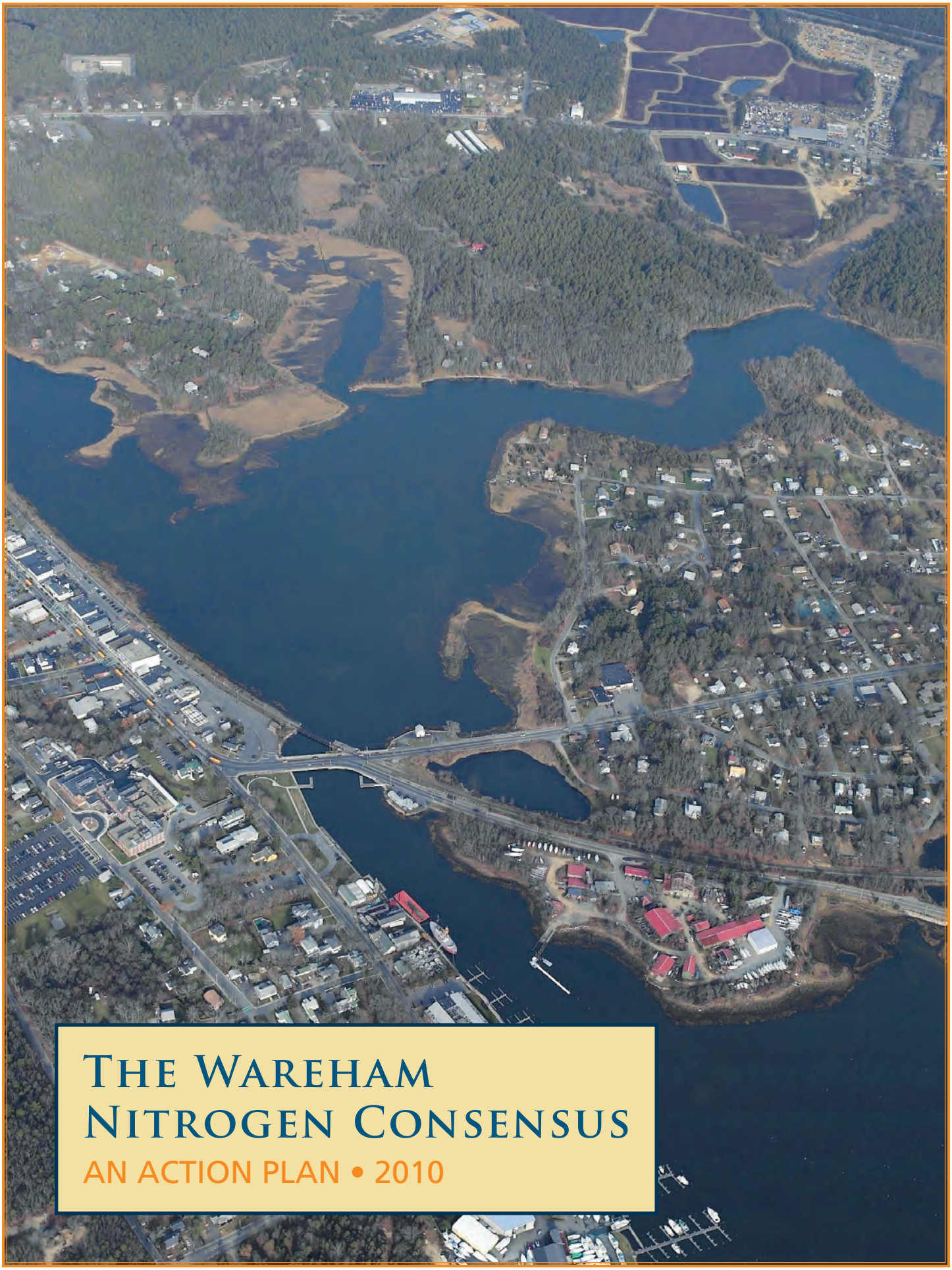

The Wareham Nitrogen Consensus

AN ACTION PLAN • 2010

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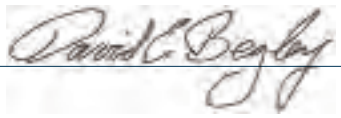
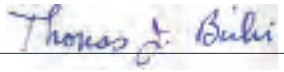
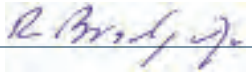
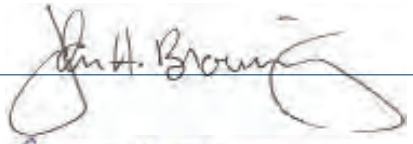
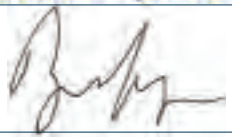
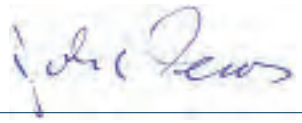
OUR COMMITMENT TO WORK TOGETHER

TO RESTORE WAREHAM'S COASTAL WATERS

We, the undersigned, came together over the winter and spring of 2010 to study the problem of nitrogen pollution in Wareham's waters. As the summary of our work, we agree with the conclusions and encourage proposed actions presented herein. This consensus document is intended to serve as a road map for immediate action. It is by no means the final word on this subject, but rather - we hope - a thoughtful beginning.

Name:	Affiiliation:
	**Mark Aiduk** **Wareham Clean Water Committee**
	**David Begley** **Citizen of Wareham**
	**Thomas Bicki** **Citizen of Wareham**
	**Bob Brady** **Citizen of Wareham**
	**John Browning** **Wareham Land Trust**
	**Daniel Cheever** **Wareham Finance Committee**
	**Barry Cosgrove** **Citizen of Wareham**
	**John Decas** **Cranberry Grower & Shipper**

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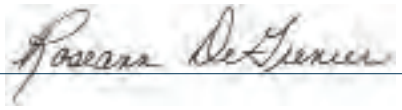
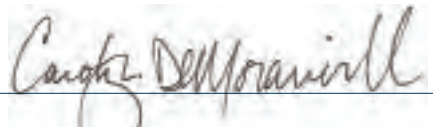
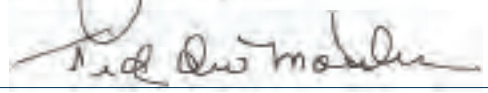
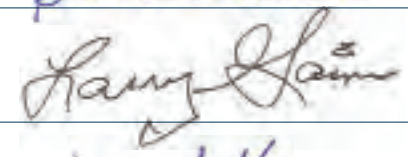
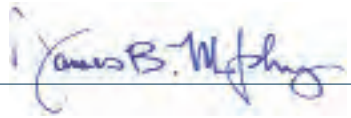
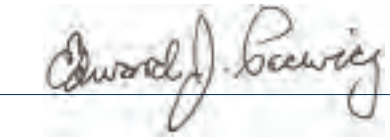
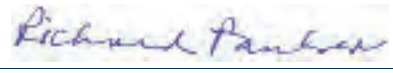
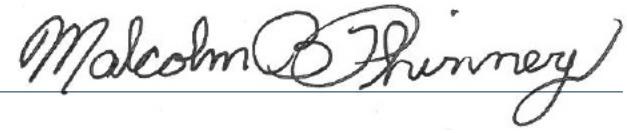
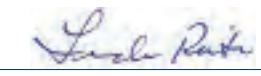
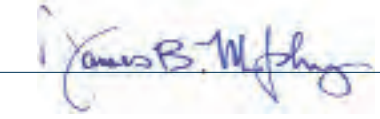
	Roseann DeGrenier Cranberry Grower
	Carolyn DeMoranville Umass Cranberry Station
	Ted duMoulin Citizen of Wareham
	Brenda Eckstrom Wareham Board of Selectmen
	Larry Gaines Citizen of Wareham
	Jeff LaFleur Cape Cod Cranberry Growers' Association
	Keith Mann Cranberry Grower
	James Murphy Blackmore Pond Homeowners Association
	Edward Pacewicz Wareham Clean Water Committee
	Richard Paulsen Wareham Finance Committee
	Malcolm Phinney Citizen of Wareham
	Linda Rinta Cranberry Grower
	James Sullivan White Island Pond Association

EXECUTIVE SUMMARY

The Wareham Nitrogen Consensus Action Plan is the final product from a series of meetings held between December 2009 and June 2010 which brought together a diverse group of Wareham citizens, including cranberry growers, developers, septic installers, scientists, community leaders, and neighborhood groups, to actively think through various local solutions to the nitrogen pollution degrading Wareham's coastal waters..

The group agreed to focus on the two principle sources of nitrogen to Wareham's rivers, harbors and coves: wastewater and cranberry bogs.

The DRAFT Wareham River Massachusetts Estuaries Project (MEP) report served to guide the discussion. While the final report will likely include different values and information, the overall goal of reducing a significant nitrogen load, and preventing new loads to the Wareham River will not change. Advocating for the immediate release of this report and the completion of studies for the Weweantic River were key action items coming out of this process.

With respect to wastewater, it was clear that Wareham must significantly reduce nitrogen from existing Title 5 septic systems as these systems do not remove more than 25% of the nitrogen in wastewater. To do this, the town must follow-through with the planned sewering outlined in the 2002 Comprehensive Wastewater Management Plan (CWMP). The nitrogen load can also be reduced by modifying the Wareham wastewater treatment plant (WWTP) permit to reduce the permitted nitrogen limit from 4 mg/l from April 1 to October 31, to a limit of 3 mg/l from at least March 1 to November 30. Furthermore, all mobile home parks in Wareham must also be brought into compliance with state wastewater regulations. Lastly, the available capacity at the WWTP after the 2002 CWMP priority areas are completed must be determined and any excess capacity must be dedicated to expanded sewering in existing, densely developed neighborhoods close to the Wareham River.

Even if all of these measures are taken, the town may still need to identify new ways of bringing municipal sewer service to up to 1,000 additional homes. Furthermore, it makes little sense to make the investments in expanding sewer service to reduce nitrogen loads from wastewater if town and state regulations allow new residential and commercial growth to add new nitrogen to replace the nitrogen that the town is working so hard to reduce. To do this, all new growth should be built to be "nitrogen-zero" and one way this can be achieved is through nitrogen "offsets" from new growth.

Unlike wastewater, we learned that there is a lack of data which accurately determines the amount of nitrogen that is discharged from cranberry bogs. In order to reduce nitrogen loss from existing cranberry bogs, we must first gather new science to better estimate nitrogen losses from different types of bogs. Once the results of this study are completed, we can better determine the actual nitrogen loadings from cranberry bogs and assign the necessary reduction targets.

The grower community also needs additional technical assistance in the area of improving water management and reducing phosphorus and nitrogen pollution to ponds and coastal waters. Finally, different cranberry bog types and management practices mean that bogs can vary widely in their ability to negatively impact waterways. Initial efforts must be focused on the replacement or conversion of old 'flow-through' bog system, the implementation of sound farm planning, and the modern renovation of bogs.

Beyond dealing with most of Wareham's nitrogen problem through improvements to the management of wastewater and cranberry bogs, other smaller steps should be taken for residential lawns, stormwater control and the protection of riverfront and coastal lands. Further actions include supporting town-sponsored, public education efforts to reduce nitrogen fertilizers used on residential lawns as well as supporting a broad-based education campaign throughout the town.

Wareham Nitrogen Consensus - Action Plan Summary

Phase I (2010-2012)		
Planning/Other	**Wastewater (existing development)**	**Cranberry (existing bogs)**
Advocate for the immediate completion of the Massachusetts Estuaries Project report for the Wareham River System and resolution of errors and outstanding questions in Draft #4 of that document.	Support the completion of all current sewer extension projects planned through 2011. Ensure that all homes in areas with sewer lines get connected.	Launch new multi-agency scientific study to better determine nitrogen loadings from various types of cranberry bogs in both the Wareham and Weweantic River systems. This is critical step to taking further action on bog remediation. Study to commence by Fall 2010.
Engage state and neighboring communities to provide funding support and commence action on the development of a comparable Nitrogen Threshold Report for the Weweantic River System.	Support a new nitrogen permit limit at the Wareham WWTP of 3 mg/l nitrogen concentration from March to November as opposed to its current 4 mg/l April to October limit.	UMass Cranberry Station will hire a dedicated Water Quality Specialist to educate and assist growers in the protection of water quantity and quality.
The Coalition will convene a stakeholder process for the Weweantic River, modeled after the process established here, including representation from all towns within the Weweantic watershed.	Ensure that all mobile home parks in Wareham are brought into compliance with state Groundwater Discharge Permit regulations to reduce N-pollution.	Cranberry growers will work to convert or replace 'flow-through' bogs and accelerate the renovation of all bogs to incorporate BMPs. Secure targeted federal grants of at least $500,000 to provide incentive, match funding for growers to convert or replace 'flow-through' bogs. This will yield approximately $1M in environmental improvements. Top priority will be given to flow-through bogs.
Support the Coalition in their continued and expanded water quality monitoring work and advocate the town to pursue the installation of groundwater monitoring wells and assessment of the data collected.	Request that the town consult with their engineers at CDM to determine exactly how much treatment capacity is at the current WWTP. If capacity exists, support the development of a new, detailed Wastewater Facilities Plan that brings sewer to the greatest number of existing homes within the limits of the existing WWTP (750-900 units). Top priority area should be the nearly 500 homes within and around Gateway Shores.	Urge USDA-NRCS to reach out directly to the owners of cranberry bog acreage not currently under a farm plan to encourage them to develop and implement plans and encourage all growers to follow BMPs.
Support the Planning Board and Conservation Commission to adopt regulations requiring specific recommended practices which will minimize stormwater runoff.	**Wastewater (new development)**	Establish a multi-party collaborative effort to create and review BMPs and other recommendations which address nutrient loading for cranberry bogs to Wareham's coastal waters.
Encourage the prioritization of Community Preservation Funds to acquire forested parcels of land along small streams and coastal areas for permanent protection. They are powerful nitrogen "sinks."	Support the MA DEP in the enforcement of a Nitrogen-Zero standard for all new large developments in town utilizing over 10,000 GPD of wastewater.	
Reconvene every 6 months for the next two years to assess the plan's progress, adjust strategies, and implement interim changes designed to help fix the problem.	Pass new Board of Health and Planning Board regulations to require that all new subdivisions over 10 units and commercial developments generating 3,300 GPD but less than 10,000 GPD be designed to be Nitrogen-Zero.	
	Support the passage of a 'Clean Water Impact Fee' or environmental standards that will achieve the Nitrogen-Zero goal for all new single-family homes, smaller developments of <10 homes and commercial developments generating less than 3,300 GDP on septic systems to achieve the elimination of nitrogen pollution.	
	Support the Board of Health and Municipal Maintenance Dept. in investing in new management, reporting and enforcement systems in order to effectively implement new wastewater improvements for septic systems.	
Phase II (2012-2014)		
Reconvene this Wareham Nitrogen Consensus group in the winter of 2012 to review our progress and make amendments to this Action Plan.	If needed, consider new ways of bringing municipal sewer service to up to 1,000 additional homes including: amending the intermunicipal agreement with Bourne, partner with Bourne on a new wastewater treatment facility, and construction of satellite wastewater treatment plants.	With findings of Bog Loading Study in Phase I, calculate total nitrogen loading from cranberry bogs in Wareham and establish specific reduction targets for the industry.
Launch a town-wide education and recognition campaign on the issue of nitrogen pollution, starting with homeowners to reduce the use of nitrogen lawn fertilizers modeled after the Falmouth Friendly Lawns program.		

