Lessons learned in the implementation of the Buzzards Bay Stormwater Collaborative effort to map and monitor stormwater discharges

Joseph E. Costa[1], Kevin Bartsch[1], Bernadette Taber[1], and Betsy White[2]

July 6, 2018

[1] Buzzards Bay National Estuary Program, Massachusetts Office of Coastal Zone Management, 2870 Cranberry Highway East Wareham, MA 02538

[2] Buzzards Bay Action Committee, 13 Atlantis Drive, Marion, MA 02738

I. INTRODUCTION

In 2015, the Buzzards Bay Action Committee (BBAC, a non-profit) established the Buzzards Bay Stormwater Collaborative in partnership with five municipalities (Dartmouth, Acushnet, Fairhaven, Mattapoisett, and Wareham, Fig. 1) and the Buzzards Bay National Estuary Program (NEP). The initiative was funded by the U.S. EPA through a $200,000 Healthy Communities grant in support of the Southeast New England Program for Coastal Watershed Restoration (SNEP). In 2017, EPA awarded supplemental funds through a $25,000 amendment to the original award and a $32,000 NEP monitoring support grant. In addition, the participating towns contributed a total of $25,000 to the program. This subsequent funding enabled another season of stormwater monitoring by the Stormwater Collaborative and mapping work through January 2018.

The purpose of the Stormwater Collaborative was to enable the five participating municipalities to work collaboratively and cost-effectively through the BBAC to map stormwater networks and monitor discharges contributing to shellfish bed closures and other impairments to water quality and natural resources. The Buzzards Bay NEP provided technical guidance to the Stormwater Collaborative and managed elements of the monitoring and mapping program. The immediate goals of this effort were to help municipalities identify and prioritize management actions on stormwater networks and discharges causing degradation of coastal receiving waters. Long-term goals include 1) improve the local capacity of municipalities to map and monitor discharges, 2) have municipalities use the information gathered to investigate any possible illicit discharges, and 3) develop plans to treat or manage nonpoint sources of pollution with the goal of eliminating impairments. This report summarizes the lessons learned by the Stormwater Collaborative in implementing the program and progress toward meeting short and long-term goals.

II. BACKGROUND

Stormwater contributes to nutrient and pathogen impairments in Buzzards Bay. There are roughly 6,000 acres of shellfish growing areas closed year-round, and many of these closures are the result of bacterial contamination related to stormwater discharges. Stormwater is also an important contributor of nutrients in Buzzards Bay. Consequently, the Massachusetts Department of Environmental Protection (DEP) lists many Buzzards Bay embayments as nutrient and/or bacteria impaired on their Integrated List. DEP has also developed bacteria or nitrogen TMDLs in many of these embayments.

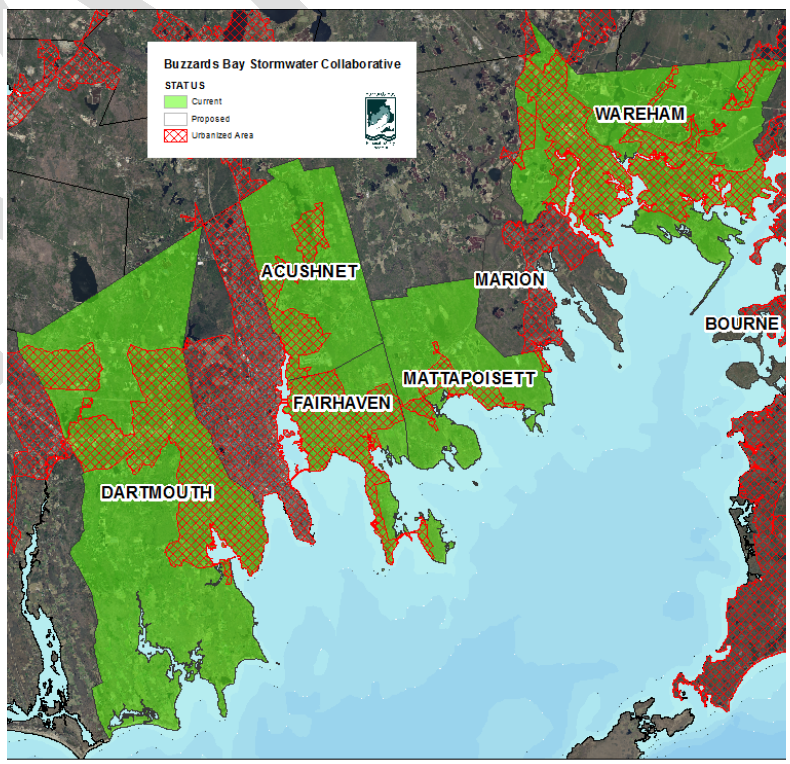


Fig. 1. Municipal particpants in the Buzzards Bay Stormwater Collaborative (highlighted in green), with areas subject to MS4 permits highlighted in red crosshatch.

