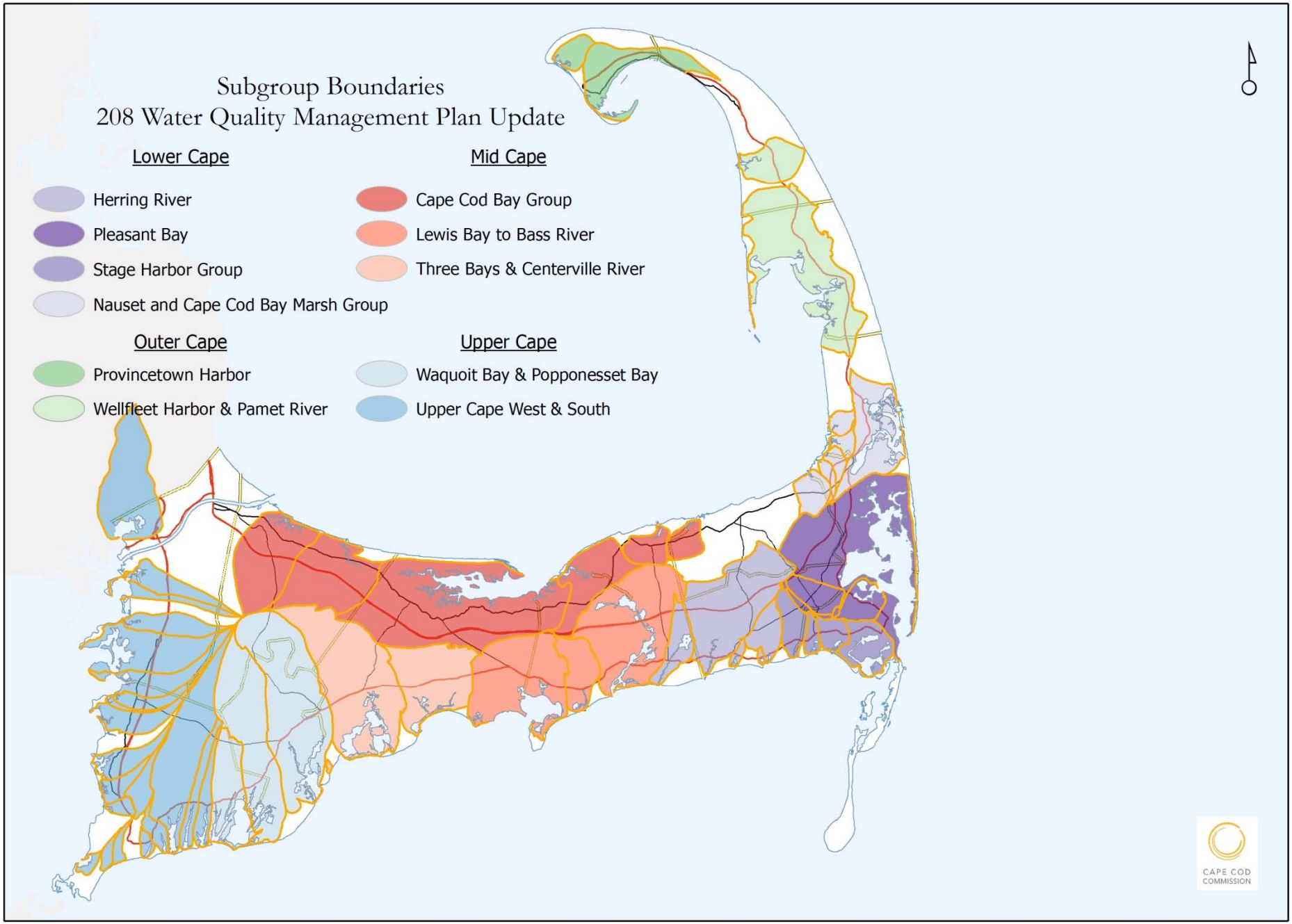


Approach to the 208 Plan Update

- Watershed Based
- Stakeholder Engagement
- Maximize Benefits of Local Planning
- No Optimal Solutions

Goal:
To generate a series of approaches in each watershed that will meet water quality standards


Area Boundaries
208 Water Quality Management Plan Update
Lower Cape
Mid Cape
Outer Cape
Upper Cape
CAPE COD COMMISSION


Subgroup Boundaries
208 Water Quality Management Plan Update
Lower Cape
Herring River
Pleasant Bay
Stage Harbor Group
Nauset and Cape Cod Bay Marsh Group
Mid Cape
Cape Cod Bay Group
Lewis Bay to Bass River
Three Bays & Centerville River
Outer Cape
Provincetown Harbor
Wellfleet Harbor & Pamet River
Upper Cape
Waquoit Bay & Popponesset Bay
Upper Cape West & South
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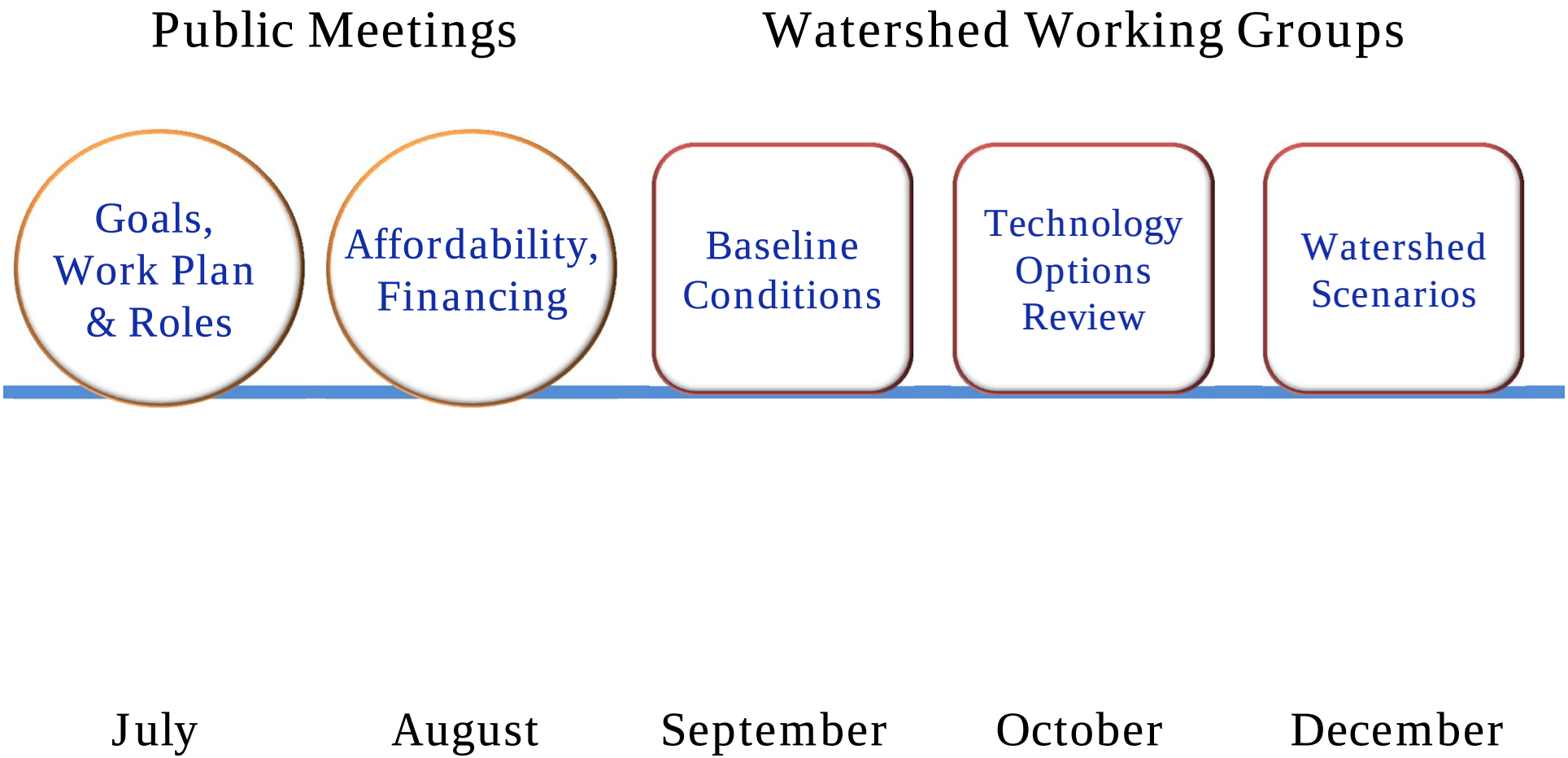
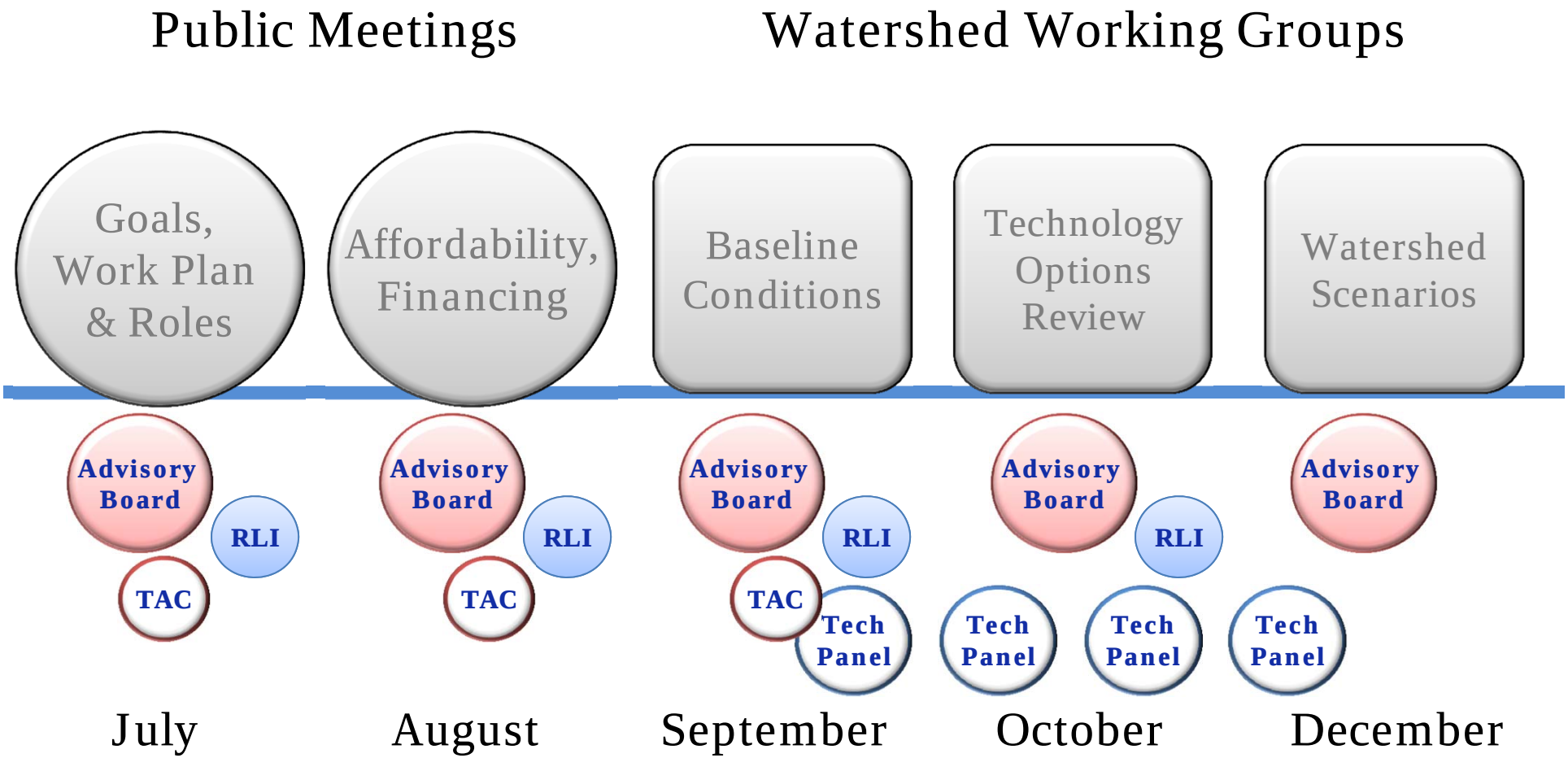
What is the stakeholder process?



208 Planning Process



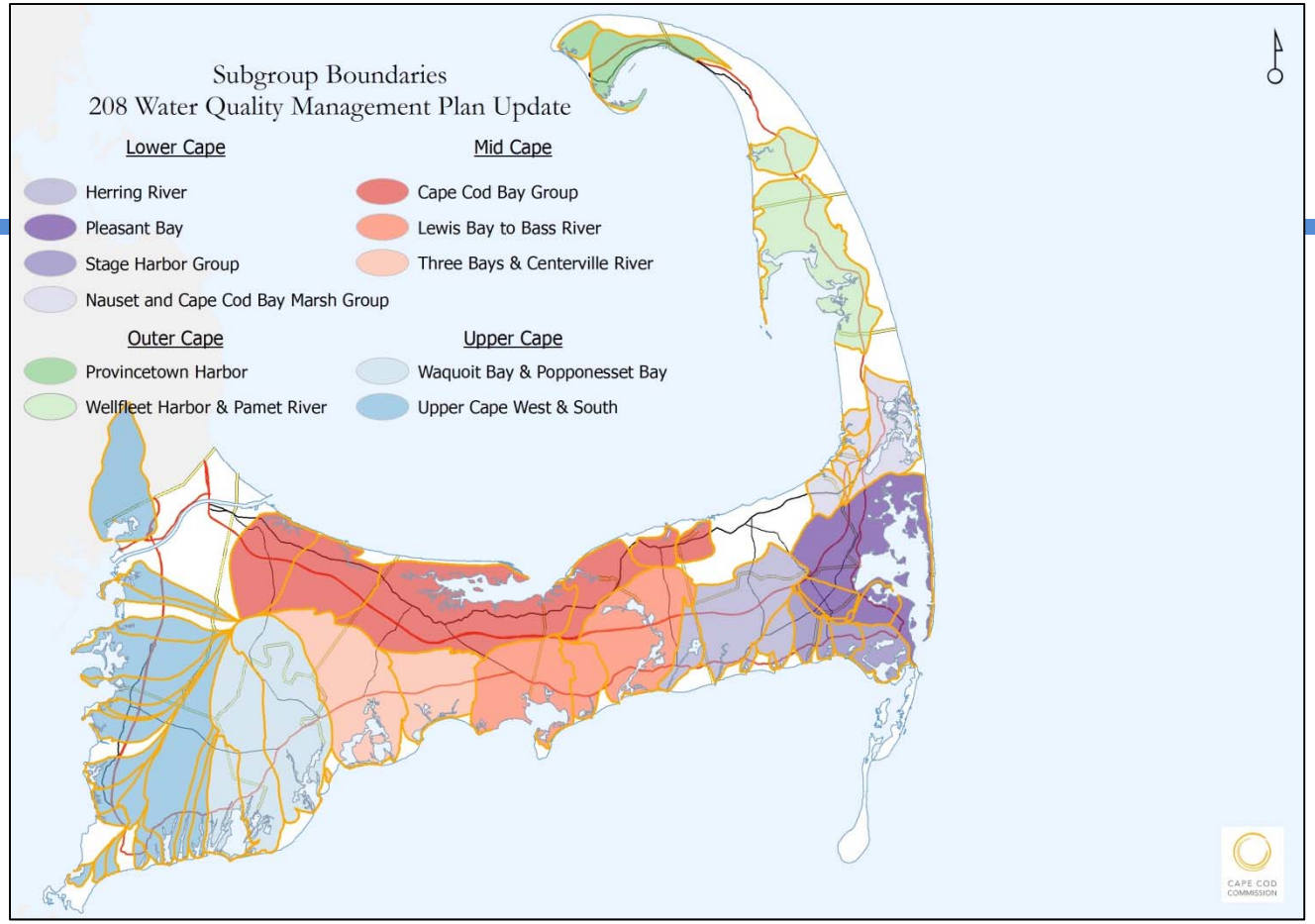
RLI — Regulatory, Legal & Institutional Work Group

TAC — Technical Advisory Committee of Cape Cod Water Protection Collaborative

208 Planning Process

Baseline Conditions

11 Working Group Meetings: Sept 18-27



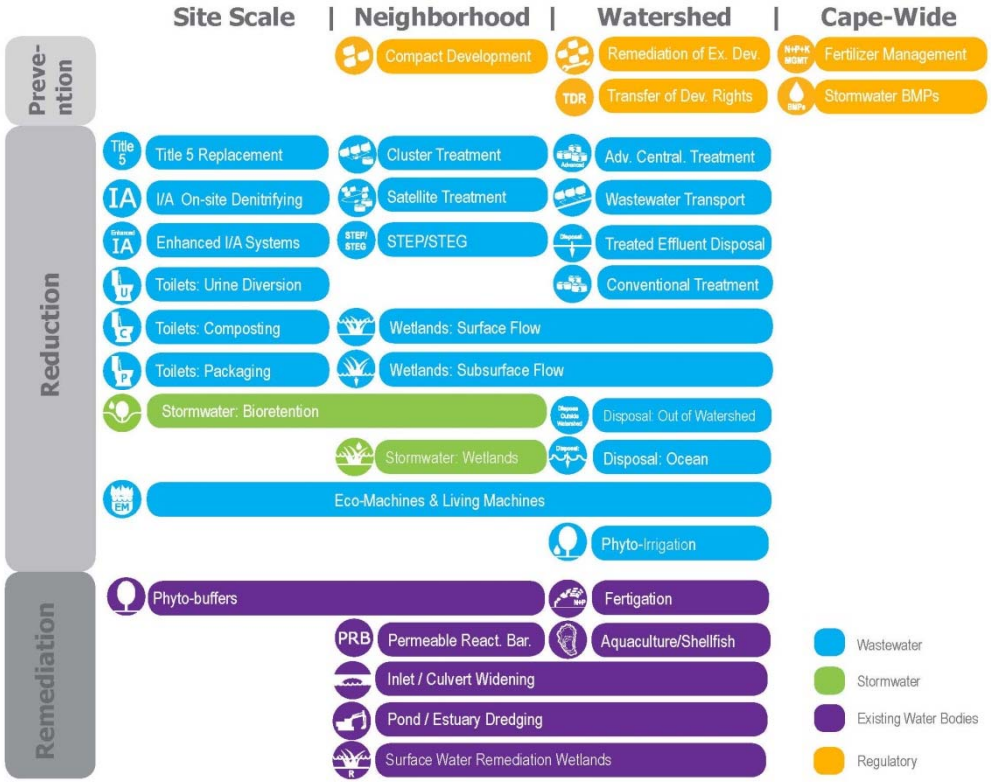
208 Planning Process

Baseline Conditions

11 Working Group Meetings: Sept 18-27

Technology Options Review

11 Working Group Meetings: Oct 21-Nov 5



208 Planning Process

Baseline Conditions

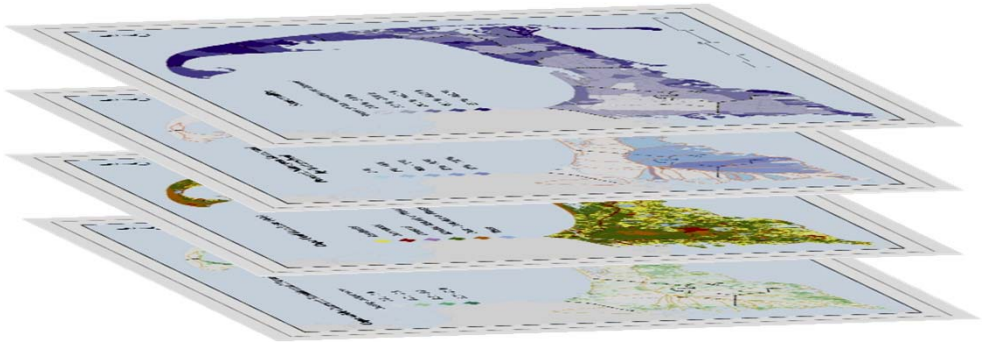
11 Working Group Meetings: Sept 18-27

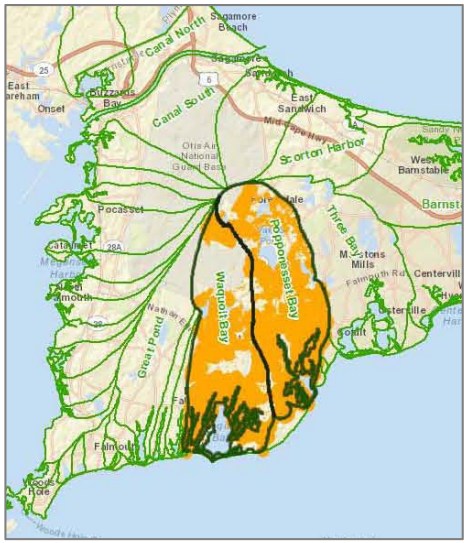
Technology Options Review

11 Working Group Meetings: Oct 21-Nov 5

Watershed Scenarios

11 Working Group Meetings: Dec 2-11





208 Planning Process

Baseline Conditions

11 Working Group Meetings: Sept 18-27

Goal of Today's Meeting:

To review and develop shared understanding of the characteristics of these watersheds, the work done to date, existing data and information available, and how to apply all of this to planning for water quality improvements for these watersheds moving forward.

208 Planning Process

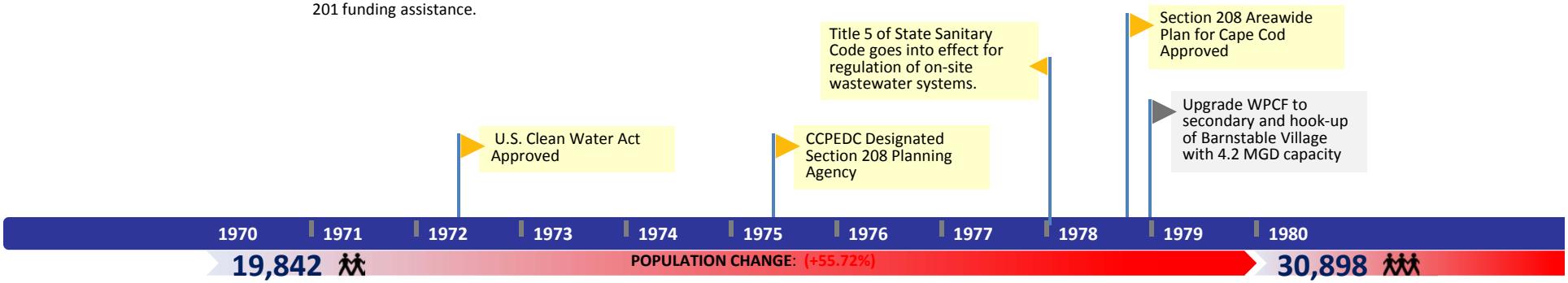
Local Progress to Date

Popponesset Bay
Waquoit Bay

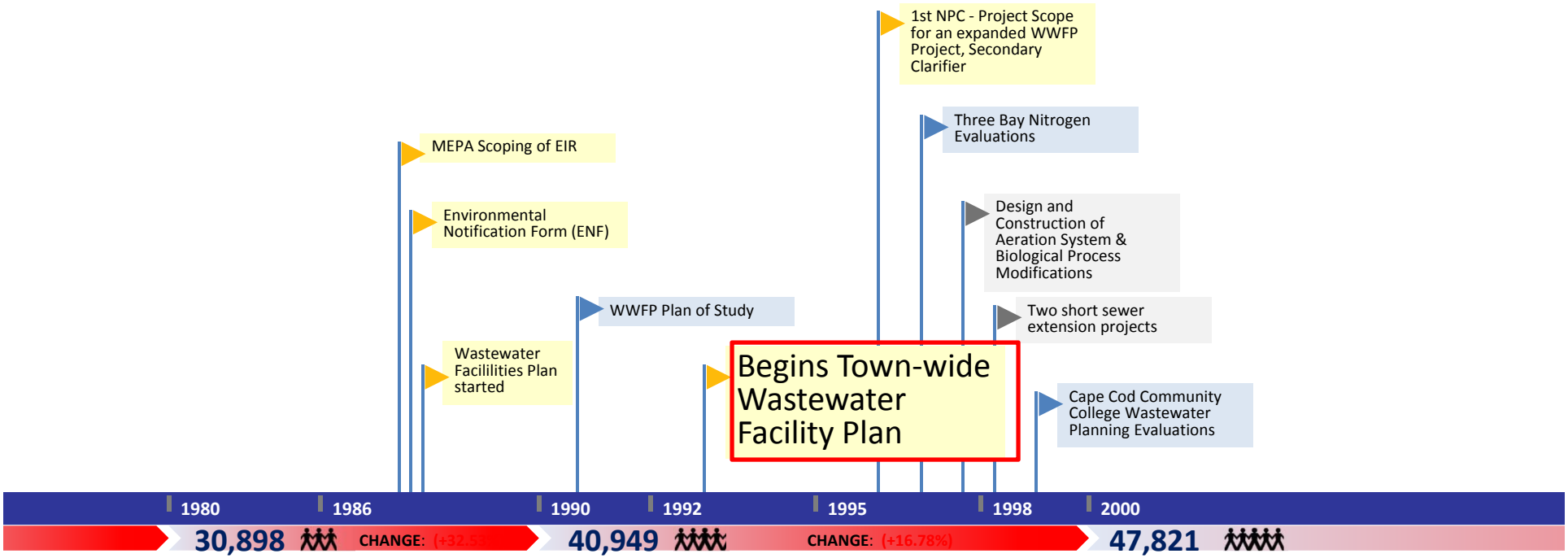
Barnstable: 1970-2013

From 1978 Section 208 Plan

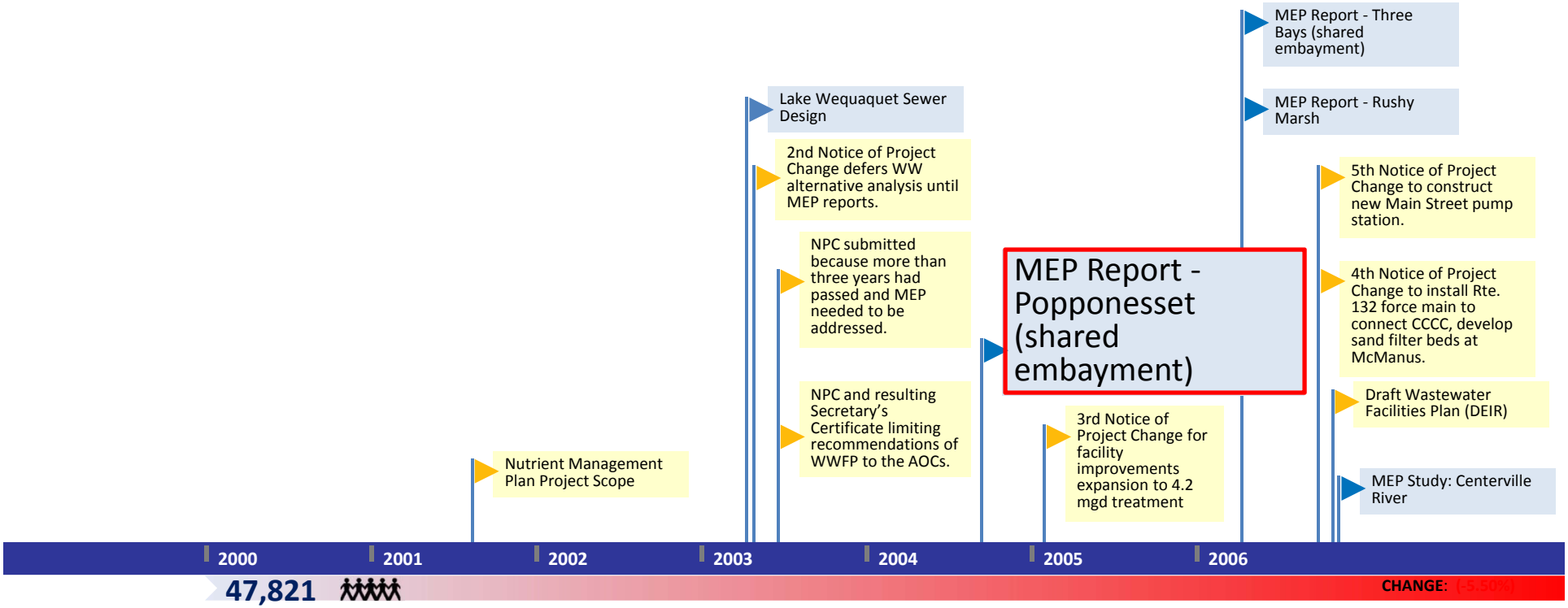
- The major 208 concern for Barnstable is the protection of its public water supply wells.
- The Planning Board appears to be interested in water supply protection as indicated by its recent zoning proposals. The coordination of town boards and the water utilities is essential to the success of this effort in Barnstable.
- Possible consolidation of the water utilities or some formal coordinative mechanism should be seriously considered to insure efficient and effective protection of the town's water resources.
- While the town is presently constructing an expansion of the sewage treatment plant and collection system with EPA 201 funds, it has not addressed all of the wastewater management problem areas in the town. Additional 201 facilities planning must be carried out to demonstrate a sewer need exists under present EPA criteria.
- Certain problem areas are included as future phases of the sewer collection system expansion in the "Sewer Service Areas" delineated in the 208 plan and would be eligible for 201 funding assistance.
- The present Hyannis treatment plant has the necessary capacity to handle all sewer service area needs in Hyannis. Should the town want to expand the collection system beyond these sewer service areas, 201 funds will not be available for these expansions or for an additional treatment plant.
- The need for collection system expansion in the Hyannis area should be carefully considered in assessing the plant's ability to accept wastewater from Yarmouth since the Hyannis treatment plant cannot be expanded beyond its present capacity.
- The town should consider, in the near future, entering into a 201 facilities plan to resolve the present Category 2 problem areas possibly through decentralized solutions.
- The 201 study and efforts of town board should address the coastal water quality problems of the town, particularly Lewis Bay.