Robert Manz

I. The Consensus Process

Recognizing that numerous unsuccessful proposals had been made at Wareham Town Meeting about how the town might manage the nitrogen pollution degrading its coastal waters from septic systems and cranberry bogs, a small group of concerned citizens took the initiative to invite more than 50 other active and outspoken Wareham residents to participate in a series of meetings to actively think through various local solutions to the nitrogen problem. Supported by The Coalition for Buzzards Bay (www.savebuzzardsbay.org), the participants came from diverse backgrounds and various expertise, including cranberry growers, developers, septic installers, scientists, financial minds and environmentalists.

The first of these meetings was held on December 5, 2009 with follow-up meetings held on January 23, 2010, February 20, 2010, March 20, 2010, April 1, 2010 (wastewater only), April 17, 2010, June 16, 2010 (wastewater only), June 29, 2010 (agriculture only) and finally, June 30, 2010. The first meeting included presentations from three experts to provide the group with a baseline of information. Dr. Joseph Costa, from the Buzzards Bay National Estuary Program, presented on the general impacts of nitrogen pollution to our estuaries; Dr. Carolyn DeMoranville, from the UMass Cranberry Station, presented on the use of nitrogen in cranberry production; and Dr. George Heufelder, from the Barnstable County Department of Health and Environment, presented on the performance of nitrogen-reducing septic systems.

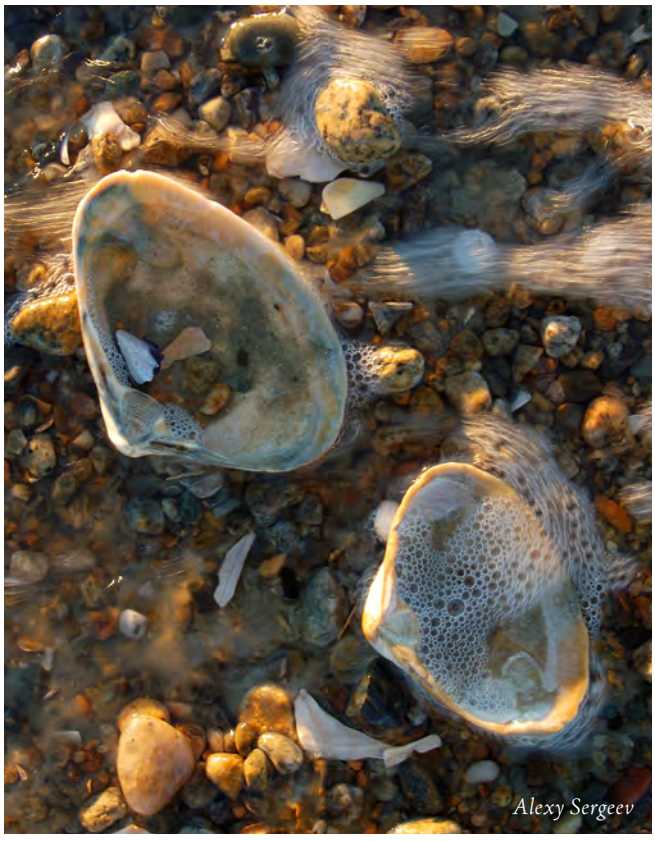
These meetings were facilitated by David Straus, a long time summer resident of Wareham, and the founder of Interaction Associates (www.interactionassociates.com), a firm specializing in getting people together to build consensus around difficult issues. At the initial December meeting it was agreed that the group would focus on the two largest sources of nitrogen in Wareham: wastewater and agriculture. The subsequent meetings included a wastewater subgroup held in the morning and an agriculture subgroup in the afternoon.

II. Importance

The one thing that bound the participants in this 'Wareham Nitrogen Consensus' effort together was their collective belief that each has a direct interest in seeing nitrogen pollution reduced and coastal water quality in Wareham restored. Wareham has over 54 miles of coastline enhanced by beaches, estuaries, rivers, and ponds, and it is critical that we restore clean water in Wareham in order to sustain and protect this valuable resource for future generations.

A. It is clear that the state of our waters requires that we **simultaneously act to reduce nitrogen pollution while also continuing to clarify and seek new information.** We acknowledge that the problem is too serious and large to wait until we have complete data and information.

1. Science is an unending pursuit of knowledge. We recognize that there are questions that still need to be answered, but at this time we have enough information to **begin** moving forward.



Alexy Sergeev

2. Government and regulators must make decisions informed by the best available (existing) scientific information. New developments will continue to be built in Wareham and we must work now, with the local government, to ensure that these developments do not negatively impact Wareham's waters. When additional information is available, we can reevaluate this Action Plan and make any necessary changes that will result in a more effective and efficient solution.

B. Similarly, we believe that **Wareham must act locally first** to control nitrogen pollution. While the watersheds to Wareham's waterways begin in upstream towns such as Rochester, Carver and Plymouth, the majority of the pollution impacting the town's waters originates within the town of Wareham and therefore Wareham must take action first. It is our hope that solutions developed for Wareham can serve as an example and model for other towns to adopt.

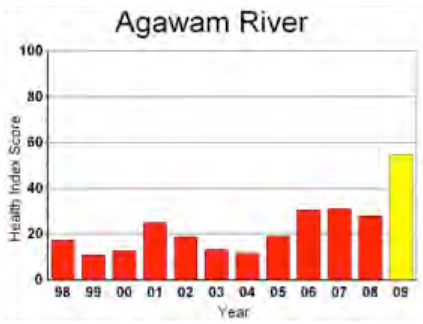
C. While there are substantial tasks required of us in the future, it is important to **recognize and celebrate those steps the town is already taking which will have an important benefit to water quality in Wareham.** The town is pursuing the completion of its 2002 Comprehensive Wastewater Management Plan (CWMP) which includes the sewering of approximately 750 homes within the Wareham River watershed and a major improvement to the wastewater treatment facility which is now discharging at some of the lowest nitrogen levels in all of Buzzards Bay. The data collected by The Coalition shows how the water quality in the Agawam has already begun to improve due to these actions. Furthermore, the town's actions to protect a declining Buttermilk Bay made it a national model in 1988. All of this illustrates Wareham's will and ability to successfully remediate nitrogen pollution.

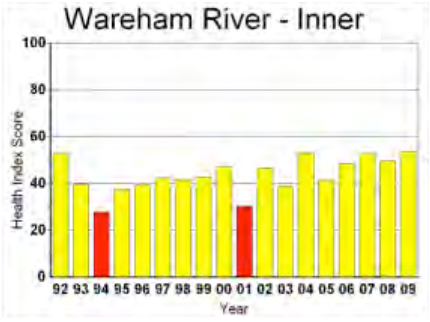
III. Agreement on the Problem

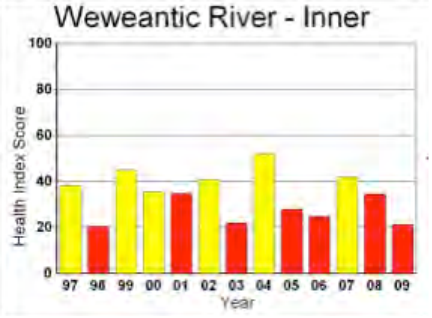
A. Nitrogen Pollution is Harming Wareham's Waters.

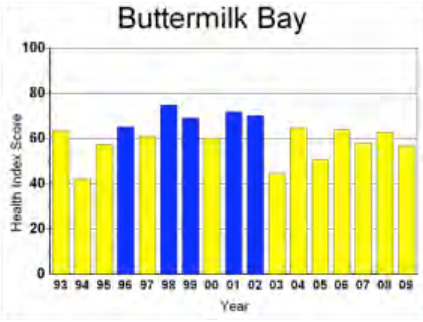
Nitrogen pollution is the greatest long-term threat both to Wareham's waters and the larger Buzzards Bay ecosystem which sustains our region's unique quality of life and economy. Nitrogen is a natural and essential part of all ecosystems, but, in excess, adversely affects water quality and degrades habitat, impacting organisms including fish and shellfish. Similar to over-fertilizing your garden, nitrogen pollution in marine ecosystems stimulates the growth of plants (algae and phytoplankton). These undesirable algae consume oxygen and reduce or eliminate the amount of oxygen in the water suffocating marine life such as Wareham's once-celebrated oyster population. This process of water quality decline creates a chain reaction of negative impacts known as eutrophication.

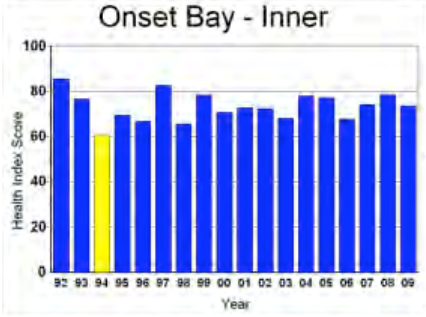
The Coalition's water quality monitoring data show that the Wareham River and the Weweantic River rank among the most impaired in the Buzzards Bay watershed, while Onset Bay and Buttermilk Bay remain relatively healthy. Both the Wareham River and the Weweantic River are also listed by the US EPA and MA DEP as impaired for nutrients on the states "Dirty Waters" 303(d) list, where Onset Bay and Buttermilk Bay are not.

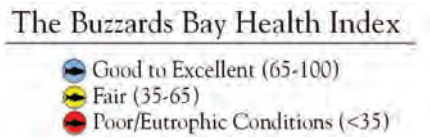












The Bay Health Index measures the nutrient-related health of each of the Bay's major harbors and coves. The index is calculated from the scores of mean summertime water clarity, phytoplankton pigments, organic nitrogen, inorganic nitrogen, and the lowest 20% of dissolved oxygen concentrations. Central Buzzards Bay—which exhibits excellent water quality—would score close to 100 percent on the Health Index. The index provides a simple mechanism for the comparison of sites within and between embayments and allows for a "bay at a glance" picture of conditions throughout Buzzards Bay. Scores in Blue represent good to excellent water quality (scoring 65-100), scores in yellow represent fair water quality (scoring 35-65), and scores in red represent poor/eutrophic water quality (scoring <35). The tables below include the index scores for the mean of the five most recent years and the graphs show the score on an annual basis.

The Coalition has been monitoring the water quality of Wareham's coastal waters since 1992 and the Bay Health Index graphs for each waterbody in Wareham are included in Appendix A.

B. What We Know.

Throughout the consensus process, discussions were based on some information that has been well studied, such as nitrogen loading from septic systems, and some information that has not been as thoroughly studied, such as nitrogen loading from cranberry bogs. Even with the well studied information, there are emerging technologies that have not been completely proven that may eventually play a role in treatment alternatives. Planning is incomplete and will be constantly advancing, but the framework and background information included in this action plan will continue to play an important role as future information is developed. Below is a summary of the information that provided the basis for our discussions.

1. Wastewater:

a. Title 5 Septic Systems:
Properly functioning Title 5 septic systems are the principle cause of nitrogen problems in Buzzards Bay and in Wareham's rivers, harbors and coves. These state-approved systems serve as the traditional solution to household wastewater disposal in areas without centralized sewer treatment plants. While they adequately treat for most types of bacteria, they do not remove more than 25% of the nitrogen in wastewater, resulting in an average concentration of approximately 40 mg/l.

b. Nitrogen Reducing Septic Systems:
Also known as Innovative and Alternative (I/A) systems, these systems add an additional treatment process to a Title 5 system. They are required under Massachusetts regulations to reduce nitrogen from 40 mg/l to 19 mg/l, or, in other words, to achieve 50% nitrogen removal. There are several different types of these systems available. While these systems may be a potential wastewater solution for more rural communities as the state of this technology continues to improve, today, they achieve little additional nitrogen removal for their added cost.

c. Package Wastewater Treatment Facilities:
These systems treat wastewater from more than one home but less than a traditional centralized sewer system and typically serve neighborhoods located far away from centralized sewer. This technology includes a small collection system and small wastewater treatment facility. This technology should be considered as a potential wastewater solution for rural and suburban communities. These systems typically reduce nitrogen from 40 mg/l to under 10 mg/l. Sharing a system can also lower the cost per home.

d. Wastewater Treatment Facility (WWTF):
Centralized sewer plants with nitrogen removal are the traditional wastewater solution for densely developed suburban communities and cities. They consist of a collection system that collects wastewater and conveys it to a wastewater treatment plant designed to remove nitrogen, and a discharge location. This technology typically achieves the best nitrogen removal, reducing nitrogen by more than 90% - from 40 mg/l to as low as 3 mg/l.

The Wareham WWTF has a seasonal (April to October) nitrogen limit of 4 mg/l, and averages a discharge of 3mg/l during that season. In 2009, the average April to October seasonal concentration was 2.04 mg/l, which resulted in an average April to October seasonal load of 3,779.5 pounds. The average off-season concentration (including January through March, November, and December) in 2009 was 11.19 mg/l, which resulted in an average off-season load of 14,632.2 pounds. The Wareham WWTF only has a seasonal nitrogen limit, as opposed to a year round limit, because in the winter the reduced light

and temperature limit how much nitrogen can be used by plants. Instead of boosting plant growth, the unused nitrogen in the winter flushes out of the river and into Buzzards Bay.