The management and remediation of stormwater-conveyed pollutants to re-open shellfish beds and protect swimming beaches is one of the highest priorities in the Buzzards Bay Comprehensive Conservation and Management Plan (CCMP). Stormwater management has also been a longtime priority of Buzzards Bay municipalities, as well as a focus of the Buzzards Bay NEP's municipal grant and technical assistance program.

The foundation of the Stormwater Collaborative was based on longstanding cooperative relationships between the Buzzards Bay Action Committee, the Buzzards Bay NEP, and municipalities in the Buzzards Bay watershed in taking action to treat problematic stormwater discharges. In fact, the first stormwater collaborative in Buzzards Bay began in 2005 with an $18,500 grant to the BBAC to work with a local vocational high school to have students map catchbasins and discharge pipes using GPS units and ArcGIS™[1] software. This data was used in 2007 to update of the Buzzards Bay Stormwater Atlas database, which was first developed in 2003.

The new Buzzards Bay Stormwater Collaborative initiative involved the Towns of Dartmouth, Fairhaven, Mattapoisett, Wareham, and Acushnet. This Collaborative went well beyond the 2005 mapping efforts in scope, precision, and sophistication, including the incorporation of scanned and georeferenced engineering plans into the GIS database. More importantly, the new initiative included monitoring contaminants in stormwater discharges and field investigations. The municipal maintenance staff from each town participated in the training and monitoring components of this program along with providing the much-needed labor to access pipes, manholes, and catchbasins to enable sampling, inspections, and documentation of stormwater network connections.

III. GENERAL APPROACH

Under the 2015 EPA Healthy Communities Grant, the BBAC provided staff to administer the grant, manage the fieldwork, and undertake field studies, including testing stormwater network samples with field kits, and collecting samples for laboratory analysis. At the peak level of effort, BBAC staff included a part-time grant administrator (10 hours per week; a retired municipal town administrator), a full-time stormwater monitoring program coordinator, and four summer interns.

Fig. 2. BBAC staff working on the stormwater collaborative during the summer of 2016.

The Buzzards Bay NEP provided two staff persons (stormwater monitoring and mapping specialists) and a portion of the NEP Director and NEP Administrative Assistant's time. The NEP Stormwater Specialists were responsible for developing and finalizing an EPA approved Quality Assurance and Project Plan (QAPP) for the stormwater monitoring program, providing

[1] See http://buzzardsbay.org/buzzards-bay-pollution/stormwater-pollution/stormwater-collaborative/

training to BBAC and municipal staff, and managing the water quality and GIS datasets, including implementing quality assurance checks and protocols. Municipal DPW staff participated in field activities including monitoring and providing access to stormwater infrastructure.

IV. DELIVERABLES AND OUTCOMES

The four core deliverables of this project (including supplemental funding tasks) included:

1) An updated and enhanced Buzzards Bay stormwater GIS database. Enhancements include catchbasin, manhole, and discharge connectivity for monitoring sites and some additional areas.
2) A water quality monitoring database that met EPA database standards; made available for use by government and researchers.
3) A technical report for each stormwater discharge based on water quality data and GIS analysis.
4) Outreach and education pieces, including mailers to residents, online interactive maps, and information about the need to manage stormwater, and outcomes of the effort, including this lessons learned report.

All these tasks were met with the specific accomplishments summarized in the four sections below.

GIS Database: Stormwater networks were mapped throughout each town, focusing on connections to priority discharge pipes. Road and development plans were scanned, and entered into a digital file, and provided to each town. The effort involved verifying and updating previously mapped stormwater infrastructure features, or adding new ones (Fig. 3), as well as adding pipe layouts from scanned and georeferenced plans.

