Stormwater BMP Retrofit Development Dedham, MA

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Executive Summary

This project built upon similar work performed as part of a grant from the America Reinvestment and Recovery Act (ARRA) in Sharon, Stoughton and Walpole, MA as well as work under the 604b grant program in Canton, MA. Similar to these projects this survey aimed at surveying large portions of the Town of Dedham, MA, and identify locations to implement structural stormwater controls to improve water quality overall but specifically in the Neponset River Watershed.

The goal of this project was to identify at least three locations in the Town of Dedham, MA, suitable for retrofitting with structural stormwater Best Management Practices (BMPs). Secondary project goals were to further ground truth and implement a methodology to efficiently survey a wide geographic area and capture data in the field in order to prioritize potential opportunities to implement stormwater BMPs and to use the data collected to support preliminary designs for the top three identified locations including estimates of the operation and maintenance costs.

This project emphasized a visual survey of the BMP retrofit potential of sites using ArcPad software as the main data collection tool which was developed during a previous project nearly identical to this one. Key criteria for the data collected during the survey were the ease of BMP implementation, likelihood for acceptance from key abutters, type of BMPs recommended for the site, approximate size of the contributing drainage area and possible implementation conflicts. ArcPad software allowed for improved data collection by getting all data into a GIS compatible, digital format in the field. A personal geodatabase was created for the town that included separate layers for Sites, Drainage Areas, BMP recommendations, Projects and Discharge Points. Each of these layers had a number of data fields that were populated in a manner similar to a paper field sheet.

Using this new survey format, the project was able to evaluate nearly 30 potential retrofit sites in Dedham. These sites were prioritized down to a list of the top ten opportunities. Project partners the Neponset River Watershed Association (the Association), Nitsch Engineering (Nitsch) and the applicable town Engineering, DPW and Conservation Commission staff then visited each of the top ten locations to further prioritize potential locations culminating in the selection of the top three sites. Criteria such as ease of implementation, overall drainage area size, type of BMP, potential operation and maintenance cost, public education value, and aesthetics were all used in narrowing the list of sites down to the best three options.

The top locations identified for stormwater BMP retrofits in this project would have an impact of treating over 81,000 ft² of impervious drainage area if implemented. These BMPs would also account for the removal of 184 trillion colonies of fecal coliform bacteria as well as 2,078 lbs. of TSS and 4.7 lbs. of total phosphorus annually.

Introduction

The Dedham Engineering Department partnered with the Neponset River Watershed Association (the Association) and Nitsch Engineering (Nitsch) to identify sites suitable for retrofitting with structural stormwater Best Management Practices (BMPs) and to develop conceptual designs for BMPs at those sites.

The specific goals of the project were to:

- Identify at least three sites (neighborhoods or discrete collection areas) that are amenable to the implementation of structural BMP retrofits.
- Prepare conceptual designs and cost estimates to support future applications for implementation funding.
- Demonstrate a methodology which can be used to efficiently identify and prioritize stormwater BMP retrofit opportunities in other towns and other watersheds in the future.

The project was conducted in the Town of Dedham, MA (Figs. 1-2). The approach for this project was based on lessons learned from past BMP development efforts by The Association. These past efforts utilized a program of intensive, wet-weather outfall testing applied to a relatively small geographic area, in an effort to prioritize stormwater retrofit sites. The sampling effort was followed by the development of conceptual BMP designs as well as efforts to secure abutter approval for implementation of the BMPs.

Based on this prior experience, an approach to identifying, prioritizing and designing BMP retrofits was used that mirrored similar surveys conducted in the Towns of Sharon, Stoughton and Walpole, MA. This approach emphasized covering a very large geographic area using a visual survey along with in the field digitization of data in the form of a Geographic Information System, or GIS. This allowed for BMP retrofit potential to be rapidly evaluated across a large area, to prioritize retrofit opportunities and at the same time take into account probable ease of implementation, engineering feasibility, potential for pollutant load reduction and the likelihood for acceptance by abutters. Once this broad assessment of opportunities was completed and vetted with key internal and external stakeholders, the relatively expensive tasks of final conceptual design and quantification of pollutant loading took place.

First, a list of preferred BMPs was developed and reviewed with the Town. The list was initially adapted from current available literature from the Massachusetts Department of Environmental Protection, Vermont Department of Natural Resources and the Center for Watershed Protection (CWP 2007, MADEP 2008, VNR 2002). The list of available BMPs was further prioritized based on review and discussion amongst the town's Engineering Department, DPW and/Conservation Agent, the Watershed Association, and Nitsch (Table 2). The criteria for the list of preferred BMPs included their ability to achieve effective levels of pollutant load reduction for the pollutants of concern (bacteria, nutrients, sediment) and compatibility with operational, aesthetic and maintenance requirements in the town. The purpose of this step was not to reinvent available BMP design guides, but rather to ensure that the needs of all key internal stakeholders were fully understood "up-front."

The next step was to assemble existing information on the drainage system within the town. Quantitative information such as maps of drainage systems and town-owned land, along with programmatic information such as plans for drainage or roadway work with which a stormwater component might be efficiently dovetailed, and anecdotal information such as existing drainage problem-areas was compiled. GIS data layers were obtained from the Town as well as a Pavement Management Road Program report for FY2012-2014 that detailed roads within the town already slated for reconstruction or resurfacing over the next 3 years. The GIS data included layers identifying individual land parcels, Town owned property, stormwater drainage and infrastructure, edge of pavement, sewer infrastructure, locations of BMPs already located within the Town and road right of ways (Appendix 1d,e,g, 3a see compact disc). Additional GIS layers were obtained from Mass GIS, including orthophotos of the study areas and hydrography (Appendix 3a, see compact disc). Finally, data from the Natural Resource Conservation Service (NRCS) was obtained outlining major hydrologic soil groups within the study areas (Appendix 3a, see compact disc).

Once this information was compiled and integrated into the overall project GIS the "BMP retrofit feasibility field survey" was then performed by first converting the desktop GIS into a mobile format using ArcPad software. Then a visual survey of drainage outfalls and collection areas was performed by Watershed Association staff to compile a preliminary rating of retrofit feasibility and potentially appropriate BMPs for sites. Data was captured in the field using ArcPad software installed onto a tablet PC notebook computer. This enabled the surveyor to input data in real time and helped to make the prioritization process more efficient by eliminating the need to transfer data from multiple paper field sheets to a more useable digital format. In addition to the increased efficiency of imputing the data directly to a digital format, the geodatabase allowed for rough calculation of drainage area size and available space for individual BMPs in the field. By using tools integrated in the ArcPad software, Association staff were able to obtain a more accurate estimate of available space for particular BMPs and how that space related to the estimated size of individual drainage areas allowing for a better initial prioritization of BMP recommendations.

Once the survey was completed site visits were conducted at the top 10 prioritized locations in Dedham by a team including Watershed Association staff, Nitsch and the Town of Dedham Engineering and Conservation Commission staff. Based on the site visits by the project team, a "draft final" list of 10 retrofit opportunities was prepared with each opportunity ranked from one to ten (Table 1).

After the top ten sites were agreed upon, the project engineering consultant prepared conceptual designs for the top three locations, detailed cost estimates for the top three locations along with more limited cost estimates and operation and maintenance requirements for all ten (Appendix 6a).

Project Approach

For this project a step by step process was created starting with defining a list of preferable BMPs. Additional steps included getting information about individual town infrastructure and potential upcoming construction projects or drainage area problems, an desktop survey of potential locations, field surveying to identify and prioritize potential retrofit opportunities, further prioritization of retrofit opportunities using agreed upon criteria between stakeholders and finally culminated with preliminary design and cost estimates produced for the top three locations in each town.

The first step was to come up with a list of BMPs that all project partners could agree upon for potential retrofit locations. This list was compiled through collaboration between the Association and Nitsch and was later vetted with Town Engineering Department DPW and Conservation Commission staff to discern which practices were more acceptable than others (Table 2). Practices that required the least amount of operation and maintenance that were also surface structures were the most favorable options. The least desirable practices were underground structures, either infiltrators or filters, or those that had unique maintenance requirements which the town felt were beyond their current capabilities, such as porous pavement. Criteria used to determine acceptable BMPs for each town included the cost of implementation, operation and maintenance schedules, pollutant removal efficiency and aesthetic criteria. The only BMPs that were taken out of consideration as a stand-alone practice were swales since some literature has suggested that they are not effective at removing bacteria and in some cases can actually increase bacteria loading (Clary et. al. 2008).

Following the meeting between the Association, Nitsch and Town staff prioritized a list of possible BMPs was agreed upon that would later be used in the field to further prioritize sites for retrofit potential. In addition to creating a list of preferred BMPs the meeting was also used as a forum to discuss any future development projects or problem drainage areas as well as collect information on town owned property, current drainage infrastructure and other utility information (Table 2, Appendix 1d,e and g).

Once the list of preferred BMPs was finalized, a digital field database was created using ArcPad software to allow for real time data collection (Appendix 3a see compact disc, 3d-g). The database included layers for Sites, Drainage Areas, BMPs, Discharge Points and also a layer to combine Sites into individual Projects if appropriate (Appendix 3a see compact disc, 3d-g).

Each layer of the database was designed to capture certain key information related to a different type of geographic feature. For the Site layer, attributes included initial survey date, site name, priority and remarks about the site in general. This layer was primarily used to prioritize and track areas for the field visits based on a desktop analysis of retrofit potential but could also be edited in the field when the need arose.

The Drainage Area layer was created to define the contributing drainage area to a recommended BMP or outfall. Attributes for this layer included Site ID, Project ID, Land Use, Existing BMPs, BMPs Sufficient, Underground Only, and Outfall ID. For each drainage area outlined, a unique ID was created in ArcPad automatically which was used as the official ID number for that

particular drainage area. Site ID and Project ID attributes were used to relate the drainage area layer to the Site and Project layers of the database. The other data fields were created to capture data about the land use within the drainage area, whether or not there were already BMPs located within the drainage area and if they were sufficient to treat the stormwater at that location.

The main project layer created for this project was the BMP layer of the field database. This layer included fields for the following attributes: Site ID, Drainage Area ID, Existing BMPs, Location Type, BMP Type 1, BMP Type 2, Soils, Constraint 1, Constraint 2, Constraint 3, Owner Type, Abutting Use, Abutter Conflict, Overall Rating and Remarks. Similar to the Drainage Area layer the BMP layer had a unique numerical ID created each time a BMP was outlined. The Site ID and Drainage Area ID attributes were included to relate each individual BMP with a specific Site and Drainage Area. Two separate attributes were included for BMP recommendations (BMP Type 1 and 2). Three separate attributes were included to denote potential conflicts that may have been apparent at the location where the BMP would be located. Additionally, attributes were included for what the abutting land use appeared to be and estimate the likliehood of conflicts with abutters if implementation of the BMP were to go forward. Criteria used to determine potential conflict with abutters was qualitative and was driven by past experience. Essentially, the more individual private land owners in an area proposed for retrofitting and the more visually intrusive the BMP, the greater the likelihood for conflicts with abutters. For example, a residential neighborhood where the proposed BMP would require an easement for implementation would be considered a high risk for conflicts whereas a retrofit located in a residential neighborhood but the practice would be entirely on Town owned property would be considered as a moderate. Finally there were attributes to give a first impression of the priority of the site (Overall Rating) relative to the ease of implementation and any other remarks that might have been worth noting (Remarks).

The Discharge Point layer of the field database was created to identify outfalls or other types of discharge points that were not otherwise mapped or available in the town's digital format. Also, the Project layer of the database was created to allow regrouping of Sites, BMPs and Drainage Areas together that made more sense as one combined project rather than individual projects.

In addition to the field database, a basemap was created using ArcMap software. Primary layers were drawn from MassGIS and NCRS and included available ortho-imagery, town boundaries, hydrologic soil units, and layers depicting major rivers, tributaries and surface waters.

In addition to the standard layers, the Town made available layers delineating stormwater drainage throughout the town, including layers depicting the placement of outfalls, manholes, catch basins and pipe connectivity. Additional layers included a parcel layer of Town owned property as well as private, sewer infrastructure and data depicting edge of pavement for most roads (Appendix3a, see compact disc).

Once the geodatabase was finalized field surveys were conducted in two parts. An initial desktop survey of potential sites was conducted using ArcMap software in the office. These sites were initially prioritized so that areas adjacent to or fully within town owned property were given the highest priority for actual field investigation.

Once the Sites layer was created and prioritized, the field survey was conducted for each town (Fig. 2). Field investigations involved inspection of individual sites, outlining potential drainage areas and outlining areas with sufficient space to construct BMPs. Nearly 30 sites were prioritized and visited. Further prioritization of the top 20 sites led to individual site investigations conducted by Association staff, Town staff and Nitsch to produce a final prioritized list of the best 10 locations (Table 1). The top three locations were then taken by Nitsch in order to produce preliminary designs and cost estimates for those locations (Table 5, Figs. 3-5, Appendix 6a).

Results

Prior to actually surveying the town, a list of preferred BMPs was created and agreed upon between Association staff, Town staff and Nitsch (Table 2, Appendix 1h). This list was derived from available literature and was not meant to be an exhaustive list of all available BMPs but rather a list of BMPs that all members of the project team felt comfortable with as recommendations going forward.

BMPs were prioritized by overall cost, operation and maintenance requirements and their effectiveness in treating pollutants of concern, specifically pathogens. For this project BMPs such as bioretention cells, infiltration basins and rain gardens ranked higher on the list whereas underground infiltration and filter chambers and porous pavement BMPs were given the lowest priority (Table 2, Appendix 1h).

This list of preferred BMPs was then incorporated into the field database for on-site prioritization of BMP recommendations (Appendix 3a, see compact disc). The field database was separated into five layers in a GIS (Site, Drainage Area, BMP, Discharge Point and Project) and exported into an ArcPad format.

Once the list of BMPs was agreed upon the actual survey portion of the project commenced and 28 Sites with potential for BMP retrofits were identified during a desktop survey of the available digital information.

After visiting these sites 37 individual Drainage Areas were outlined and 36 individual BMPs were recommended for nearly all of the associated Drainage Areas. Five BMPs received an "Excellent" rating during initial prioritization at five individual Sites (Appendix 4e-f). An additional 22 BMPs received a "Good" rating during initial prioritization at an additional 7 sites (Appendix 4e-f).

The top 10 locations selected in Dedham were Sites 11, 7, 28, 30, 20, 17, 15, 14, 27, and 6 (Table 1, Figs. 3-5). From this list a top 3 list was determined after field visits to all of the top 10 locations. The top 3 Sites were Sites 11, 7 and 28. All Sites selected as the top 3 locations received an "Excellent" rating during initial prioritization (Appendix 4e-f).

A total of 3 wet weather sampling events took place during this project. Wet weather samples could be taken at any point during a precipitation event exceeding 0.1 inches as long as there was enough flow from the outfall or in the gutter to get enough water for analysis (Appendix 2a).

Samples were taken from outfalls where possible and in some instances from the gutter prior to water entering the catchment system due to access issues at some outfalls at the top 3 locations. In addition samples were also taken from the receiving waters associated with each catchment system where a retrofit had been proposed.

The primary pollutant of concern was bacteria due to the fact that the Neponset River watershed has a TMDL for pathogens. The maximum level of bacteria found at any of the outfalls sampled was >24,196 MPN found at two separate locations and the minimum was 0.0 MPN from a site not included in the top 3 locations selected for conceptual designs(Table 3). The average level of bacteria found at outfalls during sampling was 3,735.3 MPN (Table 3). For receiving waters, the maximum level of bacteria was 24,196 MPN and the minimum was 134.0 MPN (Table 4). The average bacteria level found in receiving waters was 3,422.1 MPN (Table 4).

Samples were also analyzed for ammonia, surfactants and temperature. The maximum level of ammonia found in any of the outfall samples was 0.341 mg/L and the minimum level was 0.000 mg/L (Table 3). The average level of ammonia found at outfalls was 0.084 mg/L. The maximum level of surfactants found at outfalls was 0.25 mg/L and the minimum was 0.00 mg/L (Table 3). The average concentration of surfactants at outfalls was 0.03 mg/L (Table 3). The maximum temperature found at outfall sampling locations was 22.0 C° and the minimum temperature was 10.0 C° (Table 3). In contrast, the maximum level of ammonia found in any of the receiving waters was 0.349 mg/L and the minimum was 0.011 mg/L (Table 4). The average ammonia concentration found in receiving waters was 0.091 mg/L (Table 4). There were no surfactants detected in any of the receiving waters during this project (Table 4). The maximum temperature found in the receiving waters was 19.5 C° and the minimum temperature was 10.5 C° (Table 4). The average temperature across all receiving water samples was 14.3 C° (Table 4).

Project Summary

The three sites believed to be the best opportunities in Dedham were Colburn-Whitehall, Sawmill Ln. and Avery St. (Table 1). During field investigations there were other sites that were thought to have good potential for BMP retrofits but each Site not in the top 3 had small issues that caused the top 3 Sites to stand out. The three selected as the best opportunities for this project better fit criterion including overall implementation cost, abutter conflict and overall ease of implementation.

The top rated location for this survey was at the intersection of Colburn St. and Whitehall St. Upon initial on site investigation a bioretention cell was recommended or possibly a bioretention cell with an underdrain at BMP location 16 if soils in the area of the practice were not conducive to infiltration (Figure 3). After additional site investigation with Town staff and Nitsch it was determined that the bioretention cell would be the best practice for this location. This practice would be sized to treat 104% of the 1" WQv per year. Annually 62,735 billion colonies of fecal coliform bacteria would be removed as well as 823 lbs. of TSS and 1.8 lbs. of total phosphorus (Table 5, Appendix 6a).

The second highest rated site was determined to be along Avery St. It was proposed that a bioretention cell would be practical at this location during the initial site investigation along an old rail line adjacent to the roadway. During the site visit with the project partners though it was determined that the feature would need to be moved further downhill of the original location due to the existence of a granite wall on site at the edge of the road where it drops down to where BMP 7 was initially recommended (Figure 4, Appendix 6a). It was thought that the cost of redirecting the drain system to a practice on the opposite side of this wall would be too costly to be considered but by simply moving the practice further downhill and taking a slightly different approach the same amount of water could be treated at a much lower cost.

What was eventually decided upon was a two tiered approach where a subsurface infiltration BMP would work in concert with a surface water quality swale. These features together would treat 104% of the contributing surface runoff and 103% of the subsurface 1" WQv (Table 5, Appendix 6a). These features would be able to remove a total of 91,810 billion colonies of fecal coliform bacteria as well as 869 lbs. of TSS combined and 2.1 lbs. of total phosphorus combined annually (Table 5, Appendix 6a).

The third highest rated location was determined to be the Sawmill Ln. location at the intersection with Dedham Blvd. There is already a BMP at this location however it only treats TSS and does not treat the pollutant of greatest concern for this survey, bacteria. During both the initial site visit as well as the visit with the project partners it was agreed upon that modification of the existing BMP from primarily a rip rap swale configuration to a bioretention BMP would be the most applicable. Water quality sampling further show the need for improved bacteria controls at this site with a high bacteria level of >24,196 MPN and two out of the three samples over 9,000 MPN (Table 3). The replacement of the current swale configuration with a bioretention feature would be able to treat 104% of the 1" WQv contributing to the site which would lead to the removal of 29,464 billion colonies of fecal coliform bacteria annually in addition to 386 lbs. of TSS and 0.8 lbs. of total phosphorus (Table 5, Appendix 6a).

Lessons Learned

For this project there were several lessons learned that can be applied to future projects. First, the project geodatabase created for this project could be modified slightly for future projects. For example the Project layer of the geodatabase seems to have limited value and could be eliminated entirely. Additionally, the geodatabase could be created as a relational database so that the information in different layers is more accessible. This would require upgraded software in order to build a relational database but could be accomplished.

In addition to changes in the layer system of the geodatabase there could also be slight modifications made to the data captured in each layer of the geodatabase. For example, Remarks fields could be included in all data layers. Also, with better coordination there could be fields included for digital photographs of Sites, Drainage Areas or BMPs. For this project the tablet PC did not have an integrated webcam or digital camera which would make the addition of pictures much easier. There are also point and shoot digital cameras now available with GPS features that could allow for easier digitization and integration of photographs to the geodatabase.

A very important lesson was the value of accurate digital information. The Town of Dedham has an excellent GIS for the town that includes a lot of layers that were not available when working on similar projects in neighboring towns. Information such as sewer infrastructure, BMP locations already known to exist in the town, detention basin locations and invert heights in almost all catch basins and manholes made the prioritization of different locations much more robust. The vast amount of information did increase the length of time it took to evaluate locations however the evaluations of each site were much more substantive given the amount of additional information available for each location.

Additionally, while one of the sites selected (Colburn Whitehall) might be considered the prototypical location to build a bioretention BMP many of the locations visited in Dedham did not conform to such idealistic visions. In many cases the BMPs that were eventually recommended came after several visits to the same site along with additional time using the desktop GIS. Part of the reason for this has to do with the increased amount of information that was available for each site and part has to do with the more urbanized streetscape that is present in Dedham that was not necessarily as prevalent in other towns where this methodology was used. The tighter the spaces and closer the infrastructure was to potential sites the harder it became to recommend a BMP that would not only fit in the available space but also one that would treat a significant portion of the WQv associated with a given site.

Overall, while the project was in some respects more challenging than anticipated, we were nonetheless able to exceed the deliverables required under the project scope of services both in terms of the number of potential BMP sites evaluated and in the development and continued testing of a successful model for "direct to digital" data collection which will be of considerable benefit to other similar efforts in the future.

The original intention behind the project proposal had been to use the conceptual designs as the basis for preparing applications to the Section 319 program for construction and implementation funding. Unfortunately, since the original project funding application was submitted, the USEPA has decided that any stormwater improvement project necessary to attain water quality standards in a community that will be covered by the next generation of MS4 permits, is not eligible for 319 funding.

Thus, the next step for the project partners will be to begin working to assemble construction and implementation funds from a variety of other local, state and federal sources, so that the conceptual designs developed during the course of this project can be built and so that the residents of Dedham can begin to enjoy the many health and environmental benefits associated with more effective stormwater management and attainment of surface water quality standards.

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Tables

Table 1: Top 10 prioritized Sites in Dedham, MA. The ranking of these sites was determined through collaboration between the Town Engineering Dept., DPW and Conservation Commission staff, the Association and Nitsch Engineering.

		Site
Rank	Site Name	ID
1	Colburn-Whitehall	11
2	Sawmill Lane 1	7
3	Avery St.	28
4	Fire Station	30
5	Brookdale Ave	20
6	High School 2	17
7	Whiting Ave	15
8	Commerce Way	14
9	Eastern Ave	27
10	Dedham Blvd.	6

Table 2: List of Prioritized BMPs used for the field BMP survey in Dedham, MA.