2. Cranberry Bogs:

a. Fertilizers used in cranberry production contain nitrogen. Nutrients are needed for sustained production in cranberry systems, and nitrogen, the most important nutrient in cranberry production, has the greatest impact on plant growth and fruit yield. Cranberry production uses water to irrigate and flood cranberry beds for harvest and frost protection. While that water is in contact with the cranberry bog soil, nitrogen can dissolve into the water or be swept along as particles in the water flow, thus entering streams and wetlands as the water leaves the bog.

b. Different types of bogs have different nitrogen loading rates. 'Flow-through' bogs, those bog systems that include a stream flowing directly through the harvested cranberry bog acreage, will release the greatest amount of nitrogen where more modern bog systems that implement practices such as laser leveling, installation of automated irrigation systems, and construction of tailwater recovery ponds and ditches will result in reductions in water use and fertilizer losses.

c. Different cranberry varieties require different amounts of nitrogen. Small-fruited varieties, such as Early Black and Howes, generally require the addition of approximately 20-30 pounds of nitrogen per acre per season. Large-fruited varieties, such as Stevens or Ben Lear, may require more nitrogen, up to 60 pounds of nitrogen per acre per season. While a larger fruit may require more nitrogen, it will also use this nitrogen which is then harvested with the fruit.

C. Our Discussions Were Based on a DRAFT Wareham River Massachusetts Estuaries Project (MEP) Report.

We consulted the June 2009 draft MEP Nitrogen Threshold Report for the Wareham River in the preparation of this Action Plan. The purpose of this report is to scientifically identify the nitrogen target for the Wareham River that the town must achieve in order to reach its water quality goals. Despite a 2004 due date, the town continues to wait for a final version of this report from the MA DEP. We understand that while the final report may contain some different specific values and information, the overall goal of reducing a significant nitrogen load, and preventing new loads, to the Wareham River will not change.

The Wareham River MEP report is currently the only report scheduled for the town of Wareham. It is important that the town also advocate for a Comprehensive Nitrogen Study for the Weweantic River.

D. Assumptions We've Made.

There are several assumptions incorporated into the MEP model that were accepted by the group during the consensus process. Overall, there is much more information with respect to wastewater and septic systems than for cranberry bogs. For the Wareham River the MEP assumes that a septic system contributes 15.25 pounds of nitrogen per year. The report also assumes that the loading rate from fertilizer for residential lawns is 4.70 pounds of nitrogen per acre of lawn. For roads, driveways, and parking lots, the MEP assumes a loading rate of 13.50 pounds per acre of impervious surface and for building roofs, the MEP assumes a loading rate of 6.76 pounds per acre of impervious roof surface. For cranberry bogs, the MEP model assumes an annual net loading rate of 20.46 pounds per acre.

Additionally, discussions were based on the assumption that there is no nitrogen load from the Carver, Marion, Wareham (CMW) Landfill due to its lack of discussion within the MEP report. More information about the landfill is needed and should be fully evaluated as part of the MEP report in order to ensure that the landfill is not a nitrogen source.

E. Each of Wareham's Waters is Unique.

While some of the actions identified in this plan will work throughout Wareham, ultimately each waterbody (Wareham River, Weweantic River, Onset Bay and Buttermilk Bay) and its associated watershed is unique and will require its own specific action plan. As discussed above, at this time we only have a draft report and data for the Wareham River. Both the Wareham River and Weweantic River are listed on the federal Clean Water Act's dirty waters list as impaired for nutrients (including nitrogen), requiring the establishment of federally enforceable limits to ensure that water quality is restored, while Onset Bay and Buttermilk Bay are not. Future phases of this action plan must first address the Weweantic River, and then ultimately look at Onset Bay and Buttermilk Bay.

The Wareham Nitrogen Consensus
AN ACTION PLAN

I. Planning Actions

A. We urgently need the completion and release of the Final Wareham River Massachusetts Estuaries Project (MEP) Report.

In order to take the necessary steps forward in cleaning up the Wareham River Estuary from nitrogen pollution, the town must be provided with the information and results contained in the Massachusetts Estuaries Project (MEP) Nitrogen Threshold Report for the Wareham River. While the scale of the problem is clear, it is critical that a nitrogen target be scientifically established and defensible in order for the town to achieve its water quality goals.

In June 2000, the town of Wareham hired the engineering firm of CDM and Dr. Brian Howes from the University of Massachusetts, Dartmouth, to complete a Water Quality Investigation of the Wareham River Estuary Complex. This information served to support the development of the 2002 Comprehensive Wastewater Management Plan (CWMP) which led to the successful upgrade of the Wareham Wastewater Treatment Plant. The information gathered pursuant to this report was also to be used as baseline information for the Massachusetts Estuaries Project Nitrogen Threshold Report for the Wareham River due in 2004.

Unfortunately, six years later, the town has not received a final draft of this report, and the delay in the receipt of this report has critically handicapped past town efforts in moving forward to reduce nitrogen pollution to the Wareham River. Furthermore, draft versions of the report received by the MA Department of Environmental Protection (DEP) contain a number of significant errors and omissions that need correction. One of the first, and most basic steps needed to reduce nitrogen pollution is the release of this report.

The following list represents the type of information this group has identified which must be addressed in the MEP Report:

1. The town is well on its way to completing its 2002 CWMP which will result in sewer connections for approximately 750 existing homes in the Wareham River watershed. It is clear from draft MEP reports that significant further sewering is needed beyond what the town already has planned in order to reduce the amount of nitrogen impacting the Wareham River from residential septic systems. Understanding the full extent of additional sewer connections that are needed is critical. Therefore, the town must be provided with a nitrogen reduction target in order to begin planning for the next expansion of sewers.

2. In addition to establishing a nitrogen reduction target, the report must identify densely developed neighborhoods within the Wareham River watershed and calculate the wastewater flows based on water use from these neighborhoods to determine how much nitrogen will be removed if these areas were sewered.

3. Draft MEP reports to date do not address whether the SEMASS landfill (also known as the Carver, Marion, Wareham (CMW) Landfill) located on the Wankinco River, was leaching nitrogen into the groundwater and/or into the river. The final report must identify whether nitrogen is leaching from the landfill, if so, how much, and what percentage of the nitrogen in the Wareham River is coming from the landfill.

4. The final MEP report must reconsider the loading rate it has applied to cranberry bogs in past reports. Draft reports have utilized 20.46 pounds of nitrogen per acre to estimate the amount of nitrogen discharged in cranberry production. However, more recent information has indicated that different bogs may discharge nitrogen at very different rates and applying this loading rate may result in inaccurate information. The final MEP report must apply more precise loading rates in order to more accurately define the nitrogen contribution from cranberry bogs in the region.

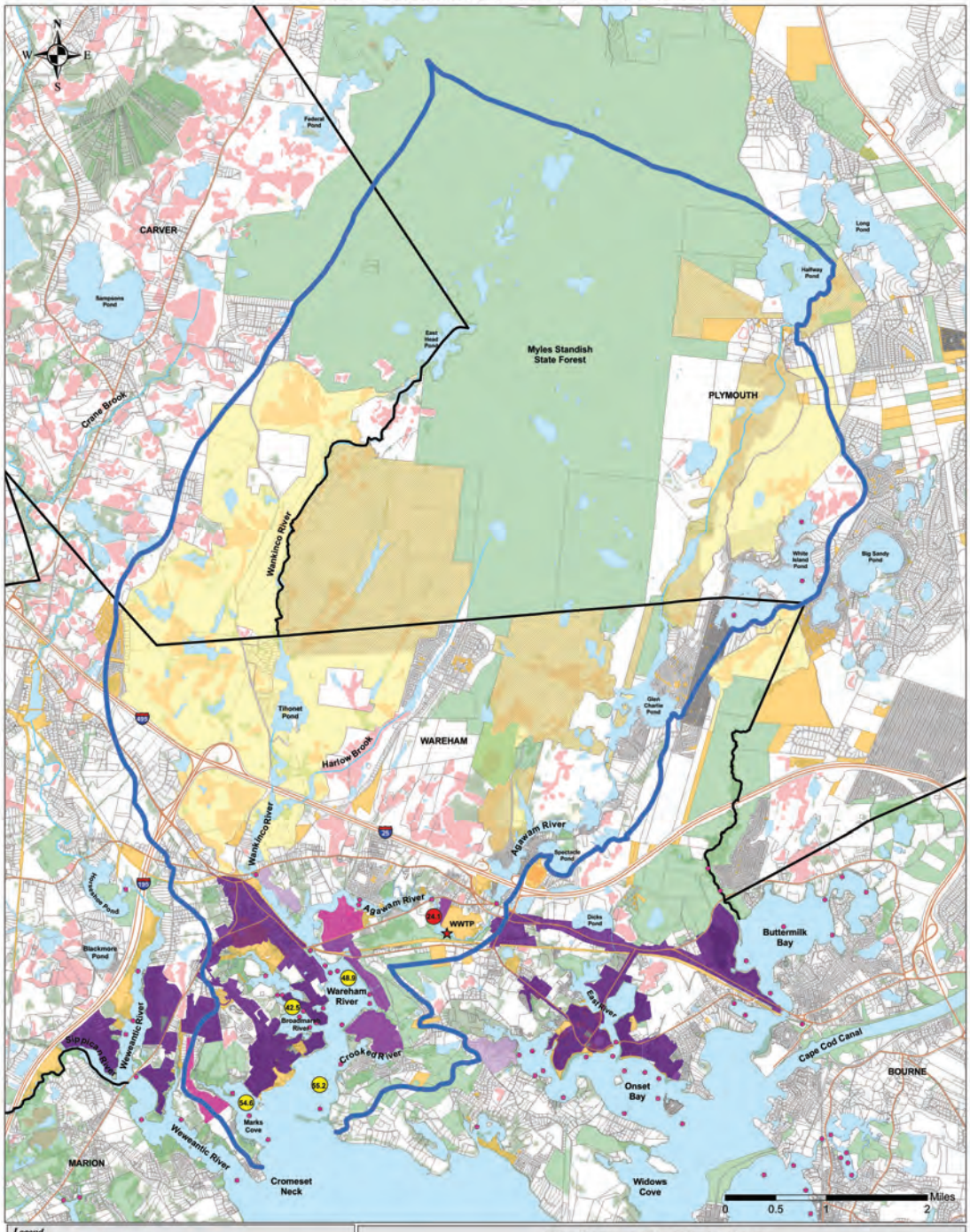
5. Draft MEP reports mischaracterized mobile home park parcel data as having only one single family home and one septic system. In reality, while there may be only one owner of the parcel, several hundred homes may be present. The final report must account for this nitrogen load.

6. While the Nitrogen Consensus Group's focus has been on the Wareham River Estuary, it is clear that the Weweantic River requires the same level of scientific assessment.

THEREFORE, WE AGREE: To encourage town boards to demand that the MA DEP and the University of Massachusetts Dartmouth release the final Wareham River Estuary MEP Report. Furthermore, we shall engage our state legislators and ask them to push to expedite the completion of the Wareham report with accurate and defensible data.

Alexy Sergeev

Wareham River Watershed



Legend

- Wareham River Watershed
- Municipal Boundaries
- Major Rivers/Streams
- Major Roads
- Coalition for Buzzards Bay Sampling Sites
- Wareham Wastewater Treatment Plant Discharge
- Permanently Protected Lands (Undevelopable)
- DFW/A.D. Makepeace Phased Conservation Plan Lands
- Lands Owned by A.D. Makepeace
- Unprotected State & Municipal Lands
- Cranberry Bogs
- DEP Core Wetland Resources
- Waterbodies
- Assessors Parcels

Sewered Areas

- Completed Sewers
- Contract #1 (Expected completion Spring 2010) (249 Estimated Connections)
- Contract #2 (Expected completion Summer 2011) (455 Estimated Connections)
- Contract #3 (Expected completion Summer 2011) (153 Estimated Connections)

Data Source: MassGIS, Buzzards Bay NEP, Towns of Wareham, Carver, Marion, Plymouth.

The Buzzards Bay Health Index

- Good to Excellent (65-100)
- Fair (35-65)
- Poor/Eutrophic Conditions (<35)

The Bay Health Index measures the nutrient-related health of each of the Bay's major harbors and coves. It does not include bacteria monitoring and is not an index of public health safety, swimmability or shellfish status.

The index is calculated from the scores of mean summertime water clarity, phytoplankton pigments, organic nitrogen, inorganic nitrogen and the lowest 20% of dissolved oxygen concentrations.

The Coalition For Buzzards Bay Water Quality Monitoring Program "Eutrophication" Health Index

Embayment	Mean of 5 most recent years data index scores 2001	2002	2003	2004	2005	2006	2007	2008
Agawam River	16.5	17.0	16.1	16.3	17.6	18.7	21.1	24.1
Wareham River, Inner	40.8	41.6	41.1	43.1	42.0	45.6	46.8	48.9
Wareham River, Outer	47.1	47.0	47.4	48.8	48.4	53.4	55.7	55.2
Marks Cove	43.9	51.5	48.9	49.7	51.0	53.4	52.7	54.6
Broadmarsh River	50.9	50.7	51.5	50.2	43.8	44.3	41.4	42.5

The Coalition for Buzzards Bay

Map prepared by: Buzzards Bay National Estuary Program , 2870 Cranberry Highway, East Wareham, MA 02538 www.buzzardsbay.org. January 20, 2010.

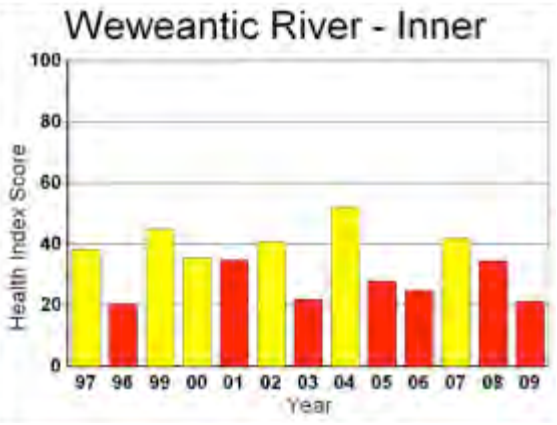
B. The Weweantic River Demands Our Attention Next

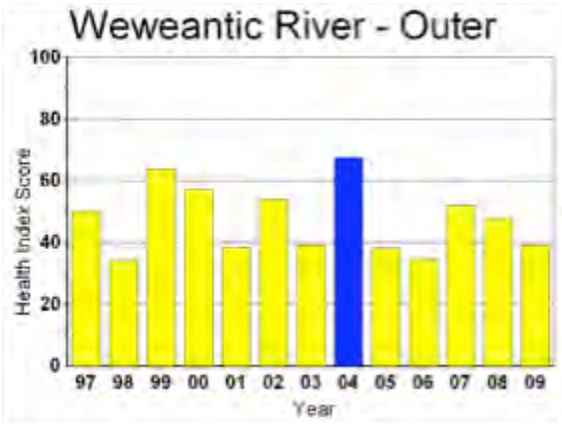
The Wareham River estuary received most of our focus as it is the most impaired waterbody in the town of Wareham and we have a substantial amount of information on which we can support our actions. However, our efforts cannot end here. As water quality in Onset and Buttermilk Bay continue to maintain fair to healthy levels, the Weweantic River demands our attention next as it is nearly as polluted as the Wareham River and has the largest sub-watershed to Buzzards Bay.

