MINUTES OF THE
CAPE COD WATER PROTECTION COLLABORATIVE
Governing Board Committee
March 9, 2016

A meeting of the Cape Cod Water Protection Collaborative was held on March 9, 2016 at 9:00 a.m. in the Strategic Information Office, Innovation Room, 3195 Main Street, Barnstable, MA.

Members:		
Barnstable	Mark Ells	Present
Bourne	Stephen Mealy	Absent
Brewster	Sue Leven (Resigned)	Absent
Chatham	Florence Seldin	Present
Dennis	Vacant	Vacant
Eastham	Jane Crowley	Absent
Falmouth	Susan Moran	Present *(left at 10:35 a.m.)*
Harwich	Larry Ballantine	Present
Mashpee	Tom Fudala	Present
Orleans	Sims McGrath	Absent
Provincetown	Vacant	Vacant
Sandwich	Frank Pannorfi	Present
Truro	Patricia Pajaron	Present
Wellfleet	Curt Felix	Present *(arrived at 9:35 a.m.)*
Yarmouth	Jeffrey Colby	Present
County Appointee	Linell Grundman	Present
County Appointee	Lindsey Counsell	Absent
Ex-officio member	George Heufelder	Present
Ex-officio member	Paul Niedzwiecki	Absent

Staff Present:	
Andrew Gottlieb	Executive Director
Gail Hanley	Cape Cod Commission

Chair Larry Ballantine noted a change in the order of the meeting agenda items to accommodate time constraints of presenters.

4. Report on Septic System Nitrogen Reduction Soil Absorption System — George Heufelder

George Heufelder, Barnstable County Health Director, with the use of PowerPoint slides gave a report on the Massachusetts Alternative Septic System Test Center (MASSTC). He said the MASSTC was established to provide information on various alternative onsite septic system technologies. He said the Center has been a collaborative effort and the goal is to examine all elements of successful projects and noted that all projects use lingo-cellulose (wood) or a byproduct as a carbon source. He said they created five different projects and he explained each of the projects for:

- Small scale unsaturated flow system (the simplest system)
- Large scale saturated system
- Large scale permeable reactive barrier (PRB) system
- Large scale unsaturated flow system
- Additional soil column experiments

Mr. Heufelder said the bottom line is that introducing lingo-cellulose can achieve reduction in total nitrogen from percolating wastewater. He said the next steps are: further beta testing with modifications that focus on how they can make it effective; put together a design manual for system installation; and to identify and address the concerns of regulators. Mr. Heufelder said the County Health Department is submitting a proposal to the EPA and they have applied for a SNEP grant.

6. Report of the Town of Falmouth on Collaborative Funded Projects

Sia Karplus, Technical Consultant for the Falmouth Water Quality Management Committee, provided a report on two projects funded by the CCWPC and she said the Town of Falmouth appreciates the funding provided by the CCWPC. She reported on the shellfish propagation project—Year 3, Little Pond Shellfish Demonstration Monitoring and said key findings of the three-year effort include:

- Growing oysters in floating bags does not reduce dissolved oxygen concentrations in the water column;
- Water clarity is measurably higher within and adjacent to the oyster growing area;
- Oysters filter algae and only remove the Particulate Organic Nitrogen fraction of the Total Nitrogen Concentration;
- Bottom planting in suitable areas for the second year of growth and harvest yields high survival rates;
- Growing oysters to harvest size in floating bags has a lower density than bottom planting;
- Measured rates of denitrification in the sediments are higher under and near the oyster growing area.