Altogether, over 15,000 surface water features were mapped with GPS, hundreds of plans were scanned and georeferenced, and some pipes were digitized and added to the Stormwater Atlas GIS database. Table 1 summarizes plans scanned and pipes digitized by town. Some GIS features contain numerous attributes such as pipe diameter, composition, and other important elements of the stormwater network. The use of this GIS data by municipalities can aid in infrastructure asset management and help address potential future regulatory requirements.

Fig. 3. The location of previously mapped features were verified, and new features added for the catchments of all priority discharge sites defined in the grant workplan.

Monitoring Program: In 2015, the Buzzards Bay NEP developed an EPA-approved QAPP that was the basis of the monitoring program. In 2018, the QAPP was updated based on lessons learned in implementing the program. The updated QAPP is available on the monitoring page of the Buzzards Bay Stormwater Collaborative website. The Buzzards Bay NEP also developed the test kits and constructed sampling device prototypes, a user manual for equipment, and Stormwater Monitoring Guidelines. Water quality data was added to a Microsoft Access™ database that was integrated with the ArcGIS™ database.

Table 1. Summary of plans scanned as part of the effort as a percent of total town inventory.

Municipality	Number of Plans Scanned	Percent of Town Covered	Percent of Pipes Digitized
Acushnet	1,172	45%	10%
Dartmouth	about 11,000 (provided by Town)	100%	80%
Fairhaven	160	100%	90%
Mattapoisett	259	50%	25%
Wareham	4,856	5%	0%

The initial monitoring focus of the Stormwater Collaborative was to sample stormwater networks discharging within 100 feet of either an area closed to shellfishing or other bacteria impaired waters (as defined in the Massachusetts Year 2012 Integrated List of Waters, Categories 4a and 5) within the Stormwater Collaborative municipalities (Dartmouth, Fairhaven, Acushnet, Mattapoisett, and Wareham). Utilizing information provided in the 2007 Stormwater Atlas, all potential discharges were inspected and evaluated. Upon completing the evaluation, 250 sites were selected for monitoring. During the two years of sampling, the Stormwater Collaborative tested, changed, and adopted protocols to streamline data collection. Staff from municipal public works departments were trained and equipped for stormwater sampling. Municipalities will continue to use this equipment to meet their MS4 permit requirements. In addition, the BBAC and Buzzards Bay NEP established strong working relationships with the participating municipalities and laboratories, which will be assets for future stormwater initiatives. Other municipalities can use the Buzzards Bay Stormwater Collaborative approach as a blueprint to develop their own stormwater mapping and monitoring program.

Fig. 4. BBAC intern testing a stormwater sample with one of the test kits.

Monitoring was conducted principally between April 2016 and November 2017 and included wet and dry weather sampling. The primary goal of the dry weather sampling was to identify illicit connections. The monitoring consisted of field observations and field testing and included additional in-office testing (Fig. 4), and laboratory testing principally for bacteria. A full list of parameters are shown in Table 2. Methodologies are detailed in the project QAPP.

Table 2. Summary of analytical methods used in the stormwater monitoring effort

Field Test Kit Measurements
- Surfactants as detergents
- Ammonia as Nitrogen
- Conductivity/Salinity/Temperature
- pH
- Nitrates as Nitrogen
- Chlorine (on an as-needed basis only)

Field Observations
- Color
- Odor
- Cloudiness (turbidity)
- Sewage/Septic System waste products (toilet paper, sanitary products, etc.)
- Flow characteristics
- Infrastructure configurations

Laboratory Analysis (Primary)
- Enterococci and/or Fecal coliform bacteria - saline
- *E. coli* bacteria - fresh water

Secondary Laboratory Analysis (optional)
- Nitrates as Nitrogen
- Total Kjeldahl Nitrogen
- Phosphorus
- Ammonia
- Hydrocarbons
- Total Suspended Solids