Barnstable: 1970-2013



Barnstable: 1970-2013



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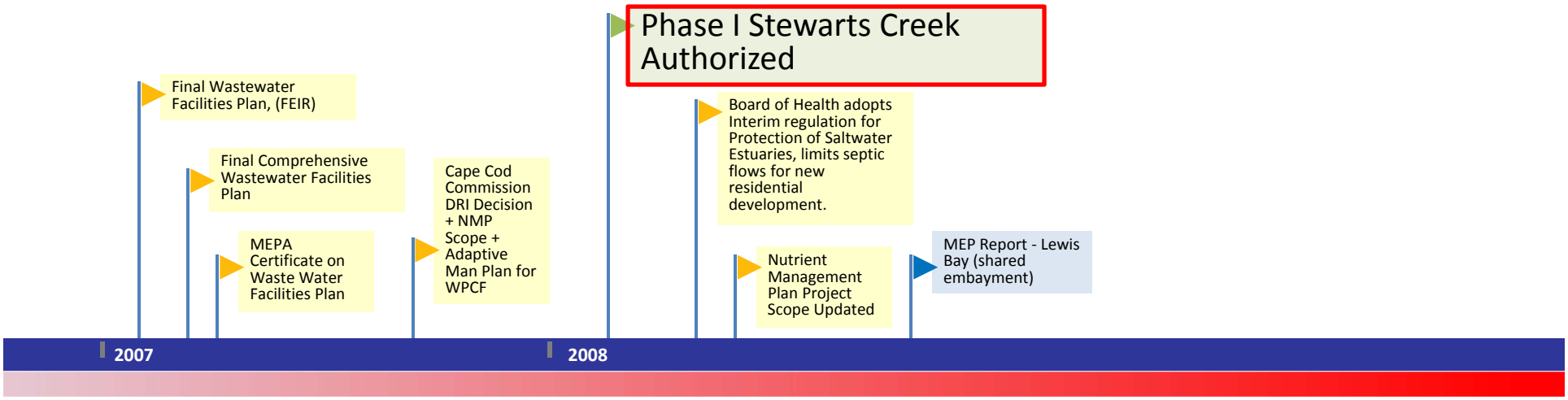

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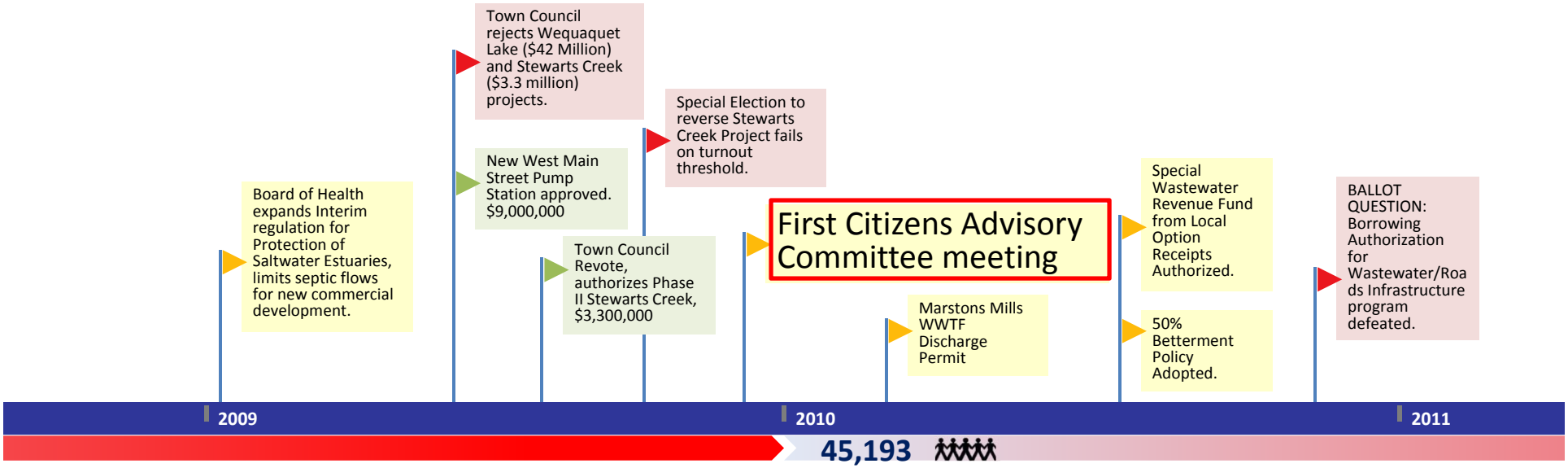
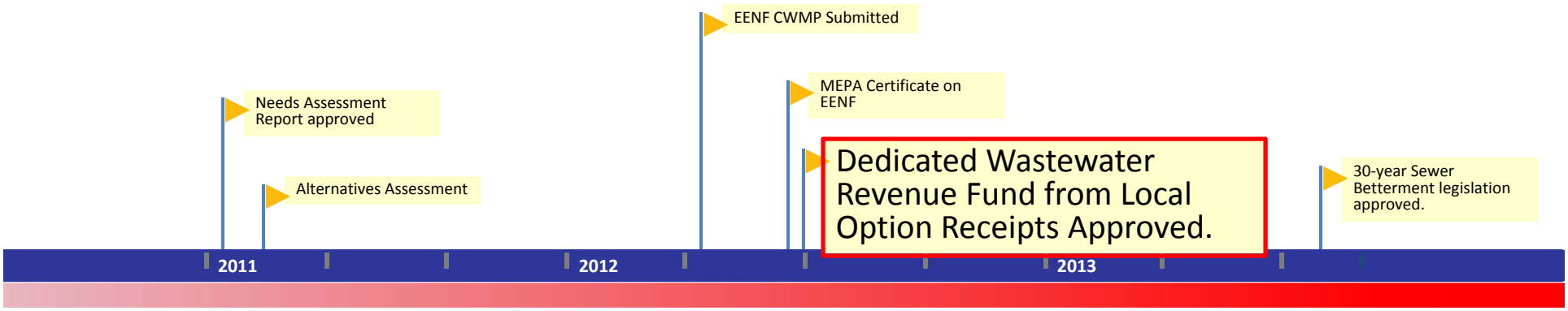


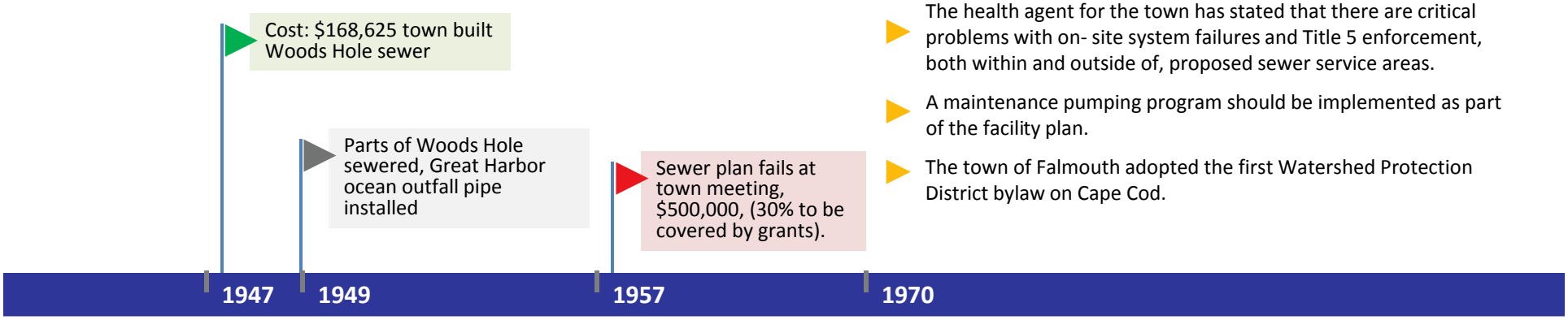
Barnstable: 1970-2013



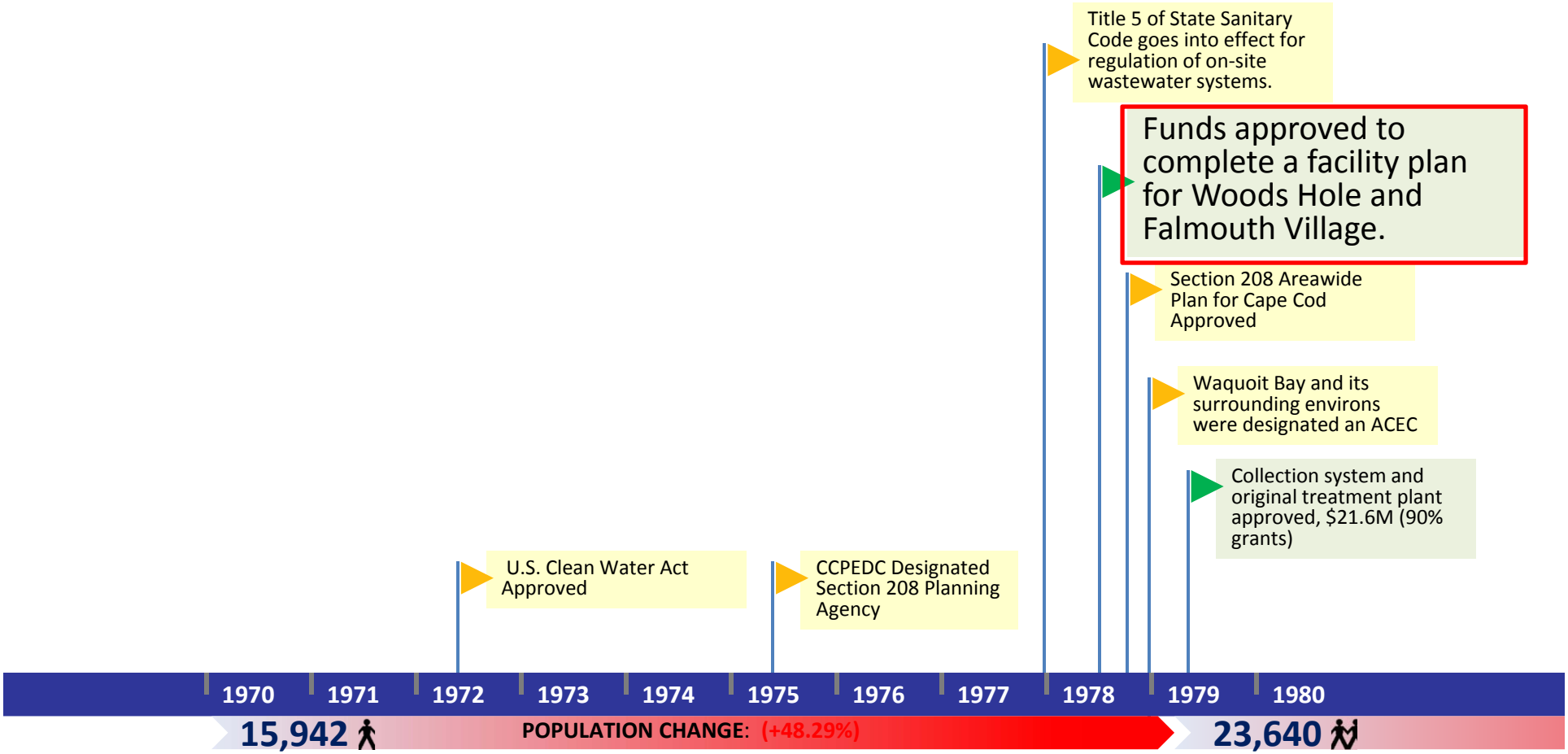
Falmouth

From 1978 Section 208 Plan

- Falmouth's difficulties with sewer system planning and construction have a 30 year history. It is strongly recommended that the town appoint a water quality advisory committee.
- A survey of residents and potential sewer users was conducted in the summer of 1978 to determine whether they would be willing to pay for sewers.
- The DWPC ordered the town to take immediate action to complete a facility plan for Woods Hole or to begin construction of sewers in downtown
- Falmouth. Town meeting voted on September 27, 1978 to appropriate additional funds to complete a facility plan for both Woods Hole and Falmouth Village. The plan recommended that DWPC not prosecute the town as long as it is moving in a positive direction towards completion of a comprehensive plan.
- The plan also recommended that if town meeting action is not taken expeditiously on the final plan recommendations, the DWPC and DEQE should pursue regulatory actions.
- The health agent for the town has stated that there are critical problems with on- site system failures and Title 5 enforcement, both within and outside of, proposed sewer service areas.
- A maintenance pumping program should be implemented as part of the facility plan.
- The town of Falmouth adopted the first Watershed Protection District bylaw on Cape Cod.



Falmouth: 1947-2013



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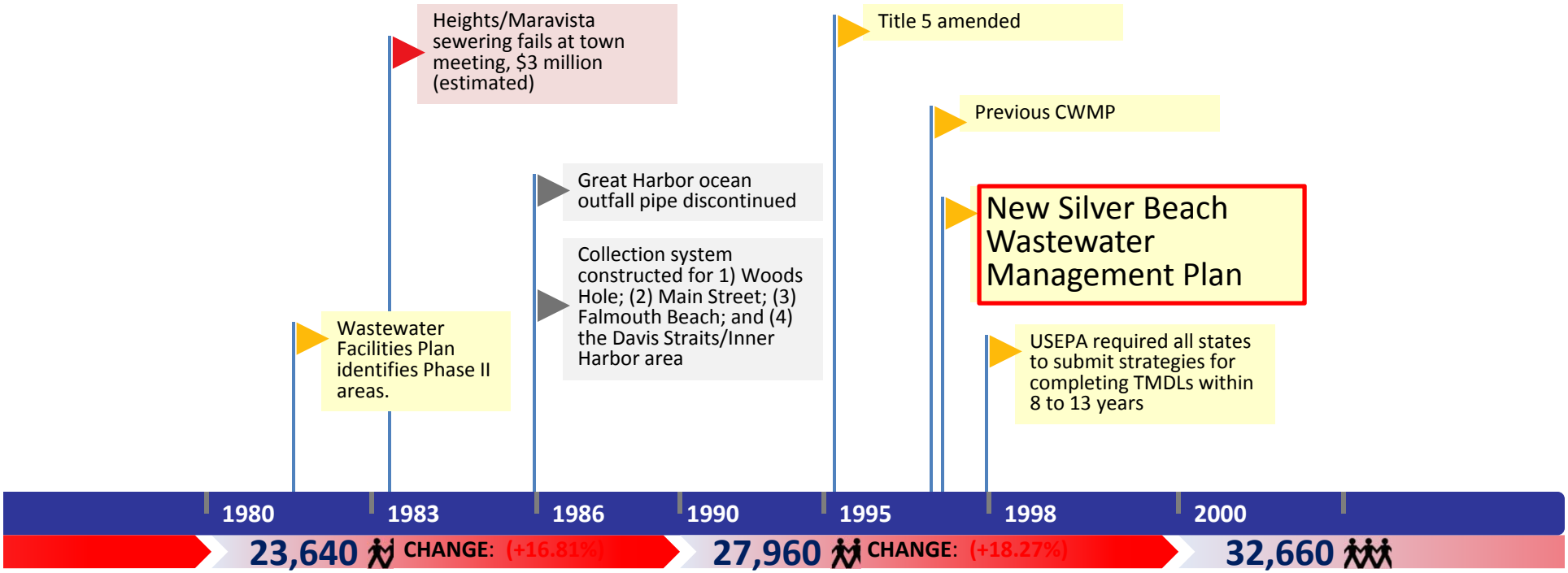

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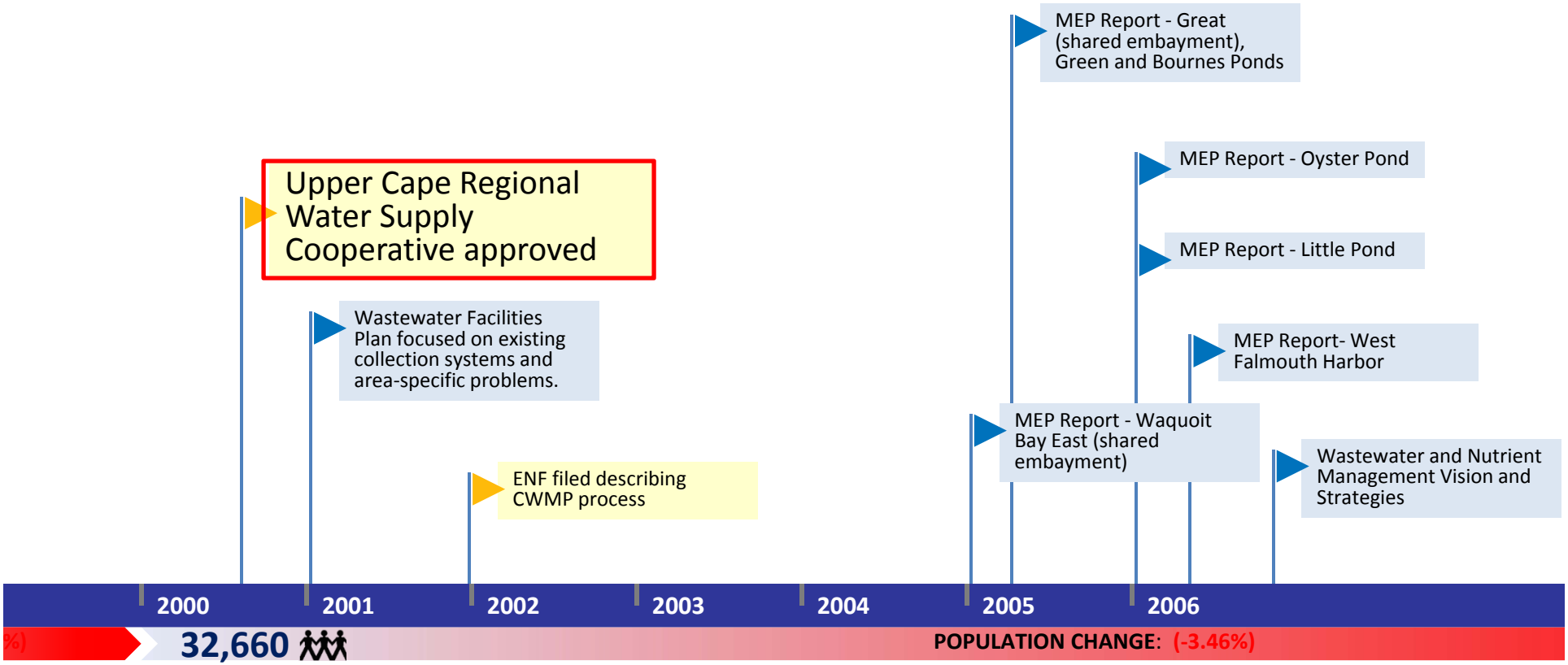
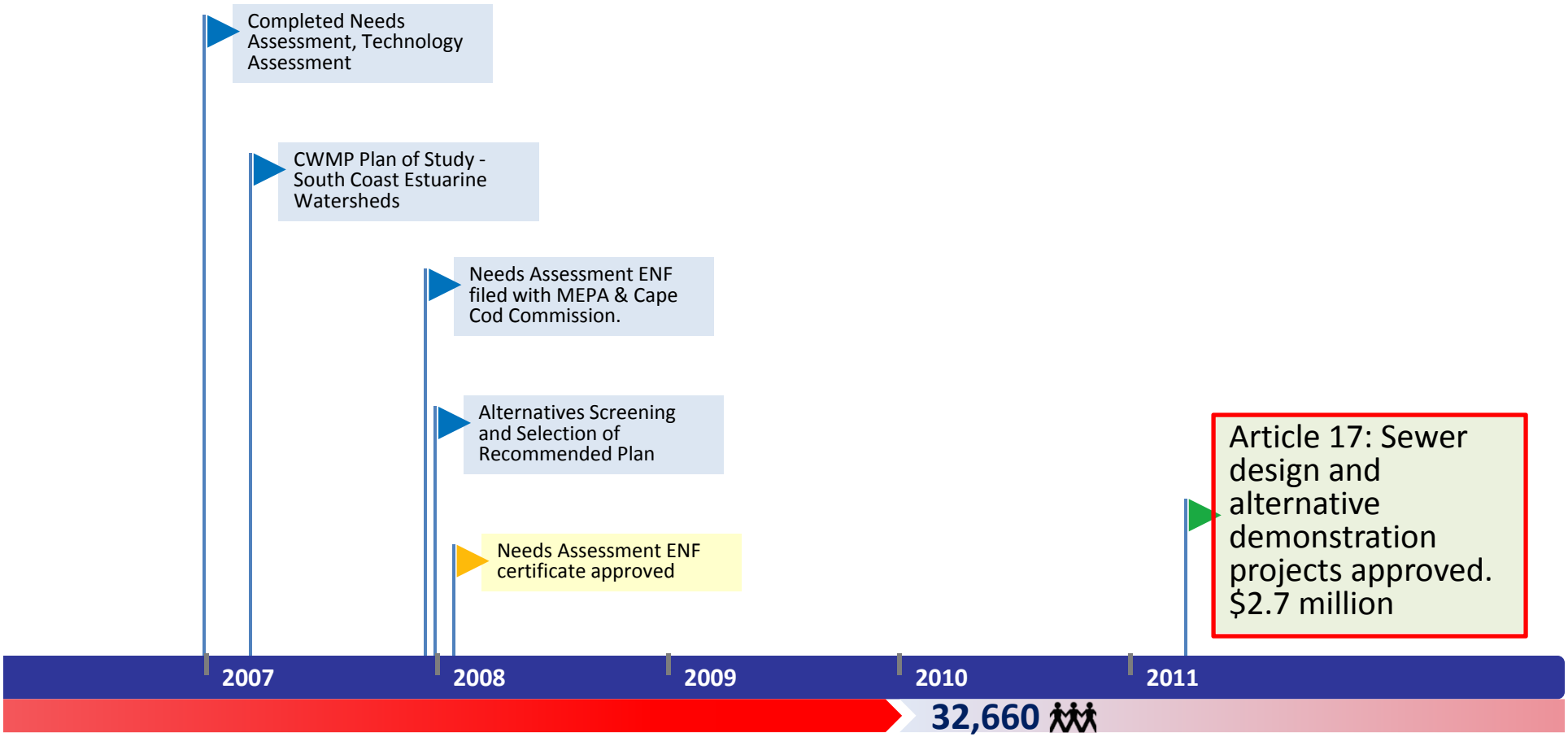
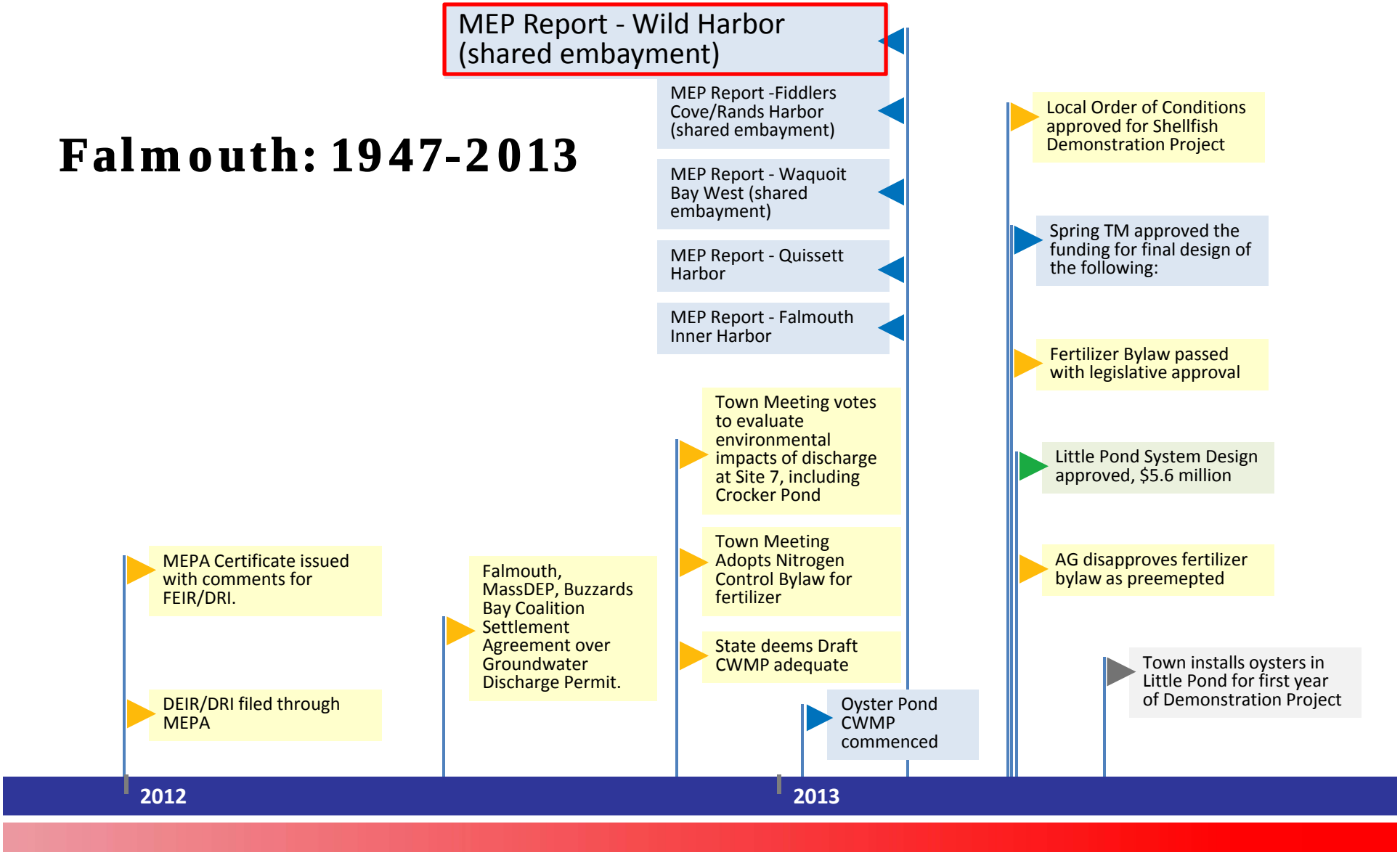