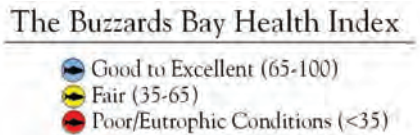
1. Statement of Facts about the Weweantic River.

   The Weweantic River flows from Middleborough and Carver to Wareham, where it joins the Sippican River and empties into Buzzards Bay between Cromeset Neck and Great Hill Point. Together, the Weweantic and Sippican Rivers comprise the largest watershed in the entire Buzzards Bay basin, which is distributed among six towns – Carver, Marion, Mattapoisett, Middleborough, Rochester and Wareham – and is home to nearly 10,000 households. The Weweantic watershed also has more cranberry bogs than any other coastal watershed in Massachusetts.

   Unfortunately, this important river system also suffers from nitrogen pollution and the impacts are well documented in Wareham's waters. The Coalition for Buzzards Bay's water quality monitoring data shows that the upper Weweantic River estuary is among the most nitrogen-polluted of all Buzzards Bay waterways. In fact, the water quality within the river has reached such poor levels that it is federally-listed as one of the state's most polluted waters for nitrogen. Documented eelgrass loss in tidal portions of the river, increasing

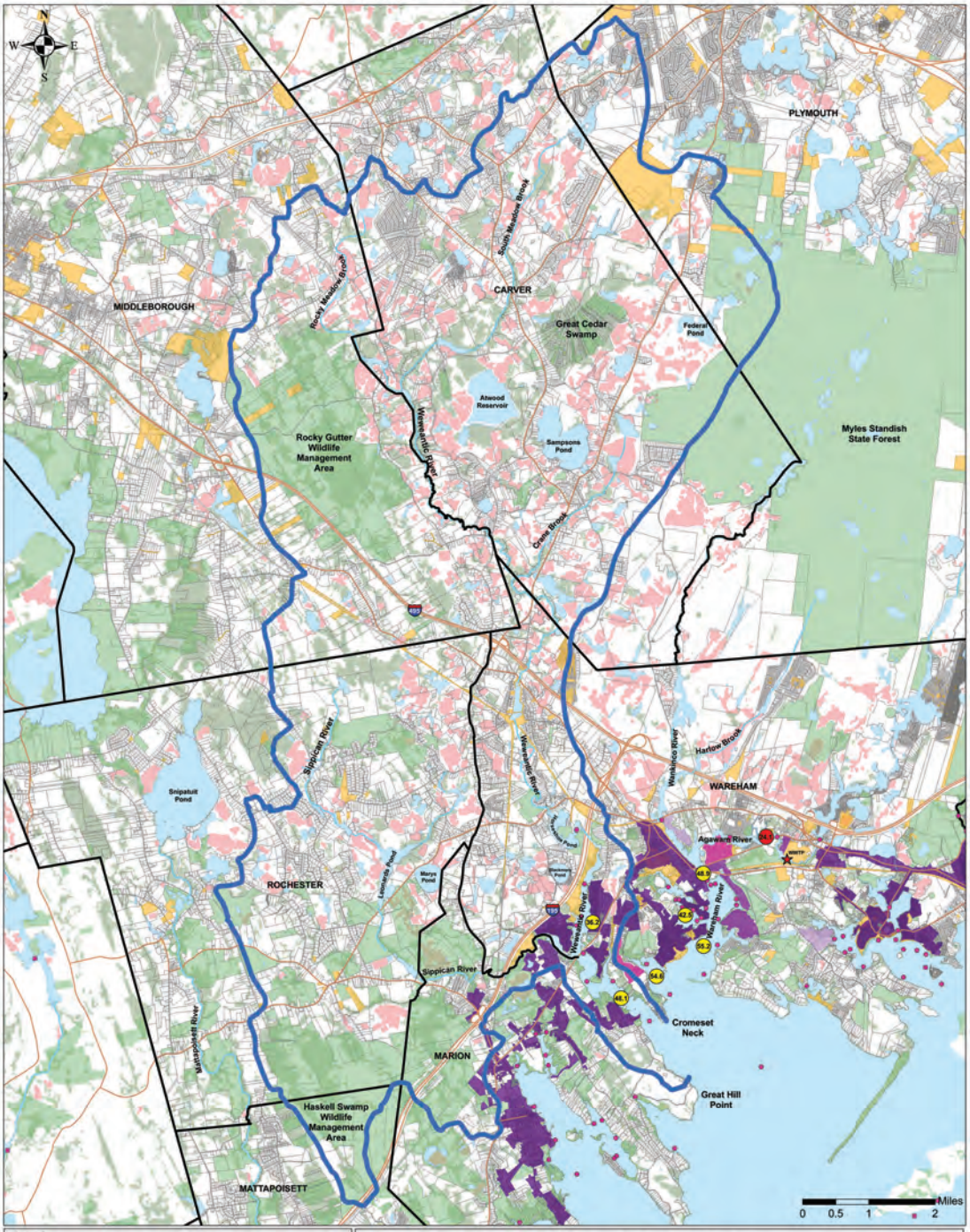






The Bay Health Index measures the nutrient-related health of each of the Bay's major harbors and coves. The index is calculated from the scores of mean summertime water clarity, phytoplankton pigments, organic nitrogen, inorganic nitrogen, and the lowest 20% of dissolved oxygen concentrations. Central Buzzards Bay—which exhibits excellent water quality—would score close to 100 percent on the Health Index. The index provides a simple mechanism for the comparison of sites within and between embayments and allows for a "bay at a glance" picture of conditions throughout Buzzards Bay. Scores in Blue represent good to excellent water quality (scoring 65-100), scores in yellow represent fair water quality (scoring 35-65), and scores in red represent poor/eutrophic water quality (scoring <35). The tables below include the index scores for the mean of the five most recent years and the graphs show the score on an annual basis.

Weweantic River Watershed



Legend

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The Coalition For Buzzards Bay Water Quality Monitoring Program "Eutrophication" Health Index

Embayment	Mean of 5 most recent years data index scores 2001	2002	2003	2004	2005	2006	2007	2008
		=		=	=	=	=	=
Weweantic River, Inner	34.7	35.2	35.5	37.0	35.5	33.5	33.7	36.2
Weweantic River, Outer	48.7	49.5	50.5	51.2	47.4	46.6	46.7	48.1

The Coalition for Buzzards Bay

Map prepared by: Buzzards Bay National Estuary Program , 2870 Cranberry Highway, East Wareham, MA 02538 www.buzzardsbay.org. January 20, 2010.

algae, and alarmingly low dissolved oxygen levels represent the physical impacts nitrogen pollution has had on the Weweantic River. While Wareham and Marion have the smallest watersheds draining to the Weweantic, the impacts of the pollution are felt most heavily within those town's borders.

2. Action Steps to Save the Weweantic.

   a. Similar to the MEP report for the Wareham River, the town needs a Comprehensive Nitrogen Study for the Weweantic River which accurately estimates current nitrogen loadings, clearly sets a nitrogen reduction target, and allocates reduction targets to the various sources within the watershed. Some data has been collected by UMass Dartmouth as part of the MEP, but the MEP is not funded to do a final report for the Weweantic. In order to complete a final report on the Weweantic we may need to seek funding for the study from all the towns within this watershed. Some funding sources could include Community Preservation Act (CPA) funds.

   b. Clearly, solutions for the Weweantic must be a multi-town collaborative effort between Wareham, Marion, Rochester and Carver. We need a Consensus process like this for the Weweantic in two years.

THEREFORE, WE AGREE: To urge our town officials to engage the state and neighboring communities to immediately fund a Comprehensive Nitrogen Study for the Weweantic River.

THEREFORE, WE AGREE: The Coalition for Buzzards Bay agrees to convene a stakeholder process modeled after the one established here, for the Weweantic River which will include representation from the towns within the watershed. This process will be initiated within two years.

C. Continue and Expand Water Quality Monitoring to Measure Success.

In order to monitor water quality and whether actions suggested by this Action Plan are resulting in an improvement in water quality, monitoring efforts must be maintained and even expanded. The Coalition currently maintains nearly two dozen monitoring sites in the Wareham River estuary and will look to extend its monitoring to the upstream reaches of the Wareham River. Additionally, we will encourage the town to consider a groundwater monitoring program to collect additional water quality data.

THEREFORE, WE AGREE: To support the Coalition in their continued and expanded water quality monitoring work and to advocate the town to pursue the installation of groundwater monitoring wells and assessment of the data collected.

D. Commitment to Make this an Ongoing Process and Reconvene in 2 Years for Phase II.

Our discussions revealed that while there are steps we can take now to reduce nitrogen pollution to the Wareham River, we have more to learn. Therefore, the actions described in this plan are broken into Phase I actions and Phase II actions. Phase I, which starts now, will require that this group reconvene at regular intervals to ensure progress is being made.

THEREFORE, WE AGREE: This group will reconvene every 6 months for the next two years to assess this plan's progress, adjust strategies, and implement interim changes designed to help fix the problem. The Coalition for Buzzards Bay agrees to organize those meetings.

After two years, more information will be available due to the actions taken as part of Phase I. We hope that the MEP report for the Wareham River will be corrected, finalized and available for use by the town, and that we will have more and better data on nitrogen loss from bogs. Furthermore, additional data from the Coalition's water quality monitoring program will show the impact that expanded sewering in town is having on the Wareham River.

THEREFORE, WE AGREE: This group will reconvene in two years to kick off Phase II of this process to incorporate Phase I findings and implement more comprehensive changes to help fix the problem. The Coalition for Buzzards Bay agrees to serve as coordinator to reconvene this group.

II. Wastewater Actions

A. Significantly Reduce Nitrogen from Existing Wastewater Sources

Drafts of the Massachusetts Estuaries Project (MEP) Report for the Wareham River Estuary estimate that approximately one third of the nitrogen currently flowing to the Wareham River must be eliminated in order to restore the river to its former health. This is calculated by determining the healthy level of nitrogen in the Wareham River which will support eelgrass and shellfish habitat and then measuring how much nitrogen is actually getting to the Wareham River. By subtracting the healthy amount of nitrogen from the amount of nitrogen actually getting to the river we can estimate how much nitrogen must be removed to restore water quality.

In order to reduce nitrogen loading to the Wareham River by a third from all sources, there is a lot of work to be done. The easiest place to secure such dramatic reductions in nitrogen pollution in Wareham is through expansion of municipal sewer service to presently unsewered areas.

On average, a typical 3 bedroom residential septic system adds 15.25 pounds per year of nitrogen to groundwater. In the lower watershed – those areas closest to saltwater – all of this nitrogen is expected to reach and impact the Bay. In the upper watershed, however, only half of the nitrogen discharged from septic systems is estimated to reach the Bay due to "natural attenuation" or uptake of the nitrogen as it emerges from groundwater in small streams and wetlands. Therefore, the greatest "bang for the buck" is to sewer homes in the lower watershed.

If the town relied solely on sewering to achieve the one-third (approximately 31,000 pounds per year) reduction in nitrogen needed to restore water quality in the Wareham River, approximately **2,100 homes would need to be sewered in the lower watershed** (or more if both lower and upper watershed areas were sewered). This is in addition to the 750 homes in the Wareham River watershed presently planned for sewer connections in the town's 2002 Comprehensive Wastewater Management Plan (CWMP).

Capable of significantly reducing nitrogen (to 4 mg/l and less), the recently upgraded Wareham Wastewater Treatment Facility (WWTF) is well suited to remove a large percentage of nitrogen from wastewater flows. However, it remains unclear as to how much capacity the wastewater treatment facility has after the 12 priority sewer areas in the 2002 CWMP are connected.

PHASE I ACTIONS (2010-2012)

1. First, we must finish what we've started.

The Town must follow-through on all its plans to connect the ~750 remaining homes in the Wareham River watershed outlined in the 2002 CWMP. Much of this work has been completed and other areas are presently underway. With many of these dense neighborhoods lying close to the shores of the Wareham River (i.e. Parkwood Beach, Tempest Knob, Oakdale), water quality improvements should be visible in a few years and provide encouragement to residents and town officials that investments in sewering will yield clear benefits.

Meanwhile, we understand that some homes which have sewer lines down their street are not connected. The town needs to identify and connect these homes as soon as possible to realize the true water quality benefits of these new sewer extensions.

THEREFORE, WE AGREE: To support all efforts at Town Meeting and before all Boards and Commissions to finance, design and complete these sewer expansion projects and all associated home connections quickly, and to help ensure that all homes with available sewer lines are connected within one year of homeowner notification.

2. The Wareham WWTF permit should be amended to reduce the permitted nitrogen limit from 4mg/l from April 1 to October 31, to a limit of 3 mg/l from at least March 1 to November 30.

The June 2009 MEP Draft estimates that the WWTF presently discharges ~15,000 pounds per year of nitrogen to the Wareham River under its current seasonal permit limit of 4mg/l between April and October. However, a review of the wastewater treatment plant's discharge indicates that the plant is capable of consistently achieving levels well below 3mg/l. By optimizing the operation of the plant to 3 mg/l and expanding the number of months that it is required to achieve that level, an additional 4,000-5,000 pounds per year of nitrogen reductions could be achieved at very little cost to the town. That is equal to removing the nitrogen load of ~300 homes from the watershed. The WWTF has the mechanical ability and staffing necessary to make this improvement immediately.

THEREFORE, WE AGREE: To gain the support of the Board of Selectmen and Municipal Maintenance Department to advocate before the MA Department of Environmental Protection (DEP) and U.S. Environmental Protection Agency (EPA) that the discharge permit for the Wareham WWTF be amended from a 4 mg/l nitrogen standard from April to October to a 3 mg/l standard from March to November when the permit comes up for renewal (expected in 2013 unless reopened earlier).