Both Enterococcus and fecal coliform bacteria tests can be used to identify potential illicit connections to stormwater connections. For financial and other pragmatic reasons, midway through the first season of sampling, it was decided to test for a single bacteria indicator. Bacteria concentrations range over many orders of magnitude, ranging from less than 10 to hundreds of thousands per 100 ml. The correlation coefficient between the two bacteria parameters indicated that measuring for one bacteria would be adequate for this project. EPA encourages the use of *Enterococcus* as an indicator in marine environments because it is presumed to be a little more specific to human and animal fecal waste, is tolerant of temperature and salinity ranges, and provides a higher correlation than fecal coliform with human pathogens in sewage. In addition, the fecal coliform bacteria test can give false positives. For example, while there are some species of *Klebsiella* bacteria that are found in fecal waste, there are other species of *Klebsiella* that are found in decomposing plant matter such as hay bales, and these bacteria can elevate bacteria counts in the fecal coliform test. Both bacteria tests cost $20 per sample and both have identical holding times for the type of samples collected for this project. While it is true that the fecal coliform bacteria test is used as the basis of shellfish bed closures in Massachusetts, water sample testing was limited to *Enterococcus* for the reasons given above and to reduce cost.

Technical Report: The Buzzards Bay NEP is preparing a 270-page discharge report summarizing the findings collected under the EPA grants. The core of the document is a summary page for each discharge that includes a description of the discharge, a map of its location, sampling locations, and data collected. Areas of concern will be identified which enable towns to focus remediation efforts on priority discharges. Fig. 5 shows a representative summary page for a discharge located in the Town of Dartmouth. These discharge summaries are also made available on the Stormwater Collaborative Interactive Map available online so that the public and government officials can navigate to any location and display information about the discharge.

BBAC Stormwater Project Report
Discharge Number **APB1037PI**
in the Town of **Dartmouth**

Water St opposite Prospect St

Water Body: Apponagansett Bay Qualifier: SFO

Urbanized: Yes Sewered: Yes Class: SA Category: 5

MS4 Ranking: High Priority Outfall

Status: Some Concern Warranted - Consider Corrective Action

DW: no issues. WW Mod to high levels of Bact and elevated Nitrates, Amm, and Surf. WW rank Bact (2), Nitrates/Amm/Surf (1 ea), Tot 5. App Bay Impair: Bact and N

2 'No Sample Visits'

Ranking, Status, and Recommendation based on the opinion of the BBNEP. Report Created on: 4/5/2018

FacilityID	SampleDate	SampleID	Sample Type	Water Classification	Last Rain	12 hr. Rain	pH	Temp	Salinity	Ammo	Nitrate	Surfact	Enterococcus	Fecal Coliform
APB1309MH	8/8/2016	6DA08AUG04-A	pipe	Fresh Water	38 hrs	0 in	7.66	26.1	0.15	0.00	4.40	0.100	10	10
APB1309MH	8/10/2016	6DA10AUG06-A	pipe	Fresh Water	0 hrs	0.18 in	7.08	23.8	0.05	0.35	4.40	0.750	2800	1600
APB1309MH	8/22/2016	6DA22AUG07-A	pipe	Fresh Water	3 hrs	0.45 in	7.30	26.7	2.75	0.25	2.64	2.000	126000	39000
APB1309MH	9/1/2016	6DA01SEP07-A	pipe	Fresh Water	0 hrs	0.1 in	6.96	23.1	0.03	3.00	2.64	1.000	6800	

Fig. 5. Sample report for a stomrwater discharge.

Sites were classified in two ways. First, in accordance with MS4 language sites were prioritized as problem outfall, high priority outfall, medium priority outfall, low priority outfall or excluded outfall. However, this methodology was not sufficient for municipal prioritization, because under MS4 permit guidance, any discharge to a bacterial-impaired water body is defined as high priority within the MS4 permit. Because some discharges have very high bacteria concentrations, a secondary prioritization was added to better guide municipal priorities. These priority descriptions provide guidance to address issues immediately, continue monitoring, or allocate resources elsewhere.

Outreach and Education: In 2016, the BBAC implemented an "only rain down the storm drain" campaign flyer and mailers (Fig. 6). More than 20,000 were mailed in water or tax bills or provided at town hall information kiosks, or at a local Earth Day event. The flyers were also available on the BBAC website. Another outreach piece titled "Story of Stormwater" was written by the BBAC Stormwater Specialist and posted on the BBAC website. Finally, the Stormwater Collaborative website contained information directed to not only municipal officials and stormwater collaborative participants, but also to the public. The public was even invited on the Stormwater Collaborative's crowdsource page to use the interactive map to upload photographs of stormwater discharge pipes using their smartphones. Most other outreach efforts related to workshops and training of municipal officials, or participating in presentations at Southeast New England Coastal Watershed Restoration Program SNEP events. By employing student interns, this project helped train and give experience to the next generation of environmental advocates.