Falmouth: 1947-2013



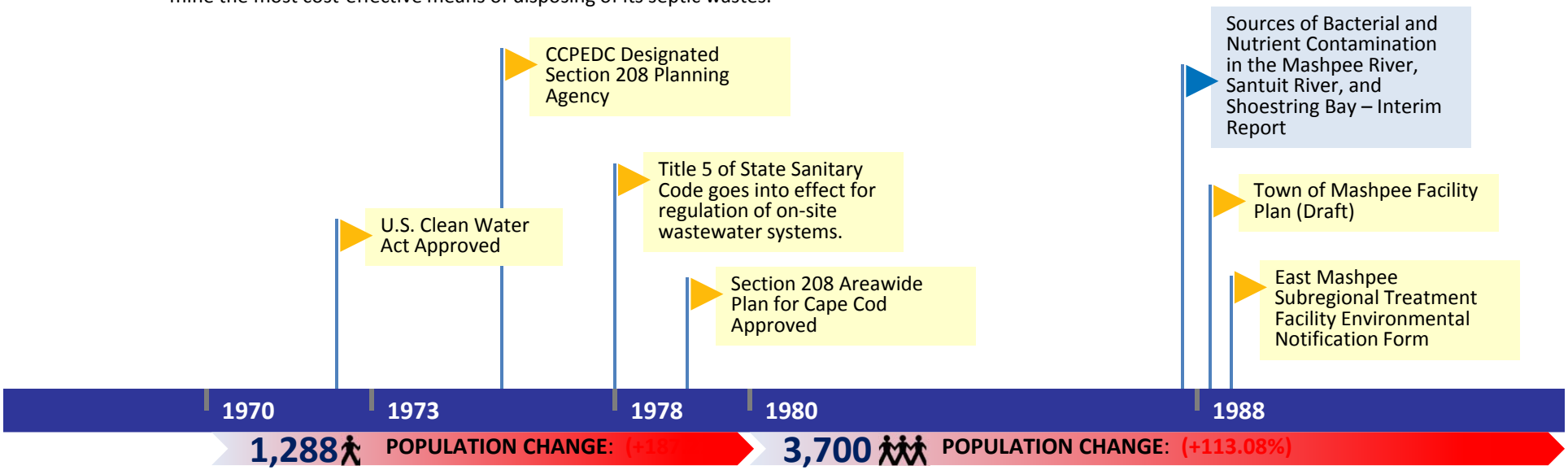
Falmouth: 1947-2013



Mashpee

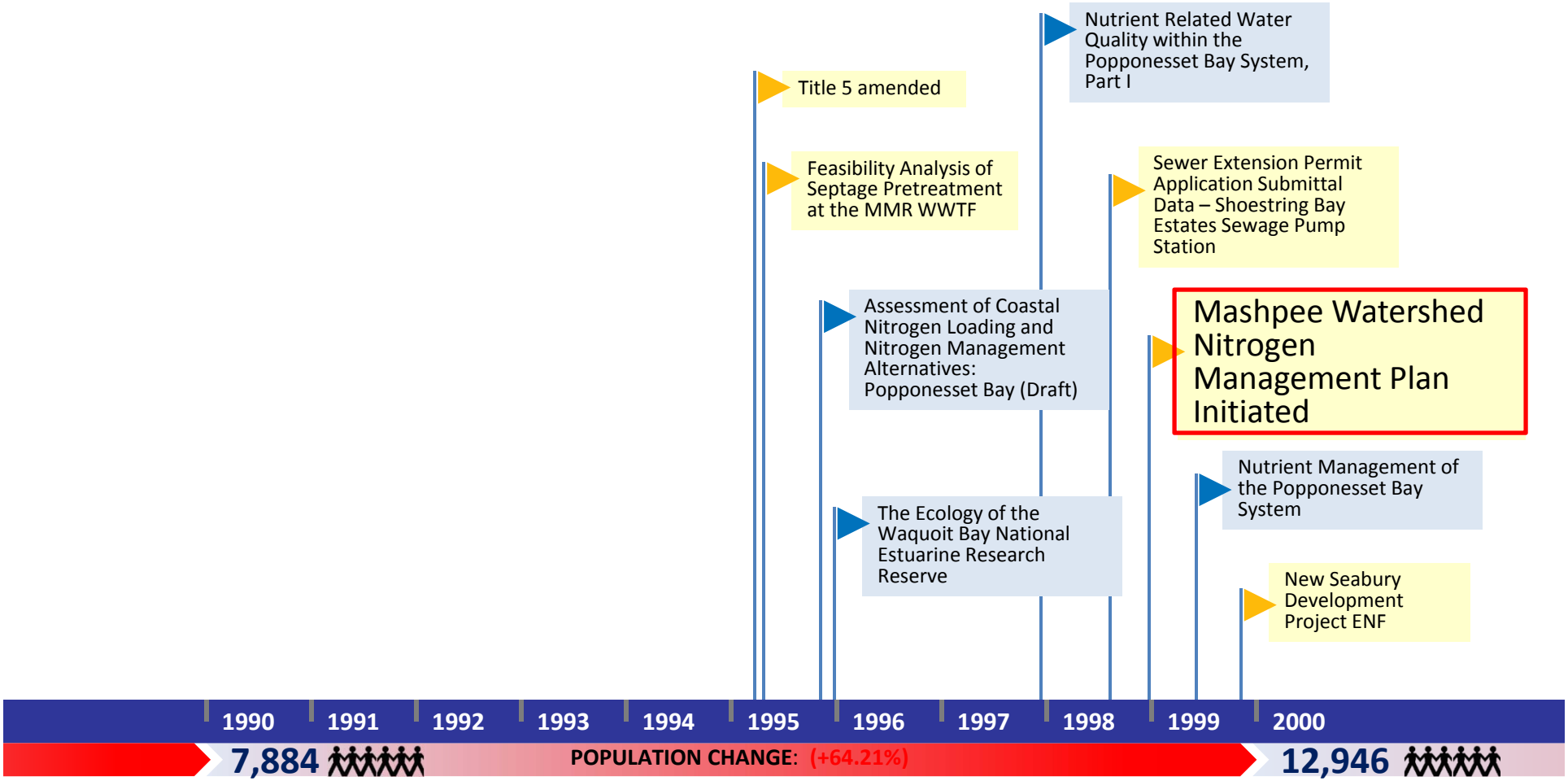
From 1978 Section 208 Plan

- While there does not appear to be any major wastewater management problem areas, pond water quality has been a problem of concern to the town for a number of years.
- The town should protect the future water supply development area, once defined, with a Watershed Protection District.
- Non-structural solutions, including careful management of on - site systems, water conservation and innovative options should be adequate to avoid creation of future sewer needs.
- Mashpee is not highly developed and is in an excellent position to plan development and manage subsurface disposal to avoid future problems.
- Mashpee should participate in regional septage planning with neighboring towns (Sandwich, Falmouth and Barnstable) to determine the most cost-effective means of disposing of its septic wastes.
- The town has been concerned about the condition of recreational ponds that have significant development around them, particularly Johns and Ashumet Ponds.
- Extensive water quality testing has been conducted on Johns Pond, and the town is interested in implementing a Pond Management program.
- It is further suggested that the town adopt a "Great Pond Protection District" as part of its zoning by-laws to begin such a management program.
- The landfill plume may be flowing towards the Mashpee River. If private wells are found to be down gradient there may be a need for town water service to the area.

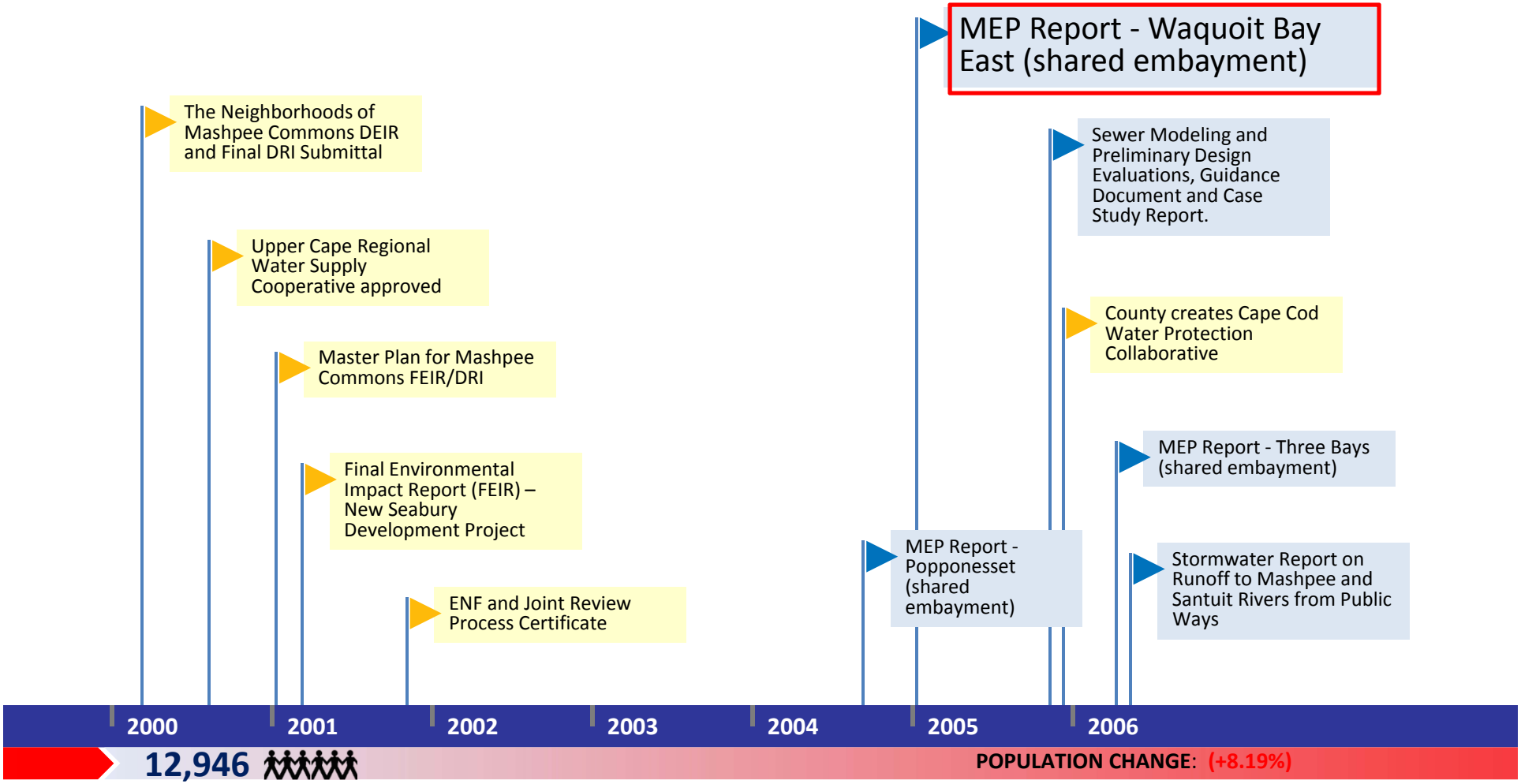


POPULATION: 7,884
(+113.08%)

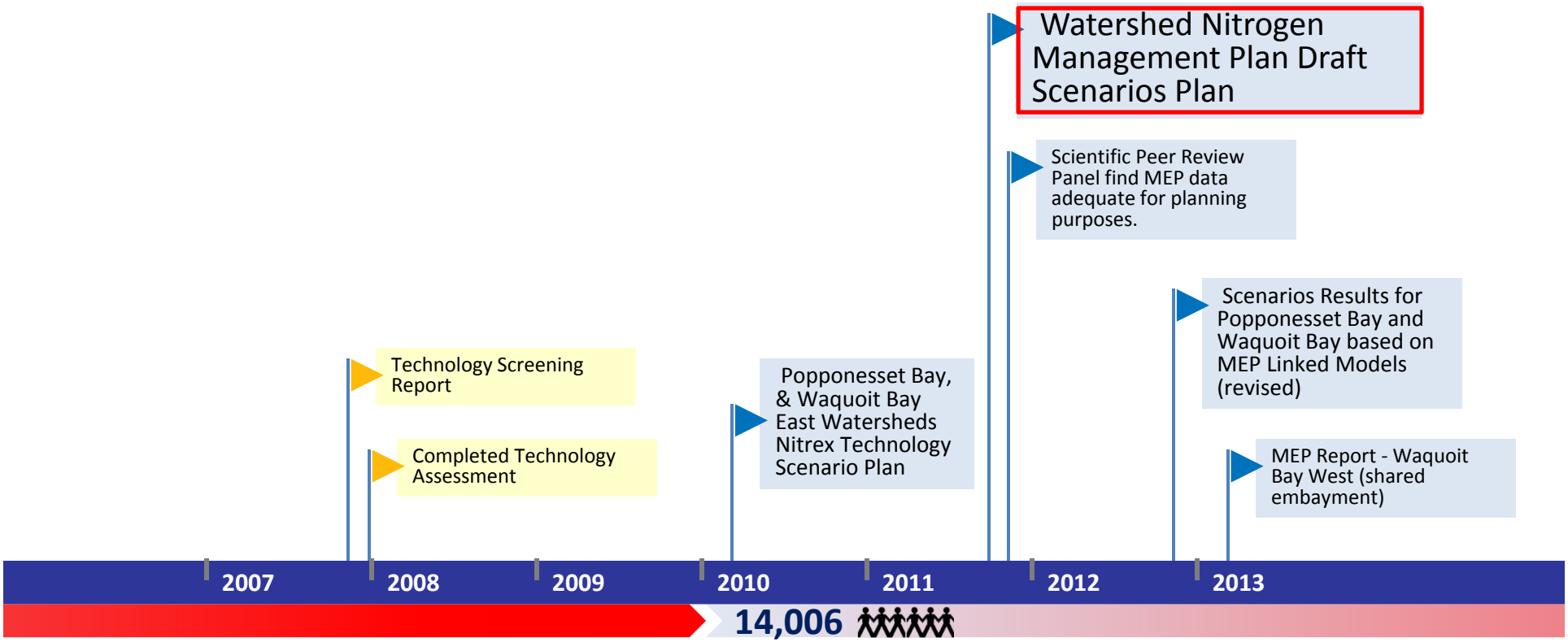
Mashpee: 1970-2013



Mashpee: 1970-2013



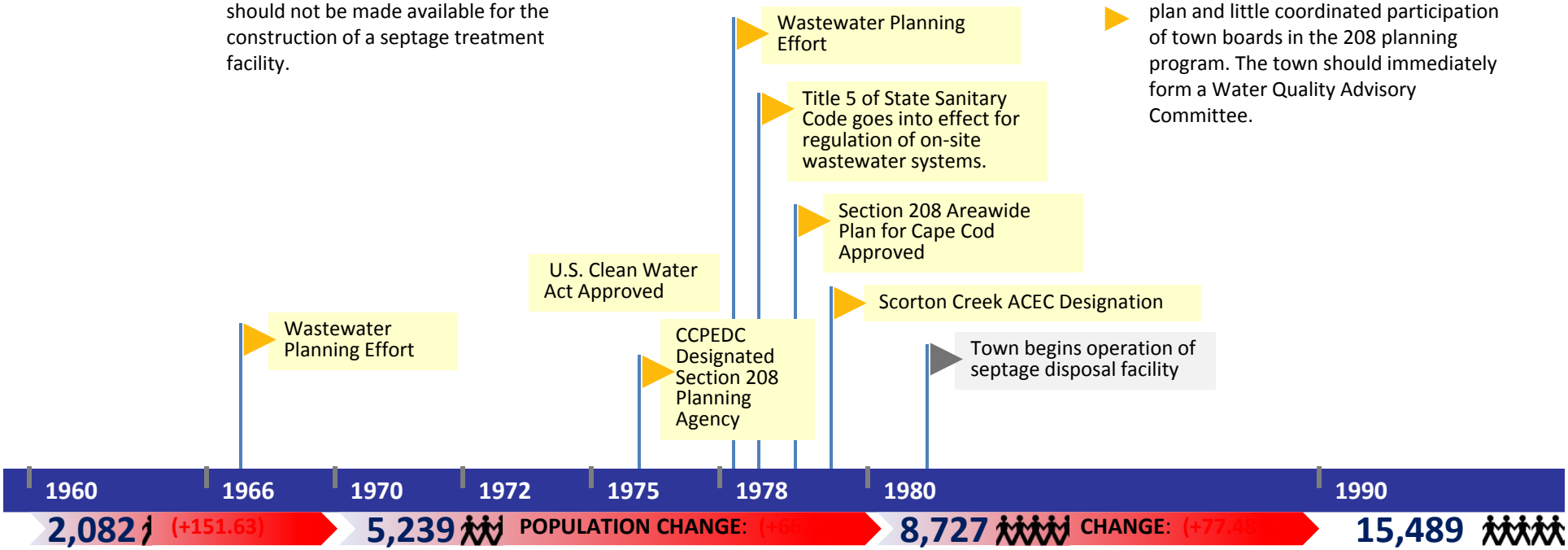
Mashpee: 1970-2013



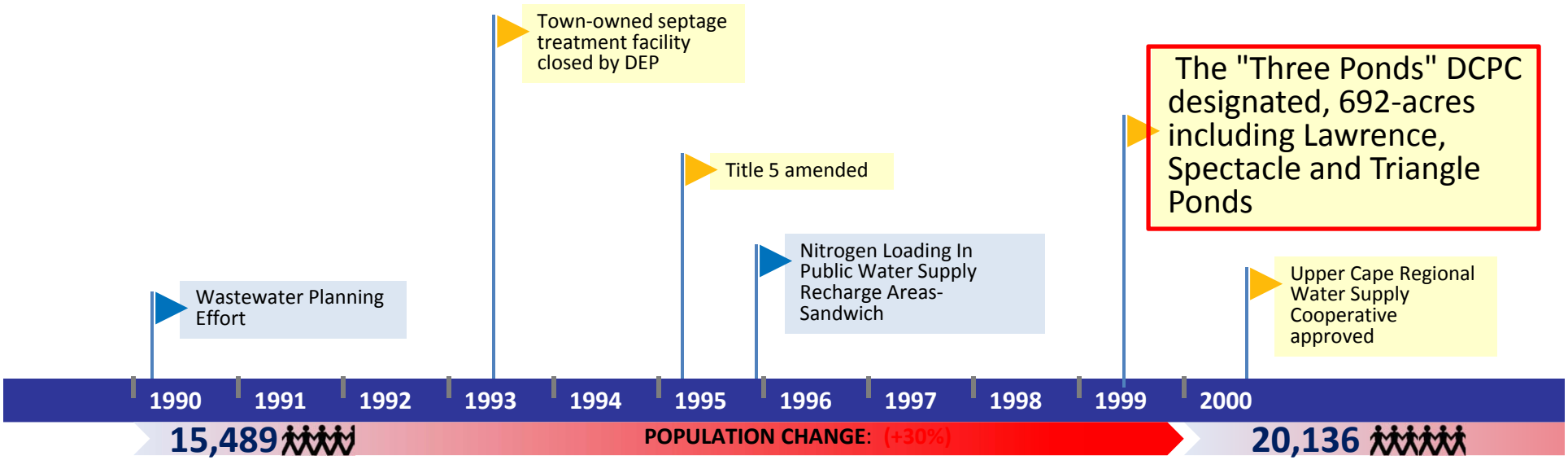
Sandwich

From 1978 Section 208 Plan

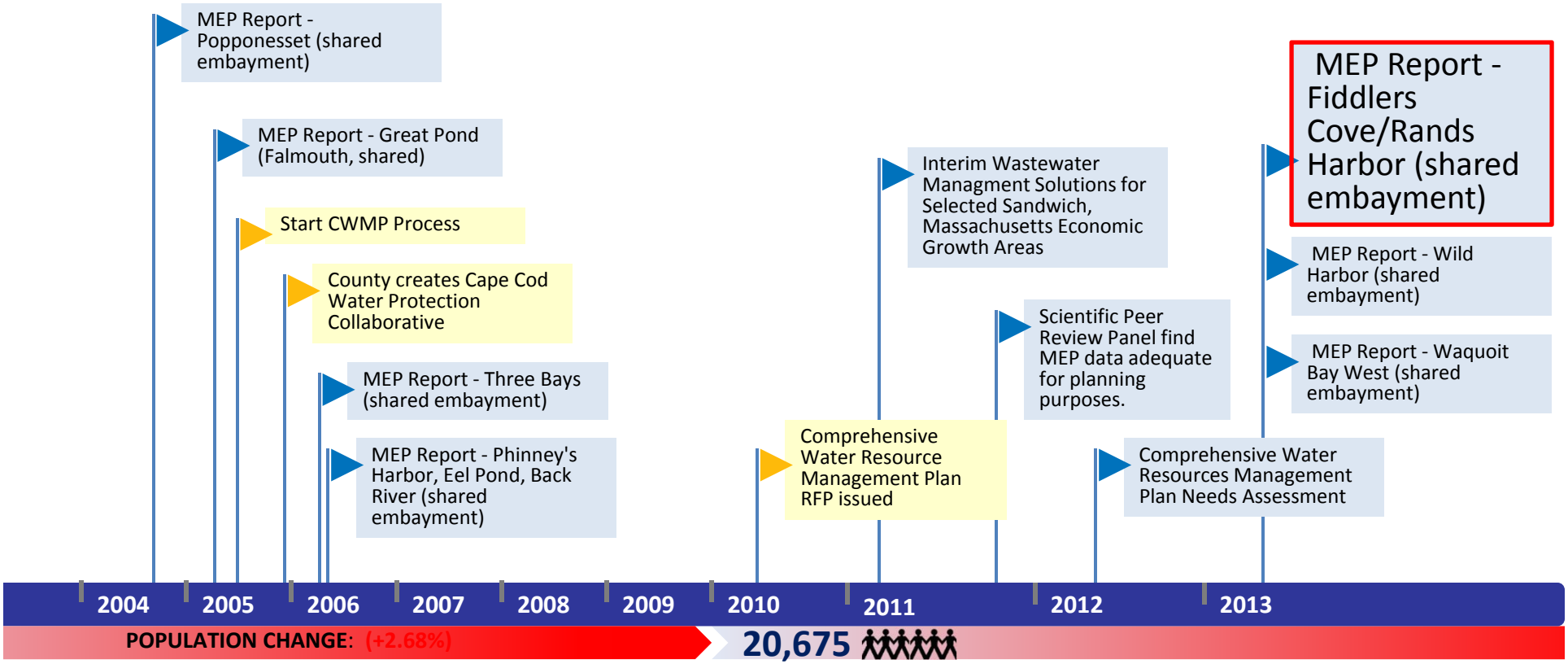
- A sewer facilities plan was completed for Sandwich in 1978. The plan calls for a small outfall into the Cape Cod Canal, which now could only be allowed through a special act of the legislature.
- Should the town fail to act by 1980, a DEQE investigation of Title 5 violations should be initiated.
- A septage treatment facility would not provide a comprehensive solution and could not be considered to be consistent with the 208 plan. Funds should not be made available for the construction of a septage treatment facility.
- The town health agent should strictly enforce Title 5 and should seek additional qualified personnel to implement the 208 recommended on-site systems management program.
- The town has taken progressive steps to increase lot sizes to at least one acre in most areas of town. The town has indicated willingness to cooperate with the 208 staff in delineating watershed areas and in adopting Watershed Protection Districts.
- The problem of the State Fish Hatchery discharging over half a million gallons of fresh water must be addressed by the Department of Fisheries and Wildlife as recommended in the "Water Conservation" section of the final plan.
- The town should actively participate in regional solid waste planning to develop a long-range solution to its solid waste management problems.
- There has been a serious delay in action on the town's proposed sewer facility plan and little coordinated participation of town boards in the 208 planning program. The town should immediately form a Water Quality Advisory Committee.