Ms. Karplus also reported on permeable reactive barriers (PRBs) for the Acapesket Hydrological Investigation. She said the Town of Falmouth has been evaluating the feasibility of PRBs to remediate nitrates in groundwater for several years. She explained the objectives of the Acapesket Phase 2 study regarding:

- Groundwater re-sampling and data analysis at Acapesket South monitoring wells;
- Data collection at Acapesket North to enable several assessments—aquifer material and hydrogeology, groundwater chemistry, saltwater interface location if possible, distribution of nitrogen compounds in groundwater, and soil conditions;
- Acapesket North work accomplished in the vicinity of Shorewood Drive, Route 28 and John Parker Road involved—collecting soil borings, installing monitoring wells;
- Acapesket North 2015 Conclusions—freshwater aquifer is more than 60 feet thick in the area of Route 28, groundwater chemistry is conducive to nitrate treatment, significant nitrate concentrations are widely distributed, the base of the nitrate plume is fairly well defined and within a feasible treatment depth range, groundwater velocity is fast, and high nitrate concentration with high flow equals high flux of nitrate and good potential location for a PRB.

Susan Moran said the projects have provided a lot of information and there has been a lot of public participation from community volunteers and that was very successful. Ms. Karplus said public participation was very helpful and they have two short videos for training purposes. Andrew Gottlieb said the results and water quality data will

start a discussion with the Department of Environmental Protection. The report presented by Ms. Karplus in its entirety is an attachment to the minutes.

7. Report of the Town of Wellfleet on Collaborative Funding Cultching Project

Anamarija Frankic, Director of Green Harbors Project at UMass Boston, with the use of PowerPoint slides provided an overview of Wellfleet's oyster reef restoration project and said they are grateful for the CCWPC's five-year support of the project. She said the goals of the project are to assess the relationship between the oyster reef restoration, its oyster population and water quality; to assess the relationship between established oyster reef and related species diversity; and to replicate the restoration of natural oyster reefs as no take zones and marine sanctuaries throughout Wellfleet Harbor. She said all reports from 2011 can be found on their website: www.umb.edu/ghp.

Amy Costa, Director Cape Cod Bay Monitoring Program/Provincetown Center for Coastal Studies, provided an overview and explained the sampling done at the water quality stations at Duck Creek and Mayo Creek:

- Sampling has been done since 2012 and is monitored every two weeks at ebb tide;
- She explained the data for total nitrogen (uM)(mg/l), oyster densities in summer months, and outer Wellfleet in the summer outside of stations;
- She explained sampling at Mayo Creek and Duck Creek in the summer;
- Cholorophyll-A levels at the oyster stations and outer Wellfleet outside of stations;
- Water quality data does suggest that oysters have a significant impact on Chorophyll levels;
- Other water quality parameters are not as directly associated with oyster density;
- Total levels within oyster propagation areas remain lower than the source waters.

Hillary Greenberg, Wellfleet Health & Conservation Agent, said the Town of Wellfleet filed a Renewal Notification Form with the Division of Marine Fisheries for a shellfish propagation permit and said it includes the Shellfish Department's clutching operation. She said they are also seeking permits from the Wellfleet Conservation Commission and MA DEP—they are applying for an Order of Conditions from the Conservation Commission and a combined license/permit for a Waterways and Water Quality Certification from MA DEP. She said this will enhance Wellfleet's clutching operation and provide future areas for clutching. Ms. Greenberg said she is working with Massachusetts Heritage Program and the town is looking to the CCWPC for funding. She said they are still waiting for the Order of Conditions.

1. Minutes of January 13, 2016

Florence Seldin moved to approve the minutes of January 13, 2016. Linell Grundman seconded the motion. The motion to approve the minutes passed with five abstentions.

5. Update on Status of FY 2017 Budget

Andrew Gottlieb gave the following report:

- Regarding the FY17 County budget the County Commissioners approved a tax increase on the sale of homes;
- The CCWPC budget will be reduced by 30%;
- Florence Seldin and Sims McGrath spoke at the County Commissioners meeting regarding the CCWPC budget cut;
- The budget was before the Assembly of Delegates' (AOD) Environment Committee two weeks ago and they supported the Commissioners' budget;

- The budget will now move onto the AOD Finance Committee and he will let CCWPC Board members know when they are scheduled to meet;
- Mr. Gottlieb said he believes the CCWPC will have a $150,000 budget cut and he said he has had to say no to towns regarding CCWPC funding.