Fig. 6. Front of the public outreach insert, *Only rain down the drain!* The insert or flyer format was used in water or tax bills, and provided at municipal information kiosks.

V. CHALLENGES AND LESSONS LEARNED

1) Challenges in ramping up and staffing the stormwater collaborative

The BBAC is a long established non-profit organization, with a staff consisting of a part-time contractual Executive Director. The grant award occurred late in 2015, which required the BBAC to hire and train staff during a short period of time before the begining of the monitoring season in early June 2016. The part time Grant Administrator and Stormwater Specialist were hired quickly, but initial duties of securing services for payroll, accounting, insurance, and other administrative infrastructure necessary to support up to six new employees were a daunting task. The BBAC Grant Administrator and Stormwater Specialist then had to hire interns, purchase equipment, construct sampling devices, and secure laboratory contracts to support the imminent start-up of water quality sampling. BBAC's part-time Grant Administrator's experience as a town administrator facilitated these activities.

2) Timing of precipitation and drought

The regional approach of this project added the factor of high variablilty of rainfall across the area. An occurrence of rain may be different a few miles away and the project worked across several towns. Many of these rainstorms were short-lived, and by the time the interns arrived at a site to be monitored, the storm had already passed.

Bacteria concentrations in stormwater diminish during cold weather, hence bacteria testing is generally undertaken during warmer weather when air temperatures are above 50° F. Stormwater monitoring depends upon precipitation and in southeastern Massachusetts the summer has limited precipitation events.

Exacerbating matters, there was a drought in the summer of 2016 at the start of the program. These conditions forced a reassessment of monitoring guidelines as to how long after the start of precipitation it was acceptable to collect a stormwater sample, because it was often logistically impossible to capture "first flush". The drought also forced the monitoring program to collect more dry weather catchbasin sump samples than originally intended, and placed more initial staff focus on the mapping needs of the program than water sampling needs. The lack of rain also facilitated the identification of suspected illicit connections, which turned out to be few.

3) Laboratory capacity and handling times issues

To comply with EPA guidelines, the allowable holding time for stormwater samples tested for bacteria isonly six hours. The BBAC contracted with several local laboratories, which required samples to be delivered before 3 PM and generally were not available on weekends. These laboratories could only accept and test a certain number of samples on any given day (10 for one laboratory). In practical terms, this meant that only rains that occurred during a particular time on weekdays could be collected.

4) Mapping should be done before monitoring

EPA provided funds for nearly two years of Stormwater Collaborative activities. Both mapping and monitoring efforts needed to be undertaken concurrently for two monitoring seasons. However, extensive knowledge of the stormwater network prior to monitoring is imperative.

Monitoring stormwater discharges in the coastal zone represents a special challenge because pipes are located in the intertidal zone (often the low intertidal zone) or subtidal (Fig. 7). Thus, unless a rainfall occurs during low tide, it may be impossible to collect a sample at the end of the pipe. Even if tides are favorable and the pipe is exposed, salt water intrusion into stormwater network means samples are not necessarily good indicators of the stormwater network contaminant levels and the presence of salt can require changes in analytical methods used to test for certain contaminants.

Fig. 7. Many discharges are intertidal or subtidal. Even when they can be sampled at low tide, the sample may be mostly salt water that intruded into the pipe.

These challenges required that sampling in most networks be undertaken at the first or second manhole upgradient of the stormwater discharge (Fig. 8). This not only required participation by municipal public works staff, but also severely limited how many sites could be practically sampled during any particular rainfall. It also required that stormwater networks be mapped so that the correct corresponding manhole locations are known, and the various pipe junctions under the manhole be identified before stormwater sampling began. This requirement is so essential, that any similar monitoring program should have mapping be the focus of start-up efforts. To a degree, the drought during the summer of 2016 provided the Stormwater

Collaborative with some breathing room to map the stormwater networks of the 250 priority discharges in the program. Detailed field notes of outfall and manhole locations, configurations, and access are essential for a streamlined sampling program.

A complete GPS and site plan inventory and inspection of all stormwater discharges to impaired waters can greatly improve the cost-effectiveness of a stormwater monitoring program. This would enable staff to confirm stormwater discharge interconnections in the manhole facilities, clear obstructed or filled junctions, and define facility IDs for all sites.