Sandwich: 1960-2013



Sandwich: 1960-2013

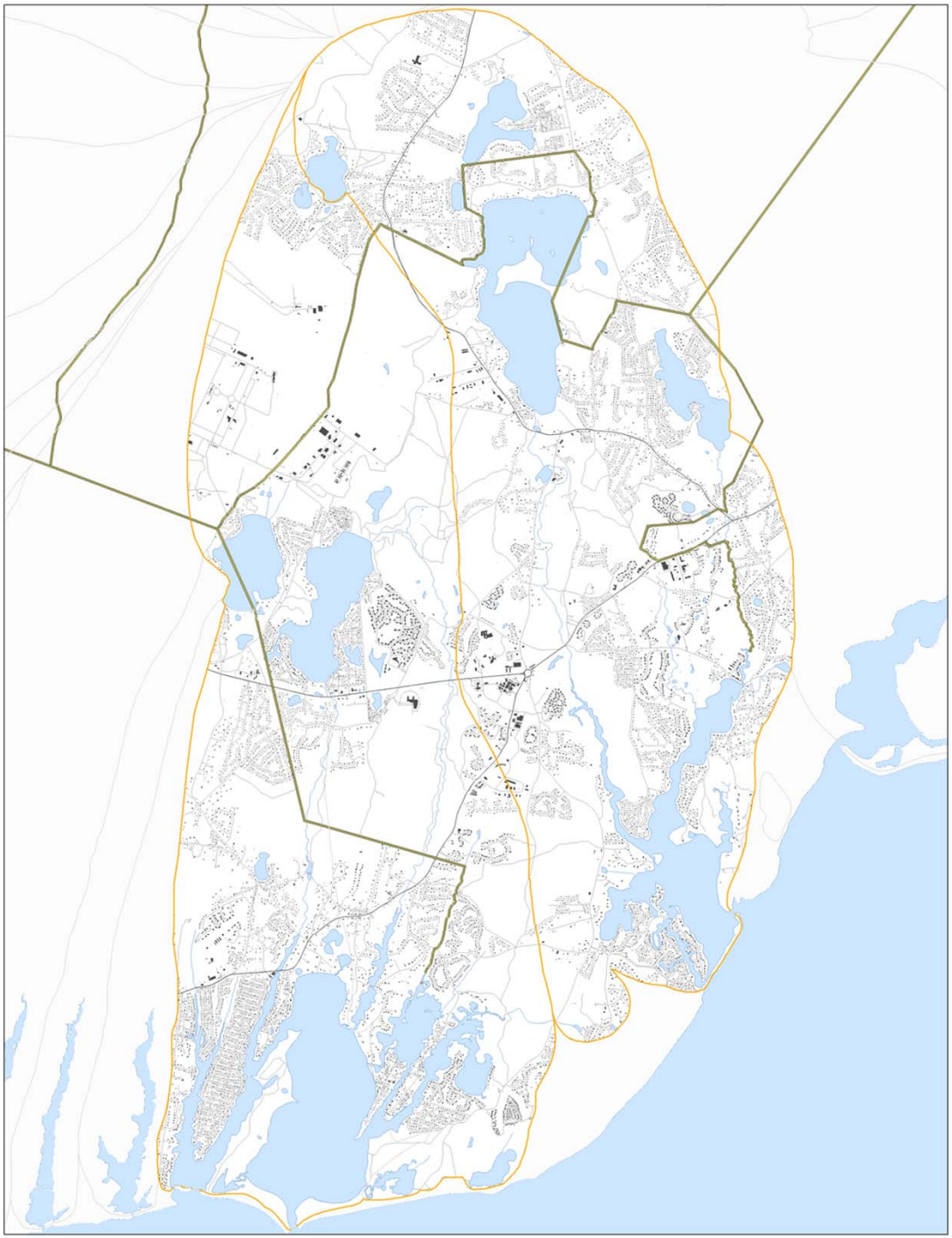


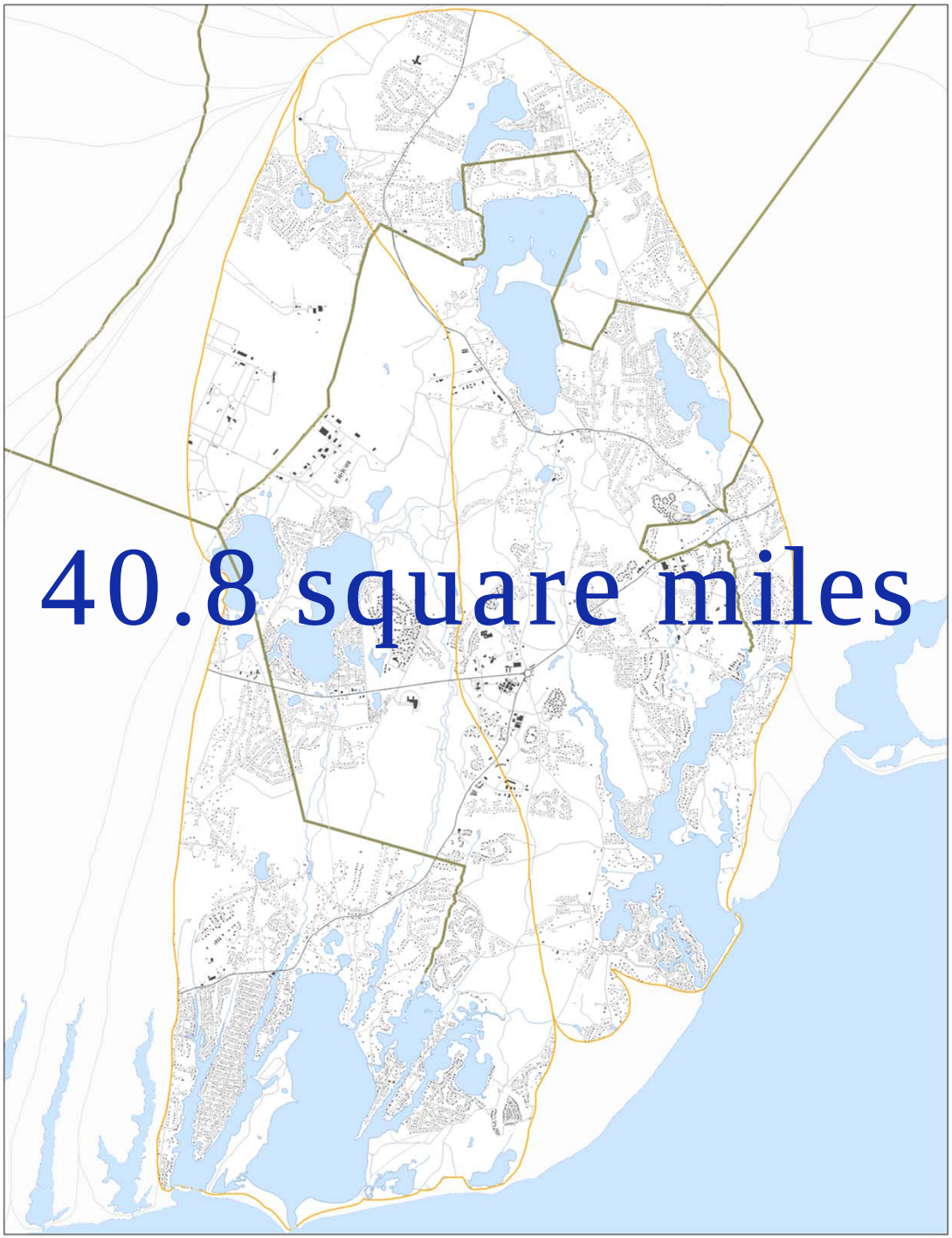
Did we miss anything?

Your Watersheds

Popponesset Bay
Waquoit Bay

"Watershed Working Group - Waquoit/Popponesset - Workshop 1"




40.8 square miles

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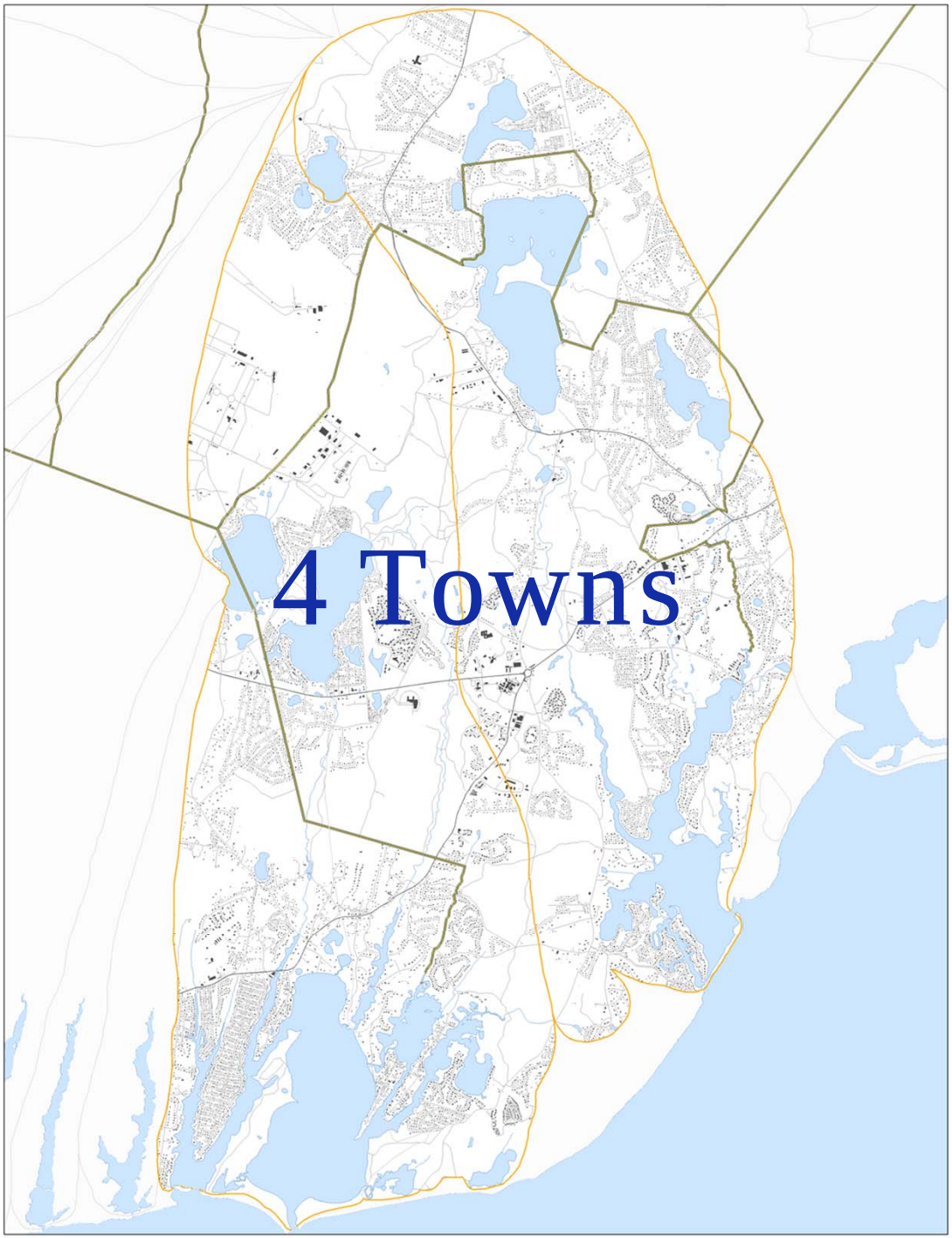


Natural Features

Base Map

- Town Lines
- Rivers

Embayment Boundary

- On Land
- On Sea

Major Roads

- US Highway
- State Highway
- Roads

- Structures
- Ponds

Natural Areas

- Natural Heritage & Endangered Sprcies Program (NHESP) Certified Vernal Pools
- Water Table Contours
- Cranberry Bogs
- Wetlands
- Sea, Lake, & Overland Surges from Hurricanes (SLOSH) Update 2013
- Preliminary FEMA Flood Insurance Rate Map (FIRM) Zones 2013

Sources: MassGIS, MassDOT, ICCOH, FEMA, CCC

Managed Surfaces

Base Map

- Town Lines
- Rivers

Embayment Boundary

- On Land
- On Sea

Major Roads

- US Highway
- State Highway
- Roads

- Structures
- Ponds

Managed Surfaces

- Approximate Managed Ground Surfaces
- Approximate Residential Managed Lawns
- Approximate Managed Golf Courses
- Approximate Municipal Managed Natural Surfaces

Sources: MassGIS, MassDOT, CCC

Regulatory

Base Map

- Town Lines
- Rivers

Embayment Boundary

- On Land
- On Sea

Major Roads

- US Highway
- State Highway
- Roads

- Structures
- Ponds

Regulatory

- Areas of Critical Environmental Concern
- DEP Approved Wellhead Protection Areas (Zone IIs)
- Growth Incentive Zone

OpenSpace: Level of Protection

- In Perpetuity
- Limited
- None

Landuse Vision Map

- Economic Center
- Industrial and Service Trade Area
- Village
- Resource Protection Area
- Other
- Undesignated

Sources: MassGIS, MassDOT, CCC

Land Use Change

Base Map

- Town Lines
- Rivers

Embayment Boundary

- On Land
- On Sea

Major Roads

- US Highway
- State Highway
- Roads

- Structures
- Ponds

LandUse Change

- Residential
- Commercial
- Industrial
- Wooded, Natural, or Wetlands
- Open - Disturbed or Managed
- Water

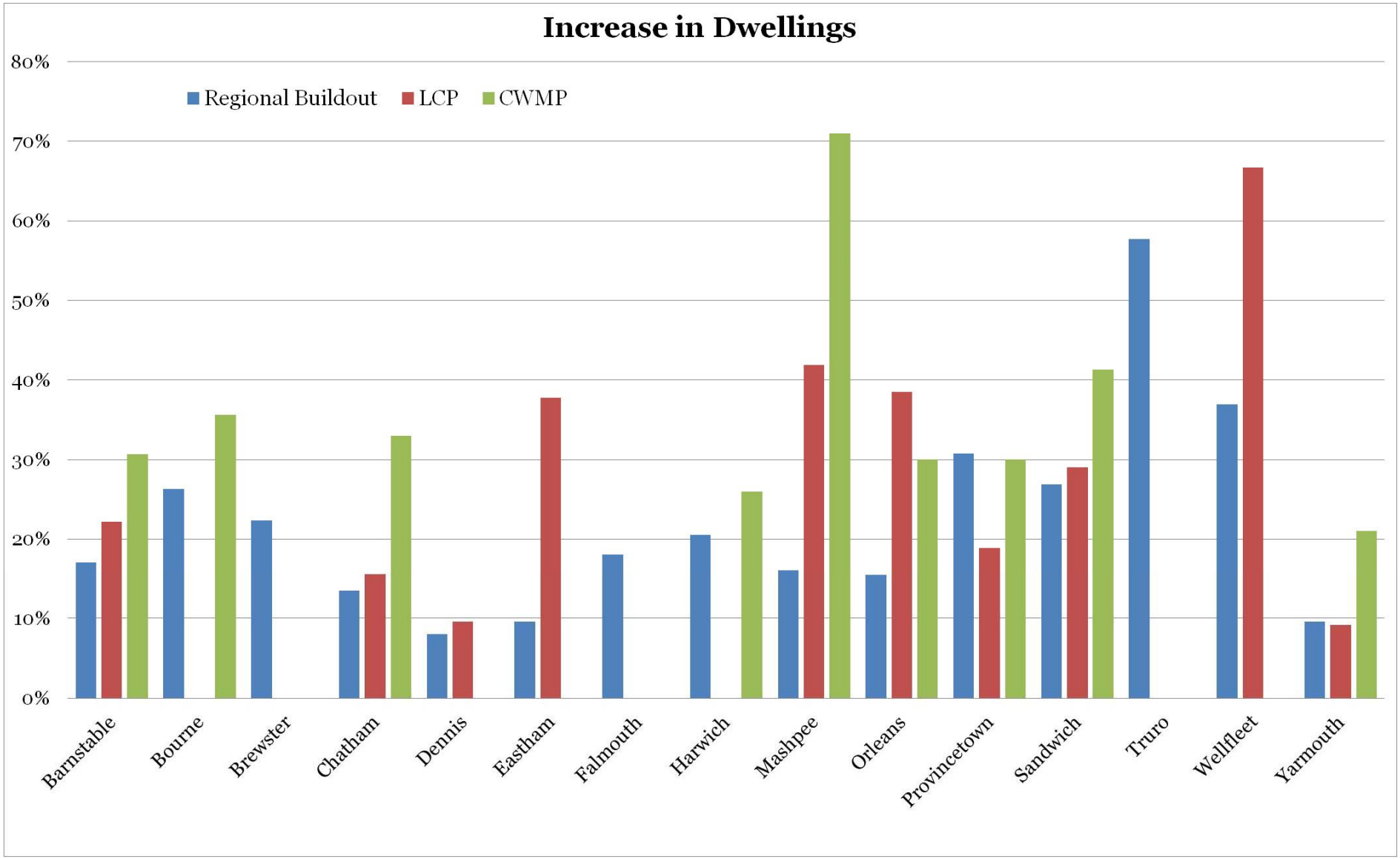
Sources: MassGIS, MassDOT

Density

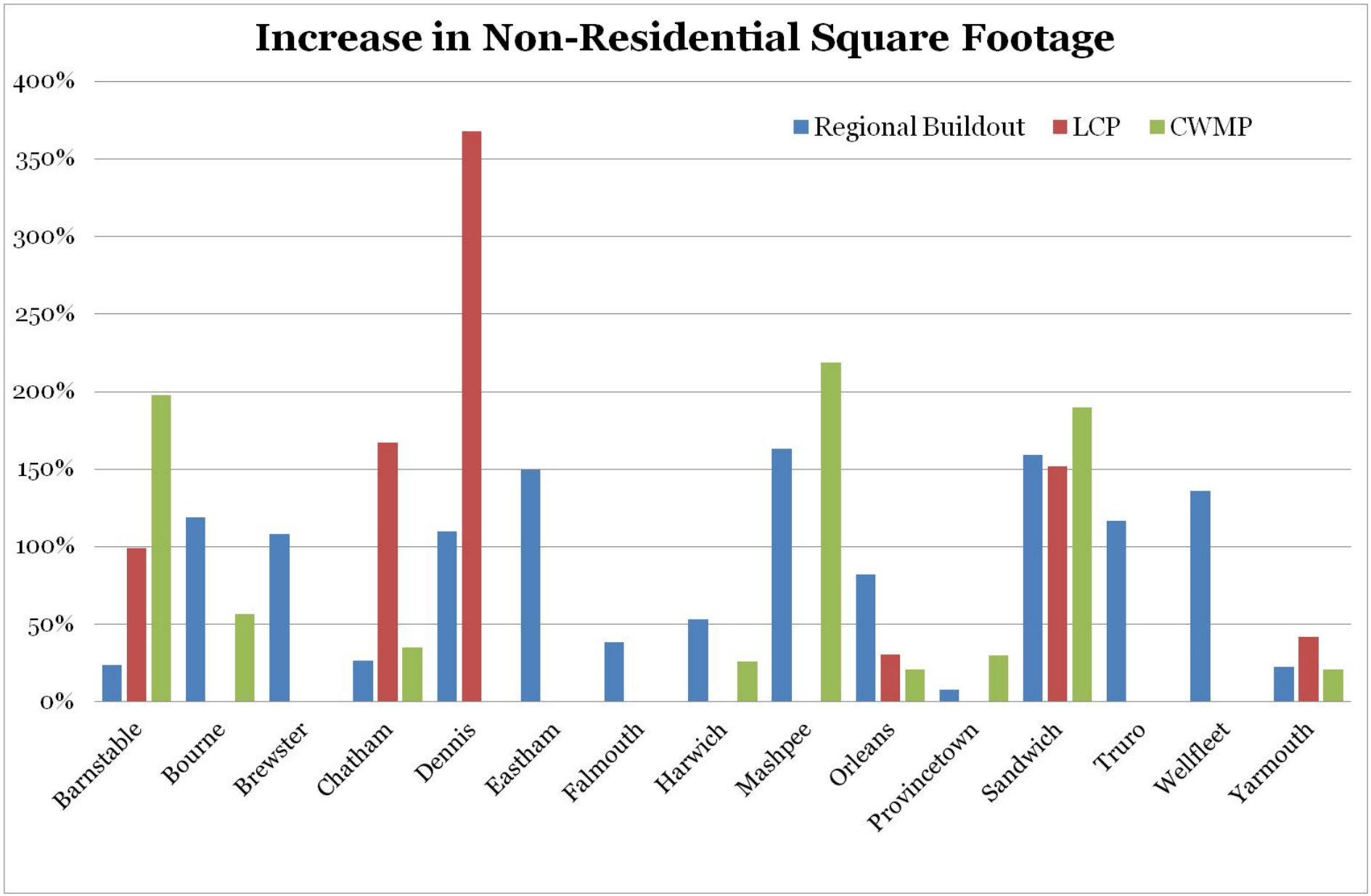
Cape Wide Cost Estimate:

30% growth will increase capital costs by 40%

Buildout

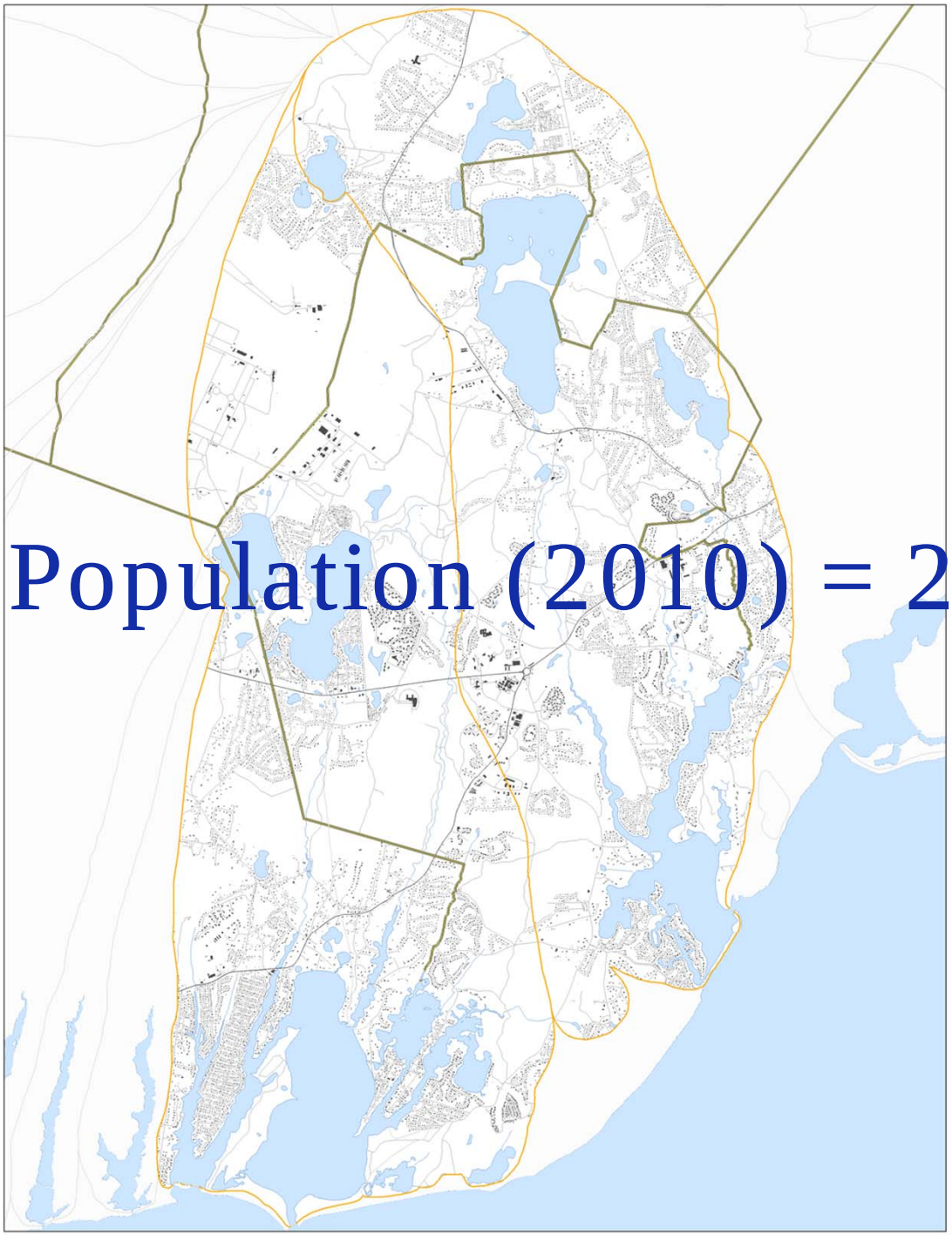

Increase in Dwellings
80%
70%
60%
50%
40%
30%
20%
10%
0%
Regional Buildout
LCP
CWMP
Barnstable
Bourne
Brewster
Chatham
Dennis
Eastham
Falmouth
Harwich
Mashpee
Orleans
Provincetown
Sandwich
Truro
Wellfleet
Yarmouth

Buildout


Increase in Non-Residential Square Footage
400%
350%
300%
250%
200%
150%
100%
50%
0%
Regional Buildout
LCP
CWMP
Barnstable
Bourne
Brewster
Chatham
Dennis
Eastham
Falmouth
Harwich
Mashpee
Orleans
Provincetown
Sandwich
Truro
Wellfleet
Yarmouth