3. All mobile home parks in Wareham must be brought into compliance with state wastewater regulations.

All single-ownership residential and commercial developments – such as Wareham's numerous mobile home parks – which produce 10,000 gallons per day (GPD) or more of wastewater flow require a Groundwater Discharge Permit (GWDP) from the MA DEP. Under these rules, the discharge must meet a minimum standard of 10 mg/l nitrogen – a 75% reduction in nitrogen over conventional septic systems. However, because several of the mobile home parks are located within the watersheds to the Wareham and Weweantic River Estuaries, a higher standard of nitrogen treatment should be required.

With approximately 636 residential units located within Wareham's numerous mobile home parks contributing to the nitrogen pollution problem, the construction of new nitrogen-reducing wastewater systems or other corrective measures is needed for these areas in order to yield a large reduction in overall nitrogen reaching our coastal waters.

The table below provides information on package wastewater treatment systems treating a similar number of residential units to Wareham's Mobile Home Parks.

Facility Name	New Silver Beach, Falmouth	West Island, Fairhaven	Tisbury	Provincetown
Date Built	2009	1998	2004	2003
Wastewater Design Flows (GPD)	60,000	100,000	104,000	575,000
Number of Homes	231	366	135 plus commercial	>500
Capital Cost	$8,500,000	$8,900,000	$12,200,000	$35,000,000
O&M Cost (per year)	$151,000	$165,000	$360,000	$780,000
Nitrogen Permit Limit	10 mg/l	7 mg/l	5 mg/l	10 mg/l
Capital Cost per Home	$36, 797	$24,317	Did not calculate due to commercial flow.	$30,638

**The flow and cost information from these plants is available in the April 2010 "Comparison of Costs for Wastewater Management Systems Applicable to Cape Cod" Report prepared by the Barnstable County Wastewater Cost Task Force (available at: http://www.ccwpc.org/images/educ_materials/wwreports/cape_cod_ww_costs--4-10.pdf). Information on the date the plants were built, the number of homes served, and the nitrogen permit limit was obtained by contacting the town directly or in conversations with MA DEP. The capital costs per home were calculated by dividing the capital cost by the number of homes served.*

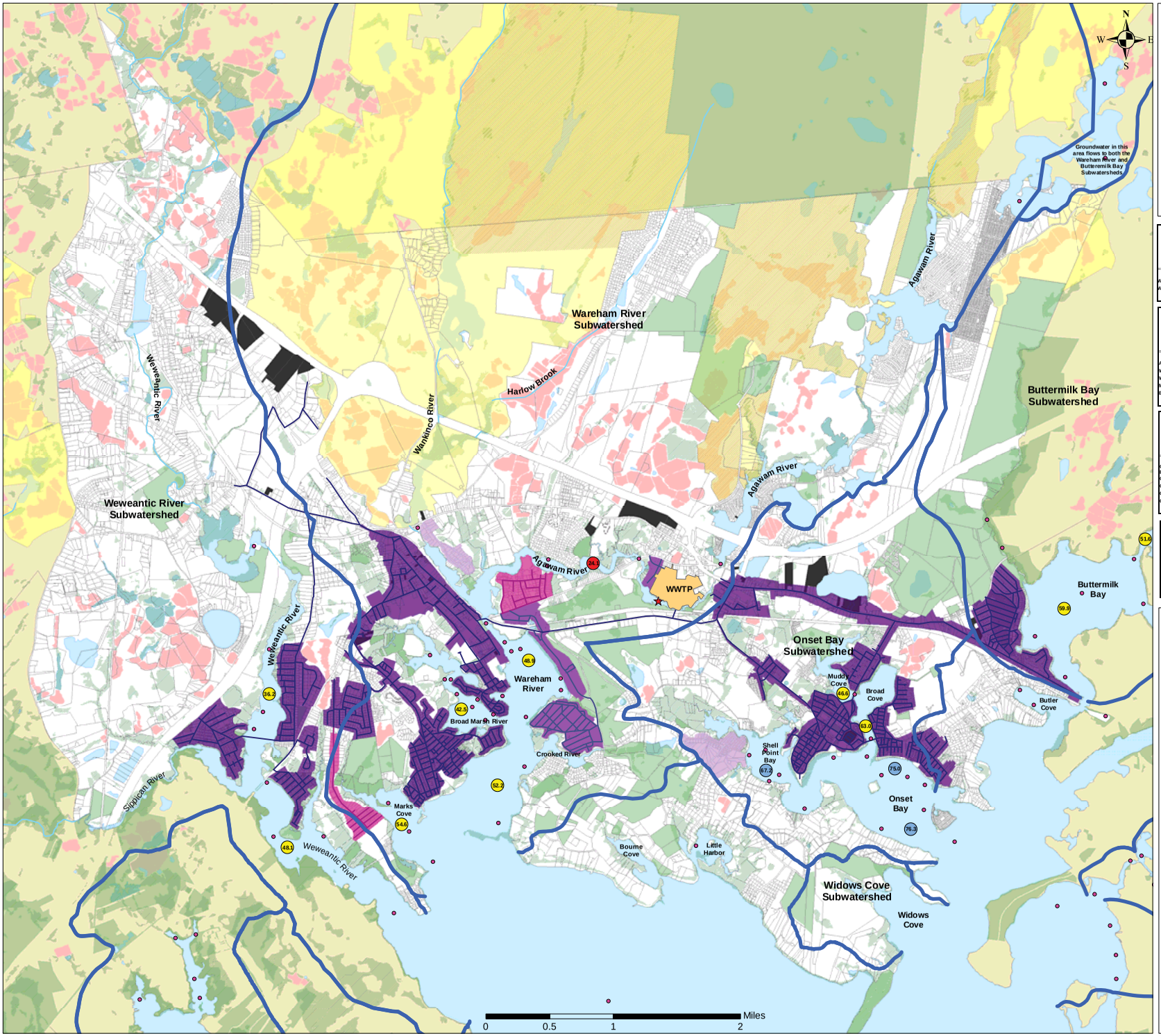
Mobile home parks in need of new wastewater permits (in order of priority) include:

- Garden Homes North and Garden Homes Pines: 144 total units (Top Priority due to its proximity to Agawam River)
- Great Hill Estates: 222 units
- Green Tree Estates: 44 units
- Holly Heights: 44 units
- Royal Crest: 154 units
- Siesta Village: 28 units

Subtotal = ~636 units

THEREFORE, WE AGREE: To urge the Board of Selectmen and Board of Health to encourage action by the MA DEP to ensure that all mobile home parks within the town of Wareham come into compliance with state GWDP rules for wastewater disposal of 10,000 GPD or more and Title 5 compliant (with advanced nitrogen removal) for less than 10,000 GPD. Discharges of 10,000 GPD or more should be required to meet nitrogen reduction limits equivalent to the town's wastewater treatment facility.

Town of Wareham - Subwatersheds and Sewers



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Weweantic River, Outer	48.7	49.5	50.5	51.2	47.4	46.6	46.7	48.1

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The Coalition For Buzzards Bay Water Quality Monitoring Program "Eutrophication" Health Index

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Onset Bay, Broad Muddy Cove	NA	59.8	56.7	50.8	51.2	46.0	46.5	46.6
Onset Bay, East River	59.5	60.9	60.6	63.5	63.4	65.3	64.1	63.0
Onset Bay, Shell Point Bay	65.3	68.2	69.7	71.0	72.8	69.5	67.0	67.2
Onset Bay, Inner	73.9	71.9	72.4	72.3	73.6	72.6	72.9	75.0
Onset Bay, Outer	80.3	78.4	78.3	76.2	77.3	76.6	75.4	76.3

The Coalition For Buzzards Bay Water Quality Monitoring Program "Eutrophication" Health Index

Embayment	Mean of 5 most recent years data index scores 2001	2002	2003	2004	2005	2006	2007	2008
Little Buttermilk Bay	62.8	64.3	60.2	58.1	53.7	54.1	51.5	51.6
Buttermilk Bay	67.3	69.1	63.1	62.2	60.2	58.7	56.2	59.9

Legend

- Subwatersheds
- Major Rivers/Streams
- Coalition for Buzzards Bay Sampling Sites
- Wareham Wastewater Treatment Plant Discharge
- Wareham Wastewater Treatment Plant
- Mobile Home Parks & 3-Family Houses
- Permanently Protected Lands (Undevelopable)
- Lands Owned by A.D. Makepeace
- DFW/A.D. Makepeace Phased Conservation Plan Lands
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- Waterbodies
- DEP Core Wetland Resources
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- Existing Sewer Lines
- Proposed Sewer Lines for Contract #1
- Proposed Sewer Lines for Contract #2

Data Sources: MassGIS, Town of Wareham and Buzzards Bay NEP.

Map prepared by: Buzzards Bay National Estuary Program , 2870 Cranberry Highway, East Wareham, MA 02538 www.buzzardsbay.org. January 20, 2010.

4. The available capacity at the WWTF after the 2002 CWMP priority areas are completed must be determined and any excess capacity must be dedicated to expanded sewering in existing, densely developed neighborhoods.

The greatest nitrogen reductions and cost-effectiveness will be achieved by sewering those densely clustered homes in neighborhoods closest to the Wareham River Estuary. However, in order to understand what options the town has to expand sewers to an additional 2,100 homes, one of the most critical pieces of information is understanding exactly how much capacity is available at the wastewater treatment facility. It has been asserted that while the wastewater treatment plant has a discharge permit limit of 1.56 million gallons per day (MGD), the facility may have capacity to treat a larger flow. However, until we determine what the maximum treatment capacity that can meet a nitrogen limit of 4mg/l (or less) is, we must consider a scenario which fixes capacity at 1.56 MGD in addition to a scenario which assumes a larger treatment capacity.

Based on what we know today about the Wareham WWTF, below are two possible scenarios facing the town:

Scenario 1:

Average Daily Treatment Capacity of Wareham WWTF (which will meet 4mg/l or lower)	1.56 MGD
–Current Average Daily Flow	1.076 MGD (as of February 2010)
Remaining Capacity =	**.484 MGD**
–12 CWMP Priority Areas to be Connected	.193 MGD*
–Bourne Reserved Capacity (unused)	.105 MGD
RECENTLY APPROVED NEW CONNECTIONS	
–Union Pond 40B	.025 MGD
–AD Makepeace – Rosebrook Technology Park	.12 MGD
–AD Makepeace – Rosebrook Place .038 MGD	.038 MGD
Remaining Capacity =	**.111 MGD**

**This estimate was calculated by multiplying build out numbers for the 12 CWMP priority areas (1,739) by 172.5 gallons/home (~.300 MGD) and subtracting the 5 CWMP areas which should already be connected and reflected in current average daily flow. Those areas include: Rose Point, Weweantic Shores, Beaver Dam Estates, Briarwood Beach, and Sunset Island (approximately 621 homes according to the CWMP's present number of residences yielding a flow of ~.107 MGD.) .300 MGD - .107 MGD = .193 MGD.*

If the calculations in the above scenario are valid, after all of the 12 CWMP areas have been completed and all other commitments met, the plant has a capacity of about 111,000 GPD and has capacity to expand sewering to approximately 640 homes. If this is the case, the town still must consider expanding both the wastewater treatment capacity and discharge capacity to accommodate additional sewer connections, or build new wastewater treatment facilities.

Scenario 2:

If the plant's treatment capacity is equal to its peak hydraulic capacity of 2 MGD rather than the 1.56 MGD which is stated in the plant's discharge permit, there may be approximately .551 MGD of excess capacity available.

If Average Daily Treatment Capacity of Wareham WWTF (which can meet 4mg/l)	2.0 MGD
–Current Average Daily Flow	1.076 MGD (as of February 2010)
Remaining Capacity =	**.924 MGD**
–12 CWMP Priority Areas	.193 MGD*
–Bourne Reserved Capacity (unused)	.105 MGD
–Union Pond 40B	.025 MGD
–AD Makepeace – Rosebrook Technology Park	.12 MGD
–AD Makepeace – Rosebrook Place .038 MGD	.038 MGD
Remaining Capacity =	**.551 MGD**

**See foot note to Scenario 1.*

.551 MGD is enough capacity to sewer more than 3,000 additional homes. However, the plant is still limited by how much it can discharge (as opposed to treat) into the Agawam River. It is not likely that the town could increase the discharge from this wastewater treatment plant due to the limitations of the state Ocean Sanctuaries Act which prohibits new and increased discharges of municipal wastewater treatment works to an Ocean Sanctuary (the Wareham River and by extension, the Agawam River, are within an Ocean Sanctuary).

However, it may be possible to apply for a groundwater discharge permit to discharge treated wastewater over the 1.56 MGD. The town of Plymouth's wastewater treatment plant has both a groundwater discharge and an ocean discharge. That same model may be applied here. This would require finding an additional discharge location for the .440 MGD over and above the permit limit of 1.56 MGD.

It is critical that the town not allocate any additional capacity to new projects without first knowing what capacity is available at the wastewater treatment plant. The town's 2002 CWMP states, "It is the understanding of the Board that any other areas requesting or demonstrating a need for sewers could only obtain approval after all of the 12 sewer areas are connected. Other sewer areas would need to be identified in future CWWMP efforts, which would be subject to future MEPA review." CWMP p. 1-11, emphasis added. This statement indicates that any expanded sewering would require a subsequent CWMP. A new CWMP must account for and reserve capacity for future growth.

THEREFORE, WE AGREE: To formally request that the town consult with their engineers at CDM to determine exactly how much treatment capacity is at the current wastewater treatment facility. It is also critical that we ensure that the town cease from approving any additional hookups for new developments while this question remains unanswered and maintain their focus on existing homes which require sewering.