			Low % DA	High % DA			Maint	Fail		Bacteria
BMP Name Abbreviated	BMP Name Full	Sizing Method	Size @ 1.2"	Size @ 1.2"	Soils	Treat Meth	Difficulty	Risk	Cost	Removal
PaveDiscon	Unstructured disconnection of payed areas	per VT, disconnected length = paved length, slope <5%	100.00%	200.00%	Any	Filtration/Infiltration	Low	Low	Low	Good
InfiltBasin	Infiltration Basin	Per VT, 1-2' ponding 0.5-2.0"/hr	5.00%	10.00%	A. B	Infiltration	Low	Low	Medium	Excellent
WetBasin	Wet Basin or Large Wetland	3' ponding for wetland with 1xWQv, 6' ponding for wet pond with 2xWQv	1.50%	3.50%		Settling	Low	Low	Low	Fair
BioCell	Bioretention Cell Infiltrating	Per VT, 30" media, 6-12" ponding, 6"/day k	5.00%	10.00%	A, B	Filtration/Infiltration	Medium	Low	Medium	Excellent
CompostFilter	Compost Amended Filter Strip	assume same as biocell	5.00%	10.00%	Any	Filtration/Infiltration	Low	Low	Medium	Good
BioCellUnder	Bioretention Cell with Underdrain	6" ponding + 24" media voids, could be deeper	5.00%	10.00%	C,D	Filtration/Infiltration	Medium	Low	Medium	Excellent
PocketWet	Pocket Wetland	Low is per VT, high per 30" ponding	1.50%	4.00%	C, D	Settling	Medium	Low	Medium	Fair
SandFilterSurface	Sand/Organic Filter Surface	Per VT, 2' filter depth, 1' ponding 3.5'- 8.7/day k	0.55%	1.14%	Any	Filtration	Low	Low	Medium	Good
InfiltTrench	Infiltration Trench	Per VT, 3-5' stone, 0.5-2.0"/hr	5.00%	8.00%	A, B	Infiltration	Low	Medium	Medium	Excellent
GravelWet	Gravel Wetland	Per CWP, if 3' filter depth and 2' ponding, need to check this!	3.00%	5.00%	Any	Filtration	Medium	Medium	Medium	Good
TreeBox	Tree Filter Box	Per filterra, 1 per 0.25 acre, may be a bit low for 1.2"	0.36%	0.36%	Any	Filtration	Medium	Low	High	Good
SandFilterStructured	Sand/Organic Filter Surface Structured or Perimeter	Per VT, 1-2' filter depth, 6-12" ponding, 3.5-8.7'/day k	0.55%	0.86%	Any	Filtration	Low	Low	High	Good
PorousPerim	Perimeter only Porous Pavement or Pavers	1 to 5	20.00%	33.00%	Any	Filtration/Infiltration	High	High	High	Excellent
PorousPave	Porous Pavement or Pavers	1 to 1	100.00%	100.00%	Any	Filtration/Infiltration	High	High	Very High	Excellent
InfiltUnder	Underground Infiltration Structures	Per VT,2-4' deep chambers, 0.5-	2.50%	5.00%	A, B	Infiltration	High	High	High	Excellent
SandFilterUnder	Sand/Organic Filter Underground	Same as surface	0.55%	1.14%		Filtration	High	Medium	High	Good
LeachCB	Leaching Catch Basin	Derived from VT, 50 CF each, need 20-22/Ac	2.50%	2.50%	A, B	Infiltration	Medium	High	High	Excellent
DMD- for Dooffer Flour										+
BMPs for Rooftop Flows DryWell	Structured downspount disconnect to Dry Well or French Drain or Stormwater Planter	50 cf storage / 4'x4', 500-1200 SF per unit, 36-87 units per acre	2.50%	2.50%	Any	Infiltration	Low	Medium	Medium	Excellent
RoofDiscon	Unstructured downspount disconnect to lawn or rain barrel	per VT, disconnection length should equal roof length, slope <5%	100.00%	200.00%	Any	Filtration/Infiltration	Low	Low	Low	Good
RainGarden	Rain Garden	Per VT, 6" ponding, 0.5-2.0"/hr	15.00%	20.00%	A, B	Infiltration	Medium	Low	Medium	Excellent
Pre Treatment BMPs										
GrassStrip								1		+
GravelDiaphragm								1	<u> </u>	+
GrassChannel										+
Forebay									1	+
GritChamber										+
MulchLayer								+		+
Other								1		+
None	+				 		1	+	 	+

Table 3: Water Quality data collected from outfalls or discharge points at the top 3 locations in Dedham, MA. Some outfall points at sites outside the top three locations were also sampled and included.

Site ID	Date	Time	Bacteria (MPN)	Ammonia (mg/L)	Surfactants (mg/L)	Temp (C°)
Colburn Whitehall	5/1/2012	10:57 AM	19,863.0	0.034	0.25	10.0
Colburn Whitehall	5/16/2012	9:49 AM	9,208.0	0.056	0.00	14.0
Colburn Whitehall	6/2/2012	1:50 PM	>24196	0.243	0.00	18.5
Avery St.	5/1/2012	11:32 AM	1,500.0	0.035	0.00	10.0
Avery St.	5/16/2012	10:28 AM	8,164.0	0.066	0.00	17.0
Avery St.	6/2/2012	1:30 PM	1,986.3	0.341	0.25	19.0
Sawmill 101	5/1/2012	12:13 PM	202.0	0.055	0.00	10.5
Sawmill 101	5/16/2012	10:15 AM	>24,196	0.025	0.00	12.0
Sawmill 101	6/2/2012	1:57 PM	9,804.0	0.176	0.00	17.0
Sawmill 201	5/1/2012	12:05 PM	203.0	0.111	0.00	10.0
Sawmill 202	5/1/2012	12:07 PM	686.7	0.079	0.00	11.0
Brookdale	5/1/2012	11:18 AM	1,376.0	0.000	0.00	10.5
High School 2	5/1/2012	11:22 AM	146.0	0.000	0.00	10.5
Eastern 1	5/1/2012	11:38 AM	256.0	0.042	0.00	10.0
Eastern 2	5/1/2012	11:43 AM	0.0	0.048	0.00	22.0
Eastern 3	5/1/2012	11:48 AM	38.3	0.037	0.00	20.0
	_					
	Maximum		>24,196	0.341	0.25	22.0
	Minimum		0.0	0.000	0.00	10.0
	Average		3735.3	0.084	0.03	13.9

Table 4: Water quality data collected from receiving waters at each of the top 3 locations in Dedham MA. Samples were also taken at two additional sites being considered for the top 3.

Site ID	Date	Time	Bacteria (MPN)	Ammonia (mg/L)	Surfactants (mg/L)	Temp (C°)
Colburn Whitehall Stream	5/1/2012	10:59 AM	134.0	0.057	0.00	12.5
Colburn Whitehall Stream	5/16/2012	9:57 AM	387.3	0.078	0.00	18.0
Colburn Whitehall Stream	6/2/2012	1:54 PM	5,475.0	0.114	0.00	19.5
Avery St. Stream	5/1/2012	11:40 AM	1,137.0	0.011	0.00	11.0
Avery St. Stream	5/16/2012	10:35 AM	365.4	0.072	0.00	16.0
Avery St. Stream	6/2/2012	1:36 PM	24,196.0	0.349	0.00	17.0
Sawmill 1 Stream	5/1/2012	12:16 PM	1,553.0	0.062	0.00	11.0
Sawmill 1 Stream	5/16/2012	10:20 AM	517.2	0.083	0.00	12.0
Sawmill 1 Stream	6/2/2012	1:59 PM	2,924.0	0.051	0.00	19.0
Sawmill 2 Stream	5/1/2012	12:09 PM	648.8	0.054	0.00	10.5
Brookdale Stream	5/1/2012	11:10 AM	305.0	0.072	0.00	11.0
	_					
	Maximum		24,196.0	0.349	0.00	19.5
	Minimum		134.0	0.011	0.00	10.5
	Average		3,422.1	0.091	0.00	14.3

Table 5: Summary table of data produced for this project by Nitsch.

Town Dedham, MA

Site	ВМР	Drainage Area (sf)	1" WQv (cf)	WQv Treated (cf)	% 1" WQv treated	Construction Cost	Annual O/M Cost
Colburn Whitehall	Bioretention Basin	33,330	2,788	2,875	104%	\$41,520	\$1,000
Avery St (2W) Avery St. (2E)	Water Quality Swale Subsurface Infiltration	14,560 20,390	1,213 1,699	1,263 1,742	104% 103%	\$43,000	\$1,500
Sawmill Ln.	Bioretention Basin	13,100	1,092	1,133	104%	\$15,620	\$1,000

Figures

Figure 1: Map of entire study area in relation to the eastern portion of the state of Massachusetts.

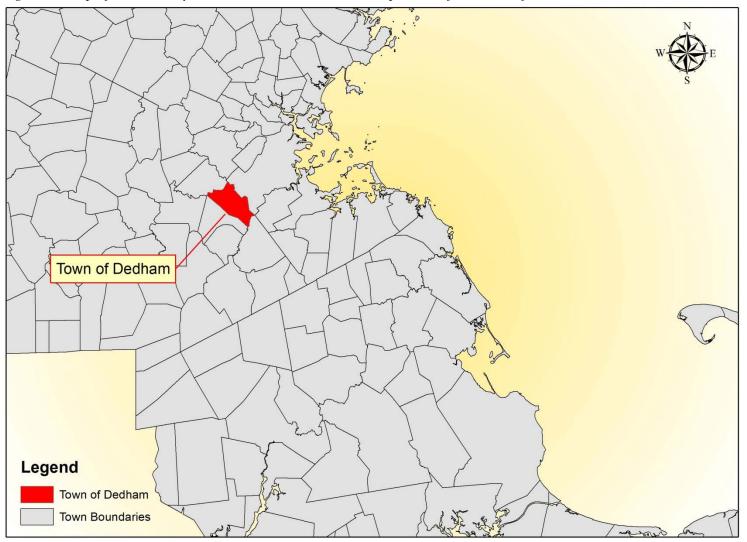
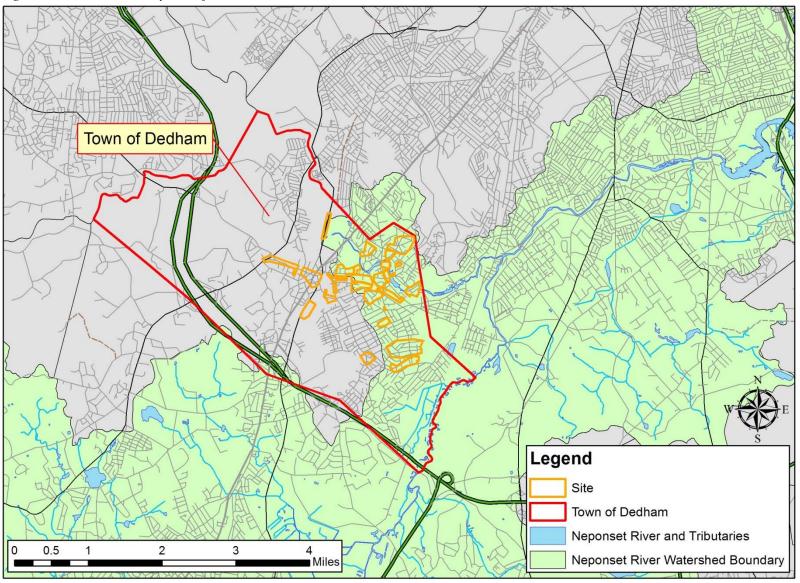


Figure 2: Individual study area for Dedham, MA.



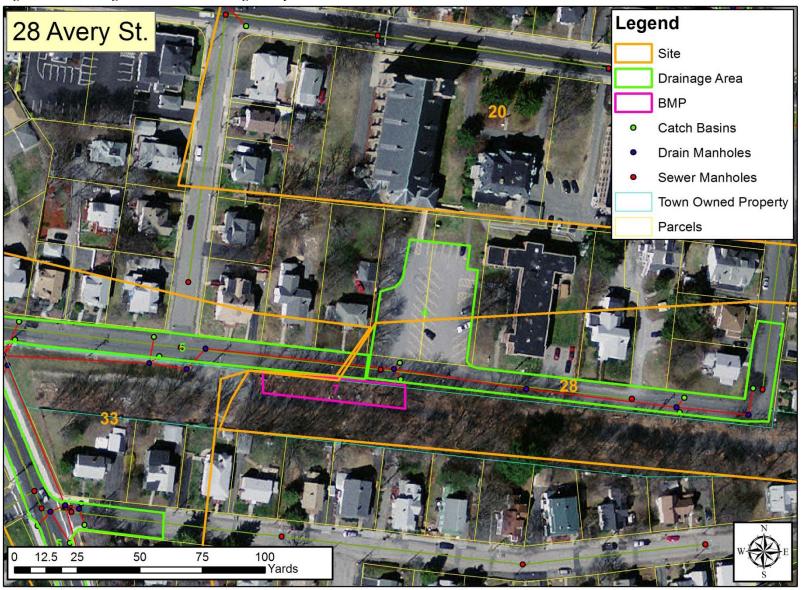
11 Coburn Whitehall Legend Site DrainageArea **BMP** CatchBasins DrainManholes Sewer Manholes Town Owned Property 50 100 150 200 Parcels

Figure 3: Top rated site at the intersection of Colburn St. and Whitehall St. in Dedham, MA..

7 Sawmill Ln Legend Site Drainage Area BMP Catch Basins Drain Manholes Sewer Manholes Town Owned Property 50 100 150 200 Yards Parcels

Figure 4: Second highest rated site at the intersection of Sawmill Ln. and Dedham Blvd. in Dedham, MA.

Figure 5:Third highest rated site along Avery St. in Dedham, MA.



Appendix 1

- a) Dedham-NepRWA MOU
- b) NepRWA-NItsch Subcontract
 - c) 2011 Jan-Fab Newsletter
- d) Dedham Meeting Notes 10-28-10
- e) Dedham Meeting Notes 11-03-11
- f) Project Commencement Press Release
- g) Approved FY2012-FY2014 Pavement Plan
- h) BMP summary sheet for field survey planning
- i) BMP target storage volumes in CF based on land use

Memorandum of Understanding between the Neponset River Watershed Association and the Dedham Engineering Department

Regarding the Dedham BMP Development Project

The Dedham Engineering Department ("Dedham" or "the Department") and the Neponset River Watershed Association ("the Association") successfully collaborated to secure grant funding from the MassDEP 604(b) Water Quality Management Planning Grant Program. The purpose of the funding is to identify potential locations where existing neighborhoods in Dedham could be retrofitted with stormwater best management practices ("BMPs") that will remediate polluted runoff. The goals of the project are to enhance public health, environmental health, and recreational opportunities for Dedham residents while also facilitating Dedham's efforts to comply with state and federal stormwater management requirements.

For purposes of the MassDEP grant, the Department will serve as the "Grantee" and receive funds from MassDEP. The Association will serve as the "prime subcontractor" to the Department under the grant. The specific tasks and deliverables to be completed are described in the final scope of services in the contract between MassDEP and the Department.

The Association will take primary responsibility for completing all of the tasks outlined under the MassDEP scope of services, with coordination and assistance as needed from the Department. Specifically, it is expected that the Department will take an active role in:

- Reviewing the list of potential BMPs to identify any potential BMPs that would be incompatible with the town's goals and operational practices;
- Sharing anecdotal information with the Association such as the location of particular drainage problem areas, or plans for future infrastructure improvements where BMP retrofits could be efficiently piggybacked on planned work;
- Sharing maps and GIS data with the Association including items such as town owned properties, pavement widths and right of way widths, existing drainage outfalls and structures, parcel data, information on conflicting utilities and the like;
- Conducting site visits to evaluate and prioritize potential BMP retrofit sites identified by the Association;
- Helping to identify any key stakeholders such as other town departments or abutting landowners whose cooperation would be needed to proceed with one or more of the preferred BMP sites and participating in meetings with any such stakeholders;
- Reviewing conceptual plans and cost estimates developed by the project sub-consultant.

The Association will prepare all required quarterly and final reporting forms (including invoices, M/WBE utilization forms, M/WBE waiver request) for review and submission by the Town. In addition the Association will retain the project engineering consultant as a subcontractor to the Association and handle all bidding and other procedures necessary to comply with MassDEP M/WBE requirements, in consultation with the Department as needed.

Continued

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Dedham reserves the right to review all publications, press releases, subconsultant selections and other materials before final publication or execution. The Department will forward reimbursement requests and progress reports prepared by the Association to MassDEP promptly and will remit payment to the Association in a timely fashion.

Under the Grant Program, MassDEP will withhold payment of 10% of each invoice until the project has been successfully completed and the Department, if it so desires, may also withhold 10% of each invoice from the Association in turn. The Department will also periodically prepare "match certification letters" (if such are required by DEP) and forward them to the Association to documenting the amount of Department staff time spent on the project as required by MassDEP.

The MassDEP project scope and budget are attached and incorporated into this agreement.

Accepted for the Association:	
20 de	3/12/20/0
Jan Cooke, Executive Director	Date '
Accepted for the Town of Dedham:	
() and () W	3/16/2010
David Field, Director of Engineering	Date

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		•



186 Lincoln Street, Suite 200 Boston, MA 02111-2403 T: 617-338-0063 F: 617-338-6472

March 30, 2012

Mr. Ian Cooke Executive Director Neponset River Watershed Association 2173 Washington Street Canton, MA 02021

RE: Nitsch Proposal #9096.P Conceptual BMP Design Civil Engineering & Planning Dedham, MA

Dear Mr. Cooke:

Nitsch Engineering is pleased to submit this proposal to the Neponset River Watershed Association (the Client) for professional civil engineering and planning services associated with the development of Conceptual Stormwater Best Management Practices (BMPs) in Dedham, Massachusetts.

SCOPE OF SERVICES

Nitsch Engineering will provide professional civil engineering and planning services to accomplish the following tasks.

TASK I: PRIORITIZE SITES

Nitsch Engineering will work with representatives from the Client to evaluate potential sites for the construction of stormwater Best Management Practices (BMPs):

- 1. Perform field inspections with the Client and Town of Dedham staff at the top 10 rated sites from the Client's field survey results:
- 2. Consult with the Client and the Town of Dedham staff to further evaluate each site's feasibility and prioritize sites for further evaluation:
- 3. Work with the Client to develop engineering feasibility considerations to incorporate into the draft final summary of retrofit opportunities for the top-rated sites;
- 4. Provide Client with a letter report narrative of the engineering feasibility considerations for each of the top 10 rated retrofit opportunities; and
- 5. Consult with the Client and the Town of Dedham to identify the top three (3) rated sites.

TASK II: CONCEPTUAL DESIGNS AND COST ESTIMATES

- 1. Prepare Conceptual Designs for the BMP retrofits at each of the top three (3) priority sites. The Conceptual Designs will include sufficient detail obtained from the existing data sources compiled by the Client during Task I (including collection area size, key pipe inverts, approximate depth to groundwater. estimated soil permeability, and obvious utility conflicts) to verify the engineering feasibility of the proposed BMP;
- 2. Submit Conceptual Design Plans and Details for the BMP retrofits at the top three (3) priority sites to include in the Client's Conceptual Design Report;

Mr. lan Cooke: Nitsch Proposal #9096.P

March 30, 2012 Page 3 of 5

ASSUMPTIONS

- Any revisions requested by the Client or other approving authorities after submission of final drawings will be considered Additional Services.
- 2. Any research required (of utilities, previous plans, abutters, etc.) will be considered Additional Services.
- 3. Nitsch Engineering will utilize in our Conceptual Design the field data that is provided by the Client. Nitsch Engineering does not guarantee the validity or completeness of the data.
- 4. The Client will indemnify and hold harmless Nitsch Engineering and its officers, agents, and employees with regard to errors or omissions within documents from which information was obtained, in whole or in part, and incorporated into documents prepared by Nitsch Engineering.

TIME AND MANNER

Nitsch Engineering is prepared to begin work immediately upon receipt of this executed proposal within 10 working, not calendar, days from the receipt of this executed proposal, and documents to be provided by the Client.

Nitsch Engineering anticipates completion of the project prior to June 30, 2012. The completion of field tasks will be subject to weather conditions affecting the required field work and circumstances beyond Nitsch Engineering's reasonable control.

COMPENSATION

Compensation for the services provided will be in accordance with Nitsch Engineering's Standard Contract Terms as attached. The lump-sum labor costs for these services is \$11,250.00

Labor costs will not be incurred by Nitsch Engineering beyond this lump-sum without verbal approval from the Client.

All expenses are included in the lump-sum amount.

ADDITIONAL SERVICES

Nitsch Engineering will be compensated for services requested by the Client that exceed the "SCOPE OF SERVICES" outlined herein. Charges for Additional Services will be billed in accordance with the attached Standard Contract Terms or the Standard Contract Terms in effect at the time the services are provided. Additional Services will not be accomplished unless Nitsch Engineering has verbal approval from the Client.

Mr. Ian Cooke: Nitsch Proposal #9096.P

March 30, 2012 Page 5 of 5

CLIENT AUTHORIZATION

This proposal and Standard Contract Terms are hereby accepted by the Client as evidenced by the execution hereof, and such a person so executing the same on behalf of the Client does hereby warrant full authority to act for, in the name of, and on behalf of the Client.

Such acceptance provides full authorization for Nitsch Engineering to proceed with providing the Scope of Services under the terms and conditions stated herein.

Signature

Printed Name and Title

5. TERMINATION

This Agreement may be terminated either by the Client or by Nitsch Engineering upon seven (7) days' written notice. In either case, all amounts for services and reimbursable expenses due as of the date of receipt of cancellation notice shall be paid to Nitsch Engineering within 30 days from the date of Nitsch Engineering's final invoice following notice of termination.

WAIVER OF SUBROGATION

The Client and Nitsch Engineering waive all rights against each other and against the contractors, consultants, agents, and employees of the other for damages, but only to the extent covered by any property or other insurance. The Client and Nitsch Engineering shall each require similar waivers from their contractors, consultants, and agents.

7. INSURANCE

Nitsch Engineering is protected by Workers Compensation Insurance and Professional Liability Insurance, and will furnish information end certificates upon request.

8. TRANSFER/REASSIGNMENT OF AGREEMENT

This Agreement cannot be transferred or reassigned to any other entity without the prior written authorization of Nitsch Engineering.

9. LIMITATION OF LIABILITY

The Client agrees to limit Nitsch Engineering's liability to the Client for or on account of all claims and/or damages of any nature whatsoever caused by or arising out of Nitsch Engineering's performance of its services, such that the total aggregate liability of Nitsch Engineering for any and all claims and/or damages of any nature whatsoever, arising out of the performance of Nitsch Engineering's services on the project, shall not exceed \$50,000 or Nitsch Engineering's total fee for services rendered on the project; whichever is greater.