The People

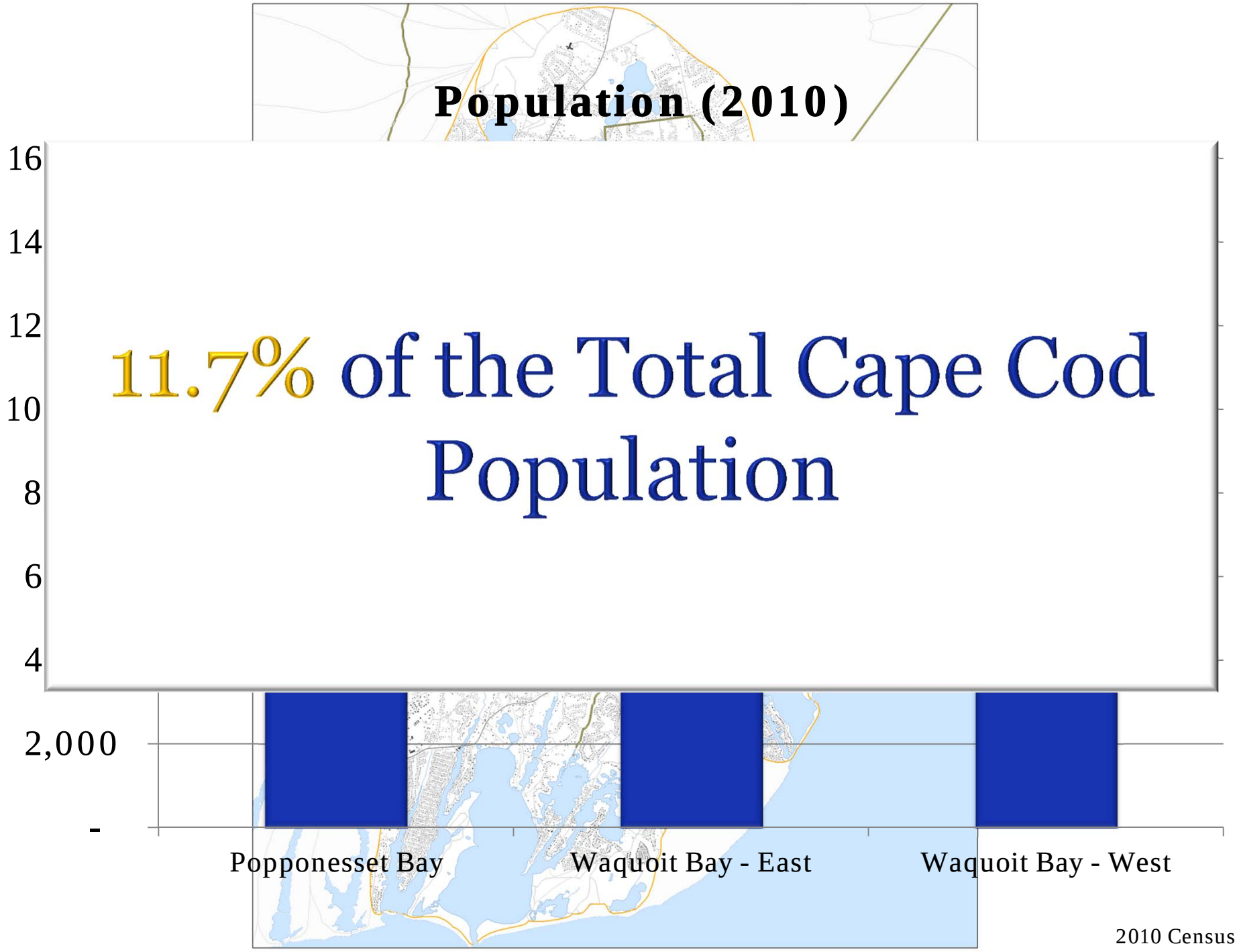
Popponesset Bay
Waquoit Bay



Total Population (2010) = 25,273

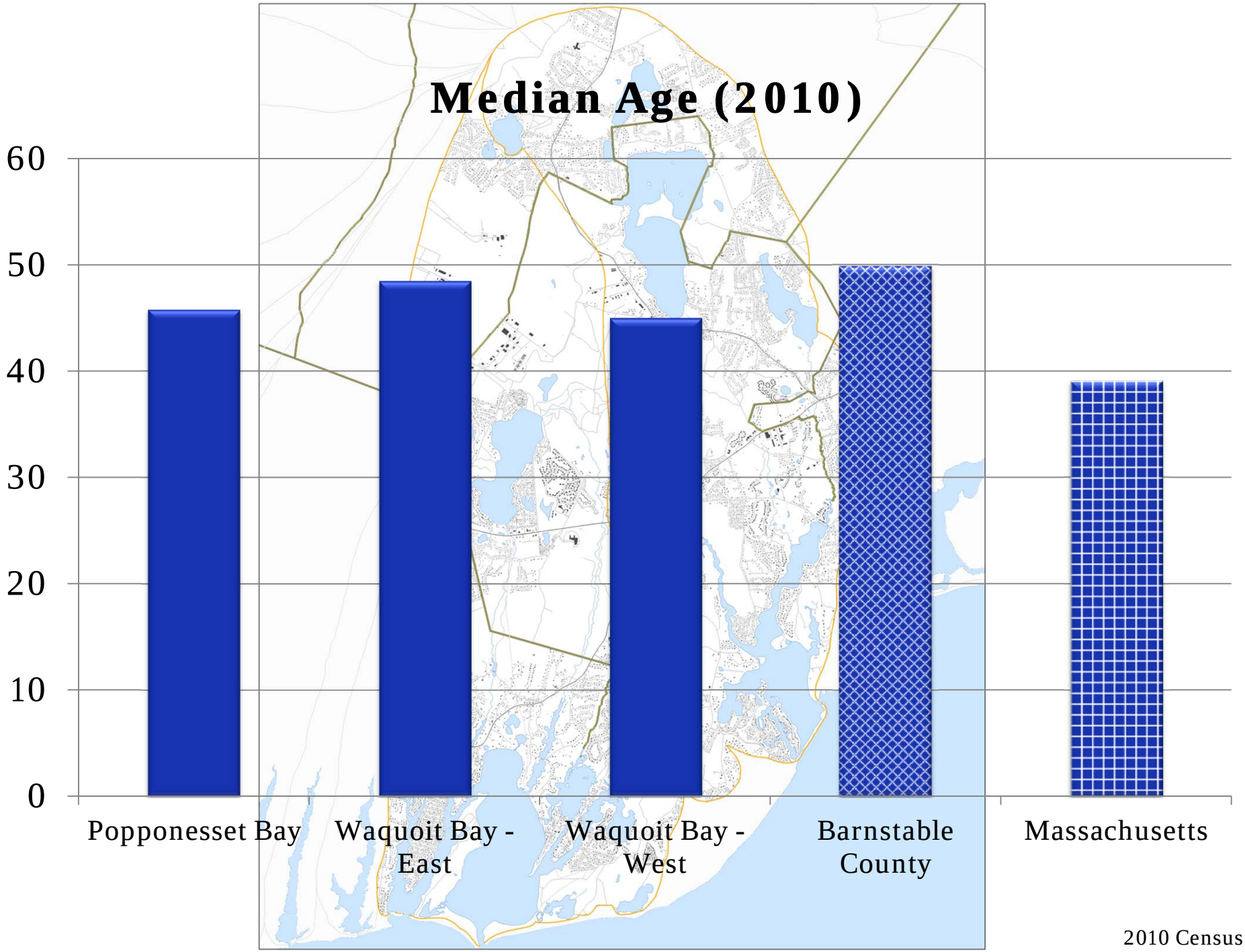
2010 Census

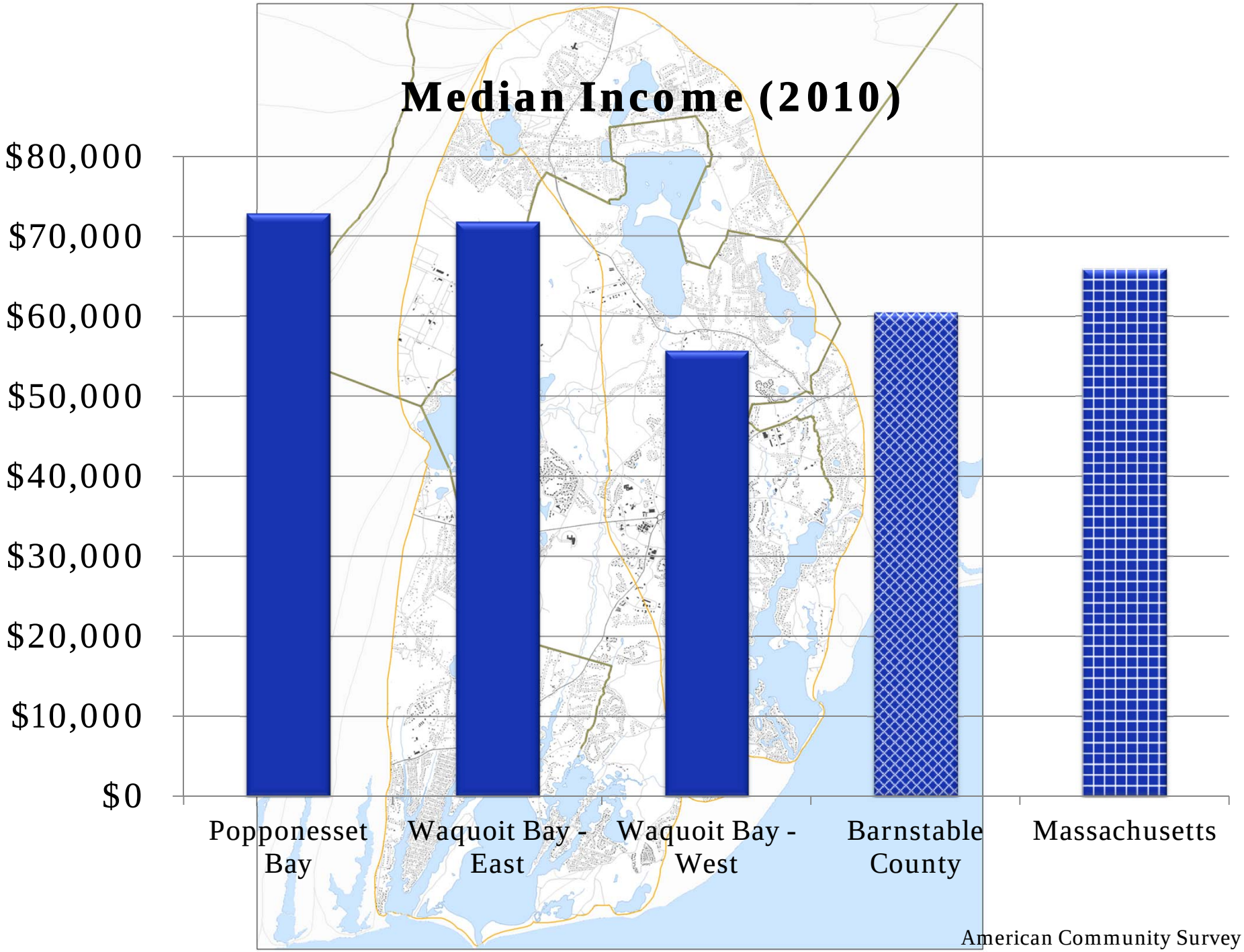
Population (2010)

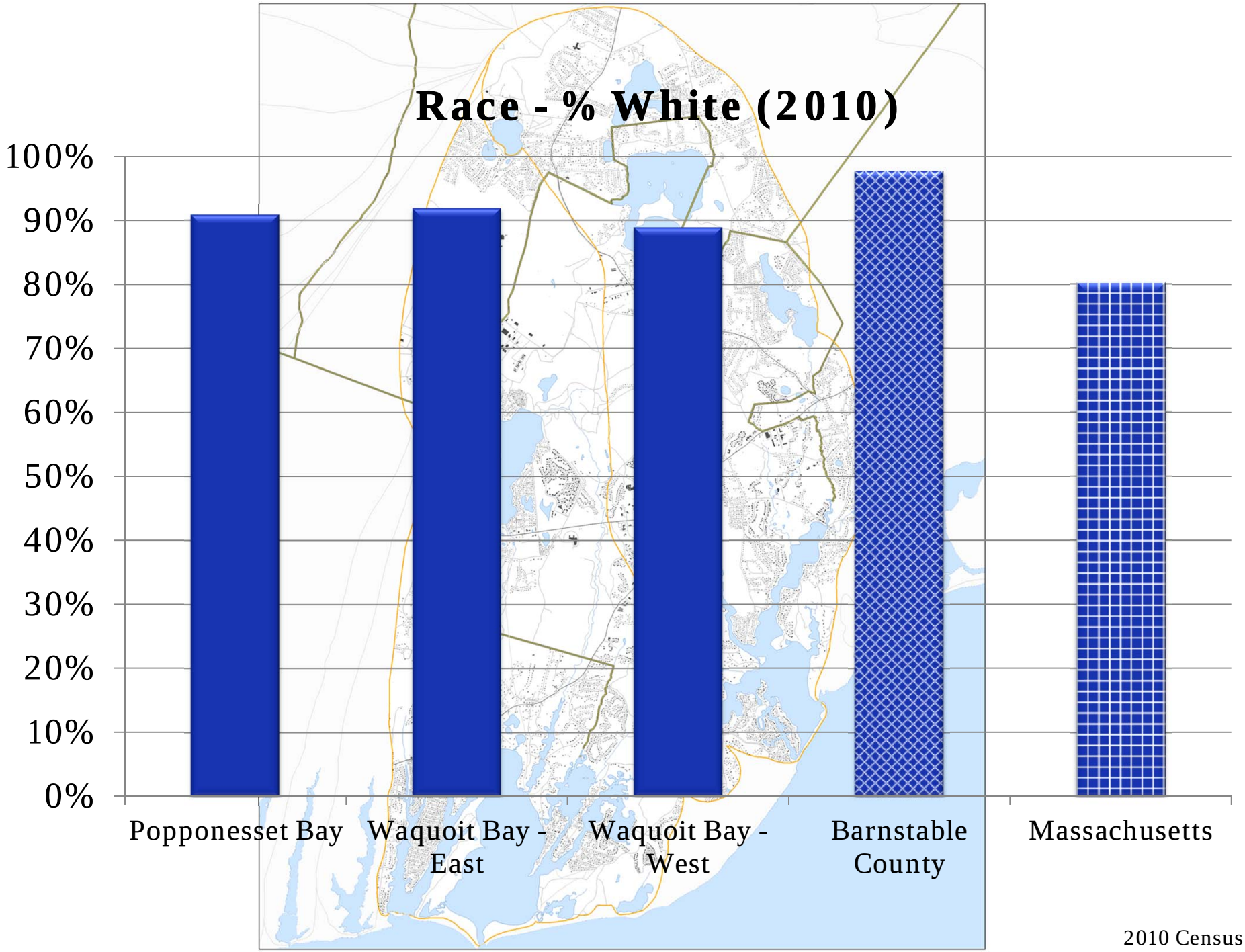


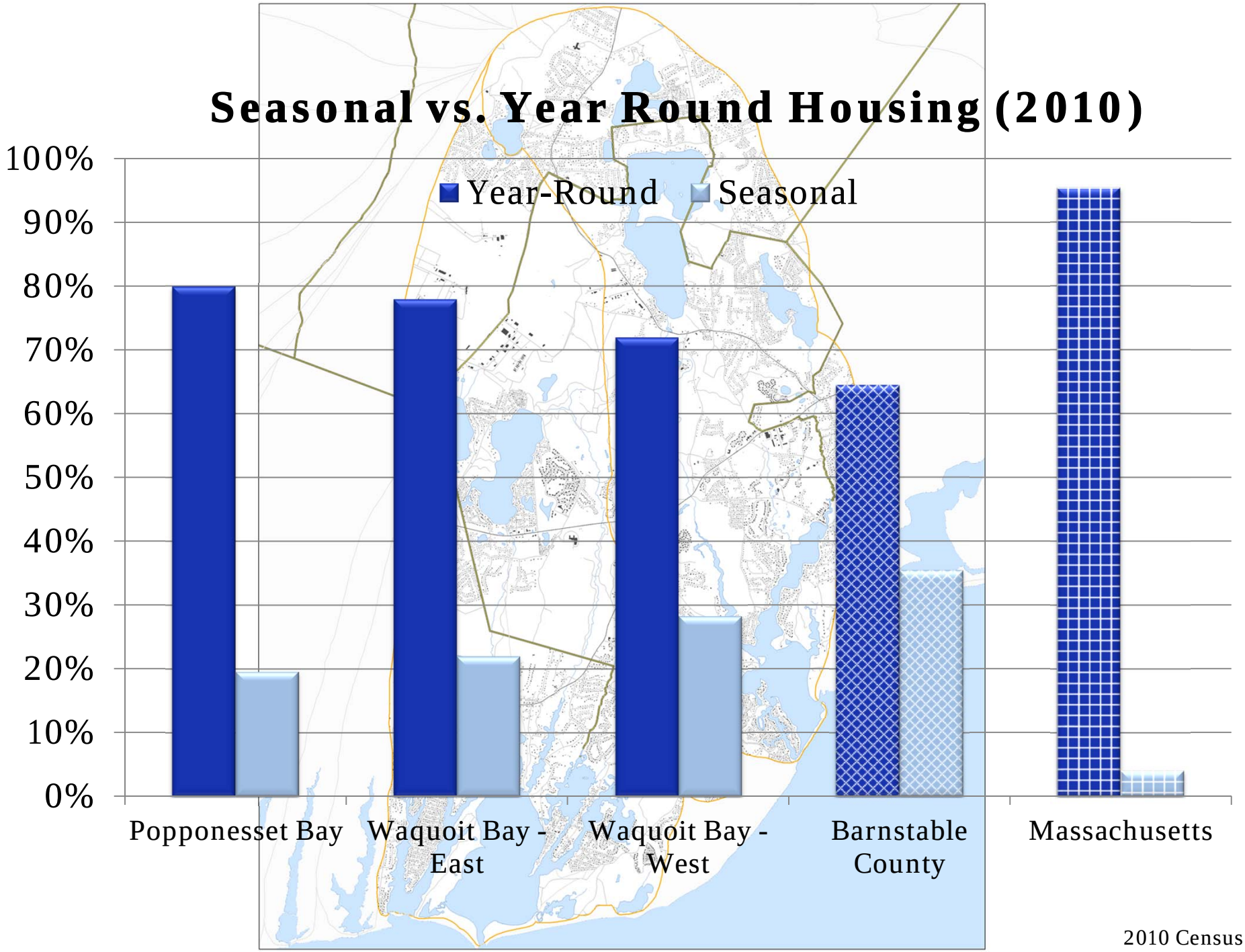
11.7% of the Total Cape Cod Population

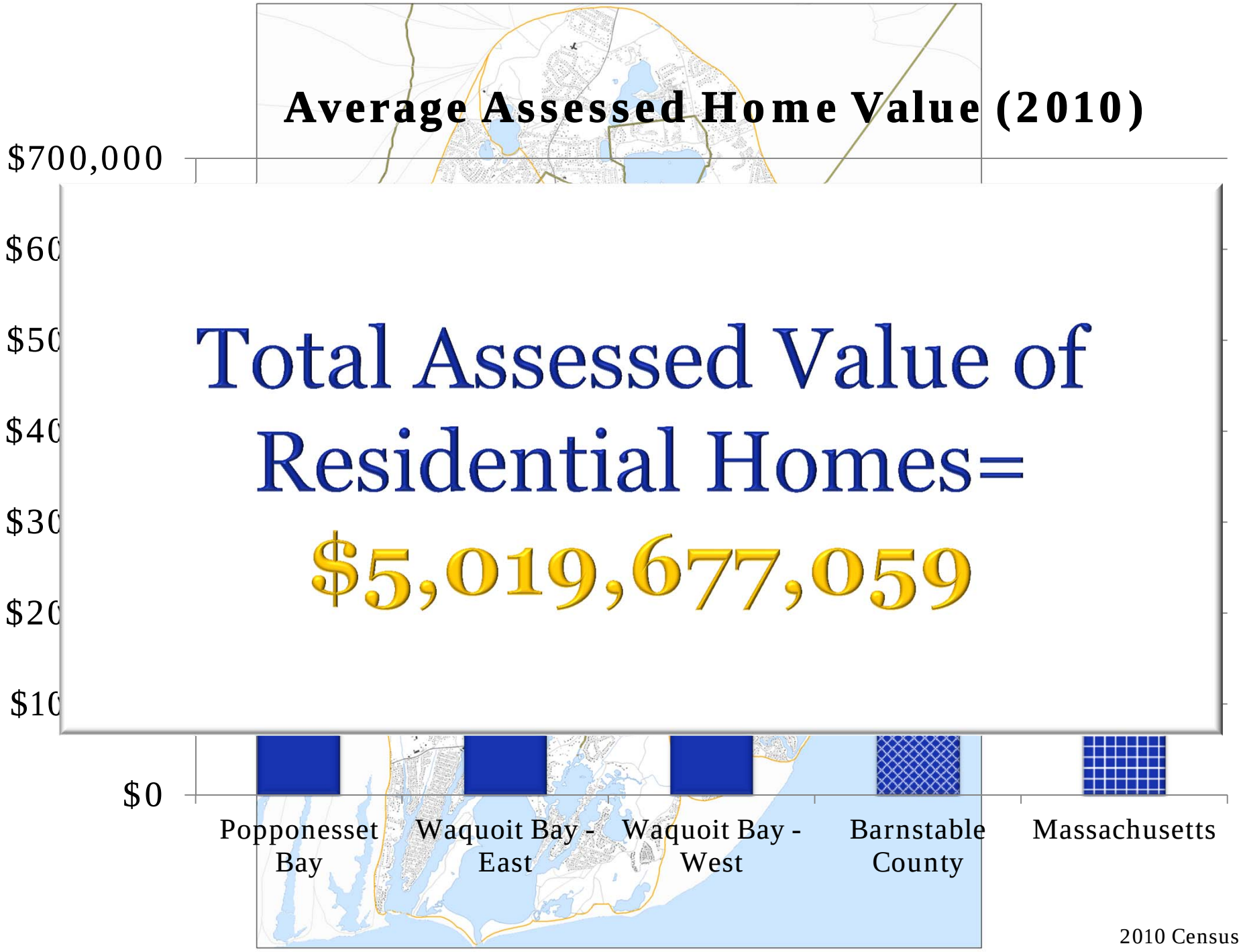
2010 Census


Median Age (2010)
60
50
40
30
20
10
0
Popponesset Bay
Waquoit Bay - East
Waquoit Bay - West
Barnstable County
Massachusetts
2010 Census


Median Income (2010)
$80,000
$70,000
$60,000
$50,000
$40,000
$30,000
$20,000
$10,000
$0
Popponesset Bay
Waquoit Bay - East
Waquoit Bay - West
Barnstable County
Massachusetts
American Community Survey

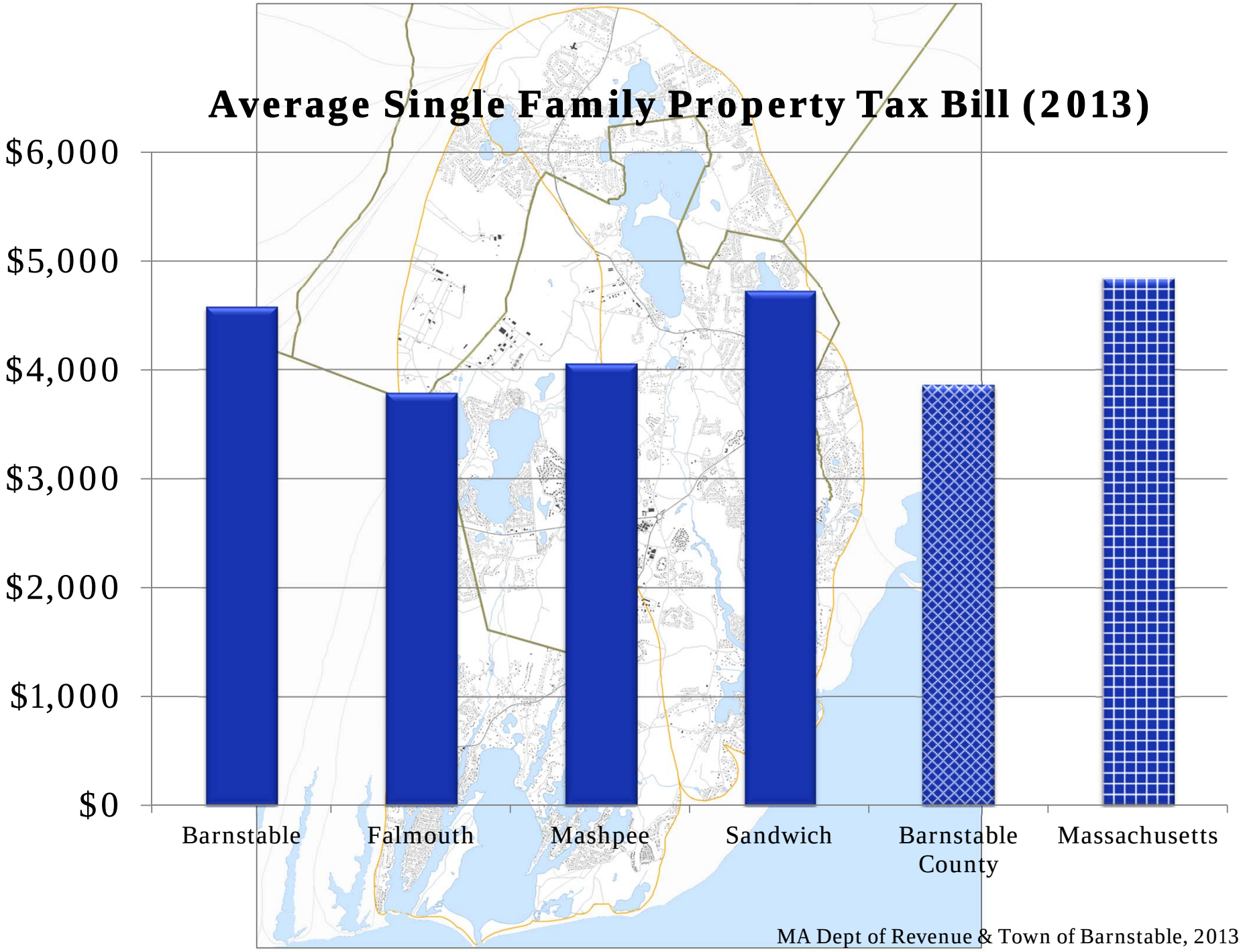

Race - % White (2010)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Popponesset Bay
Waquoit Bay - East
Waquoit Bay - West
Barnstable County
Massachusetts
2010 Census

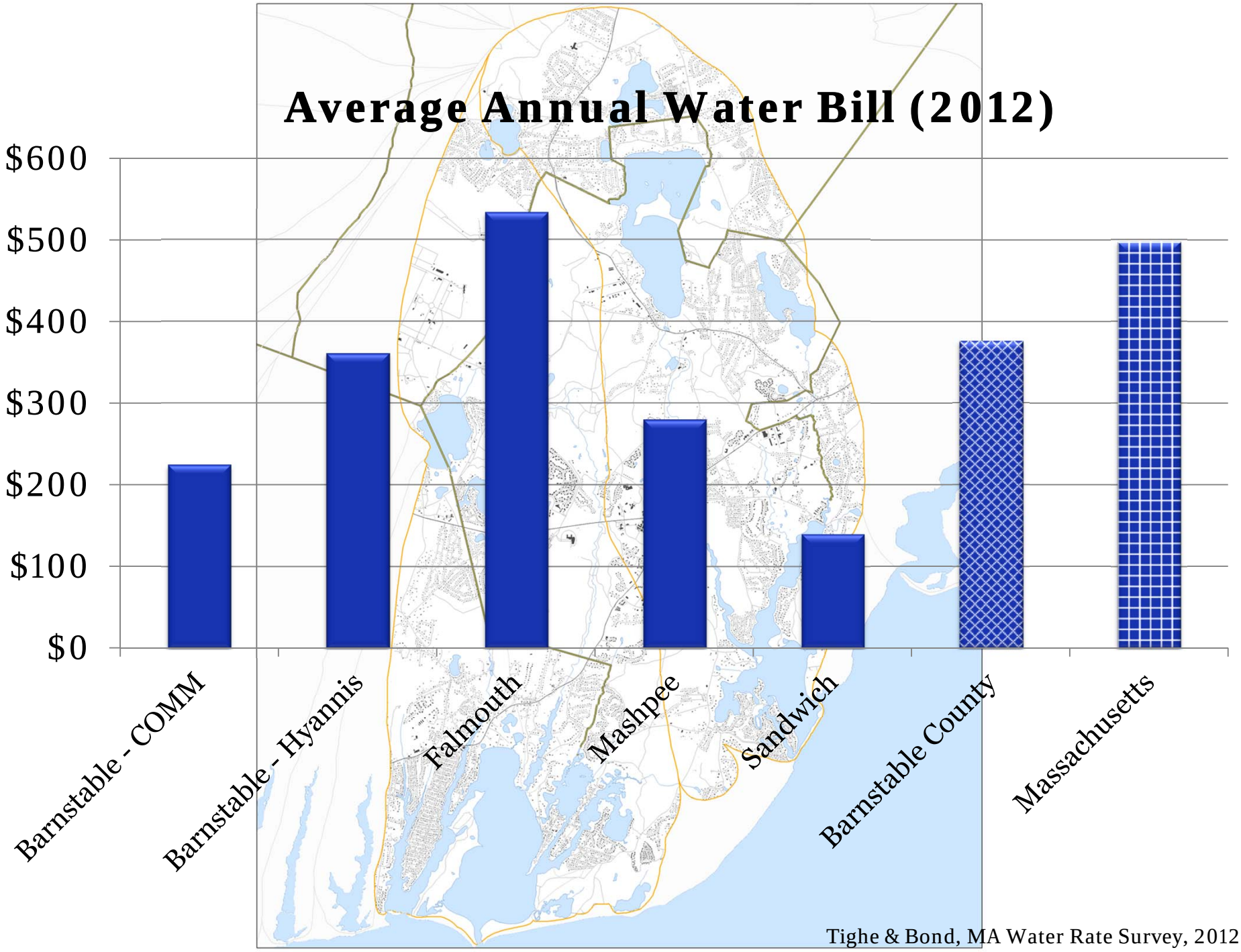

Seasonal vs. Year Round Housing (2010)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Year-Round
Seasonal
Popponesset Bay
Waquoit Bay - East
Waquoit Bay - West
Barnstable County
Massachusetts
2010 Census