Fig. 8. Manhole covers must be removed to confirm network connections and for sampling.

5) Logistics of sampling

Even when stormwater facility networks are well mapped, and sampling locations defined, the efficiency of sampling (Fig. 9) can be enhanced by planning routes in advance with multiple stops to get a better sense of route duration. Free online tools also allow importing multiple latitude and longitude coordinates to provide street directions. The Buzzards Bay NEP's interactive stormwater network map has a directions feature that will call up a smart phones mapping app to get driving directions to any location. Staff have to be made aware and trained in the use of these tools. As noted above, pre-inspection of monitoring sites is important to determine if pipes or system junctures need to be cleared or serviced before sampling hours.

6) Use searchable device for discharge IDs

Whether using tablets accessing online maps or simply loading pdf maps on tablets, it is essential to have detailed maps in the field. While some investigators prefer paper maps, most investigators will use digital devices if made available. The interactive map at stormwater.buzzardsbay.org was one tool used by staff in the field (Fig. 10). The staff used water resistant tablets with 4G service in the field to access this online data.

Fig. 9. BBAC intern working with DPW crew to collect water samples.

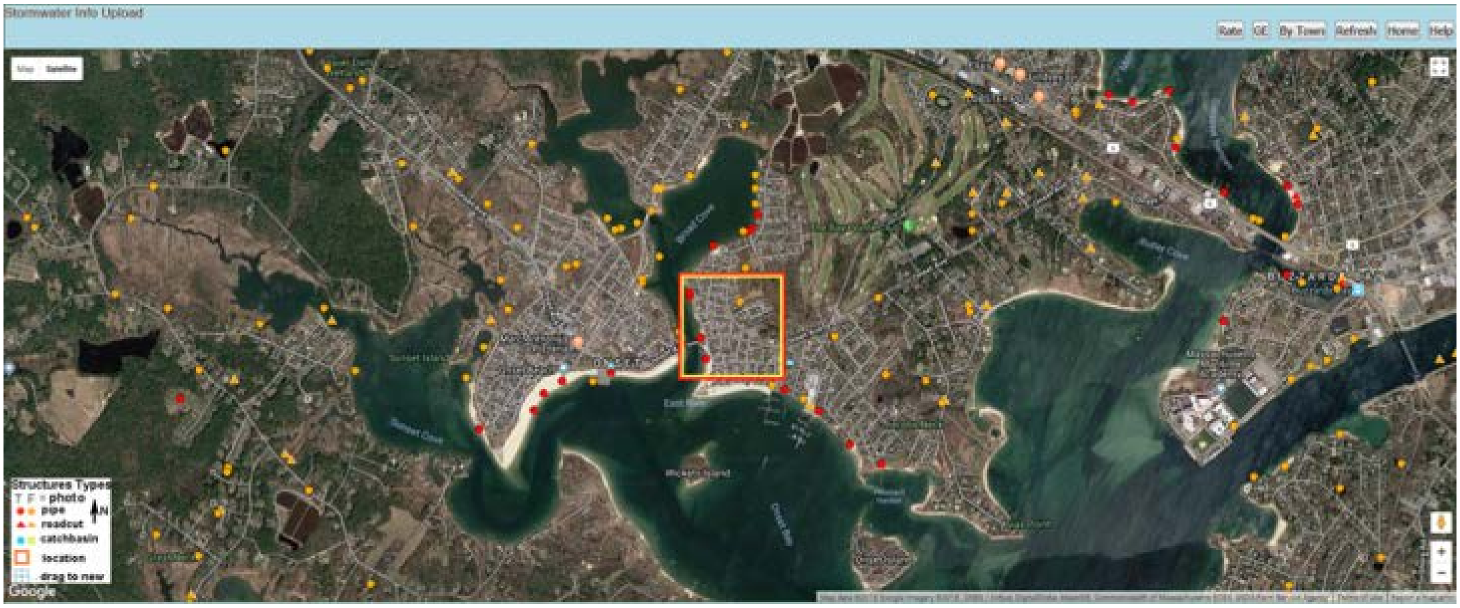


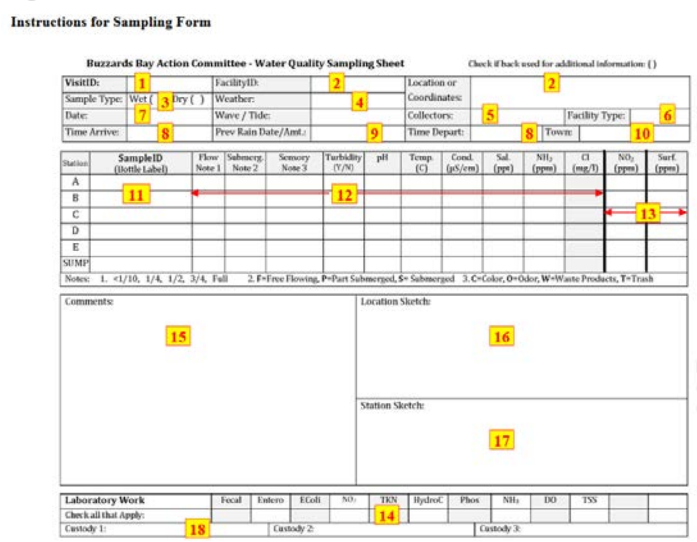
Fig. 10. The online interactive map stormwater map created by the Buzzards Bay NEP. By clicking on the points, data, facility ID, and photographs could be viewed for each structure. The interactive website allowed photographs to be uploaded in the field.

7) Issues related to field sampling and test kits

Use simple and durable equipment designed for field use. Some electronic testing equipment are not designed for field use and can be damaged by wet weather. Fieldwork during inclement weather, such as wet weather sampling, is a challenging task. Clear and simple techniques are more likely to achieve better results.

8) Coordination and scheduling with labs and DPWs

Town DPWs are often not available during severe storms, and start of the day times vary with public works departments. It is important to coordinate sample-taking and delivery to labs in advance, and to define communication protocols when plans and responsibilities need to change. Developing a weekly sampling schedule with routes is valuable for municipal staff, partner groups, and the laboratories.


Instructions for Sampling Form

