

3225 MAIN STREET • P.O. BOX 226
BARNSTABLE, MASSACHUSETTS 02630



CAPE COD
COMMISSION

(508) 362-3828 • Fax (508) 362-3136 • www.capecodcommission.org

Agenda

Section 208 Area-Wide Water Quality Management Plan Update

Monitoring Subcommittee

Tuesday, January 20, 2015
1-3 PM

Open Cape Conference Room
Open Cape Building
County Complex
Main Street, Barnstable, MA

1. Introductions/Update
2. Inlet Monitoring - Discussion
3. Conceptualize Pilot Project Ranking Criteria
4. Conceptualize 208 Monitoring Needs and Services



**Section 208 Area Wide Water Quality Management Plan Update
Monitoring Subcommittee**

Minutes

Tuesday, January 20, 2015

1-3pm

Open Cape Conference Room

Open Cape Building

County Complex

Main Street, Barnstable, MA

Attendance: Ed Eichner (SMAST), Matthew Reardon (DEP), Andrew Gottlieb, Chris Neill, Bob Duncanson, Lindsay Counsel (Three Bays), Brian Dudley (DEP), George Heufelder, Amy Costa, Scott Horsley, Marcel Belaval (EPA), Anne Giblin, Tara Nye(APCC) , Joann Muramoto, Tom Cambareri, Monica Mejia, Danielle Donahue

1. Introductions/Updates

- a. Tom gave an event reminder for the One Cape Summit to be held from Feb 25-26, 2015.
- b. Tom distributed draft criteria for proposed pilot projects and asked that it be reviewed and added to as the attendees need.
- c. The committee did not have any other updates.

2. Inlet Widening – Discussion

- a. Chris (team lead) was not available to present. Bob and Anne spoke to the summary being reviewed by the group. Chris joined in when he arrived.
- b. Bob stated that the document as presented provides a good summary and overview for the strategy but that it will need greater detail to be of most use to municipalities regarding cost and frequency of monitoring.
- c. Anne spoke to the limited information presented with regards to the improved oxygen concentrations that inlet widening may provide, suspended sediments, and larval retention.
- d. Lindsay asked if changes in the inlet and sediment levels could also have negative impact (referencing page 2, paragraph 3).
- e. Anne - Erosion of salt marshes near the inlet mouth could be a detriment. This may be able to be explored through modeling.
- f. Bob - Position should also be monitored.
- g. Lindsay – all these areas that are now being discussed should also be monitored, there are so many potential “spider effects” where it may impact other areas.
- h. Scott – agrees that there are many impacts that need to be reviewed. It would be good to incorporate information from Muddy Creek or other study areas.

- i. Lindsay - There should be a 3 year pre-sampling study and another 3-6 years post project. Weekly sampling may be overly expensive.
- j. Bob – From Muddy Creek recommendations for post monitoring criteria, most of the recommendations will be related to wetlands. He will incorporate some of the basics and even cost estimates into the draft inlet widening criteria.
- k. Brian – would still require wetland monitoring.
- l. Tara – Will add Salt Marsh study monitoring methods
- m. Anne – what about inlet stabilization?
- n. Bob – it would qualify, yes. Think of it as inlet maintenance.
- o. Joann – to what extent does inlet maintenance/dredging relate to water quality. It should be related within the document. If there weren't regular dredging maintenance there would be greater issues. Ed agreed.
- p. Ed – Communities have used inlet widening as a springboard to bring about further dredging within the system. This may not improve water quality and could even worsen it. Bob agreed and presented an example.
- q. Chris – The inlet may begin closing immediately, so the plans must consider that the system will change. Bob, this must also be factored into the credit for the system, presents an issue for the regulators.
- r. Scott – Bournes Pond, Muddy Creek, and Three Bays have all been studied for inlet widening. Ed concurred and mentioned that they have all been modeled for inlet widening. Scott recommended that an analysis of the summaries from those studies may prove useful. Tom mentioned that they have been uploaded to the Sharepoint website. Ed suggested Martha's Vineyard/Nantucket ponds for a similar review.
- s. George - Cost needs to be added in this discussion. Mitigation is also a strong consideration.
- t. Chris – It's not a protocol issue - will it work, what will it cost – those are the major concerns. We should look for a pilot that would be manageable and could be studied simply.
- u. Chris – Perhaps Mill Creek is a good study example to look at what is already happening.
- v. George – first piece of monitoring strategy should be to develop the best criteria for locations and to have bathymetry measured ahead of time. The information about the complexity of the technology and the limited information for success should be presented upfront.
- w. Joann – existing salt marsh restoration projects monitor many factors but does not monitor nutrients.
- x. Scott – how will all the data be managed and reviewed?
- y. Ed – there is a lot of data for Pleasant Bay with the natural inlet widening. Edgartown Pond and Great Pond on Martha's Vineyard/Nantucket.
- z. Bob – Concerns with existing salt marsh restoration projects where there nutrients may have been exported down-gradient into another system.
- aa. George – Minimum pre-operation standards?
 - i. Three years monitoring (absolute minimum)