10. HAZARDOUS WASTE/ASBESTOS/CONTAMINANTS

Nitsch Engineering shall not be responsible for the discovery of, treatment of, disposal of, permitting for, or any services involving or relating to the presence of or the actual or threatened release, escape, or discharge of hazardous waste, asbestos, and/or other contaminants which may exist on the site, in any of the existing structures on the site, or due to the proposed development. It is agreed that the Client, to the fullest extent permitted by law, shall release and indemnify and hold harmless Nitsch Engineering and its consultants, agents, and employees, from and against all claims, damages, losses, and expenses, direct and indirect, including but not limited to attorney's fees and defense costs, arising out of or resulting from the performance of any services by Nitsch Engineering, or claims against Nitsch Engineering related to, involving, or arising out of hazardous waste, asbestos, or other contaminants.

11. OWNERSHIP AND USE OF DOCUMENTS

All documents including drawings and specifications prepared or furnished by Nitsch Engineering under this Agreement are instruments of service with respect to the project. Nitsch Engineering shall retain the ownership and property interest in those instruments of service whether or not the project is completed; however, if the project is completed, the Client may retain copies solely for information and record reference purposes in connection with the completed project. These documents are not intended or represented to be sultable for reuse by Client or others in connection with (a) the completion of the project if Nitsch Engineering's Agreement has been terminated or Nitsch Engineering otherwise is not involved in the project; (b) extensions of the project; and/or (c) any other project. Any reuse without written verification or adaptation by Nitsch Engineering for the specific purpose intended will be at the Client's sole risk and without any liability or legal exposure to engineer or its consultants. The Client shall indemnify and hold harmless Nitsch Engineering, and its consultants, from any and all claims, damages, losses, and expenses including attorney's fees arising out of or resulting therefrom. Any such verification or adaptation will entitle Nitsch Engineering to further compensation at rates to be agreed upon by the Client and Nitsch Engineering.

Further, Nitsch Engineering agrees to provide materials to the Client stored electronically. The Client recognizes that data, plans, specifications, reports, documents, or other information recorded on or transmitted as electronic media ("CADD Documents") are subject to undetectable alteration, either intentional or unintentional, due to, among other causes, transmission, conversion, media degradation, software error, or human alteration. Accordingly, the CADD Documents provided to the Client are for informational purposes only and not as an end product. Nitsch Engineering makes no warranties, either express or implied, regarding the fitness or suitability of the CADD Documents. Accordingly, the Client agrees to waive any and all claims against Nitsch Engineering resulting in any way from the unauthorized reuse or alteration of the CADD Documents.

18. APPLICABLE STATE LAW

This Agreement shall be governed and construed in accordance with the laws of the Commonwealth of Massachusetts.

19. MUTUAL WAIVER OF CONSEQUENTIAL DAMAGES

Neither party, nor their parent, affiliated or subsidiary companies, nor the officers, directors, employees or agents of any of the forgoing, shall be liable to the other in any action or claim brought by either party against the other for incidental, indirect, or consequential damages arising out of or related to the Services whether based on contract, tort, statute or otherwise.

20. MEDIATION

Prior to the initiation of any legal proceedings, the parties agree to submit all claims, disputes, or controversies arising out of, or in relation to the interpretation, application, or enforcement of this Agreement to mediation. Mediation shall be conducted under the auspices of the American Arbitration Association in accordance with its existing terms and procedures. The cost of mediation shall be borne equally by the parties. The party seeking to initiate mediation shall do so by submitting a formal written request to the other party to this Agreement and the American Arbitration Association. This Article shall survive completion or termination of this Agreement, but under no circumstances shall either party call for mediation of any claim or dispute arising out of this Agreement after such period of time as would normally bar the initiation of legal proceedings to litigate such a claim or dispute under the laws of the Commonwealth of Massachusetts.

ACCEPTED

Signature

DATE

Printed name and title

Revised: October 6, 2011

Address Service Requested

Permit No. 54080 AM ,notsod **PAID** U.S. Postage Non-Profit Org.

Neponset River Watershed Association NepRWA is a nonprofit conservation group founded in 1967 to protect and restore the Neponset River, its tributaries and watershed lands.

2173 Washington St., Canton, MA 02021 p 781-575-0354, f 781-575-9971 staff@neponset.org, www.neponset.org

Coordinator ill Guenther, Env. Scientist cristina LaFrance, Admin.

Christine Grady, *President* Brendan McLaughlin, *V.P.* Maura O'Gara, *Treasurer* Barbara Shea McDonald,

ım Palmer, Willett Pond Mg

₽250-272-187 ● P1O.tesnoqeΝ 173 Washington Street, Canton, MA 02021



2. a crucial turning point, 3. communities connected by water

In 1972, when Congress passed the Clean Water Act, it set a bold goal: to restore the "chemical, physical and biological integrity" of the nation's it was the "chemical" that dominated NepRWA's work, but as the river has two components—"physical" and "biological"—are becoming more and

In this edition of News from the Neponset, we look at how NepRWA is working to overcome physical barriers like dams and biological threats like the river every day.

Sincerely,

News from the Neponset

January-February 2011

Director's Corner Physical & Biological Integrity Neponset Watershed's Next Challenge

Thank you to the hundreds of members and friends who responded so generously to our year-end appeal during 2010. As December came to a close, your gifts and pledges pushed us "over the top" in meeting our \$30,000 challenge grant goal. You helped to raise more than \$60,000 for watershed work as we kick off the second year of our three-year action plan!

waterways. When sewage and industrial effluent flowed freely into the Neponset, gotten cleaner over the years, the other more prominent.

invasive species, while ensuring that we have the right amount of clean water in

Whether the objective is chemical, physical or biological, it's always the generous support of members and volunteers like you that makes progress toward a healthy Neponset possible. Thank you!

Ian Cooke **Executive Director**

Won't You Be a Beetle Rancher?

The Neponset River Watershed Association seeks your help with

Come be a Beetle Rancher, and help bring native plants and animals back to the Fowl Meadow wetlands by reducing the exotic, invasive Purple loosestrife

Beetle Ranching!

Join us for our fourth year of the five-year Fowl Meadow Purple Loosestrife

there.

Biocontrol Project, a collaboration with the Massachusetts Department of Conservation and Recreation. We

focus on Purple loosestrife because it outcompetes native plants and spreads far and wide, making the landscape uninhabitable for some species and deficient for others. This issue is of particular concern in Fowl Meadow because of the site's statelisted endangered. threatened, and special concern species.

...Continued, Page 3

Herring & Shad Restoration Moves Ahead

2011 Goal to Secure Funding for Final Design & Permitting

Beetle Rancher Mary Noble releases

beetles in Fowl Meadow.

After more than a decade, the quest to restore herring and shad runs to the Neponset is moving into an important new phase.

For millennia, migratory fish like American shad and Blueback herring would swim dozens of miles up the Neponset River to lay their eggs each spring. For the Neponset, that spring ritual came to an end some time in the early 1700s when a new generation of bigger dams was constructed and blocked the fish for

Today, these fish are still blocked by two state-owned dams in Boston and Milton. By 2008, efforts to remove the dams had come to a standstill, until NepRWA, working with the City of Boston, the Town of Milton, our

local legislators and an alphabet soup of state agencies, brought together the Lower Neponset Community Advisory Committee or "CAC." Made up of representatives from some 25 neighborhood groups along the river (supporters and opponents alike), the CAC spent a year reviewing the project and ended up universally endorsing a revised plan in 2009. The plan calls for removing the more upstream dam and creating a "naturelike fishway" at the more downstream dam, while responsibly managing the PCB-contaminated sediments behind the two dams.

NepRWA spent 2010 pressing to resolve the key remaining technical and administrative hurdles standing

...Continued, Page 3



Watershed Association" Page), LinkedIn ("Neponset River Watershed Association") and Flickr (go to http:// www.flickr.com/photos/ Get Active On-Line Get timely news from NepRWA and our on-line environmental community — and speak your mind! Join us on Twitter (Jook for "NepRWA"), Facebook ("Neponset River

Be a NepRWA Member Join NepRWA if you aren't already a member, and support environmental projects around the Watershed.

Stormwater, the Underrated Polluter

NepRWA Partners with New Communities to Find Solutions

Every time it rains or snow melts, we go about our daily routines and pay little attention to one of the largest sources of pollution



Not even snow stops Environmental Scientist Bill Guenther from locating sites for stormwater treatment structures.

plaguing local waters stormwater.

The water running down the gutter goes unnoticed, and puddles in parking lots are viewed as a mere annoyance.

If asked, you probably would not consider the large puddle in the grocery store parking lot to be clean. However, that same water, flowing from parking lots around the watershed, becomes river-water every time it rains.

Stormwater collects and transports pollution into rivers and streams. This

polluted runoff damages wildlife habitat and the wildlife, themselves.

Under natural conditions, stormwater soaks into the ground and is filtered by soils and plants, then eventually recharges the groundwater. As development has spread across the landscape, however, we have replaced naturally absorbant surfaces with roads, parking lots, rooftops, sidewalks, driveways and a host of other impervious surfaces. These hard surfaces send stormwater into municipal drainage systems, which in turn direct the contaminated water into lakes, rivers and streams. In most cases, this water transports a pollutant cocktail of metals, oils, road salt, sediments and pathogens into our waterways without any treatment.

This problem of untreated, contaminated stormwater is fixable. We can build Best Management Practices (BMPs) to filter the polluted runoff. BMPs include a suite of structures that enable water to soak into the ground before reaching our rivers. Each BMP is tailored to meet specific space and water treatment needs, as well as aesthetic preferences and budget.

NepRWA has partnered with the Towns of Canton, Sharon, Stoughton, Walpole and Dedham to site BMPs for future installation. NepRWA Environmental Scientist Bill Guenther has begun to locate appropriate sites for these structures. In each town, Bill conducts a field survey to identify the best locations and creates a database of all BMP-friendly sites

For more information, visit neponset.org/Stormwater.htm or contact Environmental Scientist Bill Guenther at 781-575-0354 or guenther@neponset.org.

Thank You, Neponset Society!

Members of the Neponset Society are
NepRWA's most generous supporters—those
making gifts or pledges totaling \$500 or
more per calendar year. The support of our
Neponset Society Members plays a unique
role in protecting the Neponset and making
progress toward a healthy river possible.
Thank you to the following individuals,
businesses and institutions that joined the
Neponset Society during 2010 or renewed
their support!

Businesses and Institutions
Anonymous
Analog Devices
Boston Water and Sewer Commission
Cedar Grove Gardens
CertainTeed Roofing
CHT Foundation
The Copeland Family Foundation
Glossa Engineering
Hollingsworth and Vose
The Kraft Group, Gillette Stadium
Poirier Service Corp.
Toll Brothers

Individuals

Matthew and Sarah Begg David Biggers and Kathleen O'Connell Thomas Birmingham and Amy Killeen David and Jeanne-Marie Brookfield Maureen and Jack Ghublikian Paul and Christine Grady Anne Herbst and Barbara McCarthy Douglas and Barbara Holdridge Shirley Howard Taber and Mary Keally Andrew Kull Paul Lauenstein and Lonnie Friedman Florence Locke Pamela Lee Lowry Mr. and Mrs. Duncan McFarland Robert and Elisabeth McGregor Brendan and Mary McLaughlin Gerard O'Neill Steven H. Olanoff Mr. and Mrs. Vilis Pasts Ms. Kathleen L. Peto John C. Roche Michael Saad Fannette Sawyer James Sharpe and Deborah Stein Sharpe Barbara Shea McDonald Dr. Cathy Stern

To become a Neponset Society Member, contact NepRWA Executive Director Ian Cooke at 781-575-0354.

Beetle Ranching, from page 1

"Biological control" or using a living organism

to control
another species,
has proven
effective time
and again at

effective time and again at reducing Purple loosestrife. Join a fun-

loving, hard-working volunteer community that takes a

hands-on,



A volunteer harvests a rootball.

outdoors approach to protecting the Watershed. Sign up to be a Beetle Rancher by contacting NepRWA Restoration Manager Carly Rocklen at 781-575-0354 or rocklen@neponset.org.

Herring and Shad, from page 1

in the project's way. Over this time, the Department of Fish and Game completed conceptual designs for the proposed nature-like fishway. Technical questions about flooding were clarified and funding to resolve them committed. The US Geologial Survey (with helpful encouragement from Congressman Lynch) completed its long overdue evaluation of toxic PCBs accumulated in the sediments behind the dams. The Department of Conservation and Recreation broke ground on the cleanup of an upstream PCB-contamination site, and the Department of Environmental Protection and a local company completed remediation of PCBs upstream in Mother Brook.

All this activity came to a head on January 19, 2011, when the members of the CAC reconvened to review the conceptual designs for the Baker Dam and hear about the status of related efforts. In general, the CAC seemed pleased with what it heard, and the group is now working to craft a letter updating its support for the project.

With most of the potential "deal breakers" overcome during 2010, NepRWA's goal is to secure funding for final design and permitting work by the end of 2011. We will be working intensively with the CAC member groups, as well as with our state and federal legislators and perhaps even some private funders, to figure out how to fund this next phase.

Support from our members has enabled NepRWA to keep the pressure on, and we remain very encouraged with the depth and breadth of public support for the project and our continued steady progress on many levels. For more information on this project, contact NepRWA Advocacy Director Steve Pearlman at 781-575-0354 or pearlman@neponset.org.

Conserving Water for the Neponset

NepRWA to Launch New Programs in Stoughton & Canton,

to Follow Successes in Sharon & Milton

The amount of water we see in ponds, streams, wetlands, and the Neponset River is linked to how much water our communities are

using versus returning to the ground.



NepRWA Board Member Paul Lauenstein & Water Conservation Coordinator Nancy Fyler provide conservation tips at the 2010 Sharon Energy Water Fair.

When we remove *more* water than we return, water levels drop, pollutant concentrations rise, and aquatic wildlife run into difficulties.

This spring, NepRWA will launch water conservation programs in two new towns to help counter this local environmental issue. We will begin work in Stoughton and Canton, in addition to continuing our efforts in Sharon and Milton.

Each of us can help ensure more water for our natural

resources by making small changes at home and at work. In fact, you can make an even *bigger* difference by helping friends and family to conserve water, too.

You can do three basic things to conserve water: Make small changes to your daily routine, update your appliances, and stop leaks. Here are a few simple steps you can take to save water, immediately:

- Turn off the faucet when brushing your teeth or shaving
- Trim a few minutes off your shower
- Only run full loads in the dishwasher and clothes washer
- Turn off the water when washing dishes by hand
- Keep a bottle of water in your fridge instead of letting your faucet run to get cold

To save even more water, consider upgrading your toilet, clothes washer, faucets and showerhead to high-efficiency WaterSenseapproved models. Install faucet aerators around your home. Did you know that many local water departments offer rebates for new appliances, as well as free faucet aerators, showerheads and leak detection tablets? Give one a call. If you have an irrigation system, upgrade to a "smart" irrigation controller to reduce water use by up to 75 percent. Replace grass with drought-tolerant "turf-type tall fescue" and plant drought-tolerant native plants in your yard. Finally, check for leaks. Dripping faucets can waste up to 3,000 gallons of water each year, while leaky toilets can waste up to 200 gallons per day.

Learn more by contacting NepRWA Water Conservation Coordinator Nancy Fyler at 781-575-0354 or fyler@neponset.org or by visiting neponset.org or epa.gov/WaterSense/.

Meeting Notes: October 28, 2010

Where: Town of Dedham

Attendees: Bill Guenther (NepRWA), David Field (Director of Engineering, Dedham), Jason Mammone (Infrastructure Engineer, Dedham), Ronald Lawrence (Project Engineer, Dedham), Leon Scott (GIS Manager, Dedham), Cynthia O'Connell (Conservation Agent, Dedham)

Minutes: This was an initial meeting with Town staff to go over a short history of past projects dealing with stormwater BMPs, how those projects guided the building of our current project and a general introduction of staff and expectations going forward.

Bill Guenther led the discussion and briefly went over how NepRWA envisions the project as a whole and associated general timelines. Also, a brief discussion of some possible BMPs took place to familiarize the Town with the BMP options that NepRWA see as most effective for decreasing bacteria levels in stormwater before it is discharged into local waterways.

In addition to these preliminary discussions members from the Town talked about current BMPs within the Town, plans for additional BMPs in the near future and some areas around the Town that they feel would lend themselves best to BMP retrofits.

Meeting Notes: November 3, 2011

Where: Town of Dedham

Attendees: Bill Guenther (NepRWA), David Field (Director of Engineering, Dedham), Jason Mammone (Infrastructure Engineer, Dedham), Ronald Lawrence (Project Engineer, Dedham), Leon Scott (GIS Manager, Dedham), Cynthia O'Connell (Conservation Agent, Dedham)

Minutes: This was the second meeting with Town staff to go over potential BMPs to be used in the survey portion of the project and to discuss any infrastructure improvements planned in the Town.

Bill Guenther led the discussion and briefly described some possible BMPs to familiarize the Town with the BMP options that NepRWA sees as most effective for decreasing bacteria levels in stormwater before it is discharged into local waterways.

After the possible BMPs were discussed a list was prioritized that favored smaller less expensive BMPs and those BMPs with the least amount of maintenance cost. BMPs such as underground infiltration units and porous pavement were still included in the list of potential BMPs but were dropped to the bottom due concerns over maintenance costs and overall BMP costs.

In addition it was discussed that a formal pavement reconstruction plan would be given to NepRWA in order to better prioritize possible locations for BMPs

NEPONSET RIVER WATERSHED ASSOCIATION

2173 Washington Street • Canton, MA 02021 Phone 781-575-0354 • Fax 781-575-9971 • www.neponset.org

PRESS RELEASE

FOR IMMEDIATE RELEASE: January 14, 2011

For More Information, Contact: William Guenther guenther@neponset.org, 781-575-0354

Town Awarded Grant to Clean Polluted Runoff

The Town of Dedham was recently awarded a grant through the Massachusetts Department of Environmental Protection's (MassDEP) 604b grant program funded through the US Environmental Protection Agency (USEPA). This grant aims to identify areas where stormwater quality can be improved throughout the town. The Town has contracted the Neponset River Watershed Association to conduct the town wide survey of stormwater drainage systems.

Polluted stormwater is considered by the EPA and MassDEP to be one of major pollution sources impairing and degrading rivers and streams throughout he Commonwealth. Essentially rain and other precipitation falls to the ground and washes off into storm-drain catchment systems. Along the way the runoff brings with it sediments, oils, bacteria and other debris that make their way into waterways untreated. This grant aims to identify areas within these drainage systems where structures can be put in place to treat, or clean, stormwater before it is directly discharged to local waterways.

Bill Guenther, Environmental Scientist for the Neponset River Watershed Association said "Stormwater has become one of the major focuses of our organization. Adequately treating polluted runoff before it gets into our rivers and streams is essential to improving the health of these fragile ecosystems." He went on to say "The trick now is to locate areas where we can place structures that can clean up the runoff. In urban and suburban situations there is not always sufficient space to treat the volume of runoff in many areas. This survey will hopefully identify those areas that do exist so we can begin getting this stuff cleaned up."

Over the next several months the Neponset River Watershed Association will be conducting the survey of the town. David Field, Dedham's Director of Engineering, said "A grant like this enables us to partner with local organizations that have a specialty in areas such as this."

While there are many different types of structures that clean stormwater the general method of treatment is similar between practices. The most common way to clean stormwater is to have it filtered in some way. What the water filters through depends on the practice being employed. Water can be filtered through sand or organic material, gravel or special mixes of soils to properly treat the stormwater entering the practice. Guenther noted that "the organisms and biologic communities that live within the different types of filter media are what is really cleaning the runoff. There are all sorts of microbes that feed on the pollutants in stormwater, as the water passes through the practice it allows these organisms the time to remove the pollutants from the water before it si discharged into our waterways."

The survey will be completed by this Spring at which time the Town hopes to seek additional grant funding to construct several of the structures. For more information on the project please contact the Neponset River Watershed Association at info@neponset.org or by phone 781-575-0354

Learn more about the Neponset River Watershed Association at www.neponset.org.