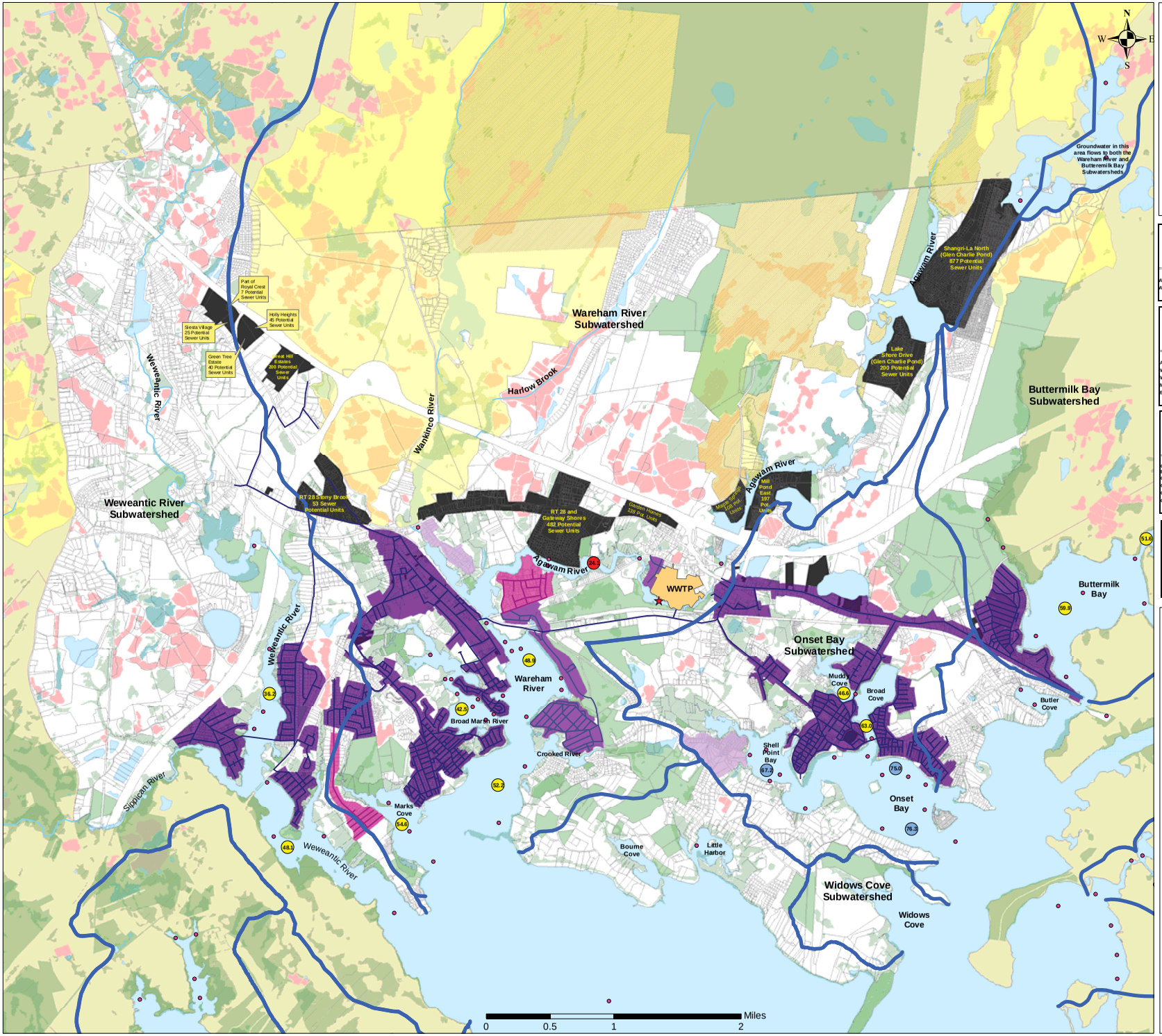
If it is found that capacity exists to expand sewering to current densely developed areas, we will advocate before all relevant town Boards and Commissions for the development of a new, detailed Wastewater Facilities Plan that designs and brings municipal sewer service to the greatest number of existing homes possible within the limits of the existing WWTF and reserves as much as possible of the remaining capacity at the wastewater treatment facility for existing development.

From our review of available sewer network and watershed mapping, the following areas should be prioritized for sewer service connections (listed in order of benefit to the Wareham River):

- Gateway Shores & Route 28: 482 units (top priority due to proximity to Agawam River)
- Route 28 near Stony Brook: 53 units
- Maple Springs East: 197 units
- Maple Springs West: 108 units

Subtotal = 840 units

Town of Wareham - Subwatersheds and Sewers



The Buzzards Bay Health Index

- Good to Excellent (65-100)
- Fair (35-65)
- Poor/Eutrophic Conditions (<35)

The Bay Health Index measures the nutrient-related health of each of the Bay's major harbors and coves. It does not include bacteria monitoring and is not an index of public health safety, swimmability or shellfish status.

The index is calculated from the scores of mean summertime water clarity, phytoplankton pigments, organic nitrogen, inorganic nitrogen and the lowest 20% of dissolved oxygen concentrations.

The Coalition For Buzzards Bay Water Quality Monitoring Program "Eutrophication" Health Index

Mean of 5 most recent years data index scores

Embayment	2001	2002	2003	2004	2005	2006	2007	2008
Weweantic River, Inner	34.7	35.2	35.5	37.0	35.5	33.5	33.7	36.2
Weweantic River, Outer	48.7	49.5	50.5	51.2	47.4	46.6	46.7	48.1

The Coalition For Buzzards Bay Water Quality Monitoring Program "Eutrophication" Health Index

Mean of 5 most recent years data index scores

Embayment	2001	2002	2003	2004	2005	2006	2007	2008
Agawam River	16.5	17.0	16.1	16.3	17.6	18.7	21.1	24.1
Wareham River, Inner	40.8	41.6	41.1	43.1	42.0	45.6	46.8	48.9
Wareham River, Outer	47.1	47.0	47.4	48.8	48.4	53.4	55.7	55.2
Marks Cove	43.9	51.5	48.9	49.7	51.0	53.4	52.7	54.6
Broadmarsh River	50.9	50.7	51.5	50.2	43.8	44.3	41.4	42.5

The Coalition For Buzzards Bay Water Quality Monitoring Program "Eutrophication" Health Index

Mean of 5 most recent years data index scores

Embayment	2001	2002	2003	2004	2005	2006	2007	2008
Onset Bay, Broad Muddy Cove	NA	59.8	56.7	50.8	51.2	46.0	46.5	46.6
Onset Bay, East River	59.5	60.9	60.6	63.5	63.4	65.3	64.1	63.0
Onset Bay, Shell Point Bay	65.3	68.2	69.7	71.0	72.8	69.5	67.0	67.2
Onset Bay, Inner	73.9	71.9	72.4	72.3	73.6	72.6	72.9	75.0
Onset Bay, Outer	80.3	78.4	78.3	76.2	77.3	76.6	75.4	76.3

The Coalition For Buzzards Bay Water Quality Monitoring Program "Eutrophication" Health Index

Mean of 5 most recent years data index scores

Embayment	2001	2002	2003	2004	2005	2006	2007	2008
Little Buttermilk Bay	62.8	64.3	60.2	58.1	53.7	54.1	51.5	51.6
Buttermilk Bay	67.3	69.1	63.1	62.2	60.2	58.7	56.2	59.9

Legend

- Subwatersheds
- Major Rivers/Streams
- Coalition for Buzzards Bay Sampling Sites
- Wareham Wastewater Treatment Plant Discharge
- Wareham Wastewater Treatment Plant
- Densely Populated Areas
- Permanently Protected Lands (Undevelopable)
- Lands Owned by A.D. Makepeace
- DFW/A.D. Makepeace Phased Conservation Plan Lands
- Cranberry Bogs
- Waterbodies
- DEP Core Wetland Resources
- Neighboring Municipalities
- Assessors Parcels

Sewered Areas

- Completed Sewers
- Contract #1 (Expected completion Spring 2010) (249 Estimated Connections)
- Contract #2 (Expected completion Summer 2011) (455 Estimated Connections)
- Contract #3 (Expected completion Summer 2011) (153 Estimated Connections)
- Existing Sewer Lines
- Proposed Sewer Lines for Contract #1
- Proposed Sewer Lines for Contract #2

Data Sources: MassGIS, Town of Wareham and Buzzards Bay NEP.

Map prepared by: Buzzards Bay National Estuary Program , 2870 Cranberry Highway, East Wareham, MA 02538 www.buzzardsbay.org. March 18, 2010.

PHASE II ACTIONS (2012-2014):

5. Beyond the measures discussed in Phase I above, the town may still need to identify new ways of bringing municipal sewer service up to 1,000 additional homes.

Options include:

a. The town should explore the possibility of amending the intermunicipal agreement with the town of Bourne and get back the approximately 105,000 GPD of unused capacity currently contracted to Bourne. This would represent the sewering of more than 600 homes (presently) and potentially > 1,000 homes (if all their allotted capacity was used). The Village of Buzzards Bay imports a lot of nitrogen from outside of the Wareham River watershed. Assisting Bourne in identifying alternative locations for treating and discharging their sewage from this area (i.e. partnership with Mass Maritime Academy) may be cheaper for Wareham than expanding its current plant.

b. The town may also want to consider partnering with the town of Bourne on the construction of a new wastewater treatment plant to take some of Wareham's flow and discharge it in an alternative location.

c. Construction of "Satellite" Municipal Wastewater Service for neighborhoods further away from the current WWTF. It may be more cost-effective to build new, "neighborhood-scale" sewer plant for areas such as Shangri-La (877 units) and Lakeshore Drive (200 units) both of which lie along the Agawam River far north of the existing sewer line. The towns of Fairhaven (West Island, 336 homes) and Falmouth (New Silver Beach, 231 homes) have done this with great success.

THEREFORE, WE AGREE: As part of the development of a new town-wide CWMP, the town should evaluate all of the options discussed above in order to identify the most cost-effective and environmentally-beneficial alternative.

B. All New Growth Must Be Built to be "Nitrogen-Zero"

It makes little sense to make the investment in expanding sewer service to reduce nitrogen loads from wastewater if town and state regulations allow new residential and commercial growth to add new nitrogen to replace the nitrogen that the town is working so hard to reduce. Fortunately, we do not need to halt needed economic growth in order to solve the nitrogen problem.

The A.D. Makepeace Company's 'River Run' development of approximately 1,100 residential and mixed-use units is pointing the way for how all developers can design projects to release "No Net Nitrogen" and even aid in reducing nitrogen loads over pre-development conditions. As part of that development's GWDP, the state has required that the project be Nitrogen-Zero and the Company is working now to comply with that rule. The state has also informed Makepeace that their 'Tihonet Mixed-Use' development will also be required to meet the Nitrogen-Zero standard.

In many ways, however, the fact that the 'River Run' and 'Tihonet' projects are large and multi-dimensional (residential, cranberry, commercial) makes it easier for them to achieve nitrogen zero due to their construction financing, ability to build so much of their own infrastructure, and potential for nitrogen "trading" between sources (ie. eliminate or renovate bog acreage to add more houses). Nevertheless, we must find ways to extend this principle to all new development regardless of size.

1. Large Developments managing their wastewater through state-issued GWDPs must meet Nitrogen-Zero.

These are developments generating greater than 10,000 GPD of wastewater and discharging that wastewater to the ground – like Makepeace's 'River Run' project. Generally, these will be >30 home subdivisions and few developments of this scale are expected in the near future. The MA DEP has made it their policy to require Nitrogen-Zero for developments on GWDPs in coastal watersheds impaired by nitrogen.

THEREFORE, WE AGREE: To closely monitor and support the application by the MA DEP of the 'Nitrogen-Zero' policy for all large developments within the Wareham and Weweantic River watersheds.

2. For Medium-sized Developments of equal to or greater than 10 homes and Commercial Developments generating 3,300 GPD but less than 10,000 GPD and not on a GWDP, new town zoning, subdivision and health regulations will be necessary to enforce the Nitrogen-Zero standard.

These represent the more typical scale of residential development in the town of Wareham and therefore, it is critical that we identify new mechanisms for eliminating new nitrogen pollution from such developments. While new technologies suggest that removal rates could improve in coming years, the use of individual or cluster on-site nitrogen-reducing septic systems will only reduce nitrogen by ~50%. The remaining 50% of nitrogen must be eliminated by other means. And for smaller properties and just new homes construction, on-site options for nitrogen "offsets" are limited making achievement of Nitrogen-Zero more challenging.

THEREFORE, WE AGREE: To engage and support the Wareham Planning and Health Boards in developing new zoning, subdivision and health regulations to require that new developments meet this Nitrogen-Zero standard. This will likely require giving developers the opportunity to offset their nitrogen additions in other parts of town (but within the same watershed) by paying for connection of an equivalent number of homes to the town WWTF or possibly eliminating cranberry acreage or fertilized lawns. So long as the offset is done within the same coastal watershed as the new development, the goal of Nitrogen-Zero can be met. We will work toward presentation of bylaws and regulations related to this goal by Fall 2010 or Spring 2011.

3. For single-family homes and smaller developments of <10 homes and commercial developments of less than 3,300 GPD, the town should consider establishing a "Clean Water Impact Fee" or establish environmental standards which will achieve the Nitrogen-Zero goal.

As a practical matter, it is more difficult for small developments to achieve a Nitrogen-Zero standard. The technology to achieve Nitrogen-Zero on a lot by lot basis does not exist and the options to off-set the nitrogen load from septic systems, lawn fertilizers and impervious surfaces are not available on a small scale. Where a large development might choose to buy and retire cranberry bogs to offset a nitrogen load, a new single-family home may not have that ability. With alternative nitrogen-reducing septic systems adding $10,000-$20,000 to the cost of a standard Title 5 system, requiring $600-$800 per year in ongoing maintenance expenses, and achieving limited and widely varying results in actual nitrogen reductions, these systems may not be the best solution

at this time. Advancements in technology and wider acceptance may improve both performance and cost over time, but today, these systems are simply not there. It may be more cost-effective and better for the environment to take the funds a homeowner may have expended on installing such a system and instead investing those dollars in reducing nitrogen from other sources.

Therefore, the town might consider establishing a "Clean Water Impact Fee" in order to create a fund which could address the added nitrogen from these small developments by pooling resources and achieving offsets in alternative ways on a townwide basis. A summary of how one version of this idea might work is included in this Action Plan as Appendix B.

Alternatively, the town should also consider establishing nitrogen standards for these small developments. Such measures may include requiring a nitrogen reducing septic system that achieves 3mg/l and prohibitions on lawn fertilizers and impervious surfaces. Establishing standards of this type may serve to minimize nitrogen from small developments but will not achieve nitrogen zero.

THEREFORE, WE AGREE: To engage and support the Wareham Board of Health, Wareham Planning Board, and Board of Selectmen as Sewer Commissioners in discussing what standards for small developments should be applied in addition to considering a "Clean Water Impact Fee" program.