1. Requirements for bathymetric parameters
- ii. Modeling exercise
 1. If the modeling shows no improvement then it doesn't proceed
 2. Modeling should document bathymetry changes
 3. What are the bathymetric parameters that you should measure
- bb. Anne - Restore the system back to original conditions if the system changes mid study?
Bob – yes.
- cc. Brian – From a permitting perspective a baseline needs to be established. Especially where adjusting a system beyond the natural system. Joann agreed that pre-project information must be submitted with permitting application.
- dd. Bob stated that the team will do further work on the criteria, maybe it won't have numbers but will explain the complexity sans numbers.
- ee. Marcel – does there need to be an actual load established to meet 208 requirements? How can it be compared to other projects with removals?
- ff. Bob and Scott agreed that it should be retitled "inlet modification"

3. Other Technologies:

- a. Tom suggested adding constructed wetlands technology to the table for review next. Heather will be looking into it and Anne offered to assist as well.
- b. Floating wetlands appears to be a preferred solution with the Orleans scenarios being presented.

4. Conceptualize Pilot Project Ranking Criteria

- a. Review of draft criteria for proposed pilot projects
- b. Joann started the document, Tom provided modifications.
- c. Performance measures section: Joann suggested adding "**contingency planning**" and "**evaluation of risk**",
- d. Adverse effects section: Add "**decreased oxygen**"
- e. In the permitting section: Add "**how to decommission a project**"
- f. Pilot Project Scale – add "**lifespan of the project**"
- g. Anne asked who puts out the health of the bays. Feedback included: Mass Bay, Provincetown, Buzzards Bay Coalition, Pleasant Bay Alliance. Could use these datasets as reference/controls for pilot data. Add, "**Define suitable reference or controls**"
- h. Sustainability or performance measures sections: George recommended quantifying amount of energy/money inputted versus value returned "**cost benefit,**" "**how well efficacy and cost benefit can be quantified**"
- i. George asked about site selection criteria, specifically on how to weigh areas of high nutrient reduction need vs. controlled areas with more available data (and potentially less variables). Brian answered that certain pilots would need to be installed in live areas. Others may be determined outside of areas where there may be adverse effects. George stated that in a controlled study area you would have better handle on variables. Tom stated that you have to weigh the efficacy of a control area vs. site with a

demonstrated need. Clear benefit needs to be demonstrated, and it may be best to test where there are less variables. Bob stated that that George's idea may be more of a "demonstration project." Anne suggested adding language to lean preference to a site where the impact can be most clearly demonstrated and monitored.

- j. Joann - the terms should be defined in stages:
 - i. Experimental/proof of concept
 - 1. In preliminary investigative stages, mostly conducted by academia/private interests
 - ii. Pilot Project
 - 1. For technologies that boast multiple sources of peer reviewed literature.
 - iii. Demonstration Project
 - 1. Implementing (alone or in conjunction with other technologies) at a particular location
- k. Committee discussion thought that distinguishing between pilot and demonstration was not necessary, especially when the Environmental Bond bill indicates that "Pilot" Projects may receive funding for implementation.