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Town of Dedham - Pavement Management Road Program	Town of Dedham	- Pavement	Management	Road Program
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ı	Name		From	То	PCI	Length (ft)	Area (sy)	Cost
7/1/20)11							
Repair :	Туре:	Preventat	ive Maintenance					
- 1	BRIDGE STI	REET	620' E OF COMMON STREE	400' W OF FULLER STREET	84	462	1,541	\$11,560.00
ĺ	BUSSEY STI	REET	TOWNLINE	95' S OF COLBURN ST	77	2,117	6,350	\$47,621.25
(COLONIAL	DRIVE	BUSSEY ST	169' N OF BUSSEY ST	85	169	488	\$3,657.33
(COMMON	STREET	BRIDGE ST	DEXTER ST	84	250	888	\$6,661.33
(COMMON	STREET	DEXTER ST	CHANNING ST	84	986	3,177	\$23,830.75
1	ELM STREE	Т	27' S OF ROBINWOOD RD	RUSTCRAFT RD	82	906	3,827	\$28,699.50
ĺ	HIGH STRE	ET	COMMON ST	BRIDGE ST	82	685	1,903	\$14,270.83
I	KIELY ROAI)	BRIDGE STREET	42' N OF HILLCREST AVENUE	84	707	2,041	\$15,309.67
9	SANDERSO	N AVENUE	MT VERNON ST	EAST ST	80	1,127	3,005	\$22,539.30
9	SHORT STR	EET	57' N OF KIELY RD	KIELY ROAD	91	57	139	\$1,044.87
9	SIDNEY STR	REET	EAST ST	CRESTON AV	85	254	706	\$5,291.67
				Repair ⁻	Type Sum	7,719	24,065	\$180,486.50
Repair :	Туре:	Reclamati	on Minor Collector and Loc	cal				
	BAYARD ST	REET	RIVERSIDE DRIVE	VINE ROCK STREET	42	795	2,121	\$74,218.67
ĺ	BONHAM F	ROAD	SHERMAN RD	TRENTON ROAD	47	1,271	3,530	\$123,550.00
(CEDAR STR	EET	WALNUT ST	71' W OF RIVER ST	47	943	2,725	\$95,368.00
(CENTRAL A	VENUE	TAFT LA	258' N OF RUSTCRAFT RD	45	360	1,679	\$58,751.00
(CENTRAL A	VENUE	WENTWORTH ST	TAFT LA	46	985	4,376	\$153,175.56
(CHARLES S	TREET	CLARK ST	DEAD END	53	206	457	\$15,996.27
(CHARLES S	TREET	MT VERNON ST	CLARK ST	50	262	874	\$30,601.67
(CLARK STRI	EET	CHARLES ST	EAST ST	43	1,111	2,717	\$95,077.89
(COLONIAL	DRIVE	169' N OF BUSSEY ST	537' N OF BUSSEY ST	53	369	1,065	\$37,269.56
	COLONIAL	DRIVE	537' N OF BUSSEY ST	THOMAS ST	37	581	1,097	\$38,381.17
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Name	From	То	PCI	Length (ft)	Area (sy)	Cost
GREENHOOD STREET	COLBURN ST	GARFIELD RD	45	748	1,828	\$63,995.56
GREENHOOD STREET	COLONIAL DR	COLBURN ST	42	894	2,284	\$79,936.50
GREENSBORO ROAD	HILLSDALE RD	FRESNO RD	47	256	682	\$23,856.00
HARVARD STREET	BROOKDALE AV	HIGH ST	46	1,130	3,138	\$109,831.94
HILLSDALE ROAD	160' W OF GAINSVILLE RD	SPRAGUE ST	46	1,157	3,085	\$107,977.33
HOLMES ROAD	SHERMAN RD	TRENTON RD	45	1,171	3,124	\$109,330.67
JEFFERSON STREET	MT VERNON ST	300' E OF EAST ST	41	993	2,538	\$88,818.33
LOUISE ROAD	HOOPER RD	SHERMAN RD	50	215	717	\$25,095.00
MADISON STREET	ELMWOOD DR	EAST ST	38	637	1,770	\$61,950.00
MADISON STREET	MT VERNON ST	ELMWOOD DR	51	651	1,808	\$63,272.22
MONROE STREET	DEAD END	EAST ST	37	1,965	5,678	\$198,723.78
MT. HOPE STREET	CURVE ST (E)	330' N OF CURVE ST (W)	45	852	1,893	\$66,243.33
NOBEL ROAD	300' S OF SPRAGUE ST	STOUGHTON RD	54	358	994	\$34,786.11
NOBEL ROAD	SPRAGUE ST	300' S OF SPRAGUE ST	40	300	834	\$29,176.39
SHORT STREET	VIOLET AVENUE	57' N OF KIELY ROAD	52	184	450	\$15,759.33
TRIMOUNT STREET	RIVERSIDE DRIVE	VINE ROCK STREET	42	792	2,112	\$73,929.33
VIOLET AVENUE	COMMONWEALTH AVENUE	50' W OF SHORT STREET	34	220	587	\$20,533.33
WILDWOOD DRIVE	FAIRBANKS RD	CENTRAL ST	46	588	1,568	\$54,889.33
WOODLAWN STREET	RIVERSIDE DRIVE	VINE ROCK STREET	43	817	2,089	\$73,111.89
		Repa	ir Type Sum	22,182	61,323	\$2,146,288.16
epair Type: Routine	Maintenance					
ABBOTT ROAD	775' W OF MT VERNON ST	WHITING AV	90	491	1,308	\$588.80
ABBOTT ROAD	MT VERNON ST	775' W OF MT VERNON ST	92	776	2,069	\$931.08
AVERY STREET	LINDEN PL	EAST ST	92	938	2,084	\$938.00
BELKNAP STREET	BUSSEY ST	CURVE ST	91	627	1,394	\$627.20
BUSSEY STREET	95' S OF COLBURN ST	350' N OF HIGH ST	92	810	3,149	\$1,417.15

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Name	From		То	PCI	Length (ft)	Area (sy)	Cos
COUNTRY CLUB	ROAD 337' E OF TH	HE TOWN LINE	TOWN LINE	91	337	750	\$337.40
EASTERN AVENU	E 150' N OF JA	ADE LA	JADE LA	91	140	404	\$181.87
EMMETT AVENU	E ODYSSEY LA	\	SAWMILL LA	90	668	1,484	\$667.96
GREENLODGE ST	REET FILLMORE R	RD	100' S OF FLINTLOCKE LA	92	393	874	\$393.40
HIGH STREET	AMES ST		BULLARD ST	89	395	1,493	\$671.84
HIGHLAND STRE	COURT ST		RICHARDS ST	84	584	1,557	\$700.56
JEFFERSON STRE	ET 300' E OF EA	AST ST	EAST ST	91	302	771	\$347.07
JERSEY STREET	EAST ST		920' E OF CENTRAL AV	91	922	2,048	\$921.60
MT. HOPE STREE	T 330' N OF C	URVE ST (W)	CURVE ST (W)	91	332	737	\$331.50
REED STREET	PRATT AV		BORDER ST	90	1,145	3,052	\$1,373.52
RICHARDS STREI	T COURT ST		HIGHLAND ST	91	1,088	2,901	\$1,305.24
STONEY LEA ROA	ND 532' E OF ST	ΓONEY LEA RD	326' E OF STONEY LEA RI	91	206	504	\$226.82
WALNUT STREE	MT VERNON	N ST	EAST ST	91	1,065	2,366	\$1,064.70
WHITCOMB ROA	D WARREN RO	DAD	COMMON STREET	90	695	2,007	\$903.11
WHITING AVENU	E EAST ST		MT VERNON ST	91	1,221	3,663	\$1,648.35
WILLIAMS AVEN	JE ASHCROFT S	ST	DALE ST	90	676	1,876	\$844.38
WILSON AVENU	WASHINGTO	ON ST	DEAD END	91	894	2,384	\$1,072.80
				Repair Type Sum	14,703	38,876	\$17,494.35
				Year Grand Total	44,604	124,264	\$2,344,269.01
7/1/2012							
Repair Type: Mi	II/Overlay						
WASHINGTON S	REET 378' N OF C	OURT ST	COURT ST	72	390	1,214	\$25,256.75
				Repair Type Sum	390	1,214	\$25,256.75
Repair Type: Pro	eventative Maintena	nce					
COBBLER LANE	OAKDALE A	V	123' N OF RIVER ST	84	272	847	\$6,607.81

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Name	From	То	PCI	Length (ft)	Area (sy)	Cost
HIGH STREET	127' W OF MILTON ST	HILL AV	89	583	3,239	\$25,263.33
HIGH STREET	250' W OF FELIX ST	50' W OF MAVERICK ST	79	385	1,155	\$9,006.66
HIGH STREET	HILL AV	250' W OF FELIX ST	84	688	2,064	\$16,096.86
MAH WAY	BOSTON-PROV HIGHWAY	EASTERN AV	80	444	1,283	\$10,009.31
PROSPECT STREET	WILLOW ST	WASHINGTON ST	84	340	832	\$6,490.29
QUAKER LANE	WALNUT ST	DEAD END	79	382	890	\$6,945.12
RIVER STREET	180' W OF MILTON ST	OAKDALE AV	84	1,608	4,644	\$36,226.84
RIVER STREET	OAKDALE AV	CEDAR ST	77	230	1,126	\$8,785.52
SAWMILL LANE	EMMITT AV	MILTON ST	78	576	1,920	\$14,978.60
WASHINGTON STREET	270' S OF PROSPECT ST	600' N OF COURT ST	82	782	2,780	\$21,687.47
WASHINGTON STREET	600' N OF COURT ST	378' N OF COURT ST	91	222	691	\$5,387.20
WASHINGTON STREET	METCALF ST	270' S OF PROSPECT ST	91	450	1,398	\$10,907.87
WILLOW STREET	SPRUCE ST	PROSPECT ST	73	878	2,537	\$19,791.03
			Repair Type Sum	7,840	25,408	\$198,183.91
Repair Type: Reclamation	on Major Collector					
EASTERN AVENUE	HIGH ST	RTE 1	46	511	3,690	\$134,309.93
HIGH STREET	250' N OF EASTERN AV	EASTERN AV	52	248	1,239	\$45,081.40
HIGH STREET	EASTERN AV	MAPLE PL	56	505	3,255	\$118,485.24
HIGH STREET	MAPLE PL	AMES ST	89	644	2,434	\$88,598.41
WASHINGTON STREET	HIGH ST	SCHOOL ST	53	303	2,557	\$93,073.99
			Repair Type Sum	2,211	13,174	\$479,548.97
Repair Type: Reclamation	on Minor Collector and Lo	ocal				
ARLINGTON ROAD	BRIDGE STREET	DEAD END	44	804	1,877	\$68,320.37
CHURCH STREET	HIGH ST	FRANKLIN SQ	41	456	1,063	\$38,687.13
COLUMBIA TERRACE	CURVE ST	WASHINGTON ST	42	538	1,434	\$52,202.45
ETNA ROAD	CRANE ST	130' N OF SPRAGUE ST	42	1,429	4,128	\$150,256.77

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Town of Dedham -	Pavement I	Management	Road Program
and the state of t			

Name	From	То	PCI	Length (ft)	Area (sy)	Cost
GLENRIDGE ROAD	COMMON STREET	HAVEN STREET	39	1,139	2,784	\$101,336.79
HIGHLAND STREET	LOWDER ST	WASHINGTON ST	40	3,068	7,499	\$272,957.13
HIGHLAND STREET	RICHARDS ST	LOWDER ST	43	1,609	3,934	\$143,191.94
LEONARD STREET	DEDHAM BLVD	BIRCH SR	42	1,646	5,119	\$186,343.73
OAK TREE ROAD	NEEDHAM STREET	VALLEY ROAD	42	550	1,465	\$53,338.13
OAKLAND TERRACE	OAKLAND ST	VETERANS RD	40	415	1,062	\$38,641.43
OVERLOOK ROAD	VINCENT RD	WINFIELD ST	43	505	1,403	\$51,061.11
PINE HILL ROAD	NEEDHAM STREET	VALLEY ROAD	41	568	1,514	\$55,124.16
RICHARDS STREET	WASHINGTON ST	205' W OF WASHINGTON ST	47	205	524	\$19,088.16
SHERWOOD STREET	LEWIS FARM RD	DEDHAM BLVD	47	1,224	2,720	\$98,991.82
WINFIELD STREET	55' S OF CRESTON AV	OVERLOOK RD	39	700	1,867	\$67,966.08
		Repair 1	Гуре Sum	14,855	38,393	\$1,397,507.20
		Voor Cu	and Tatal	25 206	70 100	¢2 100 40¢ 02
7/1/2013 Repair Type: Preventat	ive Maintenance	Year Gra	and Total	25,296	78,190	\$2,100,496.83
•	ive Maintenance 333' S OF PLEASANT ST	Year Gra	and Total	25,296 426	78,190 1,421	\$2,100,496.83 \$11,524.31
epair Type: Preventat				,	,	
epair Type: Preventat AMES STREET	333' S OF PLEASANT ST	654' N OF HIGH ST	84	426	1,421	\$11,524.31
epair Type: Preventat AMES STREET AMES STREET	333' S OF PLEASANT ST 654' N OF HIGH ST	654' N OF HIGH ST HIGH ST	84 91	426 655	1,421 2,328	\$11,524.31 \$18,880.23
epair Type: Preventat AMES STREET AMES STREET COMMON STREET	333' S OF PLEASANT ST 654' N OF HIGH ST 1155' E OF WEST ST	654' N OF HIGH ST HIGH ST 56' E OF WEST ST	84 91 83	426 655 1,100	1,421 2,328 3,543	\$11,524.31 \$18,880.23 \$28,737.60
epair Type: Preventat AMES STREET AMES STREET COMMON STREET COURT STREET	333' S OF PLEASANT ST 654' N OF HIGH ST 1155' E OF WEST ST BATES CT	654' N OF HIGH ST HIGH ST 56' E OF WEST ST CHURCH ST	84 91 83 82	426 655 1,100 388	1,421 2,328 3,543 1,594	\$11,524.31 \$18,880.23 \$28,737.60 \$12,929.68
epair Type: Preventat AMES STREET AMES STREET COMMON STREET COURT STREET COURT STREET	333' S OF PLEASANT ST 654' N OF HIGH ST 1155' E OF WEST ST BATES CT CHURCH ST	654' N OF HIGH ST HIGH ST 56' E OF WEST ST CHURCH ST MARSH ST	84 91 83 82 83	426 655 1,100 388 913	1,421 2,328 3,543 1,594 3,145	\$11,524.31 \$18,880.23 \$28,737.60 \$12,929.68 \$25,506.94
epair Type: Preventat AMES STREET AMES STREET COMMON STREET COURT STREET COURT STREET COURT STREET	333' S OF PLEASANT ST 654' N OF HIGH ST 1155' E OF WEST ST BATES CT CHURCH ST HIGH ST	654' N OF HIGH ST HIGH ST 56' E OF WEST ST CHURCH ST MARSH ST BATES CT	84 91 83 82 83	426 655 1,100 388 913 331	1,421 2,328 3,543 1,594 3,145 1,657	\$11,524.31 \$18,880.23 \$28,737.60 \$12,929.68 \$25,506.94 \$13,438.27
AMES STREET AMES STREET COMMON STREET COURT STREET COURT STREET COURT STREET COURT STREET COURT STREET	333' S OF PLEASANT ST 654' N OF HIGH ST 1155' E OF WEST ST BATES CT CHURCH ST HIGH ST MARSH ST	654' N OF HIGH ST HIGH ST 56' E OF WEST ST CHURCH ST MARSH ST BATES CT WETHERBEE ST	84 91 83 82 83 83	426 655 1,100 388 913 331 748	1,421 2,328 3,543 1,594 3,145 1,657 2,659	\$11,524.31 \$18,880.23 \$28,737.60 \$12,929.68 \$25,506.94 \$13,438.27 \$21,563.23
AMES STREET AMES STREET COMMON STREET COURT STREET	333' S OF PLEASANT ST 654' N OF HIGH ST 1155' E OF WEST ST BATES CT CHURCH ST HIGH ST MARSH ST MAVERICK ST	654' N OF HIGH ST HIGH ST 56' E OF WEST ST CHURCH ST MARSH ST BATES CT WETHERBEE ST WASHINGTON ST	84 91 83 82 83 83 84 73	426 655 1,100 388 913 331 748 1,790	1,421 2,328 3,543 1,594 3,145 1,657 2,659 3,977	\$11,524.31 \$18,880.23 \$28,737.60 \$12,929.68 \$25,506.94 \$13,438.27 \$21,563.23 \$32,250.77

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Name	From	То	PCI	Length (ft)	Area (sy)	Cost
PINE STREET	79' W OF KIELY ROAD	NEEDHAM STREET	83	2,367	7,364	\$59,718.51
SPRAGUE STREET	100' E OF DRESSER AV	50' W OF HOOPER RD	83	3,830	14,045	\$113,903.33
WHITING AVENUE	830' E OF WALNUT ST	RIVER ST	84	893	2,777	\$22,522.82
WHITING AVENUE	MT VERNON ST	WALNUT ST	83	2,311	8,730	\$70,797.78
WHITING AVENUE	WALNUT ST	830' E OF WALNUT ST	84	834	2,595	\$21,045.27
		_	Repair Type Sum	17,330	58,036	\$470,669.84
Repair Type: Reclamation	on Minor Collector and L	ocal				
ADAMS STREET	MT VERNON ST	EAST ST	41	1,228	3,276	\$124,019.26
BERKELEY ROAD	BRIDGE STREET	ARLINGTON ROAD	40	904	2,410	\$91,257.74
BORDER STREET	ASHCROFT ST	DALE ST	41	755	2,516	\$95,243.14
BOULEVARD ROAD	MT VERNON ST	EAST ST	43	1,149	3,829	\$144,965.94
BROOKDALE AVENUE	EAST ST	HIGH ST	41	1,481	3,455	\$130,787.37
CLEVELAND STREET	BIRCH ST	LEONARD ST	41	1,245	3,874	\$146,679.74
LEDGEWOOD ROAD	GREENLODGE ST	INTERVALE RD	42	1,086	3,016	\$114,189.97
LINCOLN STREET	CEDAR ST	MT VERNON ST	42	1,565	4,869	\$184,324.35
MT. VERNON STREET	SANDERSON AV	JEFFERSON ST	42	1,293	4,165	\$157,688.58
SCOTT CIRCLE	COLLWELL DR (SW)	COLLWELL DR (NE)	42	1,255	3,487	\$132,005.20
VAN BRUNT AVENUE	MT VERNON ST	ABBOTT RD	42	813	2,168	\$82,070.38
WALDO STREET	CURVE ST	MAVERICK ST	41	874	2,426	\$91,863.08
			Repair Type Sum	13,646	39,490	\$1,495,094.75
			Year Grand Total	30,977	97,526	\$1,965,764.59
		Gran	d Total of All Years	100,877	299,979	\$6,410,530.43

Monday, February 07, 2011 Page 6 of 6

BMP Name				Low %	High %						
Abbrevitated BMP Name Full Sizing Method Undervotated in Spray Bave Sizing Method Undervotated disconnection of paved per VT, disconnected length = paved length, stope <5% (area of the spray of the sp	RMP Name							Maint			Racteria
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DecketWet Pocket Wetland	BioCellUnder	Bioretention Cell with Underdrain	6" ponding + 24" media voids, could be	5.00%	10.00%	C.Ď	Filtration/Infiltrati	Medium	Low	Medium	Excellent
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Dry Well or French Drain or Stormwater Planter RoofDiscon Unstructured downspount disconnect to lawn or rain barrel Rain Garden Rain Garden Per VT, 6" ponding, 0.5-2.0"/hr Pre Treatment BMPs GrassStrip GrassChannel GravelDiaphragm GrassChannel Forebay GritChamber MulchLayer Other	BMPs for Rooftop I	Flows									
RoofDiscon Unstructured downspount disconnect to lawn or rain barrel per VT, disconnection length should equal roof length, slope <5% RainGarden Rain Garden Per VT, 6" ponding, 0.5-2.0"/hr 15.00% 20.00% A, B Infiltration Medium Low Medium Excellent Pre Treatment BMPs GrassStrip GraveIDiaphragm GrassChannel Forebay GritChamber MulchLayer Other	DryWell	Dry Well or French Drain or		2.50%	2.50%	Any	Infiltration	Low	Medium	Medium	Excellent
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GrassStrip	RainGarden			15.00%	20.00%	A, B	Infiltration	Medium	Low	Medium	Excellent
GrassStrip											
GrassStrip	Pre Treatment RMF	Ds .									
GravelDiaphragm Image: Company of the property of the		-									
GrassChannel <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>											
Forebay											
GritChamber Image: Control of the control											
MulchLayer											
Other Other											
INONE	None									+	

	t Volumes Wher					
cubic feet storage p	er acre of total d	rainage area (ind	cluding pervious	and impervious)	
			Lond II	loo Turo		
				se Type		
	1 Acre	0.5 Acre	0.25 Acre	Multi Family/		100%
	Residential	Residential	Residential	Townhouse	Commercial	Impervious
Measured Acres of DA	1.0	1.0	1.0	1.0	1.0	1.0
Assumed IC/DA Ratio	15%	22%	29%	42%	72%	100%
Estimated Acres IC	0.2	0.2	0.3	0.4	0.7	1.0
Water Quality Volume (1.2" rainfall)	806	1,080	1,355	1,864	3,040	4,138
Recharge Volume (0.4" rainfall)	269	360	452	621	1,013	1,379
Channel Protection Volume (60% of 2.4" rainfall)	1,048	1,404	1,761	2,424	3,953	5,380
Targe cubic feet of storag	t Volumes Wher e per acre of 100					
			l and l l	se Type		
	1 Acre	0.5 Acre	0.25 Acre	Multi Family/		100%
	Residential	Residential	Residential	Townhouse	Commercial	Impervious
Measured Acres of IC	1.0	1.0	1.0	1.0	1.0	1.0
Assumed IC/DA Ratio	15%	22%	29%	42%	72%	100%
Estimated Acres DA	6.7	4.5	3.4	2.4	1.4	1.0
Water Quality Volume (1.2" rainfall)	5,372	4,910	4,671	4,439	4,223	4,138
Recharge Volume (0.4" rainfall)	1,791	1,637	1,557	1,480	1,408	1,379
Channel Protection Volume (60% of 2.4" rainfall)	6,984	6,384	6,073	5,771	5,490	5,380
Above figures based on or adapted from CWP Simple	l ole Method as de	 escribed in "Urba	 an Stormwater F	 Retrofit Practices	"	

Appendix 2

- a) QAPP Addendum for Dedham BMP Survey
 - b) Association QAPP- See Compact disc

Addendum to Quality Assurance Project Plan (QAPP) 2010-2012

Neponset River Watershed Association Citizen's Water Monitoring Network (CWMN) Best management Practice (BMP) Survey Plan For Dedham/Milton BMP Surveys

Award Nos.: 2010-02/604 Dedham, 2011-02/604 Milton February 15, 2012

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Addendum to **Quality Assurance Project Plan (QAPP)** 2010-2012

Neponset River Watershed Association Citizen's Water Monitoring Network (CWMN) Best management Practice (BMP) Survey Plan For Dedham/Milton BMP Surveys

Award Nos.: 2010-02/604 Dedham, 2011-02/604 Milton February 15, 2012

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Dedham/Milton BMP Surveys

Problem and Purpose

The Neponset River Watershed is home to some 330,000 residents and includes portions of 14 communities stretching from Foxborough to the City of Boston. Land use in the basin ranges from suburban to highly urban. Industrial and residential development began early in the Neponset Watershed with the construction of the country's second dam on the Neponset, in 1633.

Until relatively recently, water quality in the Neponset Watershed was uniformly very poor due primarily to uncontrolled or partially controlled point-source discharges of industrial and domestic wastewater. Dramatic water quality improvements have been achieved over the last three decades primarily through investments in wastewater infrastructure.

In spite of this progress, many stream reaches continue to fall short of their designated uses and virtually the entire basin fails to support primary contact recreation uses during wet weather. While instream sampling data indicate that a handful of point-source hotspots remain, by far the most widespread cause of water quality impairment in the Neponset is stormwater runoff from developed areas which predate the advent of modern stormwater management rules.

Pathogens are the primary pollutant of concern associated with stormwater in the Neponset Watershed, though stormwater is also a substantial source of sediment and nutrient loading, and in some areas a source of thermal pollution. Finally, unmitigated stormwater runoff is an important factor in the loss of groundwater recharge and resulting adverse impacts to stream base flows. Loss of base flow is a particular concern in the Neponset Watershed which also has significant local water supply activity and large interbasin transfers via regional sewer systems.

The importance of stormwater runoff as a driver for water quality in the Neponset Watershed has been well documented through water quality assessments completed by both the MassDEP and the Neponset River Watershed Association ("the Association" or "the Watershed Association"). The stormwater issue has also been identified as a priority water quality concern in MassDEP's watershed-based plan for the Neponset River Watershed, in EEA's Boston Harbor Watershed Assessment and Action Plan, and in MassDEP's Pathogen TMDL for the Neponset River Watershed. All of the above planning documents call for the identification, design and implementation of structural stormwater BMP retrofits as priority tasks.