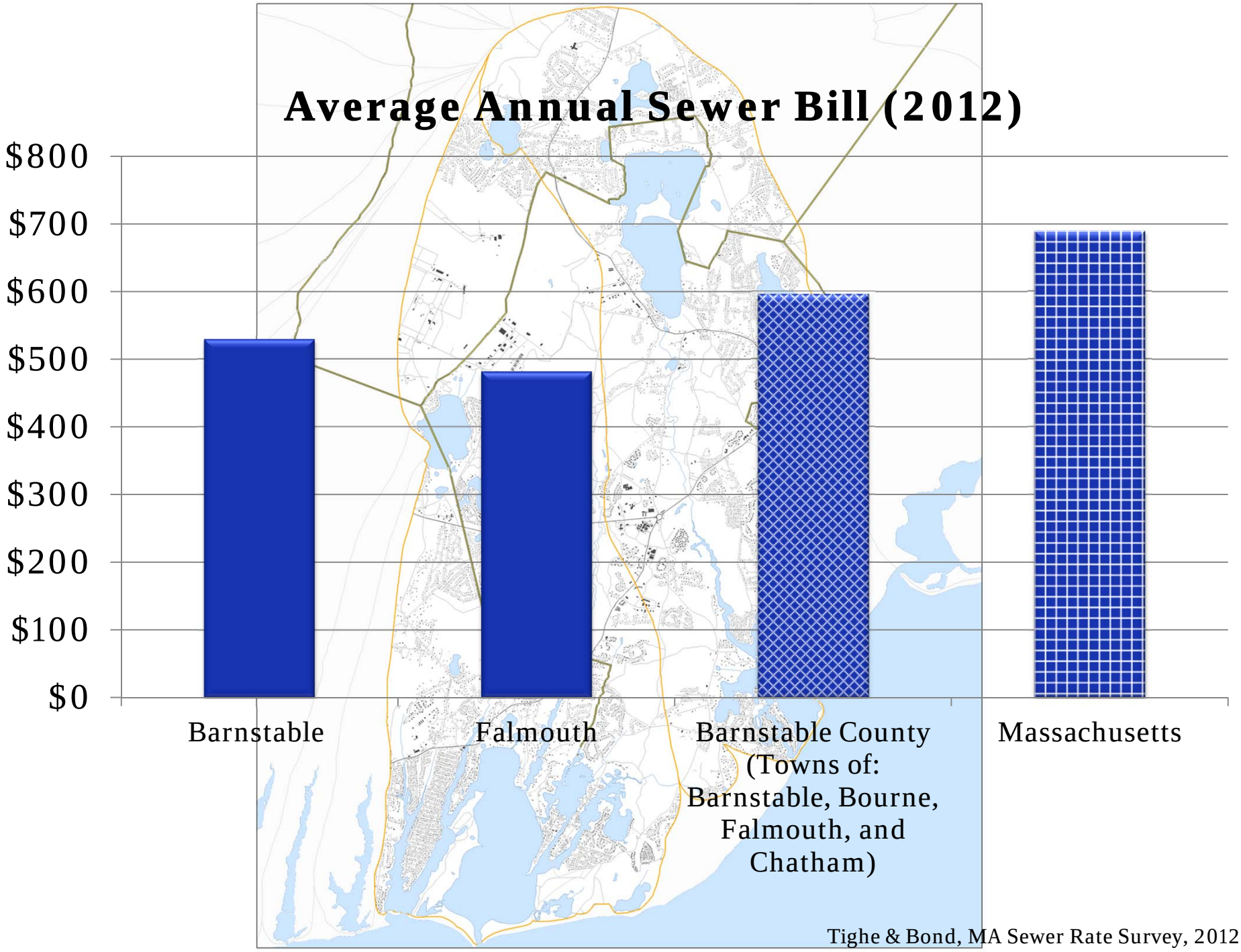

Average Assessed Home Value (2010)
$700,000
$60
$50
$40
$30
$20
$10
$0
Total Assessed Value of Residential Homes=
$5,019,677,059
Popponesset Bay
Waquoit Bay - East
Waquoit Bay - West
Barnstable County
Massachusetts
2010 Census

Your Government & Taxes

Popponesset Bay
Waquoit Bay


Average Single Family Property Tax Bill (2013)
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
Barnstable
Falmouth
Mashpee
Sandwich
Barnstable County
Massachusetts
MA Dept of Revenue & Town of Barnstable, 2013

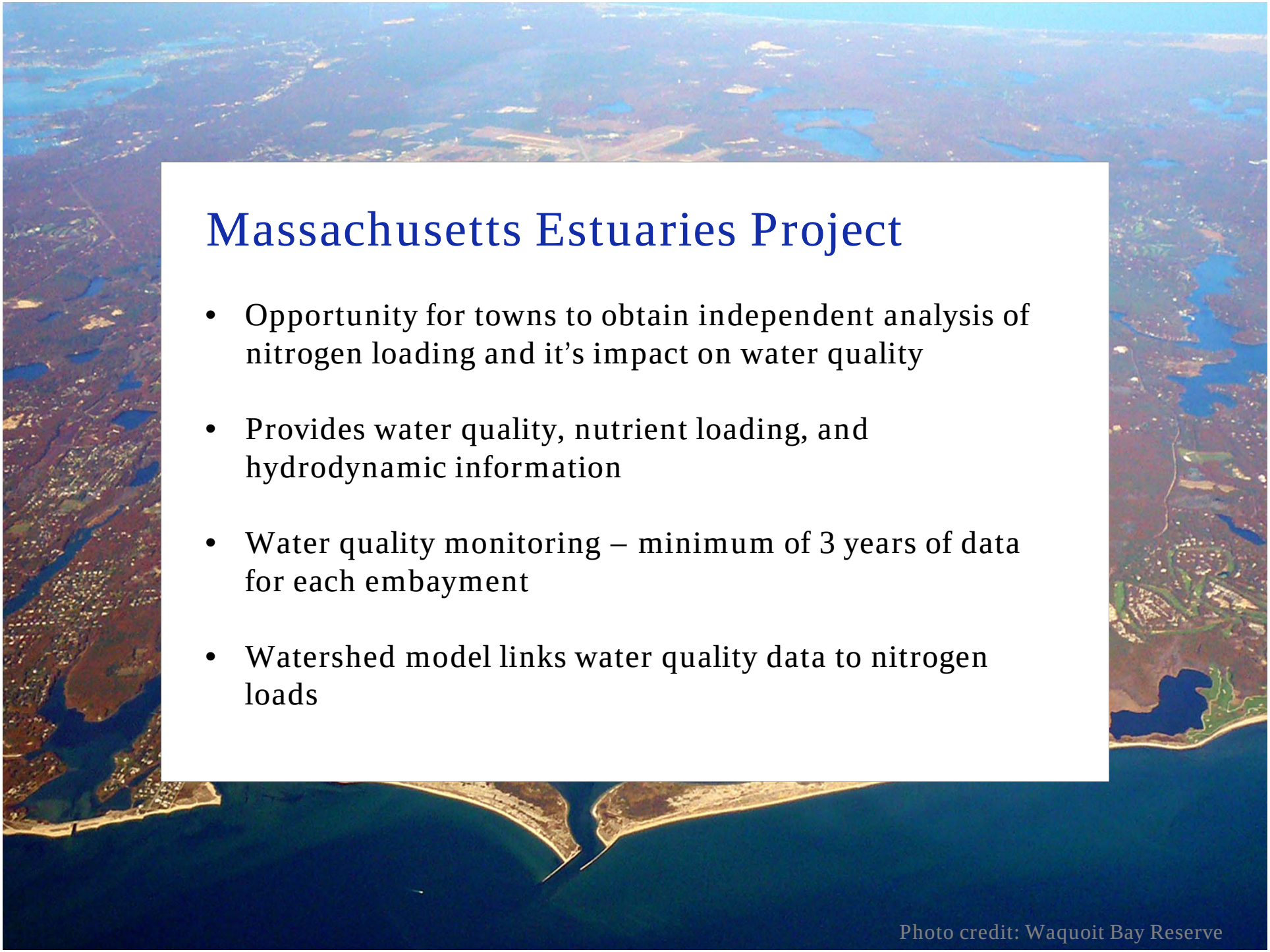

Average Annual Water Bill (2012)
$600
$500
$400
$300
$200
$100
$0
Barnstable - COMM
Barnstable - Hyannis
Falmouth
Mashpee
Sandwich
Barnstable County
Massachusetts
Tighe & Bond, MA Water Rate Survey, 2012


Average Annual Sewer Bill (2012)
$800
$700
$600
$500
$400
$300
$200
$100
$0
Barnstable
Falmouth
Barnstable County (Towns of: Barnstable, Bourne, Falmouth, and Chatham)
Massachusetts
Tighe & Bond, MA Sewer Rate Survey, 2012

The Problem

Popponesset Bay
Waquoit Bay

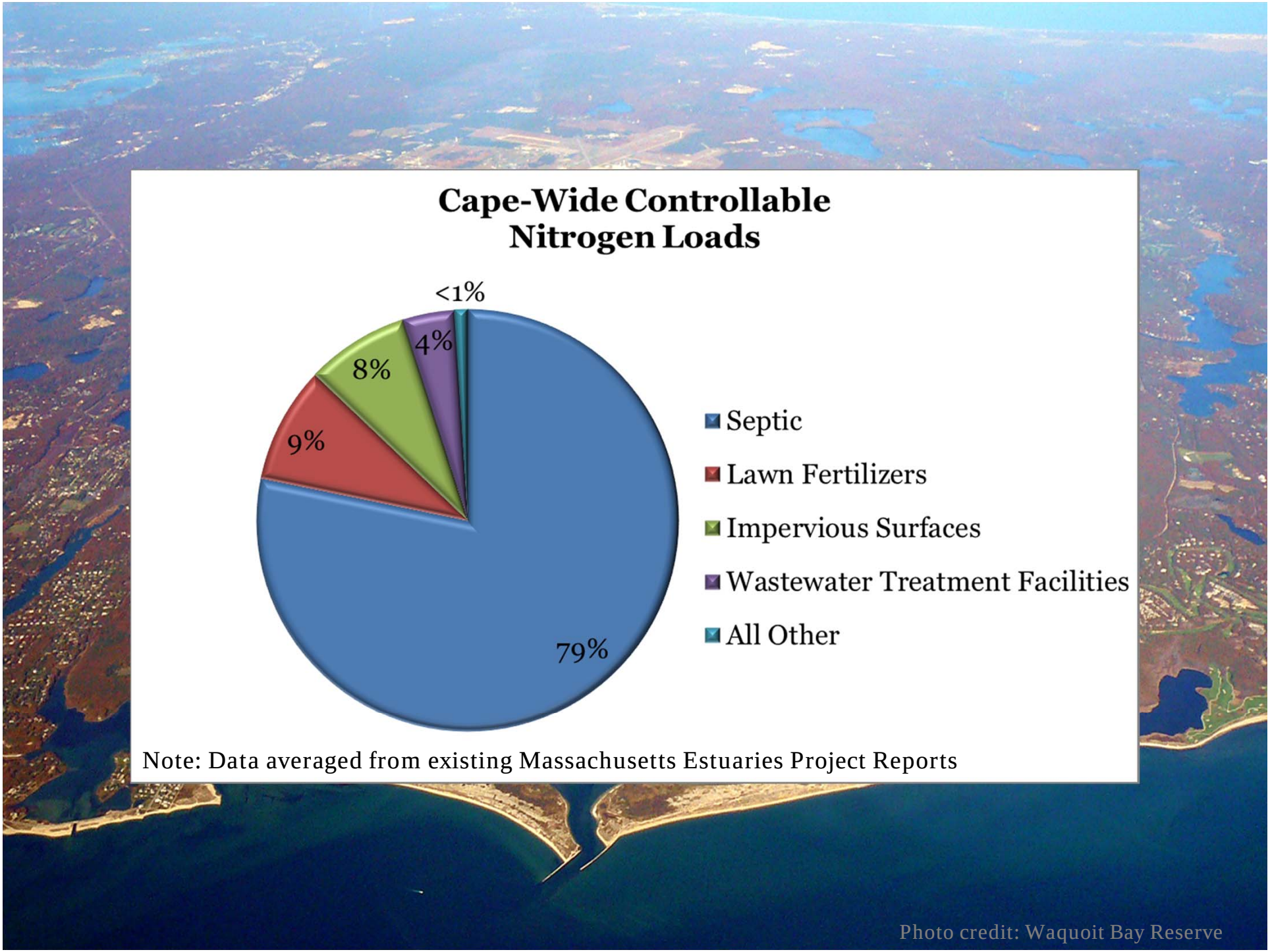
"Watershed Working Group - Waquoit/Popponesset - Workshop 1"

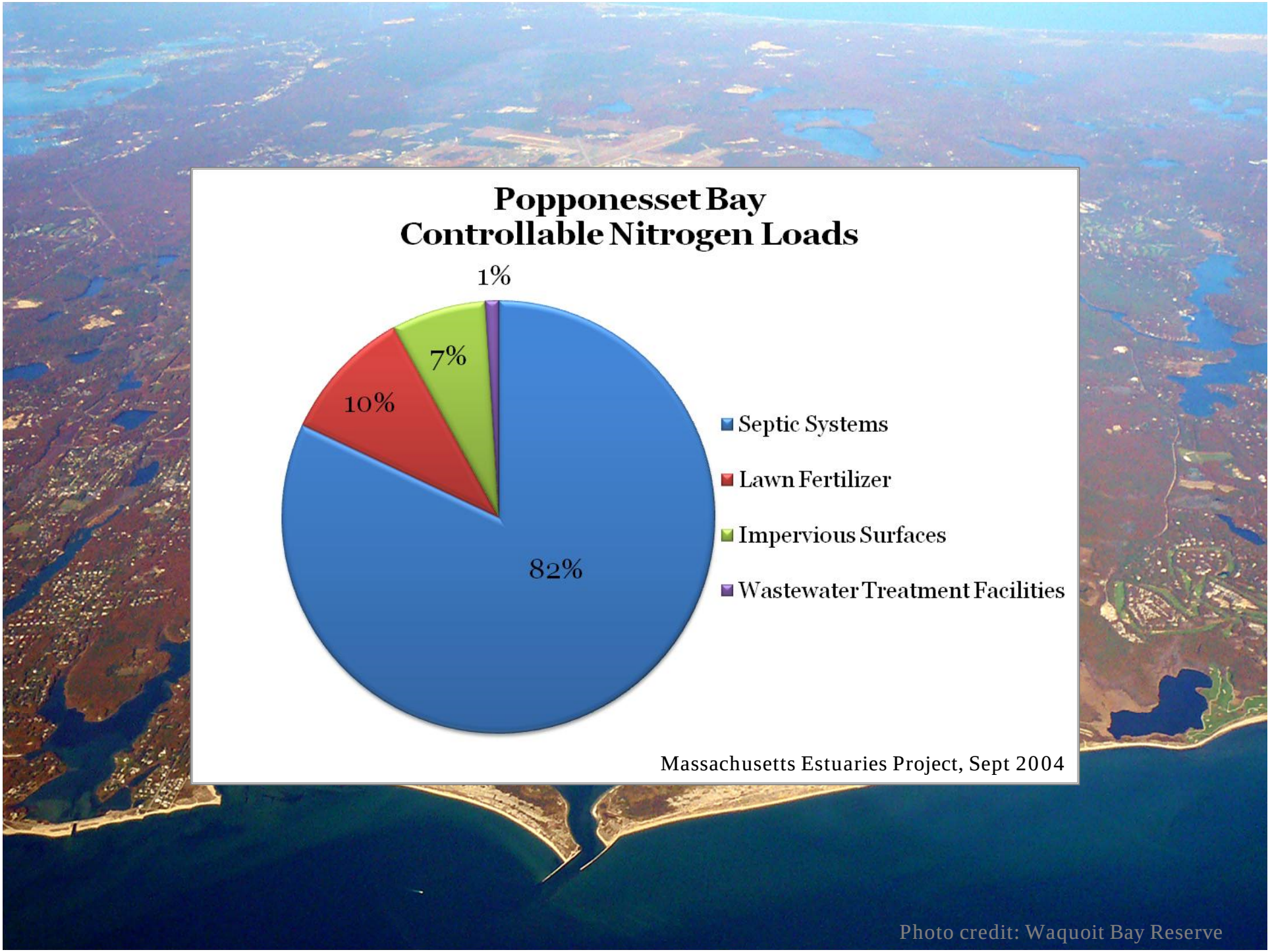


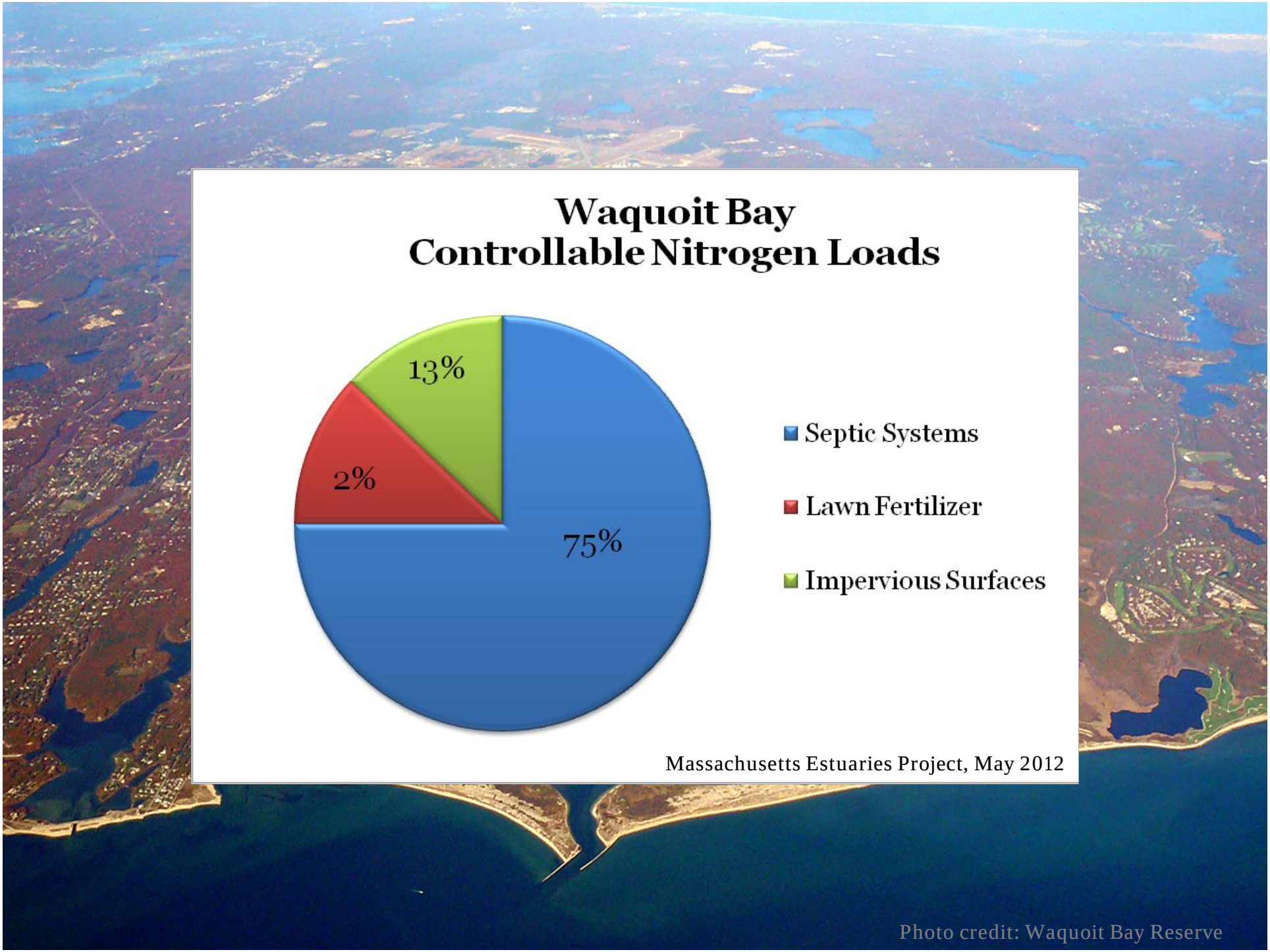
Massachusetts Estuaries Project

- Opportunity for towns to obtain independent analysis of nitrogen loading and it's impact on water quality
- Provides water quality, nutrient loading, and hydrodynamic information
- Water quality monitoring – minimum of 3 years of data for each embayment
- Watershed model links water quality data to nitrogen loads

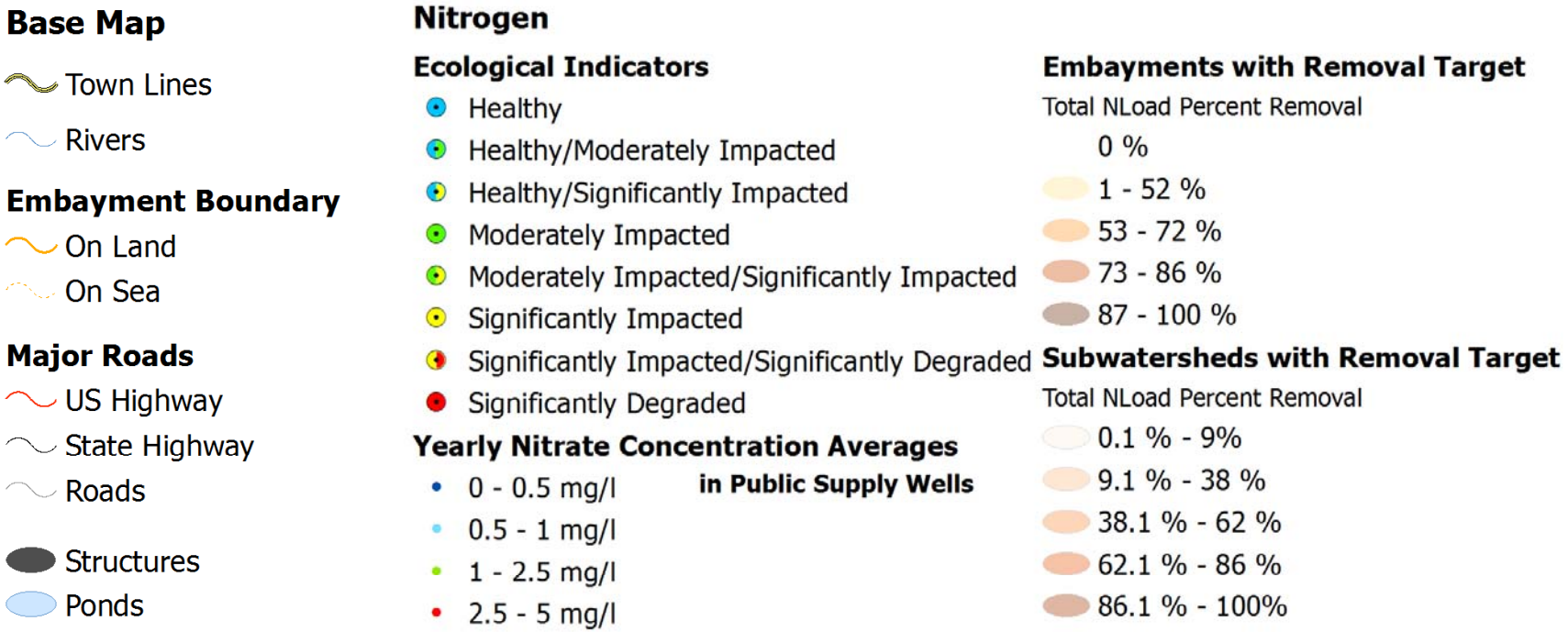
Photo credit: Waquoit Bay Reserve


Cape-Wide Controllable Nitrogen Loads
<1%
4%
8%
9%
79%
Septic
Lawn Fertilizers
Impervious Surfaces
Wastewater Treatment Facilities
All Other
Note: Data averaged from existing Massachusetts Estuaries Project Reports
Photo credit: Waquoit Bay Reserve

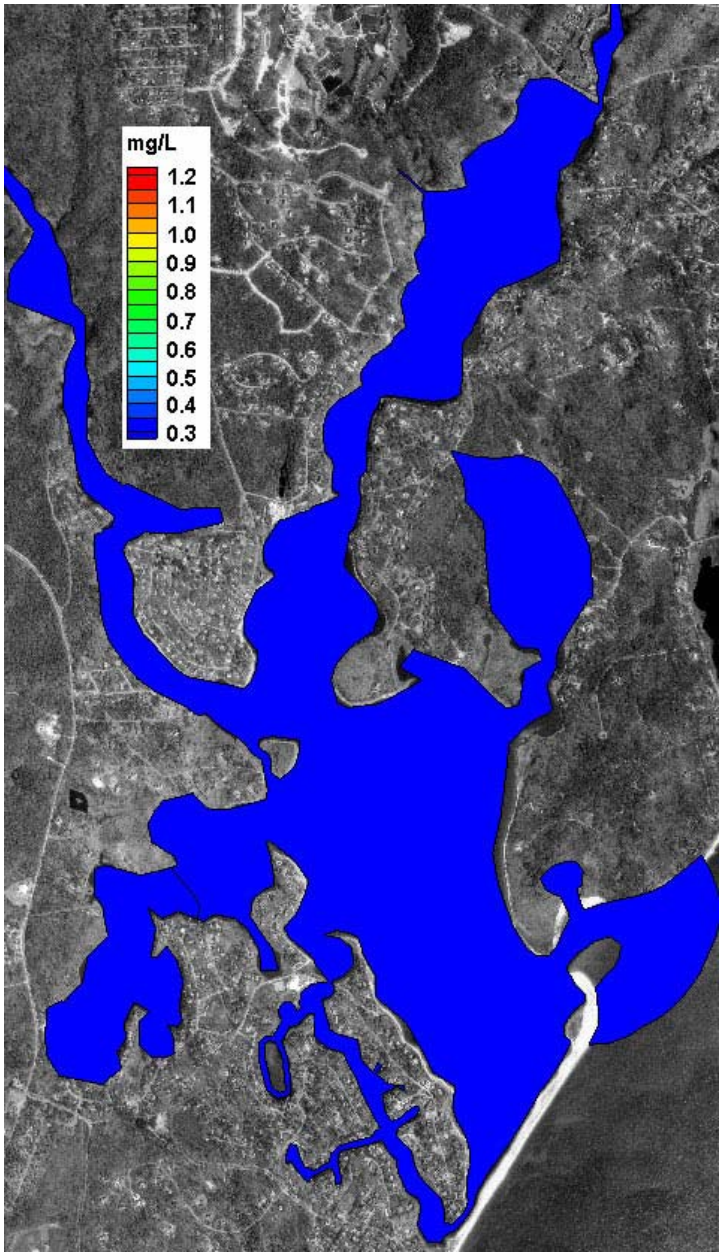

Popponesset Bay
Controllable Nitrogen Loads
1%
7%
10%
82%
Septic Systems
Lawn Fertilizer
Impervious Surfaces
Wastewater Treatment Facilities
Massachusetts Estuaries Project, Sept 2004
Photo credit: Waquoit Bay Reserve


Waquoit Bay
Controllable Nitrogen Loads
13%
2%
75%
Septic Systems
Lawn Fertilizer
Impervious Surfaces
Massachusetts Estuaries Project, May 2012
Photo credit: Waquoit Bay Reserve

Nitrogen Problem



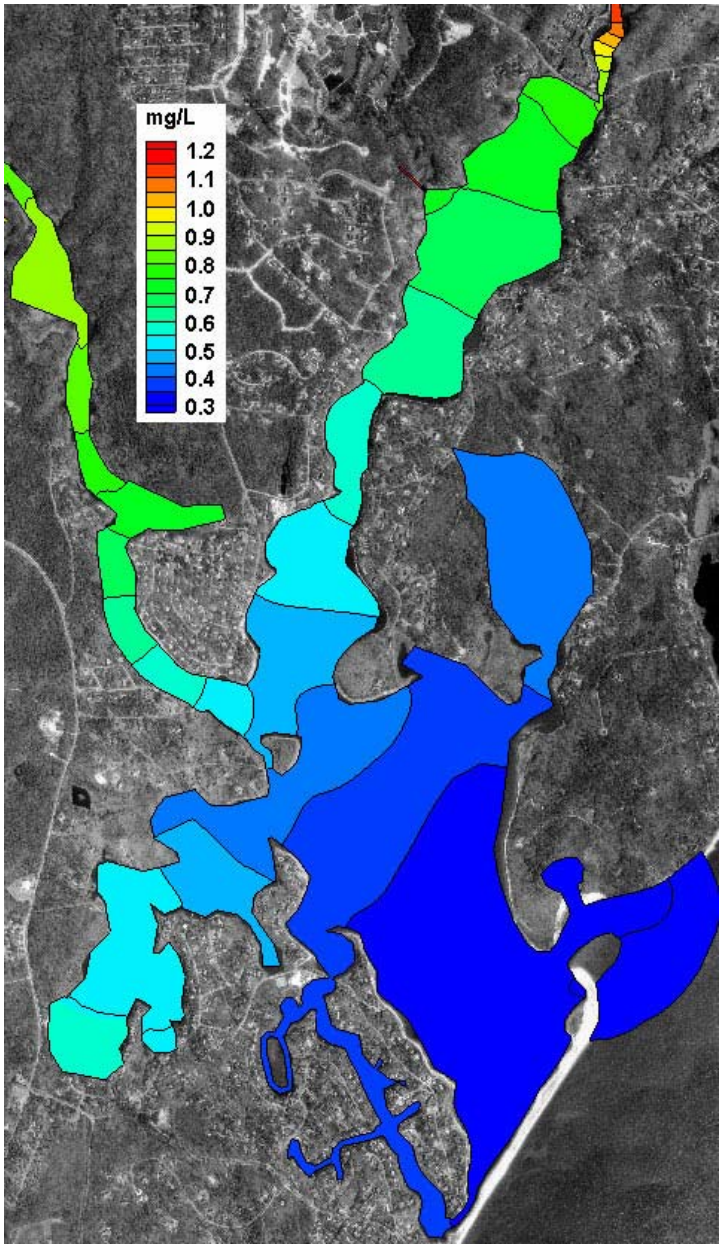
Sources: MassGIS, MEP, CCC



Contour Plot of **modeled total nitrogen concentrations (mg/L)** in Popponesset Bay, for no anthropogenic loading conditions.