5. Conceptualize 208 Monitoring Needs and Services

- a. Tom reviewed the document for discussion and added that there would be a need to further define the items contained therein.
- b. Joann – existing monitoring section - economic data would be useful for gauging the monitoring capabilities of the towns. Economic indicators that might demonstrate the need for the towns. The cost of doing nothing would be one such economic indicator. This may help make a case for finding new money.
- c. Tom offered that ensuring a sustainable source of funding for monitoring for multi-million dollar watershed solutions should be secured by explicitly identified budgets
- d. Bob asked if the 208 plan would identify responsibilities for each of these resource needs. Tom stated that he believe it would.
- e. Anne asked how we envision the data needs being addressed. Economies of scale especially with regards to data could be managed by the County, CCCC, etc.
- f. Bob – "funding" needs to be added to the list as an underlined heading.
- g. Data storage – Bob said that the State attempted to create a statewide monitoring network but it didn't last. Tara we would need to establish it. If there was a department or entity that could act in a custodial capacity for directing inquiries.
- h. Scott - believes that the data should be maintained by county, that the monitoring group remain established and meet regularly (quarterly or some such), and an annual symposium where the information could be delved into in-depth.
- i. Tara - where monitoring is happening is even still being compiled by APCC.
- j. Tara asked what the purpose of the document is. Tom stated that it represents what needs to be done and includes recommendations from 208.

- k. Bob – certain scales make sense with regard to monitoring and data collection. Eel grass makes sense for the State. Benthic monitoring makes sense on a County level. Embayment/pond monitoring makes more sense for municipalities, NGOs, watershed associations, etc. Stormwater would need to be site specific. Drinking water - CCC and towns are already handling that.
 - l. Joann suggested adding “outreach and training” as a category to the document.
 - m. Ed recommended adding “groundwater levels and streamflow” to the list.
 - i. Discussion included whether the current efforts are adequate. Ed and Tom thought that it was for groundwater levels.
6. Meeting documents:
- a. Agenda
 - b. 12/8/14 Meeting Minutes
 - c. Inlet-Widening as N-mitigation strategy: Draft (1/15/15)
 - d. Draft Criteria for proposed pilot projects
 - e. Cape Cod 208 Monitoring Needs and Services 1/12/15
7. Upcoming Meeting to be determined for mid-February. Tom will send out suggested dates to the committee.

Monitoring Subcommittee Sharepoint Site

BC\firstname.lastname

Password: 208msc!

Inlet-Widening as N-mitigation strategy: *Draft (1/15/2015)*

C. Weidman

chris.weidman@state.ma.us

Background

Inlet-widening/modification has been proposed as a non-traditional strategy to improve estuarine water quality and ecological function by removing nitrogen loads more quickly from the estuarine water column through increased tidal flushing. The general concept is based on the assumption that inlets, to one degree or another, act to limit tidal exchange between the enclosed estuary and its oceanic source. Within the estuary, this restriction should result in a smaller tidal range and attenuated tidal phase relative to its oceanic source. Less tidal exchange will also be characterized, within the estuary, by longer water mass residence times, greater watershed-derived nutrient concentrations and lower salinities. So, it is proposed that increasing the width and/or depth of an inlet will lessen the restriction on tidal exchange, increase tidal flushing and allow more effective removal of estuarine nitrogen loads.

Inlet-widening (IW) is attractive as an N-mitigation approach because of its simplicity of concept and its potential cost-effectiveness. However, there are significant concerns among coastal scientists (refs), in light of the complexity of the coastal hydrodynamic and sedimentological environment, about the method's practical effectiveness, long-term maintenance costs and potential for unintended environmental consequences. These questions related to the efficacy of IW as viable mitigation strategy will not be discussed here in detail, but to enumerate a few: 1) does IW actually result in a significant and long-term increase in tidal exchange in a given system, 2) will the modified inlet maintain its enlarged dimensions without the need for frequent and costly maintenance dredging, and 3) would IW increase local storm flooding risks.

On Cape Cod, several IW projects have been discussed and two have been formally proposed, Bournes Pond in Falmouth and Muddy Creek in Chatham, though only the former is motivated primarily for the purpose of N-mitigation (refs). At present, IW as an effective strategy for nitrogen removal is still largely theoretical and the need exists for well-controlled and monitored pilot projects to assess the methodology.