The goal of this project is to identify sites in the Towns of Dedham and Milton that are suitable for retrofitting with structural stormwater BMPs and to develop conceptual designs for BMPs at those sites. The Contractor will employ a method for identifying, prioritizing and designing BMP retrofits. This approach will emphasize a visual survey of BMP retrofit potential that can be rapidly applied to a large area to: prioritize retrofit opportunities, determine ease of implementation, provide qualitative estimates of pollutant loading, determine engineering feasibility, estimate potential for pollutant load reduction, and determine the likelihood for acceptance by abutters. Upon completion of this assessment, and the vetting of potential sites with key community stakeholders, the Contractor will prepare final conceptual designs and determine pollutant loading from the selected sites.

Specific activities to be conducted by the Contractor during this project include:

- Apply a methodology which is being used in other Neponset communities to efficiently identify and prioritize stormwater BMP retrofit opportunities
- Identify at least three sites (neighborhoods or discrete collection areas) that are amenable to the implementation of structural BMP retrofits.
- Prepare conceptual designs and cost estimates to support future applications for implementation funding.
- Conduct an outreach program through the distribution of a press release and newsletter article announcing the commencement of the project and the project's findings.

Project Location

This survey will be conducted in the Towns of Dedham and Milton, MA (Fig. 1). Within the town boundaries investigations will focus on drainage areas within the Neponset River watershed (Fig. 2). In the event that investigations are completed within the Neponset River watershed then they will be continued outside of the Neponset River watershed. Areas to be investigated include but are not limited to sections of the Neponset River, Mother Brook, Pine Tree Brook and Unquity Brook.

Survey Protocol

The survey protocol for surveys conducted by NepRWA is an adaptation of steps outlined by the Center for Watershed Protection's (CWP) Manual 3: Urban Stormwater Retrofit Practices version 1.0 (http://www.cwp.org/Resource_Library/Center_Docs/USRM/ELC_USRM3.pdf). The goal of surveys conducted by NepRWA is to identify and prioritize sites where structural stormwater BMPs can be implemented throughout an individual town's existing stormwater drainage system. The information gathered from the survey should be sufficient to create preliminary site designs. The survey process includes four steps with a total of eleven associated tasks (Table 1).

Step1: Retrofit Scoping

The retrofit scoping process is the first step in the survey process. This step has four major tasks that need to be completed adapted from six major tasks outlined by the CWP (CWP 2007). Tasks not included in this survey recommended by CWP are a screening for subwatershed retrofit potential, which is considered optional by CWP, and an estimation of retrofitting effort needed in the subwatershed.

Task 1: Review past, current and future stormwater management- It is important to initially understand the past, current, and future stormwater practices and design criteria within a community to identify retrofit opportunities.

Task 2: Define the core retrofitting objective- For each survey it is important to define the overarching retrofitting objective and designate a primary pollutant of concern. For areas within

the Neponset watershed subject to the Neponset River TMDL for bacteria the likely primary pollutant of concern will be bacteria however review of in stream water quality data from the Association's CWMN program, or other pertinent data, such as the EPA 303(d) listing for specific waters, may result in selecting an alternative primary pollutant of concern at particular sites.

Task 3: Translate objectives into minimum retrofit treatment performance criteria- Each pollutant of concern will have multiple BMP options with varying levels of performance. It is important in this step to establish performance criteria that quantify either a desired level of pollutant reduction (e.g. 25% bacteria reduction) or a target percentage of the subwatershed that will be treated by effective retrofits. BMPs will be selected from the International Stormwater BMP database as well as from select proprietary designs.

Task 4: Define the preferred methods of stormwater treatment- After completion of the previous three tasks a list of preferred BMPs will be created for a specific Town in order to guide the remaining steps in the survey process.

Step 2: Desktop Retrofit Analysis

The second step in the BMP survey is to conduct a desktop search for potential retrofit sites. In this step three tasks will be completed identical to recommendations from the CWP (CWP 2007).

Task 1: Secure GIS layers and other mapping data- NepRWA will obtain the stormwater infrastructure maps from the particular town being surveyed. These maps may be either paper maps or come in the form of Geographical Information System (GIS) data layers. Ideally the information in these maps should include the stormwater drainage connectivity of each individual system along with the location of manholes, catch basins and outfalls. Additional data layers needed to complete this task include topographic layers, hydrography, soils, aerial photography, watershed/subwatershed boundaries, parcel boundaries and other utilities and sewer lines in the immediate area which are generally available from Mass GIS and/or municipalities.

Task 2: Conduct a desktop search for retrofit sites- In this task the information from Task 1 will be used to rapidly search for sites that may be good candidates for retrofits. The desktop search relies on visual inspection of recent aerial photography and other layers to isolate areas with enough space for retrofitting. This task is meant to be a qualitative evaluation of different sites, to help prioritize scheduling of the field survey and will be further groundtruthed in the field in later tasks.

Task 3: Prepare the base field maps for the Retrofit Reconnaissance Investigation (RRI)- Field maps are needed to conduct the Retrofit Reconnaissance Investigation. The level of mapping detail is largely determined by the available data and the preference of the field crew. The basic purpose of the field map is to orient the field crew and help them accurately record findings, and record basic topographic and site data.

Step 3: Retrofit Reconnaissance Investigation

The RRI is the rapid field assessment portion of the BMP survey. The purpose of the RRI is to field verify work completed during the Desktop Retrofit Analysis. In addition to field verification the RRI will help to evaluate the potential of each individual site and provide the information necessary for preliminary conceptual designs and cost estimates. Three tasks are needed to complete the RRI which are identical to those outlined by the CWP (CWP 2007).

Task 1: Advance preparation in the office- Field equipment and materials are gathered and prepared for field investigations (Table 2).

Task 2: Evaluate individual retrofit sites using RRI form- At each individual retrofit site a field form will be filled out and include the following information:

- 1. Header Information
- 2. Site Description
- 3. Drainage Area to Proposed Retrofit
- 4. Existing Stormwater Management
- 5. Proposed Retrofit
- 6. Site Constraints
- 7. Sketch and Notes

The Field Form adapted into a personal geodatabase layer for ArcPad for BMP Survey investigations can be found in Appendix 4,k of the NepRWA CWMN QAPP 2010-2012.

Task 3: Estimate BMP Effectiveness- This task will be completed in consultation with an environmental engineering firm. Once field forms have been completed and ranked additional site visits will be made with a consulting firm to further prioritize the most appropriate locations for retrofits.

Step 4: Compile the Retrofit Inventory

There are two major tasks associated with this final step of the survey process.

Task 1: Assemble retrofit inventory- A final list of potential sites will be created and from that list the sites that ranked the highest will be prioritized for further field evaluation by a team comprised of NepRWA, a consulting engineering firm and the town. Within this section of the survey the "Team" will evaluate individual sites and rank them based on the potential effectiveness of the BMP to eliminate the primary pollutant of concern, available space, percent of the drainage area to be treated, ease of implementation and other information gathered from field investigations.

Task 2: Complete conceptual designs- This step produces conceptual designs for individual retrofit sites, at a level of detail consistent with requirements for section 319 grant applications, and compiles them in a retrofit inventory for the entire subwatershed. Conceptual designs will include a site specific engineering sketch, construction and maintenance costs and estimates and verification of key elevations to validate construction feasibility. In addition the conceptual

designs will also include information on the water quality volume that the practice will be able to treat as well as information on pollutant removal efficiencies.

Sampling and Analytical Procedures

In some cases water quality samples will be necessary in order to verify a particular location is impaired due to stormwater when permission is required from private home or business owners before implementation can begin. These samples will be taken only at sites that require private party permission for construction of BMPs and will take place after Step 4 is completed and it is clear that the sites priority ranking is one of the top three locations. The goal will be to collect screening level samples for a suite of parameters to include *E.coli* bacteria, ammonia, surfactants and temperature at each site. At least two rounds of sampling will be completed for each site during wet weather at two locations, generally the outfall or gutter and in stream below the gutter or outfall. Since these samples are for screening purposes the definition of wet weather will be more loosely defined for these surveys. Wet weather samples can be taken at any point during a precipitation event exceeding 0.1 inches as long as there is enough flow from the outfall or in the gutter to get enough water for analysis. All sampling procedures and data quality objectives for the water quality sampling will be in accordance with those procedures outlined in the QAPP for the CWMN program. Bacteria samples will be analyzed at either UMASS Boston or NepRWA in accordance with procedures detailed in the 2010 NepRWA QAPP or at Alpha Analytical Laboratories.

Use of Secondary Data Sources

In order to complete steps and tasks associated with this BMP survey the use of secondary data sources from individual towns in the forms of GIS layers and maps is necessary. All data received from towns used to evaluate potential sites will be used for screening purposes. Ultimately all of the sites identified during the initial screening steps in office will be verified during field investigations.

Tables

Table 1: Steps in the retrofit survey process and associated tasks.

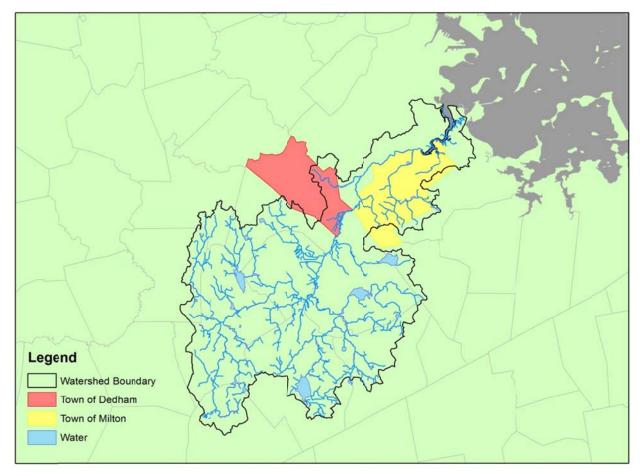
Step and Purpose	Key Tasks
Step 1: Retrofit Scoping Refine the retrofit strategy to meet local restoration objectives	Review past, current and future stormwater management Define the core retrofitting objective Translate objectives into minimum retrofit performance criteria Define the preferred methods for stormwater treatment
Step 2: Desktop Retrofit Analysis Search for potential retrofit sites across the subwatershed	Secure GIS layers and other mapping data Conduct desktop search for retrofit sites Prepare the base field maps for the Retrofit Reconnaissance Investigation
Step 3: Retrofit Reconnaissance Investigation Investigate the feasibility of retrofit sites in the field	Advance preparation in the office Evaluate individual retrofit sites using RRI forms Compute retrofit storage
Step 4: Compile Retrofit Inventory Develop initial concepts for the best retrofit sites	Assemble retrofit inventory Complete retrofit conceptual designs

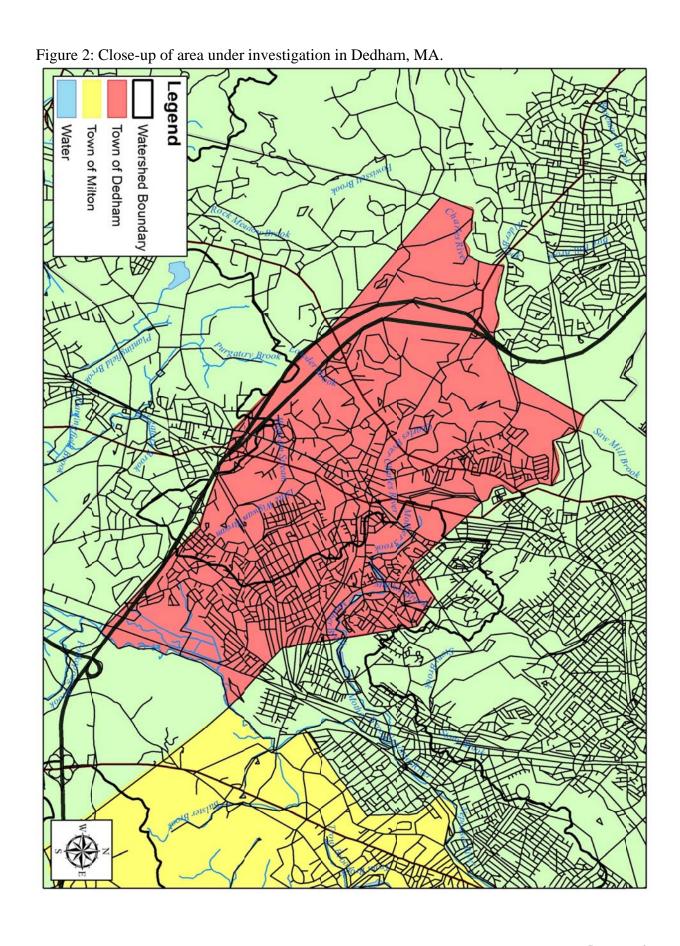
Table 2: Equipment and mapping needed for field reconnaissance investigations

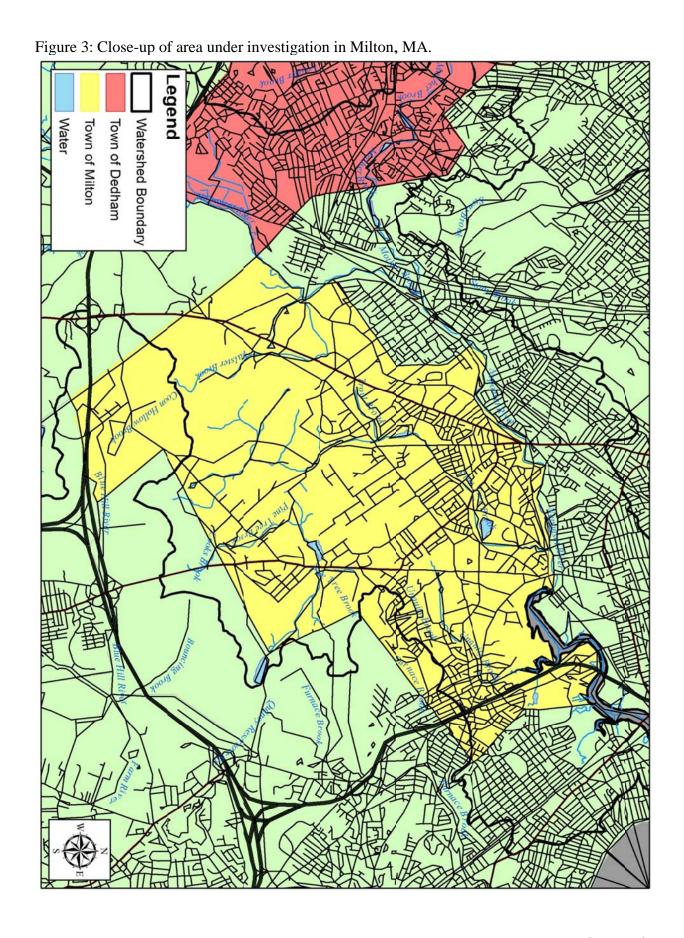
Equipment	Base Map
Clipboard, pens and pencils Laptop computer GPS unit Digital Camera Measuring wheel Safety gear (cell phone, first aid etc.)	Aerial photos Topography Hydrology Storm drain network Street names Sites to be assessed and contributing drainage Property ownership
Materials	Supplementary Maps
Field forms (ArcPad on tablet PC) Retrofit field guide Authorization letters (if necessary) Contact numbers for emergency assistance Photo IDs and business cards	Road map Land use Property ownership Utility maps

Figures

Figure 1: Area under investigation





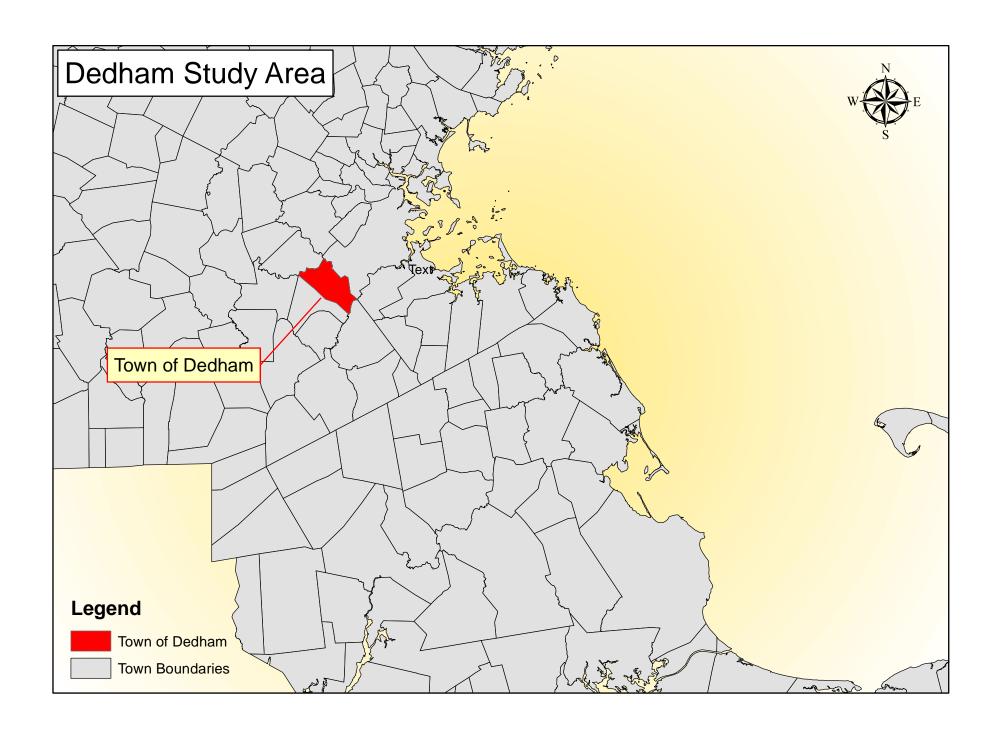


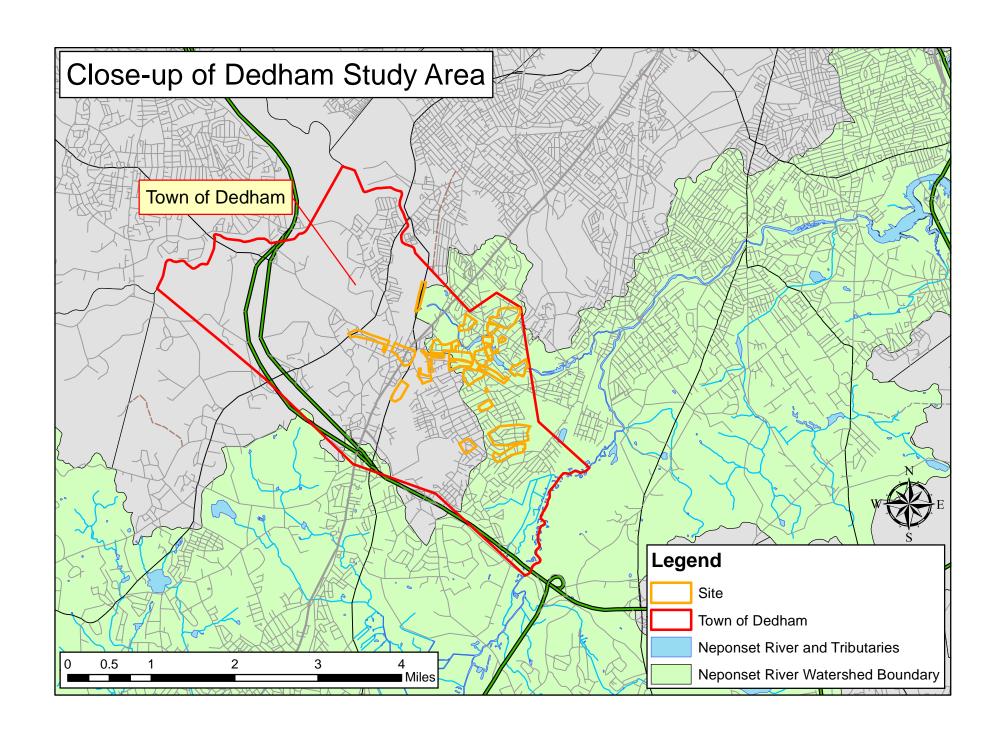
References

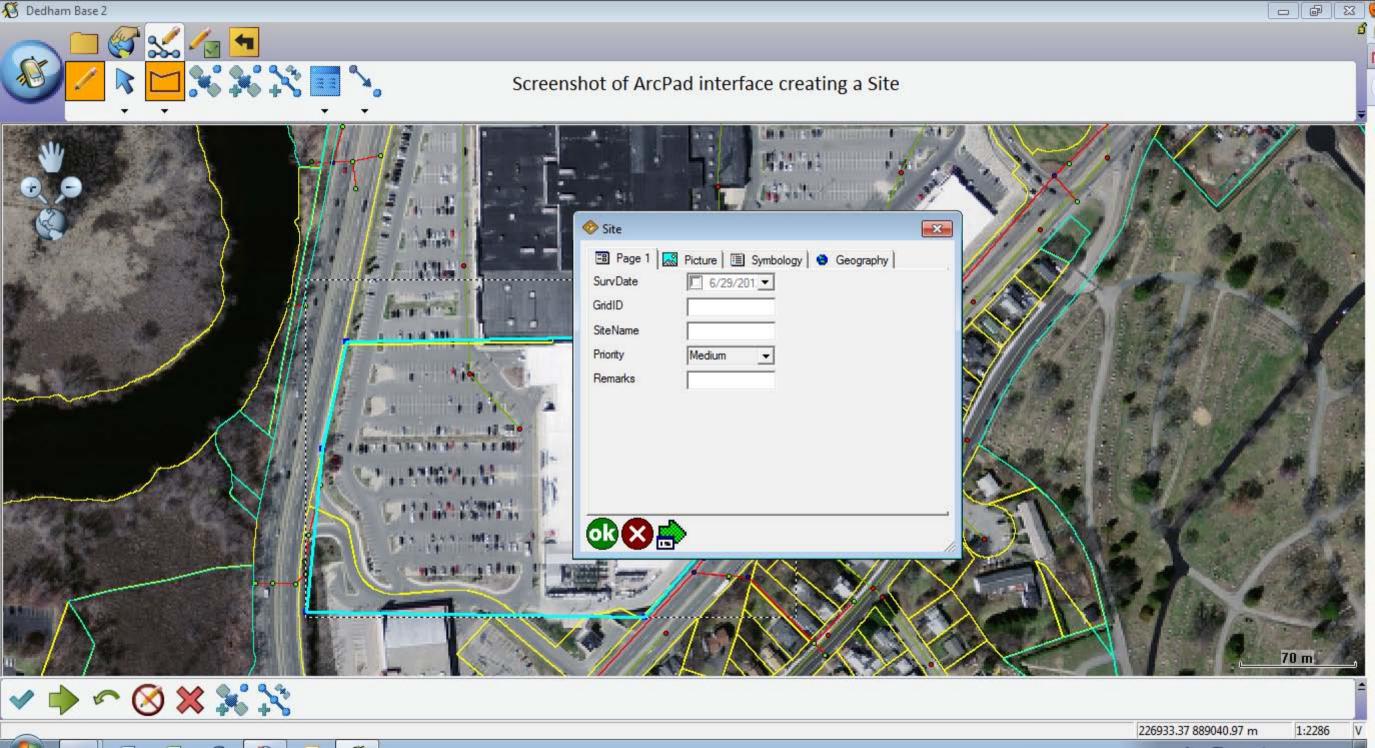
Center for Watershed Protection. 2007. Manual 3: Urban Stormwater Retrofit Practices. Version 1.0.