4. The Town must invest in new management, reporting and enforcement systems in order to effectively implement these wastewater improvements.

A necessary component of the use of advanced onsite nitrogen reducing systems is a system of tracking that ensures the systems continue to work as designed by close monitoring and follow-up enforcement. The Barnstable County Department of Health and Environment currently uses a web-based database that allows system operators to report results of inspections and sampling data directly via the internet, eliminating the need to send paper reports. The local Boards of Health have access to the database and can log in to receive real time information on systems in their town. This system may serve as a good model for the town of Wareham to develop on a smaller scale.

In order to effectively manage this program, the Board of Health will likely need additional staff, depending on the tracking and reporting system that is chosen.

THEREFORE, WE AGREE: To encourage the town to explore funding opportunities to create and manage a monitoring and enforcement program.


Alexy Sergeev

III. Cranberry Actions

A. Reducing Nitrogen Loss from Existing Cranberry Bogs

PHASE I ACTIONS (2010-2012)

1. New monitoring is needed to better estimate nitrogen losses from bogs.

There is a lack of data which accurately determines the amount of nitrogen that is discharged from cranberry bogs. Only two studies exist in Massachusetts on the subject.

a. A 1995 study by Howes & Teal of one bog in Bourne found Net Nitrogen Losses of 21.24 pounds per acre per year. This is the figure currently being used by the MEP for the Wareham River.

b. A 2005 study of six different bogs over two years by DeMoranville & Howes which was designed only to identify phosphorus dynamics and loading, observed Net Nitrogen Losses to surface waters ranging from 3.7 – 13.5 pounds per acre per year, but did not measure groundwater loading.

We note that the resolution of this question will be critical not just for the Wareham River, but for the development of cleanup plans for the Weweantic River which holds the greatest density of cranberry bogs of any Massachusetts coastal watershed.

THEREFORE, WE AGREE: Cape Cod Cranberry Growers' Association (CCCGA), The Coalition for Buzzards Bay, UMass Cranberry Station, and identified interested parties and scientists will collaborate to find funding, and design a multi-year study to further understand actual nutrient losses from various types of cranberry bogs. The study will include a survey of the quantity of fertilizer applied to bogs which will aid in site selection, determine to what extent bogs leach nutrients to groundwater, and how bogs can be used to maximize nutrient attenuation.

Other partners in this study may include scientists from the Woods Hole Oceanographic Institution (WHOI), the Marine Biological Lab in Woods Hole (MBL), the UMass School for Marine Science & Technology (SMAST), University of Rhode Island (URI), the Buzzards Bay National Estuary Program (BBNEP) and other water quality experts. The partners will present and review the study design with this workgroup in 6 months. These findings will be presented to the towns of Wareham and Carver and MA DEP for their use in developing cleanup plans for the Wareham and Weweantic Rivers.

As time is of the essence in resolving the issue of cranberry nitrogen loadings, the partners agree to make every effort to complete the design of this study and identification of available grant sources by December 2010. If no grants can be secured to commence the study by December 2010, the CCCGA and the Coalition will make every effort to fund the study from either internal or external sources in order to get it started.

2. The grower community needs additional technical assistance in the area of improving water management and reducing phosphorus & nitrogen pollution to ponds and coastal waters.

While the UMass Cranberry Station provides a wide variety of technical services to cranberry growers, most of this is research and consulting is to improve bog management practices in order to increase agricultural yields. Growers and local water quality could benefit greatly from dedicated and independent technical staff working at the UMass Cranberry Station to assist growers in reducing water use and contamination of adjacent surface waters.

The mission of the UMass Cranberry Station is to maintain and enhance the economic viability of the Massachusetts cranberry industry through research, extension and to serve the public welfare by supporting economic development and protection of the environment.

THEREFORE, WE AGREE: We will urge the town of Wareham to support the efforts of the UMass Cranberry Station to obtain on-going federal funding for a dedicated hydrologist to serve as a Water Quality Specialist to aid growers in evaluating and developing tools, practices, and technology that conserve and protect water resources in cranberry production systems

3. Different cranberry bog types and management practices mean that bogs can vary widely in their ability to negatively impact waterways. Efforts must be focused on the replacement or conversion of old 'flow-through' bog systems, the implementation of sound farm planning and modern renovation of bogs.

The table below summarizes the range of bog types and state of management in the Wareham River estuary. It is estimated that between 10-17% of the

Status of Cranberry Bogs in the Wareham River Watershed

Subbasins				
	I Wankinco River	II Wareham River Estuary	III Agawam River	TOTAL
Watershed Areas	7,584.4	1,136.4	5,913.5	14,634.3
Total Cranberry Bog Acres (percent of the watershed)	1,156.9 (15%)	77.6 (<7%)	543.2 (9%)	17,777.8 (12%)
Acres with a current Farm Plan	967.6 (84%)	77.62 (100%)	488.4 (90%)	1,533.6 (86%)
Acres that are flow-through (percent of bog acreage)	101.1 (9%)	0	71.5 (13%)	172.6 (10%)
Acres that are NOT flow-through (percent of bog acreage)	926 (80%)	77.6	466.4 (85%)	1470 (83%)
Acres uncertain - need on the ground assessment (percent of bog acreage)	129.8 (11%)	0		129.8 (7%)
Out of production			5.4	5.4

Data provided by USDA-NRCS, March 2010

bogs in the area are old 'flow-through' bogs. These systems include a stream that flows directly through cranberry bog acreage making it difficult for growers to retain fertilizers and pesticide applications on the bog for use by the plants. They are, therefore, higher exporters of nitrogen and phosphorus to local streams and the Bay. They are also often inefficient and more difficult to manage by the grower.

While 'flow-throughs' should get most of our attention, improvements are also needed on the remaining 83-90% of cranberry bogs in the area. Modern bog renovation can produce significantly higher cranberry crop yields and dramatically reduce water use – thereby also reducing opportunities for nitrogen loss from the bogs. Practices such as laser leveling, installation of automated irrigation systems, and construction of tailwater recovery ponds and ditches all result in reductions in water use and fertilizer losses.

Lastly, 87% of the acres in the Wareham River Watershed have United States Department of Agriculture (USDA)-Natural Resources Conservation Service (NRCS) Farm Plans. 13% do not. While voluntary and non-binding, these plans are the foundation of good farm and environmental management. These Plans are customized to the bog system and include recommendations for practices and improvements that reduce water use and improve fertilizer and pesticide practices. They also make the bog eligible for federal cost-sharing dollars to fund improvements.

THEREFORE, WE AGREE:

a. Cranberry growers will move deliberately and in cooperation with the town on the conversion or replacement of 'flow-through' bogs and to accelerate the renovation of all bogs to incorporate modern water conservation systems and practices as identified in existing and future Best Management Practices (BMP) guidance. In addition, CCCGA and UMass Cranberry Station will advocate for the adoption and implementation of such improvements.

We will urge and support CCCGA and the Coalition to work together with the USDA-NRCS and other entities to secure targeted federal grants over the next two years of at least $500,000 to provide incentive, match funding for growers to convert or replace old 'flow-through' bogs and to renovate others within the Wareham River Watershed.

Individual cranberry growers will match these grant funds, yielding an estimated $1 million in environmental improvements to the bogs that drain to the Wareham River Estuary.

Eligible improvements under this program fall into two categories:

Category 1: Top priority- Available funds will be targeted at 'flow-through' bogs in the lower watershed including: (1) Construction of bypass canals to physically separate natural streams from productive cranberry bogs; and (2) Restoration of bog acreage linked to streams back to natural wetlands.

Category 2: All Other Bogs: Retrofitting of bogs through laser leveling, irrigation automation, and tailwater recovery ponds in order to reduce the volumes of water needed and, therefore, the potential for pollutant losses. Priority will be given to bogs in the lower watershed.

b. We will urge the USDA-NRCS to reach out directly to the owners of the 13% of cranberry bog acreage not currently under a farm plan to encourage them to develop and implement plans and encourage all growers to follow BMPs.

4. Initiate a multi-party collaborative effort which includes all stakeholders to review and create BMPs and other recommendations which address cranberry nutrient loading, including nutrient loading from the construction of new bogs and the renovation of old bogs, within the town of Wareham.

As potential new sources of nitrogen to Wareham's coastal waters, like new septic systems, new cranberry bogs and the renovation of existing cranberry bogs must be managed so as to minimize nitrogen losses both through surface waters flows and groundwater. Modern, upland bog construction techniques inherently make new bogs less likely to lose nitrogen than older bogs constructed in natural wetlands. BMPs establish standards for construction and renovation that limit the potential for pollution from bogs and are widely accepted in the cranberry industry. The development and review of these BMPs requires both industry and independent expertise together with input from interested stakeholders.

THEREFORE, WE AGREE: To support the development of a multi-party collaborative effort to create and review BMPs and other recommendations which address nutrient loading from cranberry bogs to Wareham's coastal waters.

PHASE II ACTIONS (2012-2014):

After further information is collected as part of Phase I, we will reconvene in two years to pursue the following Phase II actions.

5. Apply the results of the study completed as part of Phase I to determine the actual nitrogen loadings from cranberry bogs and assign reduction targets.

A successful cranberry bog nitrogen loss study will provide the state and town with the added information it currently lacks to sufficiently determine the magnitude of the nitrogen discharged to the Wareham and Weweantic Rivers from cranberry bogs. Applying the results of this study will better define the relative contribution of cranberry bogs to the nitrogen pollution problem and provide data for the establishment of preventative measures going forward.

THEREFORE, WE AGREE: We will reconvene in two years to ensure the state uses the data developed pursuant to this study, along with other available data, to establish nitrogen Total Maximum Daily Loads (TMDLs) for all of Wareham's coastal waters. These TMDLs will assign a nitrogen reduction target cranberry bogs will be responsible for meeting.

IV. Other Supporting Actions

Beyond dealing with nost of Wareham's nitrogen problem through improvements to the management of wastewater and cranberry bogs, other smaller steps should be taken for residential lawns, stormwater control and the protection of riverfront and coastal lands.

PHASE I ACTIONS (2010-2012)

A. The Planning Board and Conservation Commission should enforce good stormwater management practices and aim to limit lawn sizes in new subdivisions.

All new subdivisions and commercial developments should be required to implement stormwater management practices that will eliminate, to the greatest extent practicable, stormwater runoff from their development. Specific recommended practices should include maximizing pervious surfaces, clustering developments to preserve open space, limiting lawn area, minimizing property slope, and encouraging the creation of rain gardens and areas of naturalized plantings of low-maintenance native shrubs, groundcovers, and plants with lower water and fertilizing needs.

THEREFORE, WE AGREE: To encourage the Planning Board to adopt regulations requiring specific recommended practices which will minimize stormwater runoff.

B. Encourage use of Community Preservation Funds to acquire forested parcels of land along small streams and coastal areas. They are powerful nitrogen "sinks."

The Town of Wareham Community Preservation Commission (CPC) plan emphasizes the importance of preserving waterfront property and found that protection of Wareham's water resources, including coastal waters, river systems, ponds and wetlands to be of primary concern to Wareham residents. The CPC plan specifically encourages acquisition of land along the Weweantic, Red Brook, Agawam and Wankinco rivers. The Town should continue to use CPC funds to support projects that will protect open space and forested areas in coastal areas of town. These natural areas are incredibly efficient at using and processing nitrogen, reducing the amount of nitrogen that reaches the Wareham River.

The CPC plan also provides special consideration for projects that purchase former cranberry lands for restoration to natural wetlands.

THEREFORE, WE AGREE: To support the use of CPC funds for land and conservation restriction purchases which permanently protect areas which naturally remove nitrogen.

PHASE II ACTIONS (2012-2014):

C. Support town-sponsored, public education efforts to reduce nitrogen fertilizers used on residential lawns.

The Falmouth Friendly Lawns program was developed as a community outreach campaign to encourage residents to adopt lawn care practices that prevent nitrogen leaching. Suggested practices include: soil testing, eliminating or reducing fertilizer use, and using organic, slow-release fertilizer. The program also advised homeowners of questions to ask their lawn service and provided a friendly lawn care plan calendar covering recommended practices from March until October. This program could serve as a model for the town of Wareham.

THEREFORE, WE AGREE: To encourage the town to explore the implementation of town-sponsored programs like Falmouth Friendly Lawns.

D. Support broad education campaign within the town.

It was clear during this process that a firm foundation of understanding of nitrogen pollution, its impacts and sources, is needed in order to move forward with solutions. In order to move forward as a town it is vital that a greater understanding of the nitrogen pollution problem is brought to Wareham residents.

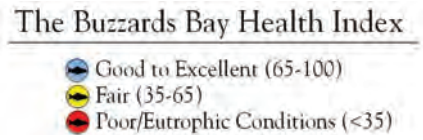
THEREFORE, WE AGREE: To make public education on the issue of nitrogen pollution an ongoing goal of this effort and to focus on new ways to get information about the issue to Wareham residents at our regular 6-month review sessions.

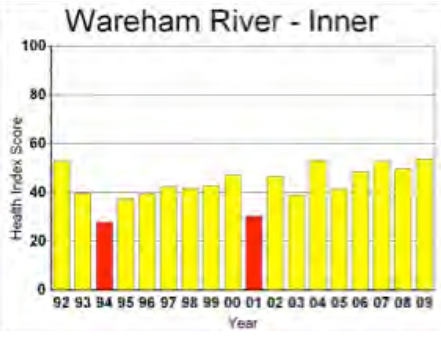
Appendix A

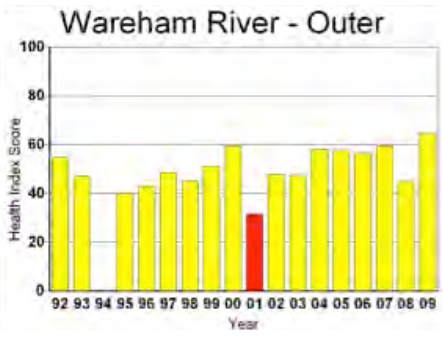
The Bay Health Index, listed below for all of Wareham's waters, measures the nutrient-related health of each of the Bay's major harbors and coves. The index is calculated from the scores of mean summertime water clarity, phytoplankton pigments, organic nitrogen, inorganic nitrogen, and the lowest 20% of dissolved oxygen concentrations. Central Buzzards Bay—which exhibits excellent water quality—would score close to 100 percent on the Health Index. The index provides a simple mechanism for the comparison of sites within and between embayments and allows for a "bay at a glance" picture of conditions throughout Buzzards Bay. Scores in Blue represent good to excellent water quality (scoring 65-100), scores in yellow represent fair water quality (scoring 35-65), and scores in red represent poor/eutrophic water quality (scoring <35). The tables below include the index scores for the mean of the five most recent years and the graphs show the score on an annual basis.