IW monitoring protocol

First, it is assumed here that something like the monitoring strategy developed for the MEP nutrient-loading TMDL assessments will be a basic component of any future water-quality monitoring program regardless of the mitigation approach (s) deployed. Since this methodology was used to establish the TMDL for each estuarine system, it seems logical that a similar protocol would be used to gauge the expected overall effect of mitigation efforts on each system.

To assess the specific effectiveness of an approved and deployed IW project, additional monitoring protocols should be in place to monitor the hydrodynamic conditions that underlie the IW approach. Approved IW projects should include vetted hydrodynamic modeling that predict specific tidal characteristics that are indicators of enhanced tidal exchange. These would include forecast changes in tidal range, MHW, MSL, and MLW as well as storm surge flooding. For example, in Falmouth's Bourne's Pond IW proposal (ref) modeler John Ramsey indicates that there should be a detectable drop in MLW post inlet modification, which in turn implies achieving greater tidal flushing (and more N-removal).

It would be best if there were at least 1 year of hydrodynamic monitoring prior to inlet modification for both modeling and post-alteration comparison purposes. Protocol, both pre- and post-modification, should require automated continuous monitoring of 1) water levels inside and outside the estuary, as well as within the inlet (for a total of 3 tidal stations), and 2) inlet current velocities. Tidal stations ought to have precise vertical control for relative reference. Inexpensive equipment (~\$1000/unit) is available to continuously monitor each of these parameters, although there would be personnel costs associated with maintenance and data analysis.

IW project plans specify precise inlet channel dimensions as these are fundamental to the IW approach. These dimensions, before and after modification, are used as the basic modeling variables for quantifying the degree of enhanced tidal exchange and estimation of N-removal. They are also used to predict inlet current velocities critical to the ability of the channel to maintain itself. A primary concern about the viability of IW mitigation is the very real potential for frequent infilling of the artificially enlarged inlet. Should the inlet dimensions vary from design criteria, as a result of shoaling for example, then the desired tidal flushing would also be at variance from design. If IW N-mitigation is to function as planned, then inlet morphometry must be maintained as close to design as possible. So, the need for frequent monitoring of inlet morphometrics is a critical oversight component for IW mitigation projects. Concurrent inlet morphometry, current velocity and inlet water level can be used to directly calculate tidal exchange and can be checked against model prediction.

How often should inlet bathymetry be surveyed? This is a difficult but critical question and is dependent on understanding the complex interaction of the local sedimentological and hydrodynamical environment, a situation extremely hard to model or forecast with accuracy. However some reasonable estimate of infilling must be applied in order to calculate the frequency of inlet maintenance and its associated costs. Historical inlet maintenance records might provide a minimum frequency estimate. However, infilling might be expected to increase after alteration as inlet velocities would likely lower as a consequence of cross-sectional enlargement. It would be prudent to survey more frequently (weekly or monthly) in the early post-modification period and develop a survey schedule based on observed infilling over time.

Finally, in consideration of the important issue of unintended environmental impacts (e.g, increased flooding, enhanced erosion, excessive shoaling, etc.), IW projects, in the pilot period at least, ought to be sites where these impacts could be easily managed or reversed without incurring great cost. Smaller scale projects should be favored over larger ones, and locations involving major infrastructure (e.g., bridges, roads) ought to be avoided until there is a better understanding of IW as a viable N-mitigation strategy.

Cape Cod 208 Monitoring Needs and Services

Jan 12, 2014

Existing Monitoring

- Embayments
- Ponds
- Drinking Water
- Treatment facilities (Municipal to IA)
(Stormwater?)