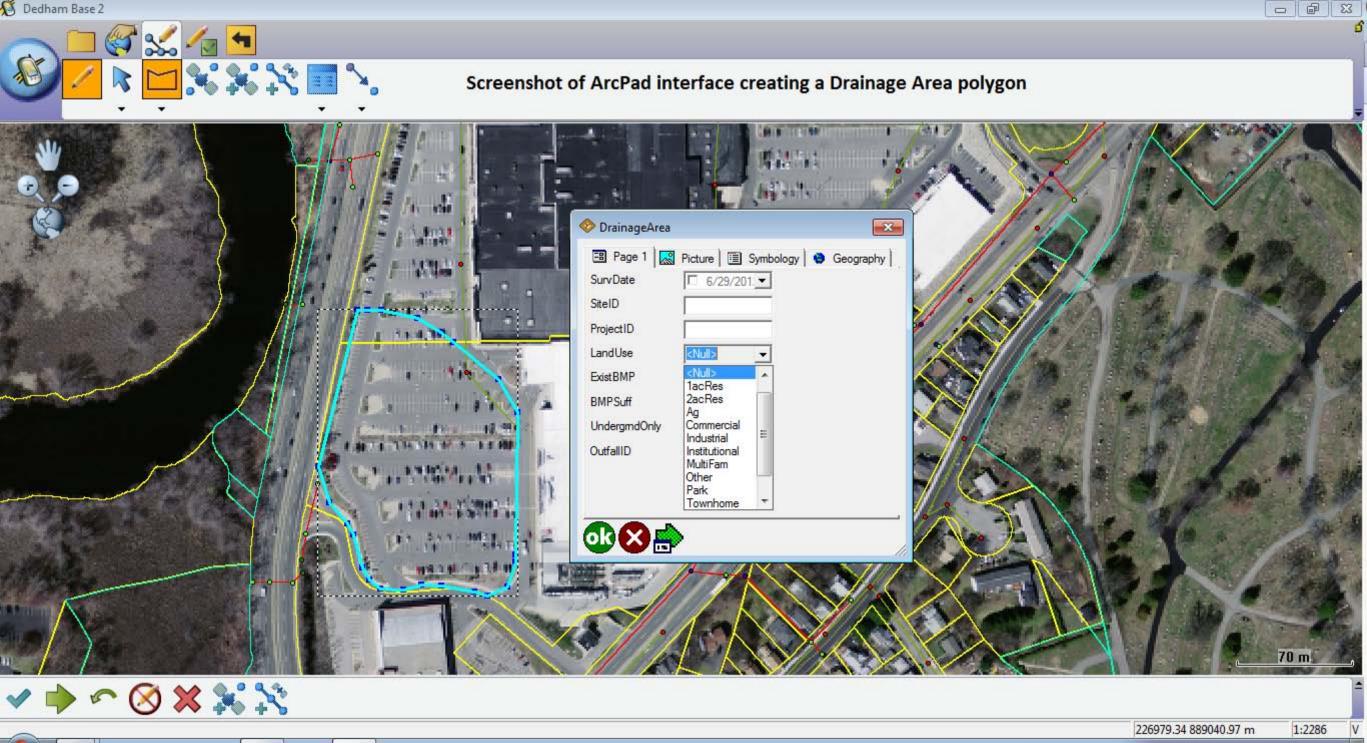
Appendix 3

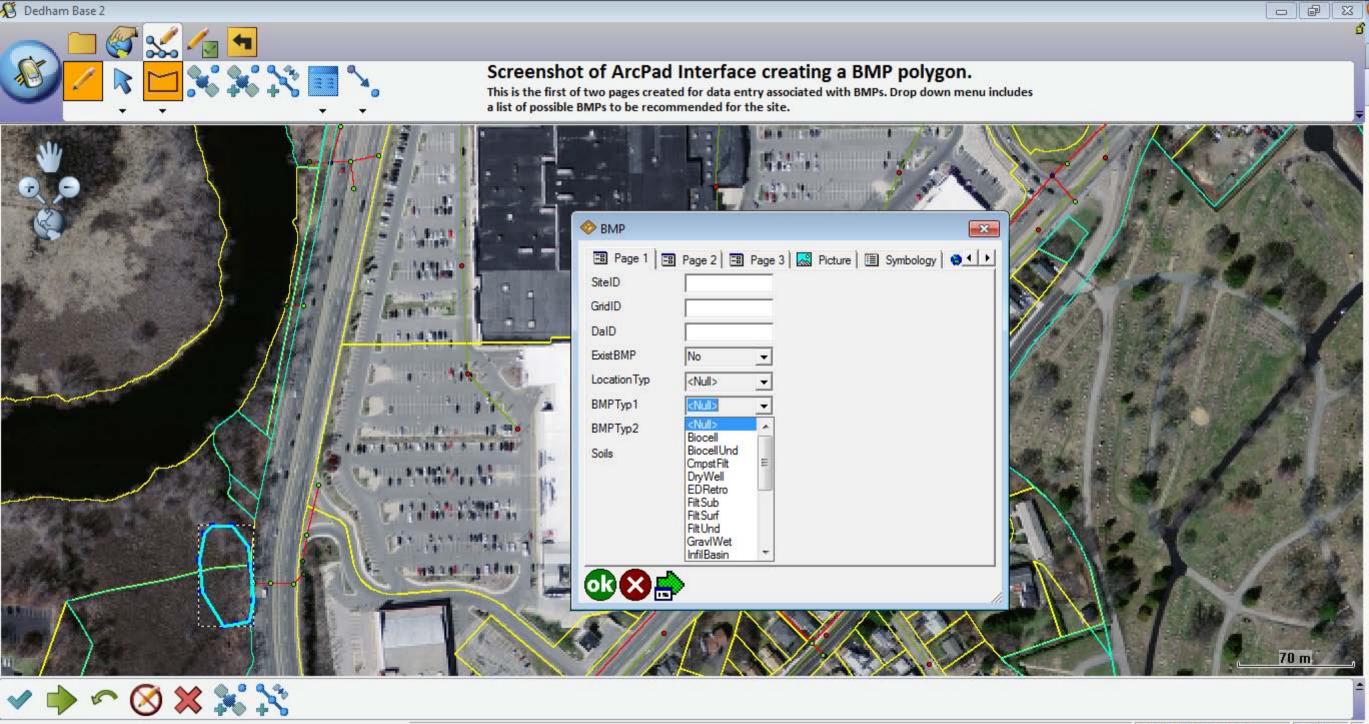
- a) Drainage Maps- See Compact discb) Dedham Study Area
 - c) Dedham Study Area Close-upd) ArcPad Site Screenshot
- e) ArcPad Drainage Area Screenshot
- f) ArcPad BMP Page 1 Screenshot
- g) ArcPad BMP Page 2 Screenshot

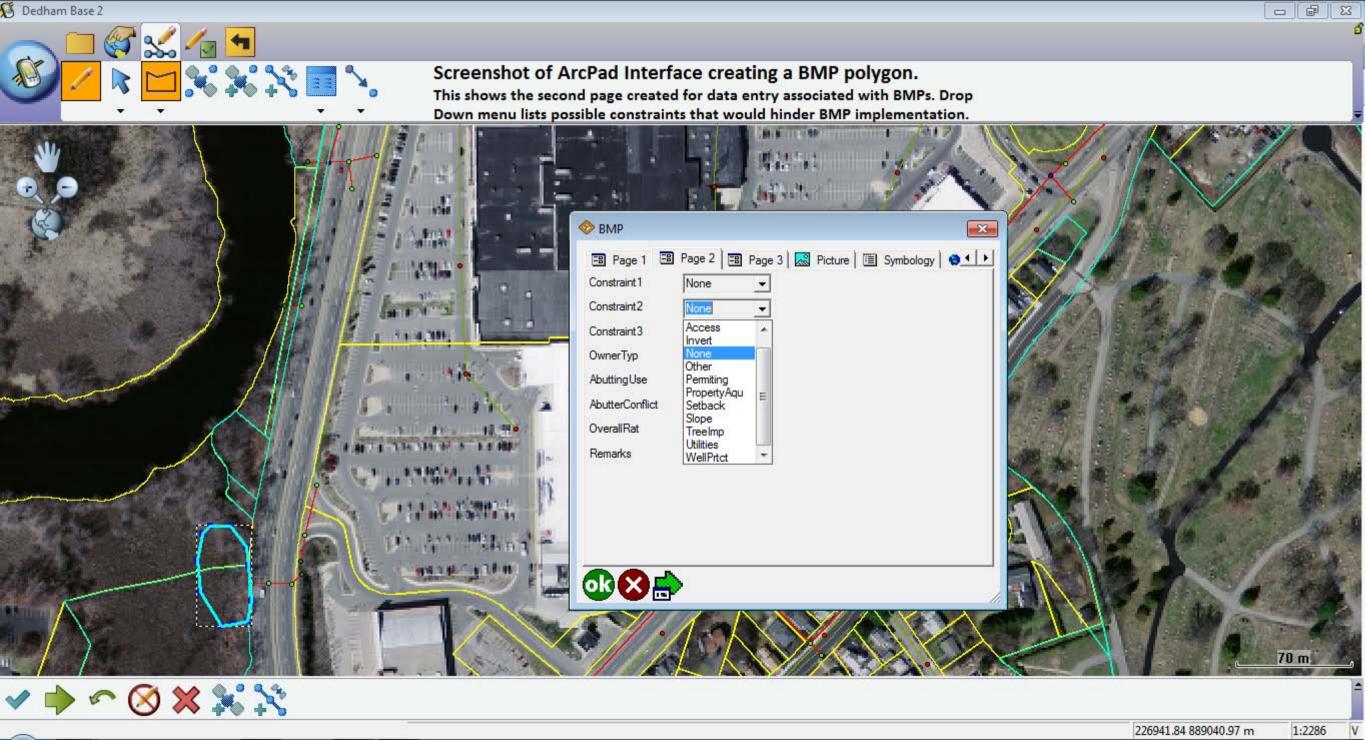












Appendix 4

- a) Blank Survey Database- See Compact disc
 - b) Top Ten Sites in Dedham
 - c) Dedham Site Data
 - d) Dedham Drainage Area Data
 - e) Dedham BMP Data
 - f) Dedham BMP Data cont

Top Ten Sites in Dedham, MA

Rank	Site Name	Site ID
1	Cobern-Whitehall	11
2	Sawmill Lane 1	7
3	Avery St.	28
4	Fire Station	30
5	Brookdale Ave	20
6	High School 2	17
7	Whiting Ave	15
8	Commerce Way	14
9	Eastern Ave	27
10	Dedham Blvd.	6

Dedham Site Data

OBJECTID	SurvDate	SiteName	Priority	Remarks
_				
6	1/6/2012 11:37:43 AM	Dedham Blvd	High	
7	1/6/2012 11:42:16 AM	Sawmill Ln 1	High	possible location for leaching catch basins and tree boxes
				catell basins and tree boxes
8	1/6/2012 11:43:28 AM	Sawmill Ln 2	Medium	More privately owned
				property and poor soils, could be difficult to locate
				appropriate BMPs
9	1/6/2012 11:52:03 AM	Odyssey Ln	Medium	Retor fit of existing BMP, Tree boxes or leaching CBs
				may work for additional treatment
				treatment
10	1/6/2012 11:54:44 AM	Colburn St	Medium	not a lot of space
10	1/0/2012 11.04.44 INV	Colbuilli	Wediam	not a fot of space
11	1/0/0010 11.70.41 AM	Colburn Whithall	Mr. 1'	1
11	1/6/2012 11:56:41 AM	Colburn whithall	Medium	large catchment area with some available town owned
				land to work with
12	1/6/2012 12:27:37 PM	Gaffney Rd	High	Public land overland ocnveyance could be
				retrofitted to function better
13	1/6/2012 12:38:30 PM	Boston Providence Turnpike	Medium	A redesign of the area would probably be needed but there
				is a lot of impervious cover
14	1/6/2012 2:24:33 PM	Commerce Way	High	Looks to have availabel space
				on Town land adjacent to private land
15	1/6/2012 2:55:35 PM	Whiting Ave 1	Medium	Separate part of a bigger

OBJECTID	SurvDate	SiteName	Priority	Remarks
				drainage area. Some smaller BMPs might work or something along the rail trail
16	1/6/2012 3:00:20 PM	High School 1	Medium	Not a lot of available space but there may be room by some of the parking areas
17	1/6/2012 3:01:28 PM	High School 2	Medium	there should be some opportunities for underground structures at parking areas.
18	1/6/2012 3:07:29 PM	High St	Medium	Tree boxes may work here, redesign of the intersection could get pricey though
19	1/6/2012 3:18:13 PM	Oneill Dr	Medium	
20	1/6/2012 3:18:42 PM	Brookdale Ave	High	May already be some treatment here but could be better
21	2/8/2012 11:36:06 AM	Alden St	Medium	
22	2/8/2012 11:41:48 AM	Capen Ln	Medium	large drainage area may need multiple treatment options
23	2/8/2012 11:44:09 AM	Oakdale School	Medium	
24	2/8/2012 11:45:53 AM	Cobbler Ln	Low	small park might be a good opportunity for a small demo project
25	2/8/2012 11:56:58 AM	East Cedar Circle	Medium	Probably best as a demo project

OBJECTID	SurvDate	SiteName	Priority	Remarks
26	2/8/2012 12:01:18 PM	Best Buy	Low	Possible opportunity for pourous perimeter, would need buy in from businesses however
27	2/8/2012 12:02:56 PM	Eastern Ave	High	Space along park edge, may be good place for demo projects in parking lot
28	2/8/2012 12:56:27 PM	Avery St	Medium	
29	5/9/2012 2:10:59 PM	Bussey St	Medium	
30	5/9/2012 2:11:43 PM	Fire Station	Medium	
31	5/2/2012 4:33:32 PM	High St 2	Medium	
32	5/9/2012 4:35:18 PM	Dedham Center	Medium	
33	5/2/2012	East St	Medium	<null></null>

Dedham Drainage Area Data

SiteID	Drainage Area II	O SurvDate	LandUse	ExistBMP	BMPSuff	UndergrndOnly	OutfallID
	18	4/26/2012 9:44:36 AM	Commercial	No	No	NA	Unknown
11	37	5/2/2012	<1acRes	No	Partial	NA	S15-OUTF7018
14	10	3/9/2012 3:27:56 PM	Industrial	No	No	Filter	Unkown
15	25	5/9/2012 2:31:00 PM	<1acRes	No	No	NA	Unknown
15	26	5/9/2012 2:33:20 PM	<null></null>	No	No	NA	Unknown
15	27	5/9/2012 2:52:38 PM	<1acRes	No	No	NA	Unknown
15	28	5/9/2012 2:53:05 PM	<null></null>	No	No	NA	Unknown
15	29	5/9/2012 2:53:35 PM	<null></null>	No	No	NA	Unknown
15	30	5/9/2012 3:16:16 PM	<1acRes	No	No	NA	Unknown
15	31	5/9/2012 3:16:44 PM	<1acRes	No	No	NA	Unknown
15	32	5/9/2012 3:17:16 PM	<1acRes	No	No	NA	Unknown
15	33	5/9/2012 3:17:46 PM	<1acRes	No	No	NA	Unknown
15	34	5/9/2012 3:51:49 PM	<1acRes	No	No	NA	Unknown
15	35	5/9/2012 3:52:13	<1acRes	No	No	NA	Unknown

SiteID	Drainage Area	a ID SurvDate	LandUse	ExistBMP	BMPSuff	UndergrndOnly	OutfallID
		PM					
15	36	5/9/2012 3:52:30 PM	<1acRes	No	No	NA	Unknown
16	21	5/8/2012 9:23:15 AM	Institutional	Yes	Yes	NA	Unknown
17	7	3/9/2012 2:48:03 PM	Park	No	No	No	R16-OUTF51
18	8	3/9/2012 3:02:11 PM	Transport	No	No	No	S17-OUTF50
18	9	3/9/2012 3:03:22 PM	Transport	No	No	No	S17-OUTF50
20	6	3/9/2012 2:29:37 PM	Transport	No	No	No	OUTF60
27	1	3/9/2012 1:22:08 PM	Park	No	No	No	OF721
27	2	3/9/2012 1:23:41 PM	Park	No	No	No	OF720
27	3	3/9/2012 1:39:31 PM	Transport	No	No	No	OF508
28	4	3/9/2012 2:09:03 PM	Transport	No	No	No	OF722
29	14	4/26/2012 8:27:22 AM	Park	Yes	Yes	NA	OF747
29	15	4/26/2012 8:29:26 AM	Commercial	No	No	NA	S16-OUTF50
30	16	4/26/2012 8:55:29 AM	Other	No	No	NA	OF750
32	19	4/26/2012 9:50:05 AM	Transport	No	No	Filter	Unknown

Page 2 of 3

SiteID	Drainage Area II	D SurvDate	LandUse	ExistBMP	BMPSuff	UndergrndOnly	OutfallID
32	20	4/26/2012 9:52:37 AM	Commercial	No	No	Filter	O18-OUTF61
33	5	3/9/2012 2:17:35 PM	<1acRes	No	No	No	OF722
6	22	5/9/2012 2:27:47 PM	<1acRes	No	No	NA	T18-OUTF50
6	23	5/9/2012 2:28:31 PM	<1acRes	No	No	NA	U18-OUTF51
6	24	5/9/2012 2:29:17 PM	<null></null>	No	No	NA	U18-OUTF50
7	12	3/9/2012 3:56:51 PM	Transport	No	No	No	S16-OUTF2
8	11	3/9/2012 3:43:32 PM	Commercial	No	No	No	Unkown
8	17	4/26/2012 9:03:25 AM	Commercial	No	No	NA	Unknown
9	13	4/18/2012	<1acRes	Yes	Partial	No	S16-OUTF3

Dedham BMP Data

SiteID	BMP ID	DaID	ExistBMP	LocationTyp	BMPTyp1	BMPTyp2	Soils	OverallRat
11	16	11	No	OSIndivSt	Biocell	BiocellUnd	AB	Excellent
14	22		Yes	STinConv	Biocell	PcktWet	<null></null>	Excellent
20	9	6	No	OSIndivSt	Biocell	BiocellUnd	Uknown	Excellent
28	7	4	No	OSIndivSt	Biocell	FiltSurf	BC	Excellent
7	14	12	No	OSIndivSt	Biocell	InfilTrench	A	Excellent
15	26	25	No	OSIndivSt	LeachCB	InfilUnd	AB	Fair
27	6	3	No	OSIndivSt	TreeBox	Biocell	BC	Fair
29	17	15	No	STBelOut	PcktWet	GravlWet	<null></null>	Fair
32	21	20	No	OSSmlPrkLt	Raingarden	BiocellUnd	<null></null>	Fair
9	15	13	Yes	OSIndivSt	InfilBasin	Biocell	AB	Fair
15	27	27	No	OSIndivSt	LeachCB	InfilUnd	AB	Good
15	28	28	No	OSIndivSt	LeachCB	InfilUnd	AB	Good
15	29	29	No	OSIndivSt	LeachCB	InfilUnd	AB	Good
15	30	36	No	OSIndivSt	LeachCB	InfilUnd	AB	Good
15	31	35	No	OSIndivSt	LeachCB	InfilUnd	AB	Good
15	32	34	No	OSIndivSt	LeachCB	InfilUnd	AB	Good

SiteID	BMP ID	DaID	ExistBMP	LocationTyp	BMPTyp1	BMPTyp2	Soils	OverallRat
15	33	30	No	OSIndivSt	LeachCB	InfilUnd	AB	Good
15	34	31	No	OSIndivSt	LeachCB	InfilUnd	AB	Good
15	35	32	No	OSIndivSt	LeachCB	InfilUnd	AB	Good
15	36	33	No	OSIndivSt	LeachCB	InfilUnd	AB	Good
17	10	7	No	OSSmlPrkLt	TreeBox	Biocell	Uknown	Good
18	11	8	No	OSIndivSt	Biocell	TreeBox	Uknown	Good
18	12	9	No	OSIndivSt	Biocell	TreeBox	Uknown	Good
27	3	3	No	OSIndivSt	TreeBox	Biocell	Uknown	Good
27	4	3	No	OSIndivSt	TreeBox	<null></null>	BC	Good
27	5	3	No	OSIndivSt	TreeBox	Biocell	BC	Good
30	18	16	No	OSSmlPrkLt	Biocell	BiocellUnd	<null></null>	Good
33	8	5	No	OSIndivSt	Biocell	BiocellUnd	AB	Good
6	23	22	No	STinConv	Biocell	PcktWet	BC	Good
6	24	23	No	STinConv	Biocell	PcktWet	BC	Good
6	25	24	No	STinConv	Biocell	PcktWet	BC	Good
8	13	11	No	OSSmlPrkLt	Biocell	BiocellUnd	Uknown	Good
	20	18	No	OSSmlPrkLt	PcktWet	BiocellUnd	<null></null>	Poor
27	1	2	No	OSSmlPrkLt	TreeBox	PorousPav	<null></null>	Poor

Page 2 of 3

SiteID	BMP ID	DaID	ExistBMP	LocationTyp	BMPTyp1	BMPTyp2	Soils	OverallRat
27	2	1	No	OSSmlPrkLt	TreeBox	PorousPav	Uknown	Poor
8	19	17	No	OSSmlPrkLt	BiocellUnd	PcktWet	<null></null>	Poor

Dedham BMP Data cont.