Buzzards Bay Action Committee - Water Quality Sampling Sheet
Check if back used for additional information: ( )

VisitID:	1	FacilityID:	2	Location or Coordinates:	2	
Sample Type:	Wet (3 Dry ( )	Weather:	4			
Date:	7	Wave / Tide:		Collectors: 5	Facility Type:	6
Time Arrive:	8	Prev Rain Date/Amt.:	9	Time Depart: 8	Town:	10

Section I

Station	SampleID (Bottle Label)	Flow Note 1	Submerg. Note 2	Sensory Note 3	Turbidity (Y/N)	pH	Temp. (C)	Cond. (µS/cm)	Sal. (ppt)	NH_3 (ppm)	Cl (mg/l)	NO_3 (ppm)	Surf. (ppm)
A													
B	11				12								
C												13	
D													
E													
SUMP													

Notes: 1. <1/10, 1/4, 1/2, 3/4, Full 2. F=Free Flowing, P=Part Submerged, S= Submerged 3. C=Color, O=Odor, W=Waste Products, T=Trash

Section II

Comments: 15
Location Sketch: 16
Station Sketch: 17

Section III

Laboratory Work	Fecal	Entero	EColi	NO_3	TKN	HydroC	Phos	NH_3	DO	TSS		
Check all that Apply:					14							

Custody 1: 18 Custody 2: Custody 3:

Fig. 11. Instructions for the sampling sheet are contained in the Stormwater Monitoring Guidelines document.

9) Data forms and data entry issues

Dry weather no-flow observations were an important part of the monitoring program. The data requirements for these observations were much less extensive than data required for a collected sample. Therefore, a different form for dry and wet weather sampling was created to document these observations. Data entry in the field was performed principally using waterproof paper. However, there was a tendency for staff to complete the forms in the shelter of their vehicles. There was also considerable interest in having data entry be done solely on tablets. Data entry forms were developed for the tablets, but this approach was not implemented.

10) Failure to receive continued funding

Too many towns wanted to participate in the Stormwater Collaborative, which was limited to $200,000 in funding. This led to an over commitment of resources for such a large geographic area. Failure of the BBAC to acquire follow-up funding to address shortcomings and continue the program and add additional municipalities hindered the successful initiative. While an important success is that the BBAC was able to secure an additional $25,000 ($5,000 per municipality), an EPA amendment of $25,000 and a $32,000 NEP support grant to meet year 2 program shortfalls, the failure to secure sustained funding led to the loss of BBAC Stormwater Collaborative staff at the start of 2018. Ongoing delays and lawsuits relating to the municipal MS4 permit program led to a lessened sense of urgency to continue funding the Stormwater Collaborative effort.