Watershed Permit Compliance Monitoring

- Water quality
- Ecosystem
 - Benthic
 - Aquatic -eelgrass
- Watershed nitrogen reduction progress
- Adaptive Management

Non-Traditional Technology Monitoring

- Pilots
- Protocols
- Performance

Standing Technology/Monitoring Committee

- Review existing monitoring efforts
- Establish Pilot Project Criteria
- Review Pilot Project proposals
- Review Watershed Permit monitoring requirements
- Establish Regionally Consistent goals and approaches for monitoring (QAPPs)
- Provide updates to the Technology Matrix
- Monitoring feedback/ Modifications
- Identify and track developing issues (CECs, Climate Change)

Technical Assistance

- Provide regionally consistent reviews
- Provide/direct/coordinate sources of funding
- Provide regular regional interpretative reviews
- Coordinate regional cost efficiencies for all aspects of monitoring
sampling, analysis, reporting

Data Warehouse

- Provide storage capacity and design digital infrastructure for monitoring data
- Provide storage for relevant studies and reports
- Provide custodial services and public access to monitoring data and reports
- Manipulate data into GIS coverages as needed

DRAFT
January 12, 2014

Criteria for proposed pilot projects

What type of pilot project is proposed?

Proof of concept to test whether a technology works: limited in scope, this focuses on showing that a particular technology works. An experimental approach may be proposed to evaluate the technology's efficacy under different conditions. A pilot project is likely not proposed as the defacto watershed intervention to achieve TMDLs. If the pilot project is successful, it is one that can be scaled up or refined to achieve a greater portion of the percent of necessary nitrogen removal. Pilot project proposals which demonstrate promising chances of success, are well defined, and the variables are well understood, will be favored.

Demonstration Pilot Project: the goal is to demonstrate that a particular technology, either alone or in conjunction with other technologies will address the problem at a particular location(s).

Problem definition

Describe the background information that indicates there is a water quality problem. How well is the problem defined?

Proposed approach to addressing problem

What is WMA overall plan for addressing the watershed nutrient problem, is a nitrogen threshold documented (MEP or TMDL)

How does the proposed pilot project fit into the overall watershed management plan? Is it consistent with the 208 Plan

What are the goals and objectives of the proposed pilot project?

If piloting results in a method/approach not being selected, has a contingency plan for addressing the watershed problem been prepared?

How effective will the method be?

Site Selection: Is the location appropriate to the objective.

Site Characterization: Has the site been adequately characterized for the proposed technology? Describe existing information.

If additional characterization is required, describe the extent of work and relative proportion of the budget to be used in site characterization.

Suitability: Will the proposed method be suitable for the site? What are the variables associated with the site and the proposed technology?

Pilot project scale: What proportion of the watershed need is expected to be met by the pilot project? Does the proposal include an assessment of the feasibility of scaling up the pilot project to serve the intended neighborhood, watershed or other service area?

Performance measures: Does the proposal include suitable performance measures, spatially and frequency of monitoring to judge the success of the project? Performance measures may be quantitative, semi-quantitative, or qualitative, in descending order of preference. Examples of performance measures:

- For efficacy of method: Nitrogen concentration in water column decreases by X % (numerical performance measure), water clarity increases over baseline (qualitative performance measure), abundance and density of eelgrass beds increase over baseline (qualitative ecological performance measure), etc.
- How soon could one expect to see results for the technology and in the embayment.
- Influent and effluent measurements
- Perturbations in the natural environment caused by the pilot.
- Duration of testing, frequency of reports
- For feasibility: pilot test can be scaled up to meet needs of service area, operations and maintenance plan is feasible, costs are acceptable, etc.
- For project management: project milestones identified, deliverables are provided on time and are complete and satisfactory; budget is met, roles and responsibilities are met, etc.

Adverse Impacts

Will the proposed pilot project cause temporary or permanent impacts on coastal or inland resource areas, rare species habitat, benthic habitat, essential fish habitat, or other natural resources? Will there be temporary or permanent impacts on public or private properties and infrastructure? Will public uses and activities be disrupted? Has the applicant proposed measures to minimize, avoid or mitigate temporary or permanent impacts?

Permitting

What existing permits and approvals will be required to protect against adverse impacts? Is the permitting path clearly and completely defined? If approvals from some agencies (e.g., DMF, NHESP, etc) are required before applying for other permits, has the applicant contacted or consulted with relevant permitting agencies and obtained the necessary approvals?

Qualifications are sufficient to ensure success of project

Qualifications (e.g., roles and responsibilities are defined, project team members have relevant knowledge, experience, demonstrated success, and references)

Tasks and deliverables are well-defined and will meet the goals of the project.

Schedule of deliverables and milestones are provided.

Budget: the budget is reasonable and is related to specific deliverables.