2. Report of Board Members on Water Resources Issues within their Respective Communities

This item was not taken up; there were no town reports given by Board members.

3. Executive Director's Report

This item was not taken up.

8. Adjourn

The meeting adjourned at 11:10 a.m.

MATERIALS USED/PRESENTED AT THE MARCH 9, 2016 CCWPC MEETING:

- March 9, 2016 CCWPC Meeting Agenda.
- Draft Minutes of the January 13, 2016 CCWPC meeting.
- Hand-out Material: Report on Use of Grant Funding from the Falmouth Water Quality Management Committee.
- Hand-out Material: Wellfleet's Renewal Notification Form for Shellfish Propagation Permit.

TO:	**Cape Cod Water Protection Collaborative**
FROM:	**Town of Falmouth Water Quality Management Committee, Sia Karplus Technical Consultant**
RE:	**Report on use of Grant Funding**
DATE:	**March 9, 2016**

Shellfish Propagation:

YEAR 3, LITTLE POND SHELLFISH DEMONSTRATION MONITORING

Falmouth has implemented an oyster aquaculture demonstration project in Little Pond, growing seed oysters to between 1" to 2" in size during the first growing season. These intermediate size seed are then relayed into other water bodies for commercial and recreational harvest. A key goal of this demonstration was to measure and quantify the specific changes in water quality that are caused by oyster cultivation. The design, implementation, and monitoring plan for this project was developed in close collaboration with the MA DEP and the UMASS Dartmouth School for Marine Science and Technology (SMAST) to meet the goal of evaluating water quality changes, for the purposes of regulatory credit for TMDL-compliance. Other goals of this demonstration project reflect the needs identified in Falmouth's approved CWMP, and include determining the effects of seasonality on nitrogen-removal rates, and assessing the aesthetic impacts from shellfish culture equipment.

For the past two years, the Cape Cod Water Protection Collaborative has provided grants to support this propagation initiative. In year three, a grant of $25,000 was used to contract with SMAST to monitor this successful demonstration. Key findings of the three-year effort include:

- Growing oysters in floating bags does not reduce dissolved oxygen concentrations in the water column
- Water clarity is measurably higher within and adjacent to the oyster growing area
- Oysters filter algae and therefore only remove the Particulate Organic Nitrogen (PON) fraction of the Total Nitrogen (TN) concentration in the water column
- Oysters uptake most of the nitrogen during their second year of growth from 2" to harvestable size
- Bottom planting in suitable areas for the second year of growth and harvest yields high survival rates and densities of approximately 1 million oysters/acre
- Growing oysters to harvest size (at least 3") in floating bags has a lower density than bottom-planting. (around 250,000 oysters/acre using 1700 floating bags per acre and 150 oysters per bag)
- Measured rates of denitrification in the sediments are higher under and near the oyster growing area

These conclusions will help guide Falmouth as we incorporate shellfish propagation and aquaculture into watershed-specific wastewater management plans.

Permeable Reactive Barriers (PRBs):

ACAPESKET HYDROLOGICAL INVESTIGATION

Falmouth has been evaluating the feasibility of PRBs to remediate nitrates in groundwater for several years. A key finding of a comprehensive study by CDMSmith in 2013 was that the thickness of the aquifer and the characteristics of the saltwater/freshwater interface are critical factors in determining whether the installation of PRB trenches is feasible. As part of this planning analysis, information from Seacoast Shores was evaluated. Groundwater profiling data from Seacoast Shores was collected by USGS in the summer of 2013 at the same location that the CCC had collected well data over a decade ago. These data, collected at a location about half way down the peninsula, indicate that a trench of over 50' deep would be required. Trench construction is impractical at these depths, but injection wells may be viable.