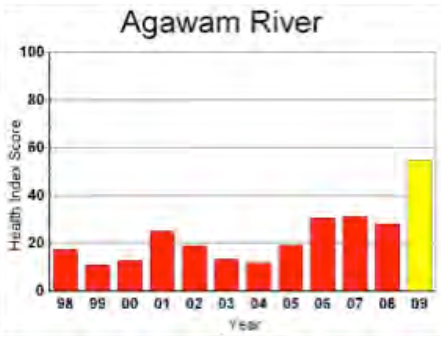
The Coalition For Buzzards Bay Water Quality Monitoring Program Bay Health Index

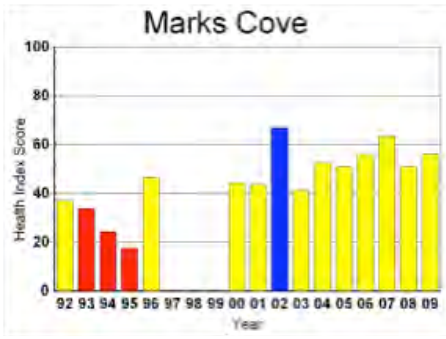
	Mean of 5 most recent years data index scores								
Embayment	2001	2002	2003	2004	2005	2006	2007	2008	2009
Agwam River	16.5	17.0	16.1	16.3	17.6	18.7	21.1	24.1	32.7
Wareham River, Inner	40.8	41.6	41.1	43.1	42.0	45.6	46.8	48.9	49.1
Wareham River, Outer	47.1	47.0	47.4	48.8	48.4	53.4	55.7	55.2	56.5
Marks Cove	43.9	51.5	48.9	49.7	51.0	53.4	52.7	54.6	55.3
Broadmarsh River	50.9	50.7	51.5	50.2	43.8	44.3	41.4	42.5	45.4

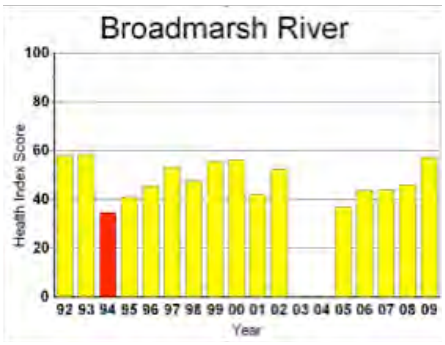






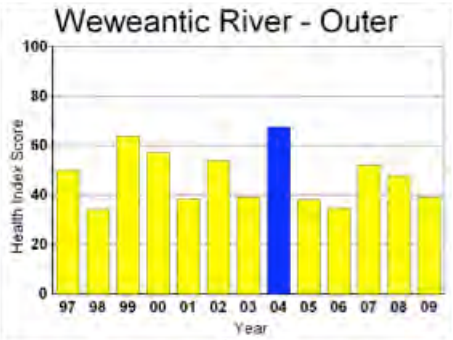


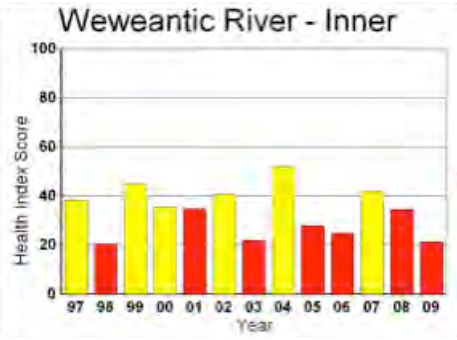




The Coalition For Buzzards Bay Water Quality Monitoring Program Bay Health Index

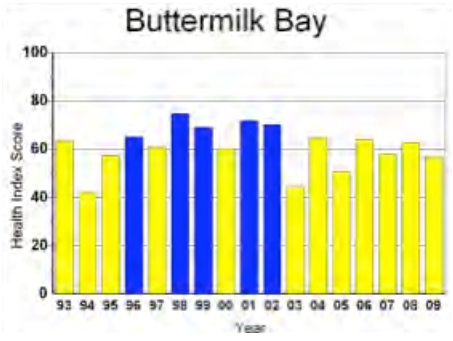
	Mean of 5 most recent years data index scores								
Embayment	2001	2002	2003	2004	2005	2006	2007	2008	2009
Weweantic River, Inner	34.7	35.2	35.5	37.0	35.5	33.5	33.7	36.2	30.0
Weweantic River, Outer	48.7	49.5	50.5	51.2	47.4	46.6	46.7	48.1	42.4

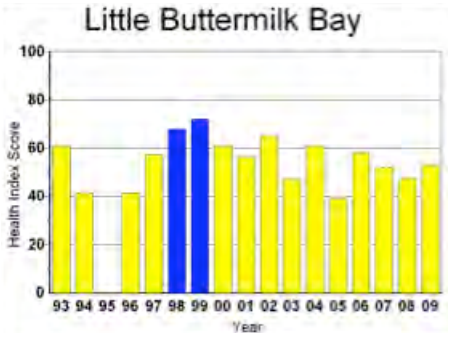




The Coalition For Buzzards Bay Water Quality Monitoring Program Bay Health Index

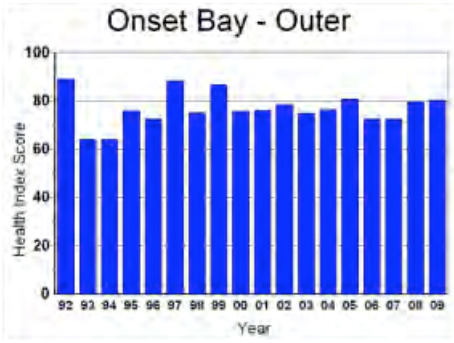
	Mean of 5 most recent years data index scores								
Embayment	2001	2002	2003	2004	2005	2006	2007	2008	2009
Little Buttermilk Bay	62.8	64.3	60.2	58.1	53.7	54.1	51.5	51.6	50.1
Buttermilk Bay	67.3	69.1	63.1	62.2	60.2	58.7	56.2	59.9	58.4

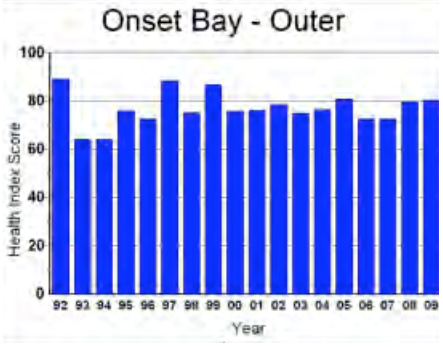


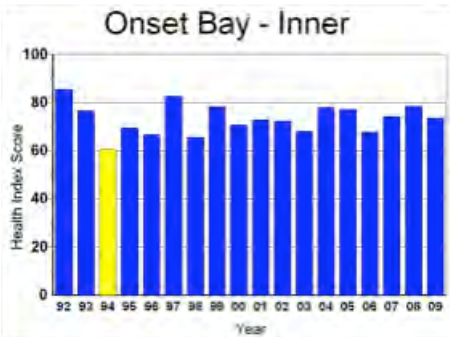


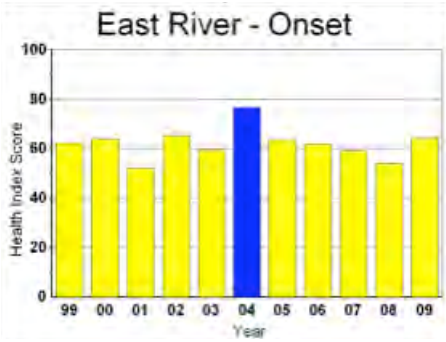
The Coalition For Buzzards Bay Water Quality Monitoring Program Bay Health Index

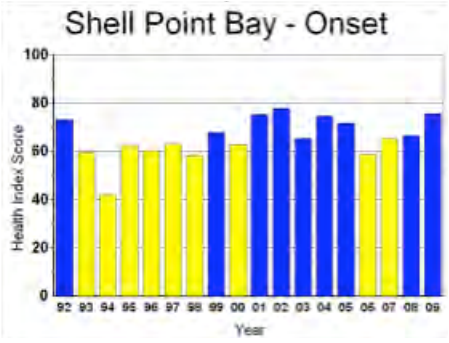
	Mean of 5 most recent years data index scores								
Embayment	2001	2002	2003	2004	2005	2006	2007	2008	2009
Onset Bay, Borad Muddy Cove	NA	59.8	56.7	50.8	51.2	46.0	46.5	46.6	51.6
Onset Bay, East River	59.5	60.9	60.6	63.5	63.4	65.3	64.1	63.0	60.5
Onset Bay, Shell Point Bay	65.3	68.2	69.7	71.0	72.8	69.5	67.0	67.2	67.4
Onset Bay, Inner	73.9	71.9	72.4	72.3	73.6	72.6	72.9	75.0	74.2
Onset Bay, Outer	80.3	78.4	78.3	76.2	77.3	76.6	75.4	76.3	77.1

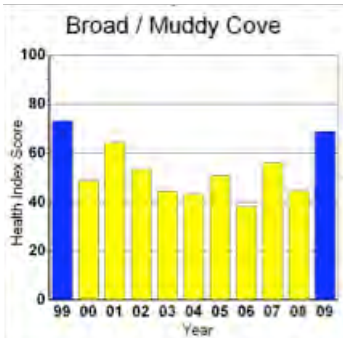












Appendix B

Wareham Clean Water Impact Fee

How it might work

1. **Only applies to NEW construction of 1-9 homes and NEW commercial construction of less than 3,300 GPD.** Existing homes and those requiring upgrades are EXEMPT from the Clean Water Impact Fee. Larger subdivisions will be required to meet Nitrogen-Zero as a requirement of subdivision approval and therefore will not need to pay an additional fee.

IV. **Goal is to incentivize low-nitrogen design principles on-site first, and then assess fee for any remaining impact.** Fee is then used by the town to fund nitrogen offsets elsewhere within the impacted watershed (either Wareham or Weweantic Rivers).

V. **Rules will be promulgated in Board of Health Regulations and Planning Board Subdivision Regulations.** These principles need to be converted to legal regulatory form.

VI. **Fee assessed will be commensurate with the proposed home or commercial development's potential impact on the health of Wareham's coastal waters,** as follows:

Cost per New Unit of Residential

Septic	Level of Impact	Title 5 System	N-Reducing System to DEP standard (19 mg/1 N)	N-Reducing System documented to meet <5 mg/1 N	Sewer Connection or Composting toilet or other technology
	Fee	$15,000	$8,000	$5,000	$1,000
Lawn	Level of Impact	>5,000 sf	3-5,000 sf	1-3,000 sf	$1,000 sf-No Lawn
	Fee	$5,000	$3,000	$1,000	$0
Storm Water	Level of Impact	> 3,000 sf Impervious	2-3,000 sf Impervious	1-2,000 sf Impervious	< 1,000 sf Impervious
	Fee	$5,000	$4,000	$2,000	$1,000

Note: Can do any number of combinations: For example, Regular Title 5 system ($15,000), but reduce lawn to 2,000 sf ($1,000) and reduce impervious areas to, say, 700 sf ($1,000) = Total Clean Water Impact Fee of $17,000. This is how we incentivize maximizing N-reductions on site first, and then only collect fee for remaining impact.

Cost per New Unit of Commercial

Septic	Level of Impact	Title 5 System	N-Reducing System to DEP standard (19 mg/1 N)	N-Reducing System documented to meet <5 mg/1 N	Sewer Connection or Composting Toilet or other technology
	Fee	$10,000 per every 1,000 gpd of flow	$5,000 per every 1,000 gpd of flow	$1,000 per every 1,000 gpd of flow	$500
Lawn	Level of Impact	>5,000 sf	3-5,000 sf	1-3,000 sf	$1,000 sf-No Lawn
	Fee	$5,000	$3,000	$1,000	$0
Storm Water	Level of Impact	> 1 acre Impervious	15,000 sf - 1 ac Impervious	5-15,000 sf Impervious	< 3,000 sf Impervious
	Fee	$20,000	$4,000	$3,000	$1,000

Additional Notes on Fee:

- Septic, lawn and impervious surface restrictions **must be recorded with subdivision plan and as a permanent covenant on the deed** for the property enforceable by Board of Health.
- **Burden of proof must be on the developer or homeowner** to prove septic system performance beyond the DEP standard of 19 mg/l through multiple, independent test results found acceptable to the Board of Health.

VII. **Credits: Developer or homeowner can avoid paying the "Clean Water Impact Fee" altogether if they can permanently reduce an equivalent amount of nitrogen from another source(s) by:**

a. Connecting another property within the same coastal watershed to municipal sewer.

b. Removing one acre of cranberry bog from production for each new septic system installed.

c. Any other method approved by the Board of Health that is proven to permanently eliminate a comparable source of nitrogen.

VIII. **How will the Clean Water Impact Fees be managed, once collected?**

i. The Board of Health will manage the fund and establish a "Clean Water Fund Subcommittee" under them. The Committee should consist of:

- A delegate member of each of the Board of Selectmen, Board of Health, Conservation Commission, Planning Board, and Municipal Maintenance Department.
- The charge of the committee shall specifically allow or require the appointment of non-resident staff from Municipal Maintenance, Conservation Commission and Board of Health to be voting members in accordance with the Town Charter.
- Three At-Large members to be appointed by the Board of Health.

ii. A "Clean Water Fund" Enterprise Account will be designed specifically to protect the funds collected under this program from diversion to other municipal needs.

iii. The Clean Water Fund Subcommittee will decide upon all projects to be funded with an express charge of maximizing the nitrogen reduction potential of all spending.

Eligible uses of the Fund will include:

- Wastewater Treatment Plant expansion.
- Design and construction of new neighborhood cluster wastewater systems for remote parts of town.
- Purchase of cranberry bogs for removal from active production and restoration.
- Municipal stormwater treatment projects that reduce nitrogen pollution.
- Support low income hook-ups.

The Wareham Nitrogen Consensus

AN ACTION PLAN