(Source: MEP 2004)

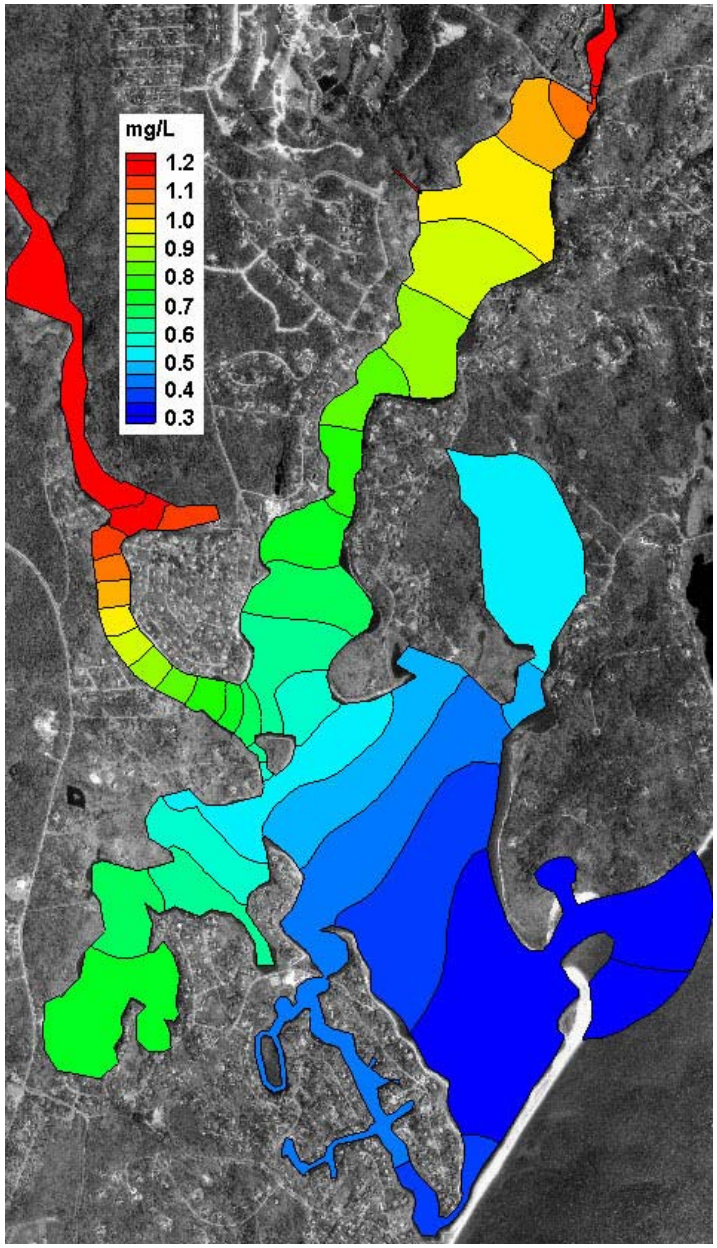
Pre-Colonial Conditions: Popponesset Bay



Contour plot of **average total nitrogen concentrations** from results of the present conditions loading scenario, for Popponesset Bay.

(Source: MEP 2004)

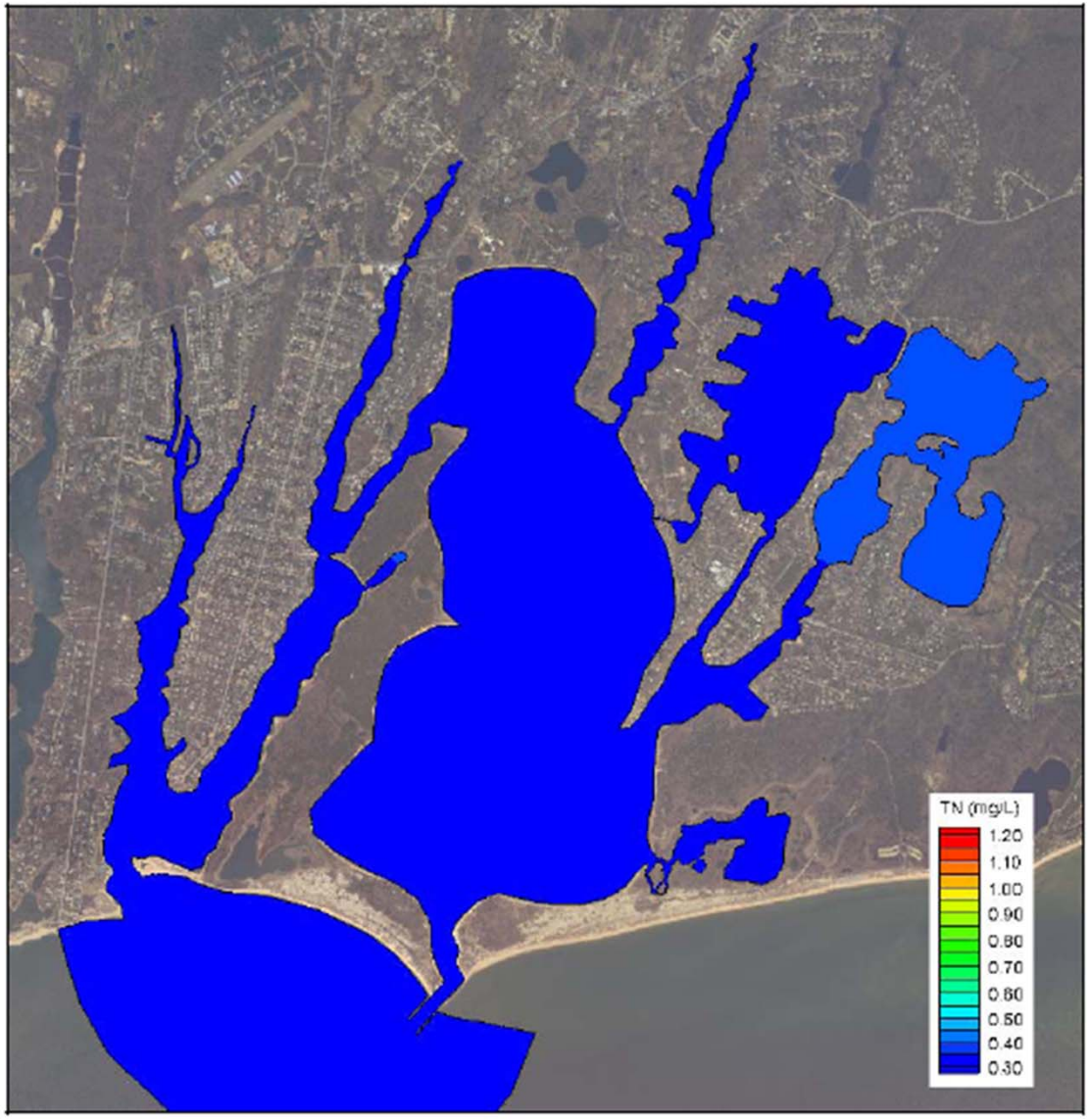
Present Conditions: Popponesset Bay



Contour Plot of **modeled total nitrogen concentrations (mg/L)** in Popponesset Bay, for projected build out loading conditions.

(Source: MEP 2004)

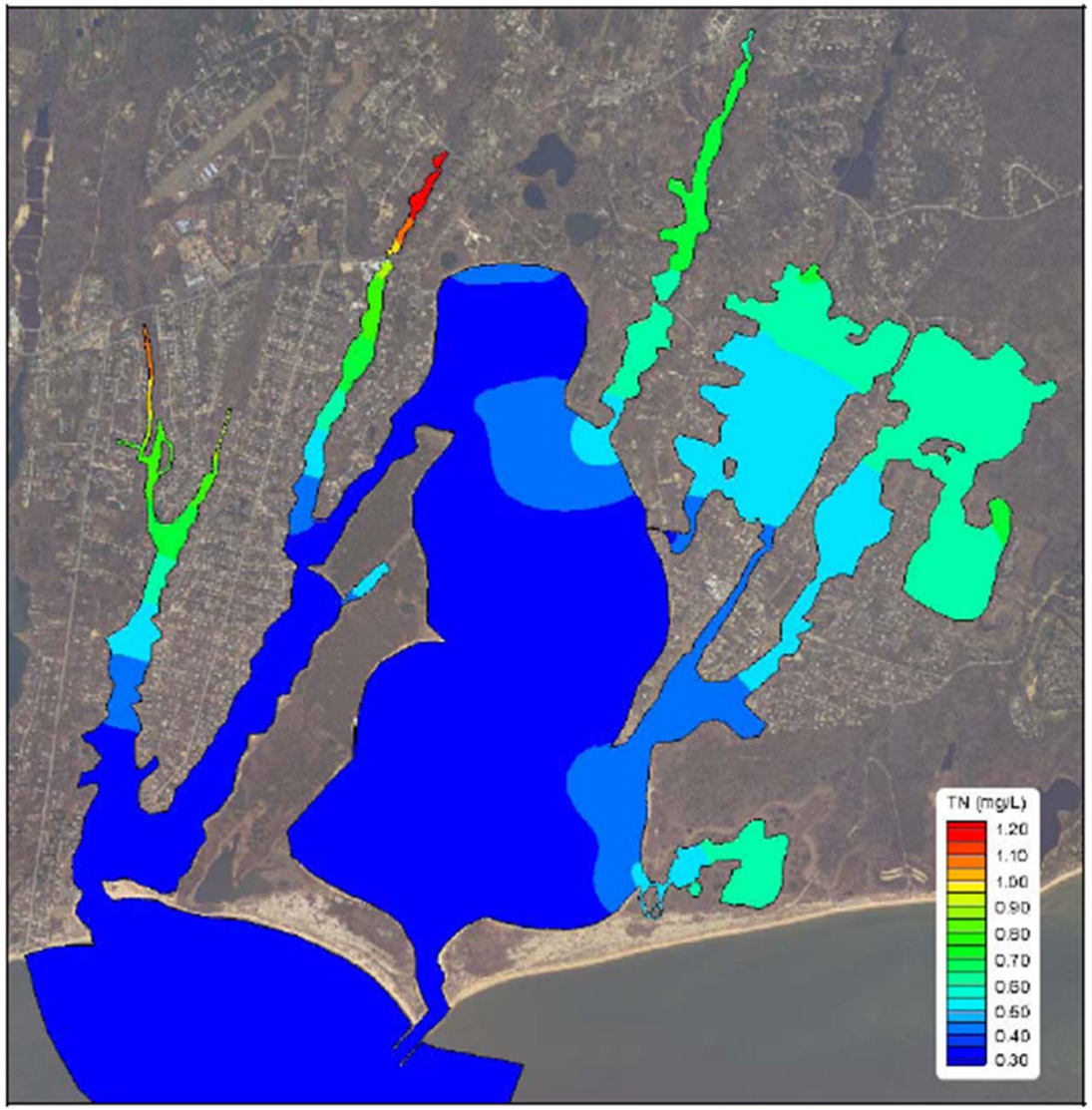
Buildout Conditions: Popponesset Bay



Contour plots of **modeled total nitrogen concentrations (mg/L)** in Waquoit Bay system, for no anthropogenic loading conditions, and bathymetry.

(Source: MEP 2012)

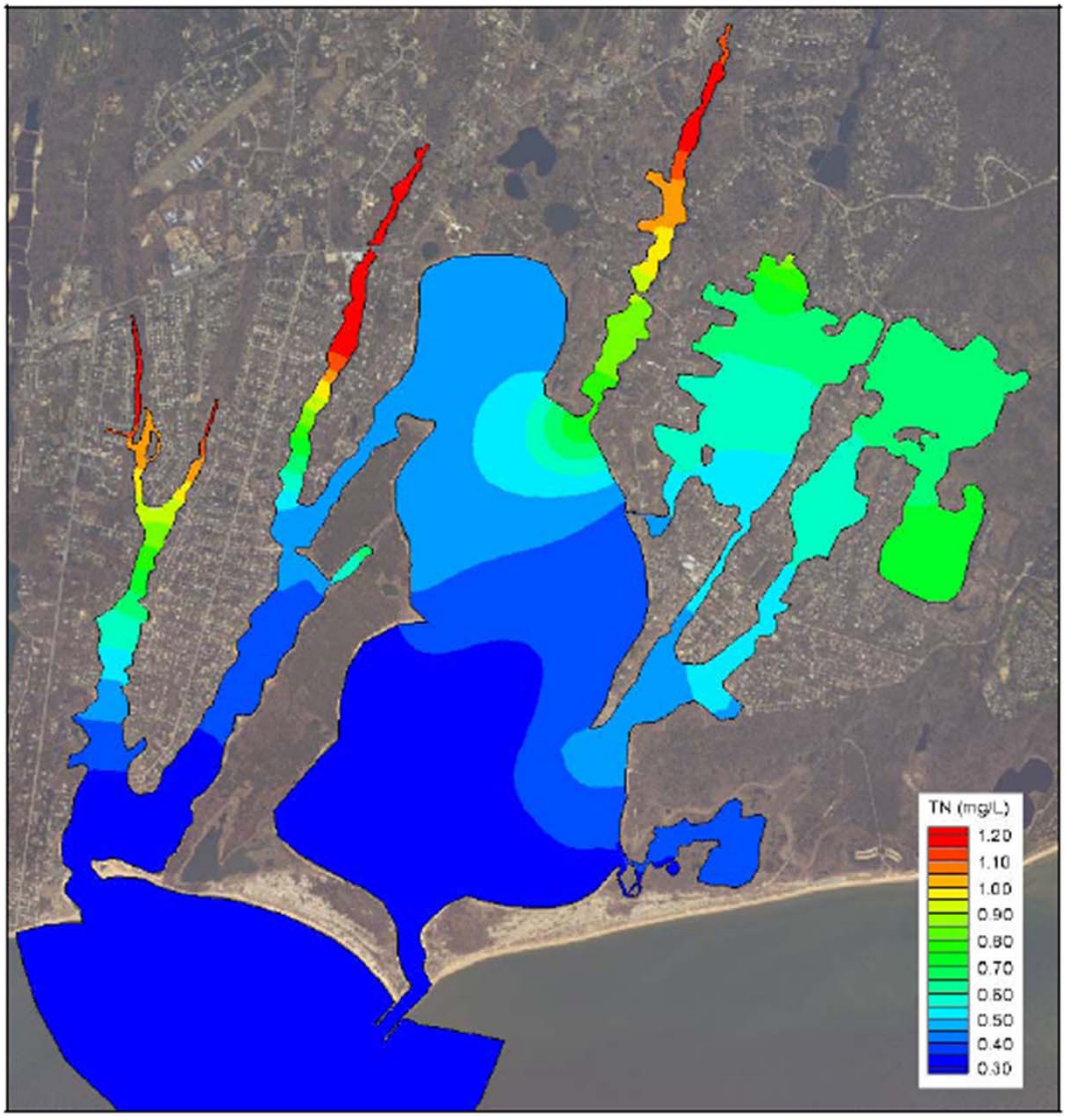
Precolonial Conditions: Waquoit Bay



Contour plots of **average total nitrogen concentrations** from results of the present conditions loading scenario, for the Waquoit Bay system.

(Source: MEP 2012)

Present Conditions: Waquoit Bay

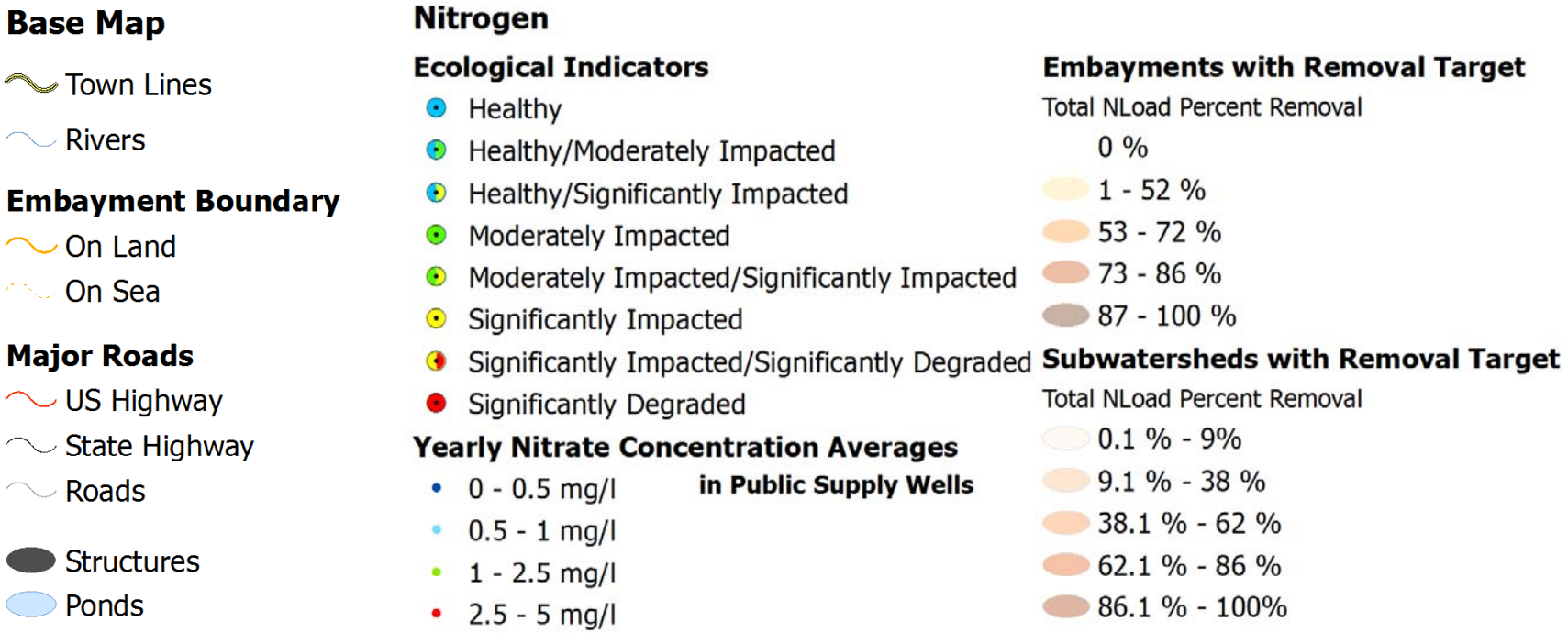


Contour plots of **modeled total nitrogen concentrations (mg/L)** in Waquoit Bay system, for projected build-out loading conditions, and bathymetry.

(Source: MEP 2012)

Buildout Conditions: Waquoit Bay

Nitrogen Problem



Sources: MassGIS, MEP, CCC

Eelgrass Extent

Base Map

Town Lines

Rivers

Embayment Boundary

On Land

On Sea

Major Roads

US Highway

State Highway

Roads

Structures

Ponds

Eelgrass

Eelgrass Extent

Sources: MassGIS

Phosphorus Problem

Base Map

- Town Lines
- Rivers

Embayment Boundary

- On Land
- On Sea

Major Roads

- US Highway
- State Highway
- Roads

- Structures
- Ponds

Phosphorus

Priority Ponds

Trophic Status

- Eutrophic — *Most Impacted*
- Mesotrophic
- Oligotrophic — *Least Impacted*
- Not Interpreted

Sources: MassGIS, MassDOT, CCC

Title 5 Compliance Issues

Base Map

- Town Lines
- Rivers

Embayment Boundary

- On Land
- On Sea

Major Roads

- US Highway
- State Highway
- Roads

- Structures
- Ponds

Existing Conditions

- Approx. Locations of Loans Issued for Title 5 Repair
- Potential Title 5 Compliance Issues
- Wastewater Treatment Facility
- Groundwater Discharge Points
- Sewered Parcels

Sources: MassGIS, MassDOT, MassDEP, Barnstable County Community Septic Loan Program, CCC

Existing & Proposed Solutions

Popponesset Bay
Waquoit Bay

Existing Infrastructure

Base Map

- Town Lines
- Rivers

Embayment Boundary

- On Land
- On Sea

Major Roads

- US Highway
- State Highway
- Roads

- Structures
- Ponds

Existing Conditions

- Approx. Locations of Loans Issued for Title 5 Repair
- Potential Title 5 Compliance Issues
- Wastewater Treatment Facility
- Groundwater Discharge Points
- Sewered Parcels

Enhanced Attenuation Sites

- Pipe
- Stormwater

Public Supply Wells

- Public Water Supply Well
- Small Volume Wells, Non-Transient
- Proposed Public Water Supply Well
- Surface Water Supply
- Small Volume Wells, Transient

Sources: MassGIS, MassDOT, MassDEP, Barnstable County Community Septic Loan Program, CCC

Proposed Infrastructure

Base Map

Town Lines

Rivers

Embayment Boundary

On Land

On Sea

Major Roads

US Highway

State Highway

Roads

Structures

Ponds

Proposed Conditions

Natural Attenuation Sites

Bridge

Culvert

Inlet

Pipe

Sewer Alternatives

Stormwater

CWMP Sewershed Phasing

No Date Set

Phase Date

2001 - 2010

2011 - 2020

2021 - 2030

2031 - 2040

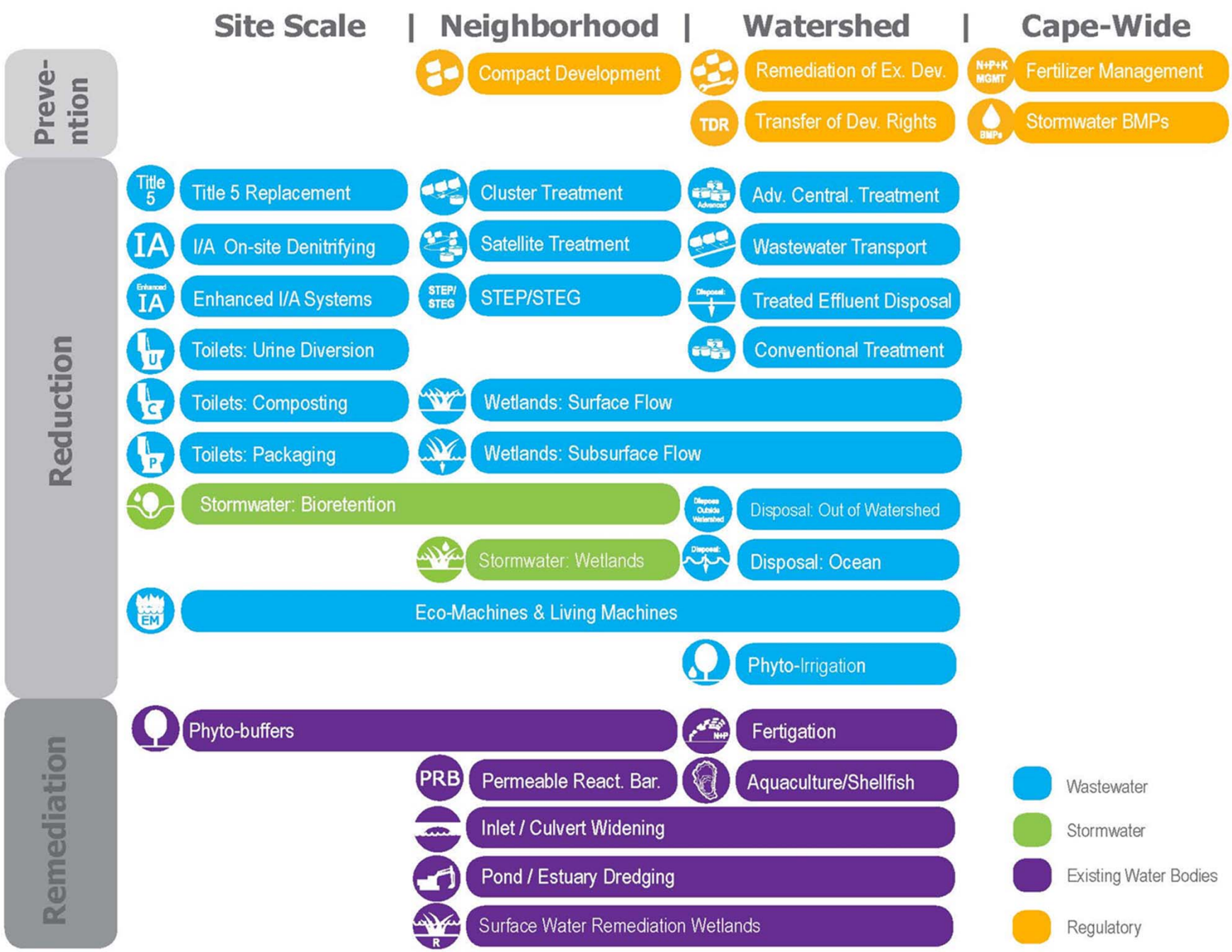
2041 - 2050

Sources: MassGIS, MassDOT, CCC

Framework for Addressing Solutions Moving Forward

Popponesset Bay
Waquoit Bay

"Watershed Working Group - Waquoit/Popponesset - Workshop 1"




Alternatives: Screening Method
1
2
3
4
5
6
7
Wastewater
Existing Water Bodies
Regulatory
Targets/ Goals
Present Load:
X kg/day
Target:
Y kg/day
Reduction Required:
N kg/day
Composite Target Areas
A. High Nitrogen Reduction Areas
B. Pond Recharge Areas
C. Title 5 Problem Areas
Low Barrier to Implementation
A. Fertilizer Management
B. Stormwater Mitigation
N+P+K MGMT
BMPs
Watershed/Embayment Options
A. Permeable Reactive Barriers
B. Inlet/Culvert Openings
C. Constructed Wetlands
D. Dredging
PRB
R
Alternative On-Site Options
A. Eco-toilets (UD & Compost)
B. I/A Technologies
C. Enhanced I/A Technologies
D. Shared Systems
Title 5
Enhanced IA
IA
C
U
P
Priority Collection/High-Density Areas
A. Greater Than 1 Dwelling Unit/acre
B. Village Centers
C. Economic Centers
D. Growth Incentive Zones
Advanced
Disposal:
STEP/ STEG
Supplemental Sewering
Advanced

All materials and resources for the Popponesset Bay and Waquoit Bay Group will be available on the Cape Cod Commission website:

http://watersheds.capecodcommission.org/index.php/watersheds/upper-cape/waquoit-popponesset

Popponesset Bay
Waquoit Bay

Cape Cod 208 Area Water Quality Planning
Popponesset Bay and Waquoit Bay Watershed Working Group

Meeting One
Wednesday, September 25, 2013
Mashpee Town Hall, 16 Great Neck Road North, Mashpee, MA

DRAFT SUMMARY NOTES

ACTION ITEMS

Working Group Members

- Working group members should follow up with Ms. Patty Daley or other Cape Cod Commission staff if they have any further additions or comments about the chronologies. Participants expressed particular interest in adding some milestones related to the phosphorus issue.
- The Cape Cod Commission welcomes any data local groups have on phosphorus in local ponds and freshwater bodies. If local groups want to collect data on new ponds, this would be helpful to the Commission and region.
- Working group members can contact Ms. Daley or other Cape Cod Commission staff if they would like to arrange a presentation on affordability and financial matters l for their groups or people in their area.