SiteID	BMP ID	Constraint1	Constraint2	Constraint3	OwnerTyp	AbuttingUse	AbutterConflict	OverallRat	Remarks
11	16	Invert	TreeImp	Utilities	PubLocal	Res	Medium	Excellent	A well landscaped bioretention cell could be put here that was big enough to treat a large drainage area.
14	22	Other	None	None	PubLocal	Res	Low	Excellent	originally installed as a swale. would be much better as a biocell or wetland feature
20	9	Utilities	None	None	PubLocal	Res	Low	Excellent	It would be nice to tie in more from adjoining streets since there is so much room to work but that would increase cost considerably
28	7	Slope	TreeImp	None	PubLocal	Res	Low	Excellent	Plenty of space. Very good location. Could be part of a trail revitilization effort
7	14	Slope	TreeImp	None	Unknown	Res	Low	Excellent	There appears to be some sort of BMP here but could be improved substantially

SiteID	BMP ID	Constraint1	Constraint2	Constraint3	OwnerTyp	AbuttingUse	AbutterConflict	OverallRat	Remarks
15	26	None	None	None	<null></null>	<null></null>	Medium	Fair	<null></null>
27	6		Other	None	PubLocal PrivComm	Park	Low	Fair	Catch basin is upstream of where the practice could be located. It would require relocating the catch basin. Telephone pole would be in the middle of the proposed practice as well.
32	21	Setback	Slope	Utilities	PubLocal	Comm	Low	Fair	nice for a small demo project
9	15	Access	Other	None	PrivInd	Res	High	Fair	looks to be an existing BMP that is now possibly being bypassed and a

SiteID	BMP ID	Constraint1	Constraint2	Constraint3	OwnerTyp	AbuttingUse	AbutterConflict	OverallRat	Remarks
15	27	Utilities	None	None	PubLocal	Res	Low	Good	garden is in its place Would be best to include multiple CBs as one project
15	28	Utilities	None	None	PubLocal	Res	Low	Good	would be advisable to combine wultiple Leaching CB retrofits into one project
15	29	None	None	None	PubLocal	Res	Low	Good	one project
15	30	None	None	None	PubLocal	Res	Low	Good	
15	31	Utilities	None	None	PubLocal	Res	Low	Good	
15	32	Utilities	None	None	PubLocal	Res	Low	Good	

SiteID	BMP ID	Constraint1	Constraint2	Constraint3	OwnerTyp	AbuttingUse	AbutterConflict	OverallRat	Remarks
15	33	Utilities	None	None	PubLocal	Res	Low	Good	
15	34	Utilities	None	None	PubLocal	Res	Low	Good	
15	35	Utilities	None	None	PubLocal	Res	Low	Good	
15	36	Utilities	None	None	PubLocal	Res	Low	Good	
17	10	Slope	Invert	None	PubLocal	Res	Low	Good	It appears that there has been recent construction here but practices could be worked in along with the existing new construction

SiteID	BMP ID	Constraint1	Constraint2	Constraint3	OwnerTyp	AbuttingUse	AbutterConflict	OverallRat	Remarks
18	11	Other	Utilities	None	PubLocal	Res	Low	Good	Curb bump out would require loss of 1-2 parking spaces.
18	12	Utilities	Other	None	PubLocal	Res	Low	Good	Good place for curb bump outs. Would lose parking however
27	3	TreeImp	Permiting	Setback	PubLocal	Undvlpd	Low	Good	Treatment could be installed here but it would make sense to have multiple treatment options within the DA
27	4	Setback	TreeImp	Utilities	PubLocal	Res	Medium	Good	
27	5	Slope	Utilities	None	PubLocal	Res	Low	Good	would be good if combined with other treatment options in the same DA
30	18	TreeImp	Slope	Invert	PubLocal	Comm	Low	Good	small site. small contributing drainage area

SiteID	BMP ID	Constraint1	Constraint2	Constraint3	OwnerTyp	Abutting Use	AbutterConflict	OverallRat	Remarks
33	8	Slope	Utilities	Other	PubLocal	Park	Low	Good	might be difficult to put in if the drainage area is too big or the current infrastructure is buried too deep. A smaller tree box like structure could also be used just to take the runoff from Avery S
6	23	Slope	TreeImp	None	PubLocal	Res	Low	Good	·
6	24	Utilities	Slope	TreeImp	PubLocal	Res	Low	Good	
6	25	Slope	TreeImp	None	PubLocal	Res	Low	Good	
8	13	Setback	Slope	Utilities	PubLocal	Comm	Medium	Good	Would likely need the

SiteID	BMP ID	Constraint1	Constraint2	Constraint3	OwnerTyp	Abutting Use	AbutterConflict	OverallRat	Remarks
									businesses to buy in and help with cost. It would make sense to remove existing catch basins and redo lot
	20	PropertyAqu	Utilities	Other	PrivComm	Comm	High	Poor	water table may be too high
27	1	Setback	Other	None	PubLocal	Park	Low	Poor	Recent reconstruction of parking lot would probably prevent most BMPs from being installed for some time
27	2	Setback	Other	None	PubLocal	Park	Low	Poor	Recent reconstruction of parking lot would probab ly prevent BMP installation for some time. Lot could be redesigned to pitch away from brook and install treatment on side nearest fields
8	19	PropertyAqu	Slope	TreeImp	PrivComm	Comm	High	Poor	decent space to work in but very close to

SiteID	BMP ID	Constraint1	Constraint2	Constraint3	OwnerTyp	AbuttingUse	AbutterConflict	OverallRat	Remarks
									river. private property also a barrier to implementation

Appendix 5

- a) Dedham Water Sampling Datab) Water Sampling Field Sheet
- c) Colburn-Whitehall Sampling Locations
 - d) Avery St. Sampling Locations
 - e) Sawmill Ln. Sampling Locations

Raw water quality data for	Dedham BMP	survey, De	dham, MA.			
Site ID	Date	Time	Bacteria	Ammonia	Surfactants	Temp
Sawmill 201	5/1/2012	12:05	203	0.111	0	10
Sawmill 202	5/1/2012	12:07	686.7	0.079	0	11
Sawmill 2 Stream	5/1/2012	12:09	648.8	0.054	0	10.5
Sawmill 101	5/1/2012	12:13	202	0.055	0	10.5
Sawmill 1 Stream	5/1/2012	12:16	1553	0.062	0	11
Coburn Whitehall	5/1/2012	10:57	19863	0.034	0.25	10
Coburn Whitehall Stream	5/1/2012	10:59	134	0.057	0	12.5
Brookdale Stream	5/1/2012	11:10	305	0.072	0	11
Brookdale	5/1/2012	11:18	1376	0	0	10.5
High School 2	5/1/2012	11:22	146	0	0	10.5
Avery St.	5/1/2012	11:32	1500	0.035	0	10
Eastern 1	5/1/2012	11:38	256	0.042	0	10
Eastern 2	5/1/2012	11:43	0	0.048	0	22
Eastern 3	5/1/2012	11:48	38.3	0.037	0	20
Avery St. Stream	5/1/2012	11:40	1137	0.011	0	11
Coburn Whitehall	5/16/2012	9:49	9208	0.056	0	14
Coburn Whitehall Stream	5/16/2012	9:57	387.3	0.078	0	18
Sawmill 101	5/16/2012	10:15	>24196	0.025	0	12
Sawmill 1 Stream	5/16/2012	10:20	517.2	0.083	0	12
Avery St.	5/16/2012	10:28	8164	0.066	0	17
Avery St. Stream	5/16/2012	10:35	365.4	0.072	0	16
Avery St.	6/2/2012	1:30	1986.3	0.341	0.25	19
Avery St. Stream	6/2/2012	1:36	24196	0.349	0	17
Coburn Whitehall	6/2/2012	1:50	>24196	0.243	0	18.5
Coburn Whitehall Stream	6/2/2012	1:54	5475	0.114	0	19.5
Sawmill 101	6/2/2012	1:57	9804	0.176	0	17
Sawmill 1 Stream	6/2/2012	1:59	2924	0.051	0	19

Summary Table of water quality data taken from outfalls. Dedham BMP survey Dedham, MA

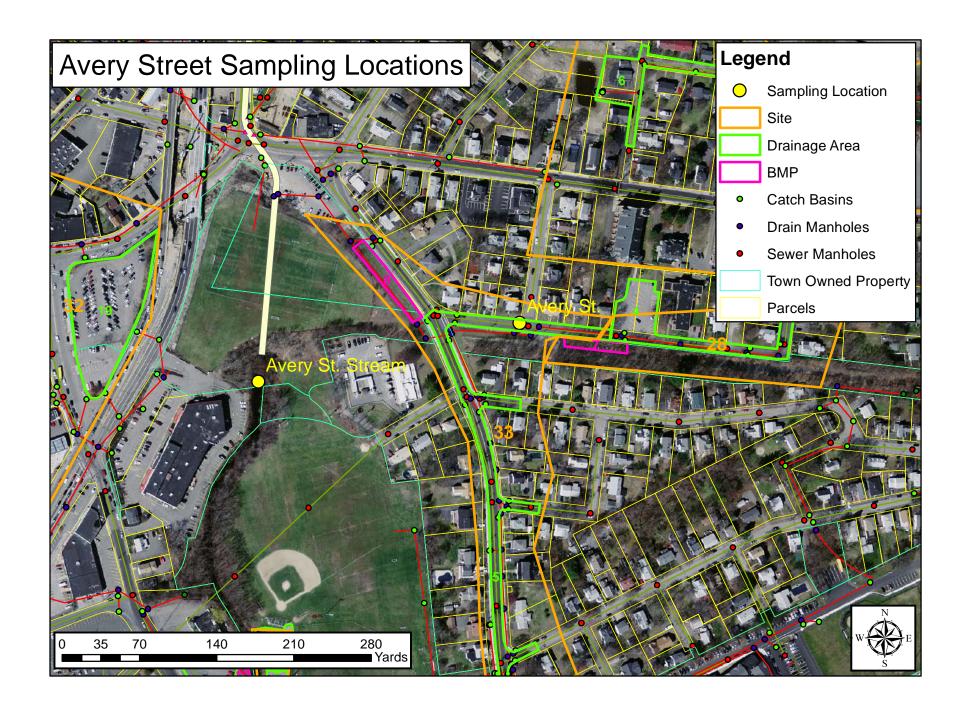
Site ID	Date	Time	Bacteria (MPN)	Ammonia (mg/L)	Surfactants (mg/L)	Temp (C°)
Coburn Whitehall	5/1/2012	10:57 AM	19,863.0	0.034	0.25	10.0
Coburn Whitehall	5/16/2012	9:49 AM	9,208.0	0.056	0.00	14.0
Coburn Whitehall	6/2/2012	1:50 PM	>24,196	0.243	0.00	18.5
Avery St.	5/1/2012	11:32 AM	1,500.0	0.035	0.00	10.0
Avery St.	5/16/2012	10:28 AM	8,164.0	0.066	0.00	17.0
Avery St.	6/2/2012	1:30 PM	1,986.3	0.341	0.25	19.0
Sawmill 101	5/1/2012	12:13 PM	202.0	0.055	0.00	10.5
Sawmill 101	5/16/2012	10:15 AM	>24,196	0.025	0.00	12.0
Sawmill 101	6/2/2012	1:57 PM	9,804.0	0.176	0.00	17.0
Sawmill 201	5/1/2012	12:05 PM	203.0	0.111	0.00	10.0
Sawmill 202	5/1/2012	12:07 PM	686.7	0.079	0.00	11.0
Brookdale	5/1/2012	11:18 AM	1,376.0	0.000	0.00	10.5
High School 2	5/1/2012	11:22 AM	146.0	0.000	0.00	10.5
Eastern 1	5/1/2012	11:38 AM	256.0	0.042	0.00	10.0
Eastern 2	5/1/2012	11:43 AM	0.0	0.048	0.00	22.0
Eastern 3	5/1/2012	11:48 AM	38.3	0.037	0.00	20.0
	_	_				
	Maximum		>24,196	0.341	0.25	22.0
	Minimum		0.0	0.000	0.00	10.0
	Average		2030.2	0.084	0.03	13.9

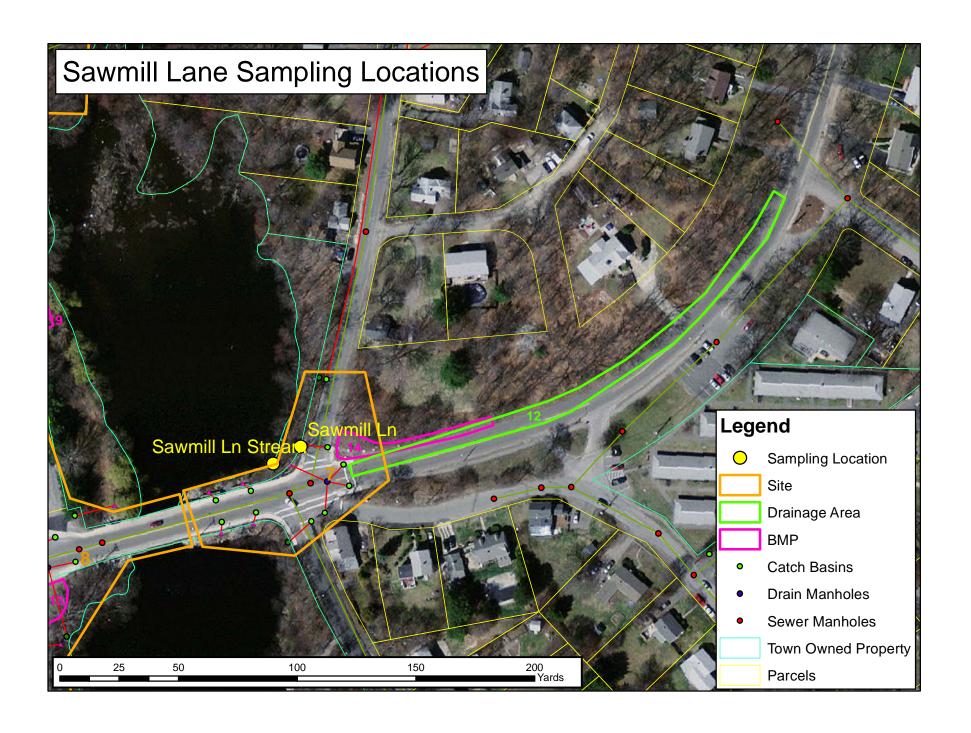
 $Summary\ Table\ fo\ water\ Quality\ data\ taken\ at\ stream\ locations.\ Dedham\ BMP\ survey\ Dedham,\ MA.$

Summary Table to Water Que	anty uata tak	en at streat	ii iocations. Deun	aili bivir survey Dec	ilialii, iviA.	
Site ID	Date	Time	Bacteria (MPN)	Ammonia (mg/L)	Surfactants (mg/L)	Temp (C°)
Coburn Whitehall Stream	5/1/2012	10:59 AM	134.0	0.057	0.00	12.5
Coburn Whitehall Stream	5/16/2012	9:57 AM	387.3	0.078	0.00	18.0
Coburn Whitehall Stream	6/2/2012	1:54 PM	5,475.0	0.114	0.00	19.5
Avery St. Stream	5/1/2012	11:40 AM	1,137.0	0.011	0.00	11.0
Avery St. Stream	5/16/2012	10:35 AM	365.4	0.072	0.00	16.0
Avery St. Stream	6/2/2012	1:36 PM	24,196.0	0.349	0.00	17.0
Sawmill 1 Stream	5/1/2012	12:16 PM	1,553.0	0.062	0.00	11.0
Sawmill 1 Stream	5/16/2012	10:20 AM	517.2	0.083	0.00	12.0
Sawmill 1 Stream	6/2/2012	1:59 PM	2,924.0	0.051	0.00	19.0
Sawmill 2 Stream	5/1/2012	12:09 PM	648.8	0.054	0.00	10.5
Brookdale Stream	5/1/2012	11:10 AM	305.0	0.072	0.00	11.0
	=					
	Maximum		24,196.0	0.349	0.00	19.5
	Minimum		134.0	0.011	0.00	10.5
	Average		3,422.1	0.091	0.00	14.3

Site			
Date			
Time Start	Time End		
Sample ID	Bacteria	Surfactants	
Time	Ammonia	Temp	
Sample ID	Bacteria	Surfactants	
Time	Ammonia	Temp	
Sample ID	Bacteria	Surfactants	
Time	Ammonia	Temp	
Sample ID	Bacteria	Surfactants	
Time	Ammonia	Temp	
Sample ID	Bacteria	Surfactants	
Time	Ammonia	Temp	
Sample ID	Bacteria	Surfactants	
Time	Ammonia	Temp	







Appendix 6

a) Dedham Conceptual Design Report

Retrofit Design Summary Table Dedham Stormwater Retrofits 28-Jun-12



No.	Catchment Area	Stormwater Best Management Practice	Drainage Area (sf)	1-inch Water Quality Volume (cf)	WQV Treated (cf)	%WQV Treated	Construction Cost	Annual O&M Cost
1	Colburn Street	Biorention Basin	33,330	2778	2,875	104%	\$ 41,520	\$ 1,000
2W	Avery Street	Water Quality Swale	14,560	1213	1,263	104%	\$ 43,000	\$ 1,500
2E	Avery Street	Subsurface Infiltration	20,390	1699	1,742	103%	φ 43,000	φ 1,500
3	Sawmill Lane/ Dedham Blvd	Biorention Basin	13,100	1092	1,133	104%	\$ 15,620	\$ 1,000

Prepared by: Nitsch Engineering
June 2012
Prepare for: Neponset River Watershed Association
Dedham, MA

Runoff and Pollutant Load Calculations Dedham Stormwater Retrofits 28-Jun-12



No.	Catchment Area	Stormwater Best Management Practice	(A) Area (ac.)	(R) Runoff (in.)	(L) Annual TSS (lbs)	(L) Annual TP (lbs)	(L) Annual TN (lbs)	(L) Annual FC (billion colonies)
1	Colburn Street	Biorention Basin	0.64	36.8	914	2.9	7.4	89,622
2W	Avery Street	Water Quality Swale	0.33	36.8	478	1.5	3.9	46,845
2E	Avery Street	Subsurface Infiltration	0.47	36.8	669	2.1	5.4	65,575
3	Sawmill Lane/ Dedham Blvd	Biorention Basin	0.30	36.8	429	1.4	3.5	42,091

Coefficients for Use in Polluted Load Calculations

Landuse	% Impervious	(C) TSS (mg/l)	(C) TP (mg/l)	(C) TN (mg/l)	Fecal Coliform (1,000 colonies/ ml)
Residential Street	100%	172	0.55	1.40	37

Pollutant Loading Formulas - The Simple Method:

TSS, TP, & TN: L = 0.226 * R *C* A

Fecal Coliform (FC): L = 103* R *C* A

L = 0.226 * R * C* AL = 103 * R * C* AR = $P * P_j * Rv$ Where: L=Annual load (lbs)Where: L=Annual load (billion colonies)Where: R=Annual runoff= 43 inches

R=Annual runoff (inches)

C=Pollutant concentration (mg/l)

R=Annual runoff (inches)

C=Bacteria concentration (1,000 colonies/ml)

P=Annual rainfall (inches)

Pj =Fraction of annual rainfall events

A=Area (acres)

A=Area (acres)

that produce runoff (assume 0.9)

0.226=Unit conversion factor 103=Unit conversion factor Rv=Runoff Coefficient

References:

1. New York State Stormwater Management Design Manual, Appendix A-The Simple Method to Calculate Urban Stormwater Loads

http://www.dec.ny.gov/docs/water_pdf/simple.pdf

Prepared by: Nitsch Engineering

June 2012

Prepare for: Neponset River Watershed Association

Dedham, MA

Pollutant Removal Calculations Dedham Stormwater Retrofits 28-Jun-12



					BMP Removal Efficiency				Quantity of Pollutant Removed			
No.	Catchment Area	ВМР Туре	Drainage Area (ac.)	TSS Removal (%)	TP Removal (%)	TN Removal (%)	Fecal Coliform Removal (%)	Annual TSS Removed (lbs.)	Annual TP Removed (lbs.)	Annual TN Removed (lbs.)	Annual FC Removed (billion collonies)	
1	Colburn Street	Biorention Basin	0.64	90%	60%	40%	70%	823	1.8	3.0	62,735	
2W	Avery Street	Water Quality Swale	0.33	70%	40%	50%	70%	334	0.6	1.9	32,792	
2E	Avery Street	Subsurface Infiltration	0.47	80%	70%	50%	90%	535	1.5	2.7	59,018	
3	Sawmill Lane/ Dedham Blvd	Biorention Basin	0.30	90%	60%	70%	70%	386	0.8	2.4	29,464	

BMP Removal Efficiencies

BMP Type	TSS Removal (%)	TP Removal (%)	TN Removal (%)	Fecal Coliform (FC) Removal (%)
Biorention Basin	90%	60%	40%	70%
Water Quality Swale	70%	40%	50%	70%
Subsurface Infiltration	80%	70%	50%	90%

Annual Calculated Pollutant Load (from Table 1)

No.	Catchment Area	Annual TSS (lbs)	Annual TP (lbs)	Annual TN (lbs)	Annual FC (billion colonies)
1	Colburn Street	914	2.9	7.4	89,622
2W	Avery Street	478	1.5	3.9	46,845
2E	Avery Street	669	2.1	5.4	65,575
3	Sawmill Lane/ Dedham Blvd	429	1.4	3.5	42,091

References:

1. New York State Stormwater Management Design Manual, Appendix A-The Simple Method to Calculate Urban Stormwater Loads http://www.dec.ny.gov/docs/water_pdf/simple.pdf

2. Massachusetts Stormwater Handbook, Volume 2 Chapter 2: Structural BMP Specifications for the Massachusetts Stormwater Handbook http://www.mass.gov/dep/water/laws/policies.htm#storm