In order to further evaluate whether a PRB demonstration makes sense in Falmouth's south facing estuaries, additional hydrogeology data from its other south facing peninsulas was collected to enable a comparative analysis with the Seacoast Shores information. In 2014, the Collaborative provided a $25,000 grant to support data collection of a number of parameters in the adjacent Acapesket peninsula, including hydrogeology, soils, and water chemistry. Jim Begley of MT Environmental Restoration was sub-contracted by GHD Engineering to install test wells approximately one-third of the way down the Great Pond side of the peninsula, about 3500 feet south of Rt. 28. The preliminary findings of this field investigation showed that at this location groundwater movement is slow (approximately 1 foot/week), and nitrate concentrations are less than 1 mg N/L.

At the Rt. 28 intersection on the Great Pond side of the Acapesket peninsula, preliminary data from a different project seemed to indicate that groundwater flow is much faster and nitrogen concentrations are much higher. The Cape Cod Water Protection Collaborative grant of $50,000 enabled monitoring wells to be installed in the northern section of the peninsula, closer to Rt. 28 as well as additional sampling at the existing wells in the southern section of the peninsula. These new wells allowed a number of parameters to be investigated in the northern portion of the Great Pond watershed, such as nitrogen load, groundwater flow paths, aquifer thickness, salt water/fresh water interface, and the rate of groundwater flow. Soil borings and water sampling were also completed. Below is a summary of the objectives and findings of this investigation, which included both Acapesket South [Phase 1} and Acapesket North [Phase 2].

Objectives of Acapesket Phase 2 study:

- Groundwater re-sampling and data analysis at Acapesket South monitoring wells
- Data collection at Acapesket North to enable several assessments:
    - Aquifer material and hydrogeology
    - Groundwater chemistry
    - Saltwater interface location (if possible)
    - Distribution of nitrogen compounds in groundwater
    - Soil conditions (iron, grain size)

Acapesket North work was accomplished in the vicinity of 0 Shorewood Drive, Rt. 28 and John Parker Rd. and involved:

- Collecting soil borings
- Installing monitoring wells:
  - Three shallow water table monitoring wells
  - Two multi-level 2-inch diameter monitoring well clusters
    - One 4-screen cluster
    - One 6-screen cluster
  - One 14 sampling port USGS multilevel sampler installed by USGS

The Acapesket North groundwater sampling and analyses found:

- Groundwater flow is to the southwest
- Significant gradient (0.002 feet/foot)
- Groundwater velocity range
  - 1.67 ft/day to 2.0 ft/day (610 ft/year to 730 ft/yr)
- Significant concentrations of nitrate (up to 11.6 mg/L) detected over a wide area
- Vertical distribution of nitrate in groundwater is within accessible treatment installation depths
- Fairly well defined base of the nitrate plume observed at about -40' MSL
- Conditions generally conducive to groundwater nitrate treatment
- Salt water/fresh water interface was not reached

Acapesket North 2015 Conclusions:

- The freshwater aquifer is more than 60 ft. thick in the area near Rt. 28
- Groundwater chemistry is generally conducive to nitrate treatment
- Significant nitrate concentrations are widely distributed (up to 11.6 mg/L observed)
- The base of the nitrate plume is fairly well defined and within a feasible treatment depth range
- Groundwater velocity is fast
- High nitrate concentration with high flow = high flux of nitrate = good potential location for a PRB

Additional monitoring at Acapesket south led to a number of conclusions that confirmed the findings of the previous study. These conclusions are:

- The freshwater aquifer is ~ 50 ft thick near the center of the peninsula
- Groundwater chemistry is generally conducive to nitrate treatment
- Based on limited data, nitrate concentrations were relatively low
- Groundwater velocity is slow, and in a northwesterly direction
- Low nitrate concentration with low flow = low flux of nitrate = not ideal conditions for a PRB
- MTER 5 may have intercepted a nearby septic system plume because N levels are high and extend throughout the water column

The Town of Falmouth appreciates the support the Collaborative has provided to help us identify a likely location for a PRB. Based on the Phase I and 2 information collected, Falmouth was able to receive a grant from EPA in 2016 to complete the site characterization required before a pilot PRB could be installed. This next phase of work includes a refined water table map, measurements of hydraulic conductivity, and another round of water quality sampling.