Fig. 12. Buzzards Bay NEP and BBAC staff conducting a training session for municpal officials.

11) Training time and learning curves

Data quality and consistency can vary among field staff. Continued training of interns and municipal staff is important, as all become more proficient with time. Field testing of instruments and protocols, and equipment recalibration are also essential to ensure consistency and efficiency in data collection. New field equipment should always be calibranted and sampling methods evaluated by program managers before use. Interns and towns staff should be assessed periodically to ensure conformance with monitoring protocols.

12) EPA chlorine monitoring goals impractical

EPA has recommended stormwater be tested for free and total chlorine be recorded at the reporting limit of the Hach Pocket Colorimeter ll (0.01 mg/L). Because the method requires titrating the sample to the proper pH with sulfuric acid, determining chlorine concentration in stormwater with this test kit is difficult in the field, particularly during inclement weather. There is no allowable holding time; chlorine needs to be tested in the field (as opposed to in the office), and the method necessitates 15 to 30 minutes per location. This doubles or triples the typical field sampling protocol time per site. In addition, there are pragmatic issues in handling sulfuric acid in the field, and the expensive instruments are not waterproof. Given that drinking water chlorine concentrations are typically 0.2–1 mg/L, and swimming pool concentrations are typically 1 to 3 mg/L, the Buzzards Bay NEP recommends that free and total chlorine be screened with test strips with sufficient detection limits to meet EPA requirements.

13) Cleaning bottles versus disposable sample containers

Initially sampling protocols involved the use of 500 ml bottles, whose contents were split into separate containers for bacteria and other test kit analyses. This approach required sterilizing the 500 ml bottles after each use and also imposed some sample processing problems in the field to prevent contamination. The sampling protocol was changed to sequential direct collection into one or two 100 ml pre-sterilized disposable sample cups (for bacteria) and a 125 ml bottle for field and in-office tests.

14) Project management and grant administration issues

Effective monitoring programs require good administrative and personnel management skills. It is essential for all partners, staff, interns, and municipal personnel to meet regularly to discuss project goals, objectives, progress made, and any updates or changes to protocols. Weekly staff meetings should be undertaken to review data, problems, and concerns. Monthly meetings should be undertaken with all science staff to review project progress, and refine protocols and priorities if necessary. The inventory of testing equipment and supplies should be checked frequently to insure availability, and mechanisms, responsibilities, and protocols for ordering materials should be established. Vendor accounts with shipping address and delivery availability should be set up in advance, and non-profit tax ID number should be used to lower costs. Organizational chain of command for information flow, and decision-making should be defined. Each municipality must define a principal point of contact to reliably relay information, schedule joint field investigations, and to respond to inquiries or provide needed information about stormwater infrastructure.

VI. CONCLUSION

The Stormwater Collaborative was established as a coordinated intermunicipal program to inventory stormwater networks and monitor discharges to impaired surface waters in Buzzards Bay. The long-term goal of this initiative was to help municipal governments and residents reduce environmental and human health risks associated with stormwater discharges to shellfish beds, swimming beaches, and other impaired priority waters. Actions taken based on the data collected can lead to elimination of illicit connections, and the treatment of nonpoint sources of pollution that will lead to reductions in shellfish bed closures and other impairments caused by stormwater discharges.

The use of a non-profit organization and student interns provided a highly cost effective solution to achieve program goals. Had the municipalities independently contracted for the services and data collected, their cumulative costs would have been many multiples of the grant funding obtained by the BBAC. The Buzzards Bay National Estuary Program provided essential guidance and technical support to overcome technical challenges faced throughout the program.

The BBAC Stormwater Collaborative was quite successful despite not obtaining funding for a third year. While the contribution of $25,000 by the five participating municipalities was an important achievement in meeting funding shortfalls at the end of 2017 and into 2018, the sustained cost of continuing this program to and expanding geographic coverage in the five towns would be closer to $100,000 to $150,000 annually. While the long-term goal is to grow the Buzzards Bay Stormwater Collaborative into a watershed wide effort, where municipalities use a common set of approaches and GIS analysis to define priority sites for remediation, this goal will be impossible to achieve without dedicated sustained funding.