Cape Cod Commission

- Update chronologies for Barnstable, Falmouth, Mashpee, and Sandwich to reflect suggested changes.
- Make GIS data available as soon as the first round of meetings is completed.
- Make sure that all presentations, diagrams, and information on working groups and advisory committees is available online.
- Check with towns to see what their local build-out projections are, as well as what the related assumptions are, and incorporate these into the CCC's build-out numbers where possible and reasonable.
- Fix the typo on the pie chart of nitrogen sources for Waquoit Bay. One section says 2% but should say 12%.
- Contact the Waquoit Bay Reserve to get eelgrass data from a Reserve survey last summer. One participant also said that Brian Howes has good eelgrass data that can be shared with the CCC.
- Tom Fudala from Mashpee saw a number of potential issues with the Existing Infrastructure GIS data; follow up with him to get more information.
- During the meeting, there was quite a bit of confusion about total maximum daily loads (TMDLs) and reduction targets. The Commission may want to intentionally clarify this for working group members and the general public.
- Move STEP and STEG to the collection part of the technology matrix (from the treatment section). A couple other participants thought there were some similar issues. The CCC may want to run the matrix by participants in advance of the next meeting to collect this additional feedback.

WELCOME AND INTRODUCTIONS

Ms. Patty Daley from the Cape Cod Commission (CCC) opened the meeting with a welcome. The meeting facilitator, Mr. Doug Thompson from the Consensus Building Institute, introduced himself and explained that his goal as the facilitator of the meeting was to make the discussion process easier. All of the representatives around the table and the public attendees introduced themselves and explained their interest in the issue (see Appendix A).

REVIEW OF GOALS AND PROCESS

The stated goal of the meeting was: "To review and develop shared understanding of the characteristics of these watersheds, the work done to date, existing data and information available, and how to apply all of this to planning for water quality improvements for these watersheds moving forward."

Ms. Daley explained the 208 planning process. The Commission was directed by the state to update the section 208 plan, which has not been updated since it was created in 1978. This update will focus on the "21st century problems," with a focus on nitrogen loads in saline waters, phosphorus loads in fresh waters, and related water quality issues. The Commonwealth has provided $3 million to fund this process, which will involve a 3-year planning effort. The intent is to produce a plan in the first year in order to help secure federal and state funds to support the effort going forward.

Ms. Daley noted that there are 105 watersheds on Cape Cod and 57 embayments. She said that the Massachusetts Estuaries Project (MEP) has found that almost all of the Cape embayments for which it has studies require nitrogen removal. She explained that in light of the fact that these watersheds and embayments cross town lines, this a regional issue. Ms. Daley explained that the goal of the 208 Update Process is to generate a series of approaches in each watershed that will meet water quality standards. The process is watershed-based, includes a focus on both stakeholder engagement and technical work, seeks to maximize the benefits of local planning, and favors allowing local stakeholders to decide which of a range of options to pursue instead of mandating a single "optimal" solution. Ms. Daley noted that the 208 Update Planning Process is occurring simultaneously in 11 subgroups across the Cape, one of which is the Popponesset Bay and Waquoit Bay Watershed Working Group.

Ms. Daley reviewed the timeline of the 208 planning process. Public meetings were held in July and August, and the Watershed Working Groups will meet three times: once in September (the current meeting), once in October, and once in early December. The September (current) meetings are focused on discussing baseline conditions; the October meetings will focus on technology options; and the December meetings will focus on reviewing different scenarios for the local watersheds covered by each Working Group. The efforts of each Working Group will be supported by:

- An Advisory Board of six people who provide ongoing feedback to the CCC;
- A Regulatory, Legal and Institutional Work Group, which provides legal and regulatory input;
- A Technical Advisory Committee of the Cape Cod Water Protection Collaborative, which will provide input on the potential technologies;

- Technology Panel of experts throughout the country who will be giving high-level review of possible technologies.

Comments and Questions from Attendees

- A member of the public wanted to know who was on these boards and groups. Ms. Daley said these boards, their members, and their function are listed on the CCC website.

LOCAL PROGRESS TO DATE

Ms. Daley provided an overview of efforts made across the Cape, and in the municipalities of Barnstable, Falmouth, Mashpee, and Sandwich to address water pollutants.

The study group members and observers were then encouraged to review printed chronologies of what the towns of Barnstable, Falmouth, Mashpee, and Sandwich have done to protect the watersheds in the area over the last couple decades. CCC staff asked all attendees to make additions or corrections to the chronologies through use of sticky notes. Ms. Daley asked the working group to reflect on what stood out to them as they reviewed the chronology. She also asked the group to identify some "lessons learned" from the past that should be applied going forward. Before the participants began reviewing the chronologies, Ms. Daley asked for comments and questions.

Comments and Questions from Attendees

- One participant asked whether the participatory process would be done in December, or whether there will be more involvement after that.
    - Ms. Daley responded that there will be more involvement and that Working Group members would likely be asked to come back a fourth time to review the plan.
    - She said there will also be a 120-day public comment period on the draft plan.
- A participant asked whether the plan will be regional and specific to the estuaries or whether it would be "one size fits all."
    - Ms. Daley responded that it will probably be tailored to be site specific.
- A participant asked Ms. Daley to discuss the cost and affordability of implementation of the plan.
    - Ms. Daley responded that affordability is uppermost in the CCC's thoughts. As an example of this, she explained that on the technology matrix the CCC has put together (discussed later in the meeting), there is information about where these technologies are appropriate and what the costs are likely to be.
- A participant asked whether the CCC would be willing to present about the planning process and related technologies for other groups. He also asked whether the CCC could tailor the presentation to talk about issues and technologies that are most relevant to each site.
    - Ms. Daley said that the CCC would be more than happy to come out to talk to folks and could probably tailor the material presented to be appropriate for the site.

Attendees were given approximately 15 minutes to review the chronologies and to make suggested changes or additions on sticky notes. Everyone reviewed the printed timelines and posted their suggested changes and additions. There were a number of notes on all but Sandwich timelines; there was no one from Sandwich in attendance.

The group then reconvened and the facilitator, Mr. Thompson, asked for people's comments and thoughts on the chronologies.

Comments and questions from the attendees:

- One participant noted that there was a shift in the Barnstable timeline from a focus on pathogens prior to 1990 to more attention on nitrogen issues after that point. She said that Title 5 has taken care of most of the pathogen issues, and have now shifted into an era of new problems. She noted that we are dealing with different problems than we were in 1978. We didn't even know about the nitrogen problem then.
    - Another participant noted that the first time he became aware of the nitrogen problem was in the 1980s.
- A participant noted that phosphorus is a major problem in freshwater systems and asked whether people should be commenting on this issue as well.
    - Ms. Daley replied yes.
    - People indicated that they may have more to add to the chronologies about the phosphorus issue.
    - Ms. Daley indicated that people can email her directly with their additional comments about and suggested additions to the chronology.
    - One participant noted that the chronologies missed the shellfish overlay district and that the CCC may want to add the land acquisition efforts in that area to the chronologies.
- A participant asked for reasons to believe that the outcome of this process will be different from past attempts to deal with wastewater issues on the Cape.
    - Ms. Daley responded by saying that the process is centered around a lot of stakeholder engagement and public outreach with the intent of engaging people as a whole and getting widespread buy-in. There will also be a heavy focus on affordability and financing, which the CCC thinks will generate widespread interest and support as well.
    - Another participant mentioned that there is another reason to think this process will be more effective than past attempts to address the water quality issue: that fact the water quality issues are affecting economic viability on the Cape. Back in 1978, she said, nitrogen and phosphorus loading wasn't affecting people the way it is now. As a result, people believe the experts more now than they did before.
- One participant said that something people in the region need to think about now is that there will be another 30-40 years of lag time affects as nitrogen moves through the soil and water system. He thinks that things like oysters will be necessary to deal with water quality issues that will occur for the next couple of decades regardless of whether nitrogen and phosphorus inputs are reduced today. He expressed concern about investing all of the region's resources in sewering Mashpee but not addressing effects in the Bay, as there will be ongoing problems due to the nitrogen already in the ecosystem. He thinks that attacking the problem in the Bay and then moving upward would be best.
    - Another participant agreed with this point, but said that Falmouth has a different problem. There are an enormous number of people in the estuary, so Falmouth thought that all they needed to do was to sewer the properties on the estuary. Now they are looking at other options. He said that if they were able to invest $600 million to sewer all of Falmouth, the problem would basically be solved in 10 years.

  - The participant who made the initial comment about the lag time of nitrogen in the ecosystem said he wasn't so sure that sewering Falmouth would address the issue so quickly.
- One participant said that in 1978 the increase in algae due to nitrogen was helping shellfish populations, particularly scallops. Now, there are almost no scallops. They are trying to seed scallops, and he felt that without intervention, there would be no scallops. He thinks there needs to be a balance of science, technology, and nature in dealing with this problem.
- One participant made the comment that he thinks it is important that, before any plan or policy goes to vote, funding for the implementation of the plan or proposal has to be secured. He feels that without this, any effort will not pass the vote and will prove fruitless.
  - In response to this, another participant said that she thinks one of the benefits of this regional approach is the political clout that it could generate. She also said that she has heard stories about disintegrating wastewater infrastructure throughout the U.S. and that there is a huge national problem around wastewater handling. She said she feels this has to be something that the federal government is going to have to throw money at.
    - Ms. Daley replied that most of Massachusetts is on sewer systems, so other places are looking at upgrading. The Cape is looking at putting in something entirely new, which is a different challenge. Additionally, it is a tough political environment for obtaining funding. However, she added, one of the key goals of this planning process is to attract high level financial support.
- In regard to the earlier comment about nitrogen lag time, one participant said his understanding is that there is very little nitrogen more than 10 years away from the Bay.

BASELINE CONDITIONS

Ms. Daley and Shawn Goulet from the Cape Cod Commission presented a number of slides and GIS maps illustrating the water quality challenges the Cape faces as well as some of the data the CCC uses for its modeling and analysis. Working Group members were asked to identify anything they believed was missing from the data, as well as any differences of opinion they had with the CCC's analysis or approach.

Ms. Daley said that the GIS information would be made publically available online as soon as first round of stakeholder meetings is completed.

Natural Features: Ms. Daly explained the GIS data on natural features, including jurisdictional wetlands, vernal pools, two different types of floodplains, and cranberry bogs (many of which were previously wetlands). She stated that one option to consider later is the possible conversion of abandoned bogs to treatment areas.

Managed Surfaces: Ms. Daley explained that managed surfaces layers on the GIS map, which include impervious areas as well as areas that are disturbed and open. Golf course, residential and municipal lawns are also shown to demonstrate managed turf areas that may be appropriate for fertilizer management.

Regulatory Surfaces: Ms. Daley then explained the regulatory surfaces GIS layers. She commented that this region has one of the most impressive open space coverage in the watershed. She also said that the CCC looks at local land use vision maps when making decisions about Development of Regional Impact mitigation requirements and other such policies; Sandwich and Barnstable have land use vision maps, Mashpee and Falmouth do not.

Land Use Change: Ms. Daley discussed the land use change GIS layers. She said that development and growth are the main reasons for the Cape's water quality issues.

- One participant commented that the base was categorized as "commercial" when in reality the area is mostly forest. She asked how this works.
    - Mr. Shawn Goulet clarified that the data is not accurate to the parcel level.
    - Another participant added that this information in not granular enough for developing Comprehensive Wastewater Management Plans (CWMPs)

Density: Ms. Daley explained the density GIS layers, explaining these show the current development density. She added that the CCC wants to use this planning opportunity to talk about the importance of density and build-out. When collecting wastewater, it is reasonably affordable to do collection on parcels that are less than 200 feet apart (calculated via road distance). When parcels are farther apart than that, wastewater collection gets really expensive really quickly. The collection portion of a wastewater management solution can comprise 70% of the cost of the infrastructure.

Density Build-Out: Ms. Daley explained that these layers show projected or potential density. On a parcel basis, the CCC determined how much density could be developed or re-developed. This is based only on what zoning will allow. She noted that the MEP includes build-out numbers in their technical reports.

- One participant commented that the point of thinking about build-out is to say: "What areas would be affordable for collection systems?"
    - Ms. Daley replied that part of the goal in looking at build-out possibilities was to see whether doing wastewater collection at scales other than town collection systems would be more sensible and effective. She said that, assuming sewer systems are put in, 30% growth on the Cape will increase capital costs by 40%.
    - Ms. Daley also noted that nitrogen from all new development has to be taken out as well. She said that if the Cape grows in a more compact footprint, putting in wastewater infrastructure will be less expensive. If growth is more spread out, it will be more expensive to collect wastewater.
- Another participant noted that the CCC's build-out projections are lower than the increase in dwellings predicted in LCPs and CWMPs for most of the areas considered. She asked whether it is possible to adjust CCC's build-out projections to fit with town build-out numbers.
    - Ms. Daley said that the CCC will check in with towns and will try to use local build-outs to adjust their numbers. She said that the CCC will need to know what assumptions were built into town build-out projections.

Demographics: Ms. Daley then discussed the census data for demographics, including age, race, seasonal v. year round residence, and water costs for the towns in the working group area.

- In response to census data saying that the cumulative home value for the area is about $5 billion, a participant asked whether this is the cumulative value for homes or for land (homes plus property).
    - Ms. Daley clarified that this is the total assessed value, so the homes plus properties.

Nitrogen Problem: Ms. Daley proceeded to describe the key challenges facing Cape Cod and the Popponesset Bay and Waquoit Bay subarea with regards to wastewater treatment and water quality. She explained that the MEP provides water quality, nutrient loading, and hydrodynamic information,. With the MEP reports, she said, the Cape will be better able to tailor its efforts for each watershed .

- When showing a pie chart of where nitrogen is coming from in each area, a meeting participant pointed out that the number on the Waquoit Bay pie chart needs to say 12% not 2%. The CCC indicated that it would fix the mistake.
- A participant asked where golf courses fit into this discussion
    - Another participant said that Popponesset golf course recycles its water and perhaps that is why it doesn't show up on the nitrogen source chart.

Mr. Shawn Goulet walked through the nitrogen GIS data. In response to participant confusion about nitrogen reduction targeted and total maximum daily loads (TMDLs), he clarified that MEP published two sets of targets: 1) What percent would you have to remove if you aggregate of all sources (i.e., the total load in an embayment); and 2) percentage of septic load you'd have to remove if you ignore all other inputs. He said this is done for the sub-watershed level.

- Scott Michaud from the CCC said there are a number of ways you can look at reduction targets and that this is something that the group can talk about more.
- A participant mentioned that the EPA has done work on nitrogen loads and reduction targets, and asked whether the Cape will explore using these other sources rather than the MEP information. Other participants said this wouldn't make any sense, because the MEP information is much more granular and specific. Everyone agreed that the MEP data should be used.
- One participant asked a question about where the water quality is seriously damaged and which maps indicate this.
    - The CCC staff responded that this is on the GIS layer with environmental indicators.
- One participant said that there is a need to work on the Child's River, which was shown as highly impacted under future build-out scenarios.

Eelgrass Extent: Cape Cod Commission staff then explained the eelgrass extent GIS data, saying this is based on information from a Massachusetts Department of Environmental Protection (DEP) project.

- One participant said that Brian Howes has really good data on eelgrass.
    - Ms. Daley said that the CCC should follow up on this.
    - Another participant said that the Waquoit Bay National Estuarine Research Reserve did a survey last summer on eelgrass and can provide data.

Phosphorus Problem: Ms. Daley clarified that phosphorus and its impacts on freshwater systems is also a problem. The CCC works with SMAST on this. There are volunteer groups that work on data collection in the ponds.

- One participant asked whether the CCC was open to having new ponds added to the GIS data. She said that a local watershed association wants to collect data on one of the ponds.

- Ms. Daley said absolutely yes.

- Another participant said that water transparency is a key indicator of progress.
  - Mr. Michaud from the CCC said that they are looking at this as an indicator.
- A participant asked why there is so much information for some water bodies and not others.
  - Mr. Michaud explained that a lot of the information on phosphorus in freshwater is driven by local communities and groups that are willing to go out and do the sampling.

Existing Infrastructure: Cape Cod Commission staff explained the existing infrastructure GIS layers.

- Participants identified some potential issues with a couple of the GIS layers and thought a couple things needs to be updated
  - Tom from Mashpee saw a number of issues, the CCC will follow up with him to identify these issues and correct if need be.

Potential Title 5 Compliance Issues: Finally, Ms. Daley displayed a map showing various types of Title 5 compliance issues, including groundwater discharge points, locations of loans issued by the County for Title 5 repairs, and areas with potential Title 5 compliance issues.

- One participant asked whether Barnstable County Title 5 loans could only be used for failed systems.
  - Another participant said that her colleague had been interested in using the loan program for their eco-toilet program and that her understanding based on the experience is that loans were only for failed systems.
  - Another participant said it would be helpful to know where Title 5 loan money is going. She said she thought that this money could perhaps be more effective if invested in broader fixes rather than individual issues.

The group took a short break. When everyone reconvened, Mr. Thompson opened up the floor for questions.

Comments and Questions from Attendees

- One participant said he is concerned about environmental justice. He said he would like more clarity on what adaptive management means and what it might look like, so when he talks to people he knows what to tell them. He's also very concerned about climate change; he said his fear is that climate change effects are going to overwhelm the benefits of nutrient management in terms of effect on ecosystems. He thinks the Cape may need to include effects of climate change when setting expectations for water quality improvement.
- Another participant asked whether TMDLs refer to only the controllable nitrogen or all nitrogen in the system.
  - Mr. Michaud from the CCC said that the objective of TMDLs is to achieve a certain nitrogen concentration in the water quality in the embayment. It is also looking at environmental outcomes, for example if we want to get eelgrass back in a place, the TMDL tries to help with that.
  - The participants said they agreed, but asked for clarification on whether this pertains to the controllable nitrogen or total nitrogen in the system.
  - Mr. Michaud clarified that it relates to the total amount of nitrogen, so human-created nitrogen as well as atmospheric nitrogen, soil releases of nitrogen, etc.

  - Some confusion remained about this issue among the participants. Another participant asked a question along the lines of "If you have to remove 70% of the total nitrogen, does that mean that you need to remove 80-90% of your controllable sources?"
    - Mr. Michaud said that could be the result.
  - NOTE: This discussion underscored there seems to be some confusion about what a TMDL is and what it means, as well as how to interpret reduction targets. This may need more clarification for stakeholders and the public.
- One participant asked another participant the clarifying question: "I think you're saying that "global warming" will make the water quality worse?"
  - To which the other participant said yes and that his understanding is that climate change will also affect a number of things often used as indicators of water quality. There are already signs of this in the Gulf of Maine.
- One participant added the comment that when setting goals for removing nitrogen, it is important to really think about what is controllable. He said the Cape needs to be realistic about what you people can do.

Ms. Daley used this point to segue into a conversation about technical options for addressing nitrogen problem.

NEXT STEPS

Ms. Daley, Cape Cod Commission, provided an overview of what the Working Group will be tackling in coming months. She explained that there are many different technologies and options on the table for the group to consider, and that these range in both the type of approach – preventative efforts using regulatory tools, wastewater and stormwater reduction efforts, and remediation of existing water bodies – and in the scale at which the intervention would take place – at the site-level, neighborhood-level, watershed-level, or Cape-wide. She showed the Working Group a technology matrix the CCC has put together to lay out these technological options. This matrix is currently being vetted and will be officially shared with everyone once it's done.

- In response to this figure, one participant said that this diagram seems to assume that atmospheric nitrogen is fixed and can't be changed. She said that alternative transportation modes might be able to reduce the sources of atmospheric nitrogen.
  - Another participant said that measuring this effect would be really challenging.
  - One participant added that controls on powerplants could help by reducing atmospheric nitrogen at a broad scale. He said maybe things will get better quicker than expected due to these powerplant emission controls.
  - Another participant said that land use can be used to remediate nitrogen loads.

Ms. Daley also laid out a seven-step screening process for consideration of different options, which begins with considering targets and goals for the intervention and proceeds progressively from low-cost / low-barrier options to higher-cost options. Ultimately, the CCC will synthesize input received from the eleven Watershed Working Groups and as important input into creating a regional plan for the Cape that offers a series of options to mix and match after considering environmental and economic factors.

- One participant said the CCC needs to add shellfish to number 4 (watershed/embayment options)

- Ms. Daley noted that the Harvard Graduate School of Design is using the Cape wastewater and 208 planning situation as a case study; they may circle around to evaluating overall sustainability of the plan.
- Another participant commented that the CCC's proposed process assumes that alternative methods are more cost effective than sewering. He does not think it is likely that these alternative methods alone will meet TMDLs.
    - Ms. Daley said this is a good point. She explained that the CCC is considering a traditional engineering approach at the same time as it's considering alternative methods. Meeting TMDLs is critical, she said.
- One participant said that no one is talking about dealing with the nitrogenous "muck" because it isn't cost effective. But the muck isn't going to go away, and the environmental impact of this polluted muck won't go away with sewering.
- One participant said that STEP and STEG need to be moved to the collection section (they are currently in the treatment section) of the matrix. A couple other participants thought that some things are in the wrong place on the figures about alternatives and technological options.
- A participant asked whether the Powerpoint presentations and maps are available.
    - Ms Daley said that the Powerpoints are already online. The GIS data will be online next week.

OPERATING PROTOCOLS

Mr. Thompson, the facilitator, reviewed a draft of the operating protocols for upcoming meetings and asked the group for their feedback. He asked them to indicate their willingness to support these discussion guidelines. He synthesized the guidelines to include: 1) Share the floor and other customary courtesies; 2) Listen to understand before evaluating; 3) Feel free to explore without committing; 4) Keep "Beginners Mind" and let expertise inform not constrain the conversation; 5) Consensus is welcome, but not required; and 6) Seek opportunities for mutual gain. He asked the Working Group for comments.

Final Comments and Questions from Attendees

- One participant said that his interest is in getting shellfish and Waquoit Bay higher on Falmouth's interest list, since it is important to him and Mashpee.
- Another participant said he agrees with that point—he wants to see Waquoit Bay higher up on Falmouth's interests. He is also concerned that the group might be biting off more than three meetings can address.
    - CCC staff explained that this group's work is just a piece of a larger project that many other people in the area are working on.
- Another participant followed up to clarify that the group is not trying to figure out a solution for this area, but rather to make suggestions. He wanted confirmation that the group is not trying to come up with a plan.
    - Ms. Daley said that is correct. She explained that the CCC is working with a big engineering firm to make a plan and that "We want you to inform the process."
- Referring to the makeup of the stakeholder group, one participant asked, "These are the usual suspects. Was that intentional?" She said that the challenge tends to be that it is

always the same people in the room who are agreeing or disagreeing about the same issues. She asked whether there was an attempt to engage the "hair dressers" in this process.
    - Ms. Daley explained that there was an attempt to make the group representative. She said that average citizens who do not have a special interest in the issue tend not to show up.
- One participant said that the timing of the meetings excludes a number of people who are working but would otherwise like to be there.
    - Ms. Daley said that the CCC recognizes this, but also recognized that there is never a perfect time. They chose the best time they could.
- A participant said that he thinks this effort is going to require a huge amount of public outreach. These meetings are putting out data and thoughts that people will never see. He asked: "How can that be overcome?"
    - Ms. Daley said that the CCC is trying an online game as a way to increase awareness and engage the public. The CCC is trying to get this game, which was put together by the Emerson Game Lab, into local schools. However, she said that she recognizes that until this issue goes to vote, it is really hard to get people's attention.
- A participant asked whether there is there any restriction on showing presentations or other materials with other people.
    - Ms. Daley clarified that all presentations and information is public. She also explained that meeting notes will be general (i.e., anonymous) to help participants engage openly and freely.
- Ms. Daley closed the discussion by reminding people that any groups that are interested in having the CCC present on the affordability and financing issue or this process should contact her or someone else at the CCC directly.

Closing Remarks

The facilitator, reminded the group that the upcoming meetings will be on October 30th and December 11th, both will be from 1-5pm, and they will be held at the same location.

Appendix A
Attendance

Name	Affiliation
Representatives	
Diane Lang	Trustees of the Reservations
Jessica Rapp Grasselti	Precinct 7 Representative from Barnstable
Art Tracsek	Town of Barnstable
Chuckie Green	Mashpee Wampanoag Tribe
Alison Leschen	Waquoit Bay National Estuarine Research Reserve
Sia Karplus	Water management committee in Falmouth
Peter Hargraves	Falmouth Associations Concerned with Estuaries and Saltmarshes (FACES)
Rick York	Shellfish Constable, Town of Mashpee
Peter White	Community Organizer
Tom Fudala	Town Planner, Town of Mashpee
Public Attendees	
Tim Lynch	Fisherman
Jane Abbott	Falmouth League of Women's Voters
Win Monro	Falmouth W2MC
David Dow	Sierra Club
David Saad	Barnstable Department of Public Works
Staff	
Patty Daley	Cape Cod Commission
Scott Michaud	Cape Cod Commission
Shawn Goulet	Cape Cod Commission
Maria McCauley	Cape Cod Commission
Doug Thompson	Consensus Building Institute
Danya Rumore	Consensus Building Institute