Prepared by: Nitsch Engineering

June 2012

Prepared for: Neponset River Watershed Association

Dedham, MA

Preliminary Cost Estimate Dedham Stormwater Retrofits 6/28/2012



Colburn BMP: Bioretention Basin with Stone Swale

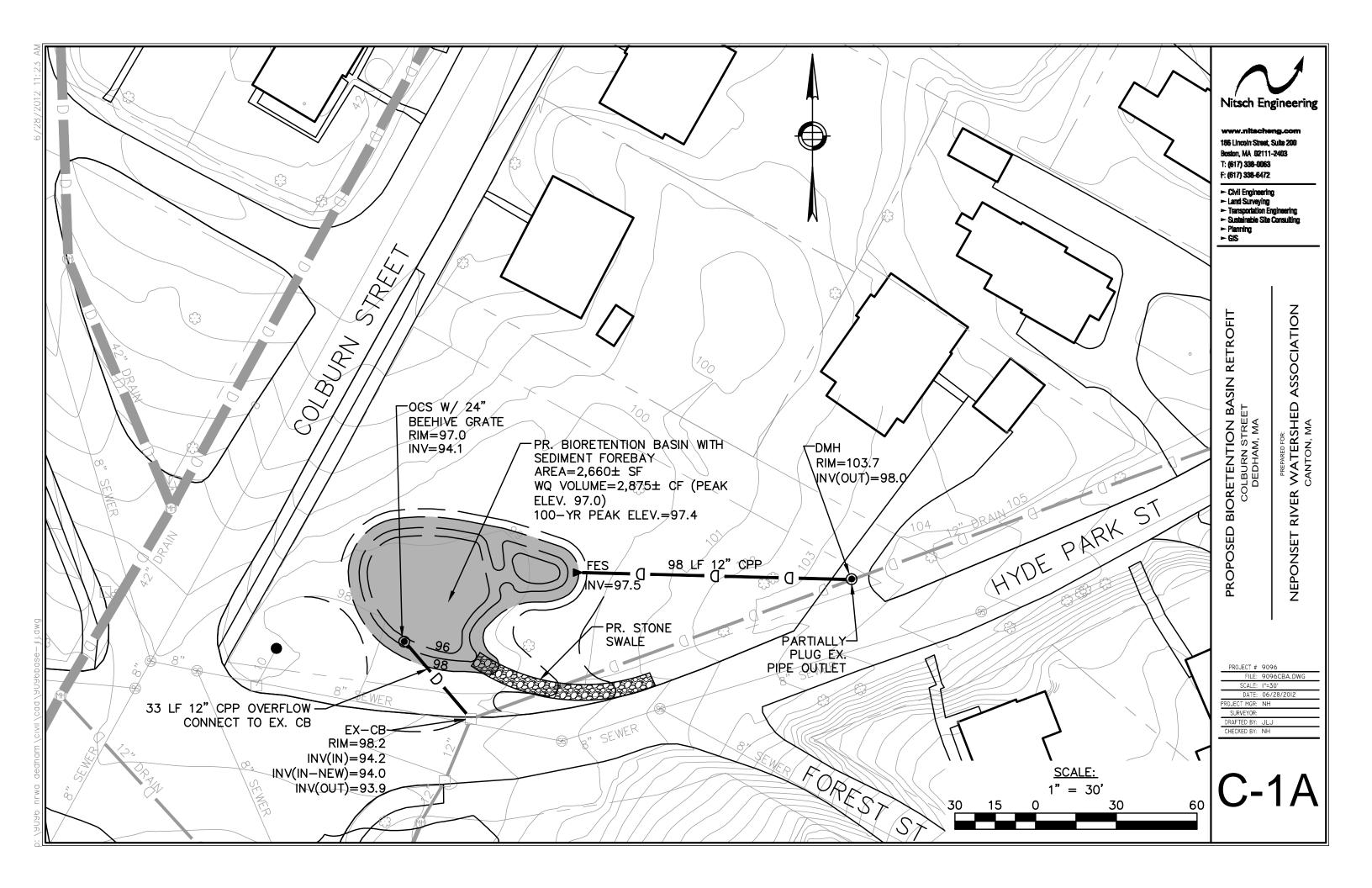
	Ų	Jnit Cost	Unit	Quantity		Total Cost
Bioretention Basin	\$	10.00	sf	2700	\$	27,000
Sediment Forebay	\$	5.00	sf	1000	\$	5,000
Stone Swale	\$	6.00	sf	410	\$	2,460
12" CPP Pipe	\$	18.00	lf	140	\$	2,520
Drainage Structures	\$	2,200.00	ea	2	\$	4,400
Flared End	\$	70.00	ea	2	\$	140
		IV	laterials & Inst	allation Total	\$	41,520
	\$	15,000				
Estimated Annual Operation and Maintenance						1,000

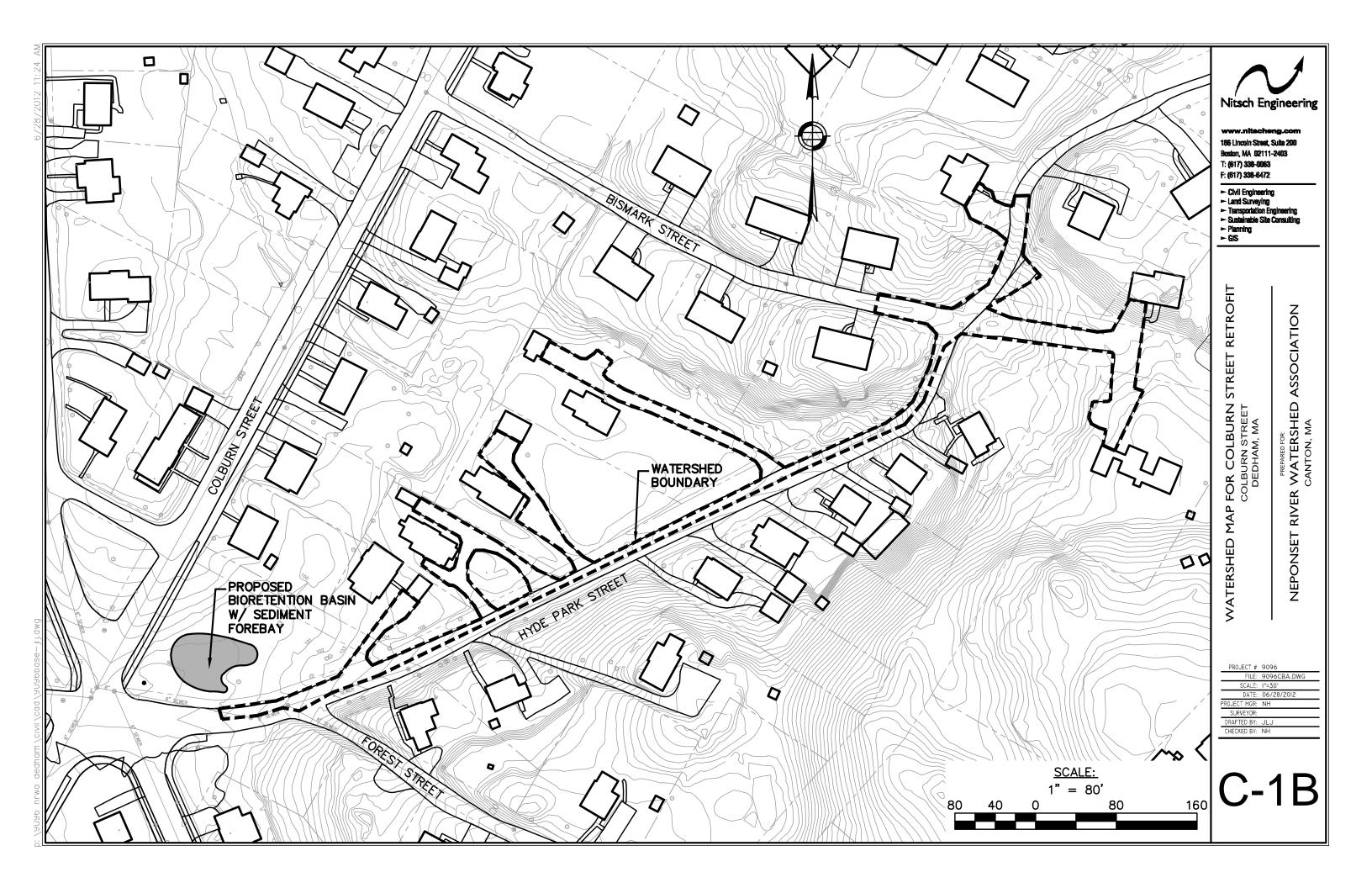
Sawmill BMP: Bioretention Basin with Stone Swale

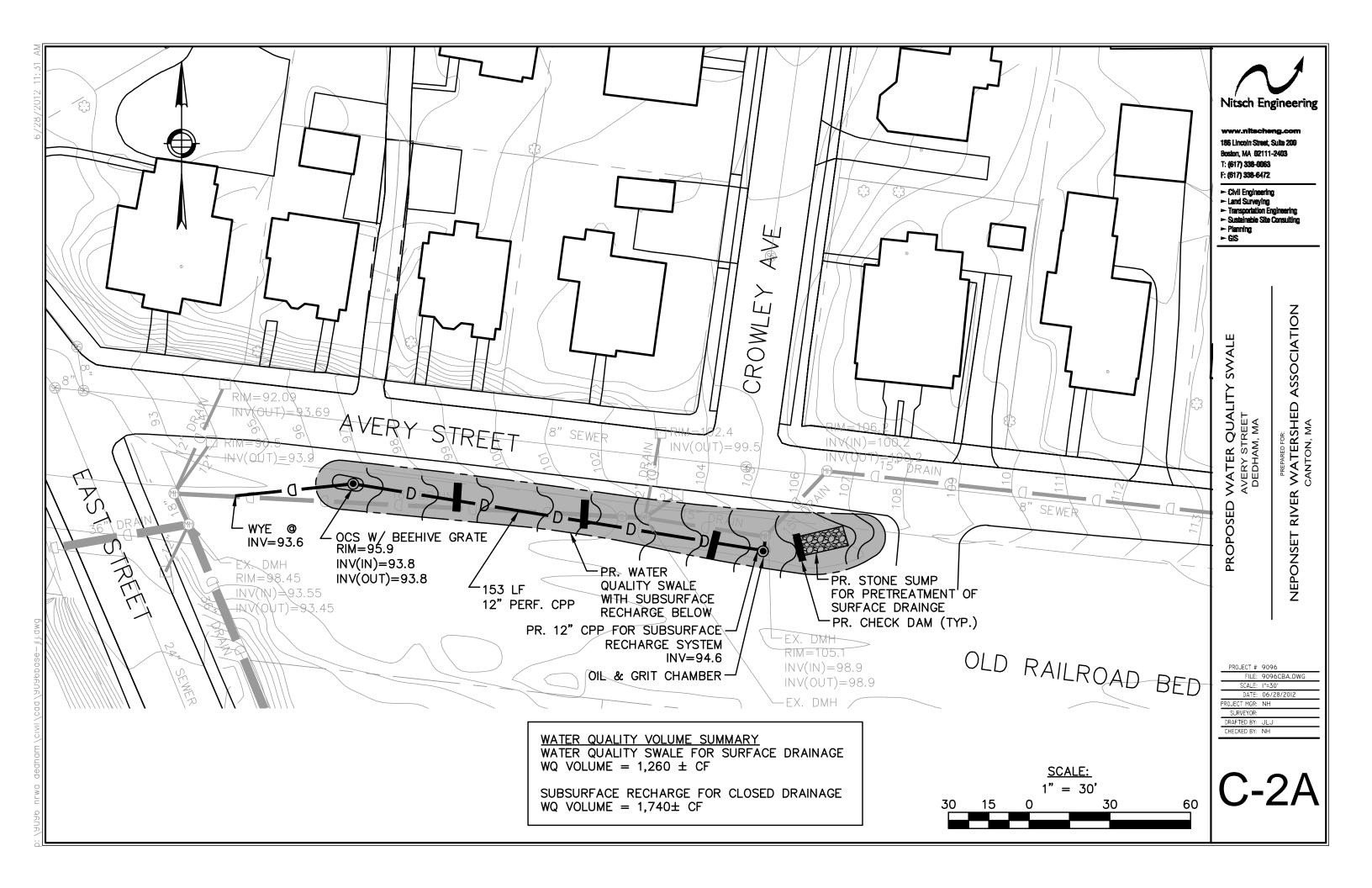
	_	Jnit Cost	Unit	Quantity		Total Cost
Bioretention Basin	\$	10.00	sf	1000	\$	10,000
Stone Swale	\$	6.00	sf	570	\$	3,420
Drainage Structures	\$	2,200.00	ea	1	\$	2,200
		M	laterials & Inst	allation Total	\$	15,620
Design and Permitting Estimate						10,000
Estimated Annual Operation and Maintenance					\$	1,000.0

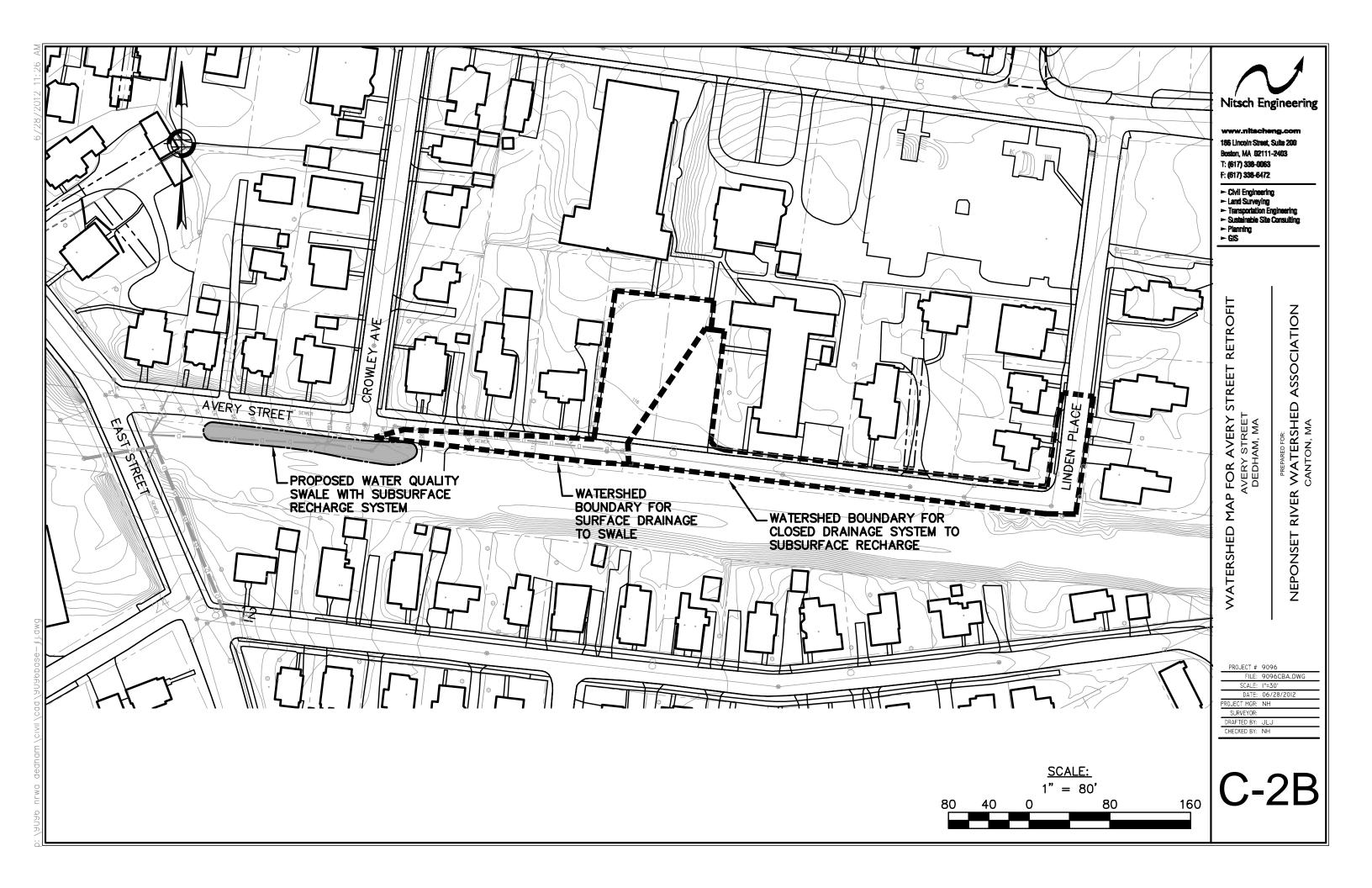
Avery BMP: Water Quality Swale with Subsurface Recharge

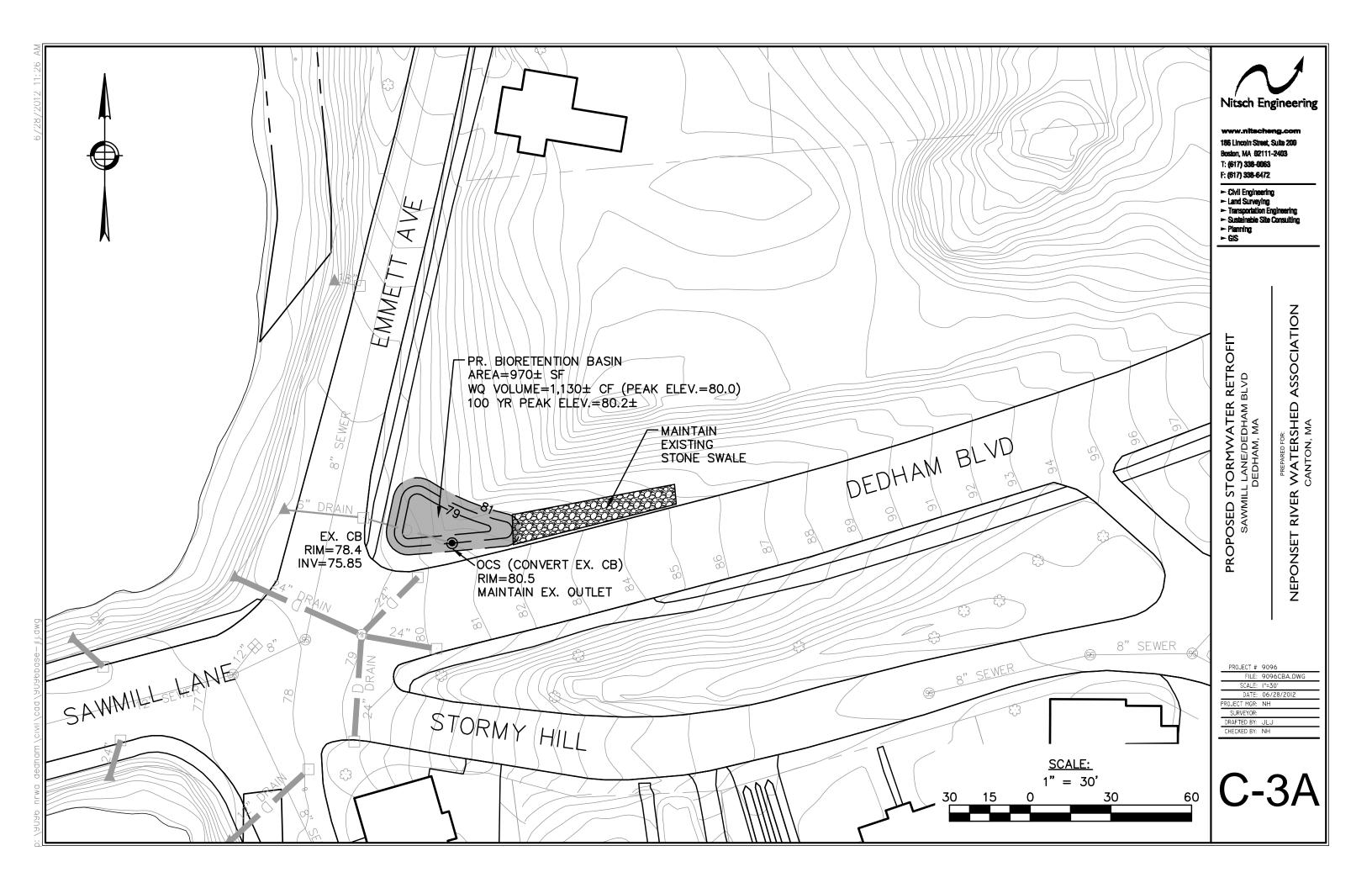
treny sin i trater quanty estate trun eabourtace needlange							
	Unit Cost	Unit	Quantity		Total Cost		
Water Quality Swale	\$ 10.00	sf	1000	\$	10,000		
Oil and Grit Separator	\$ 10,000.00	ea	1	\$	10,000		
Stone Swale	\$ 6.00	sf	150	\$	900		
Stone Check Dams	\$ 100.00	ea	4	\$	400		
Subsurface Recharge	\$ 15.00	sf	1240	\$	18,600		
12" CPP Pipe	\$ 18.00	lf	50	\$	900		
Drainage Structures	\$ 2,200.00	ea	1	\$	2,200		
	\$	43,000					
	\$	15,000					
Estim	\$	1,500					

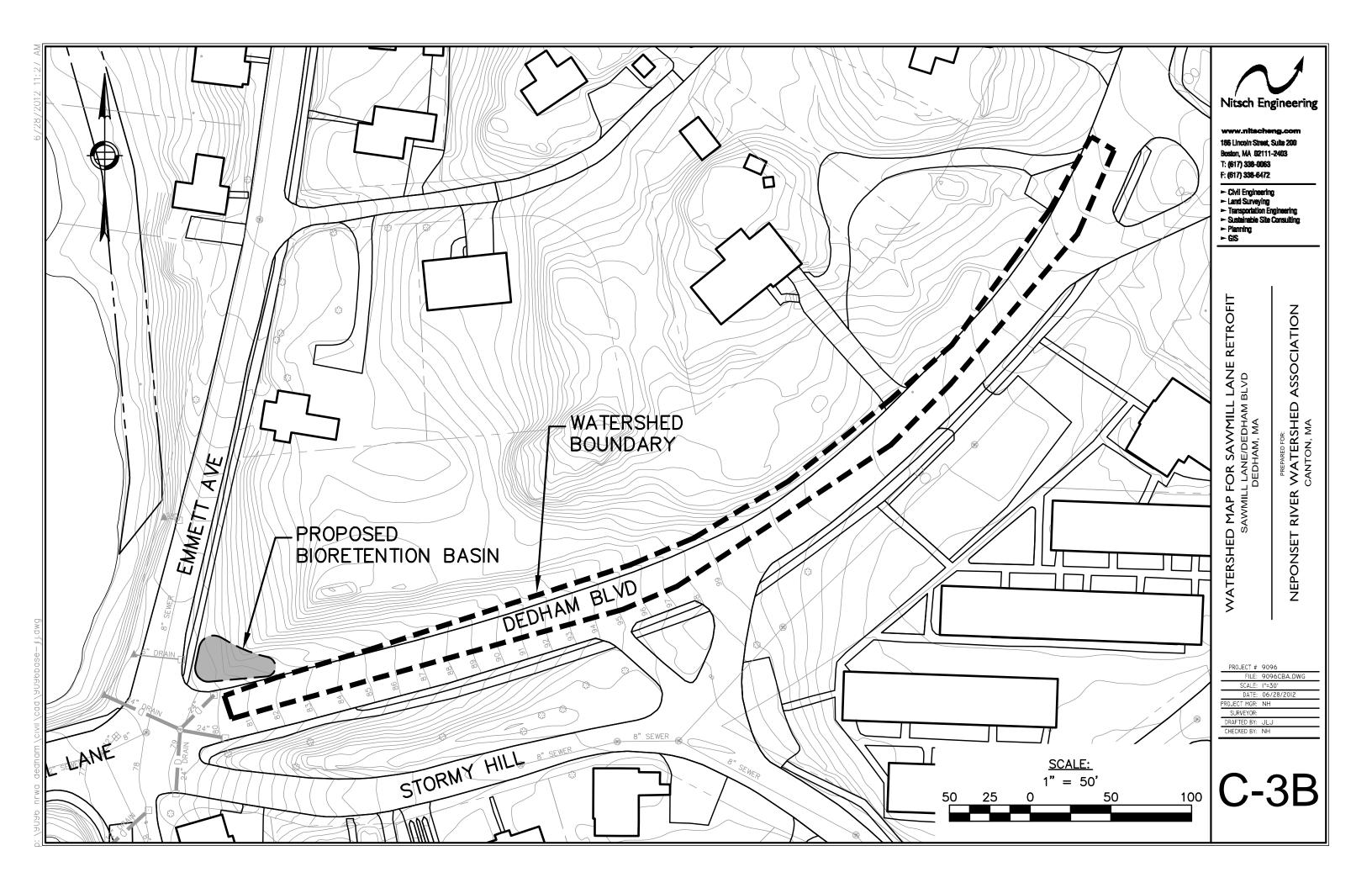


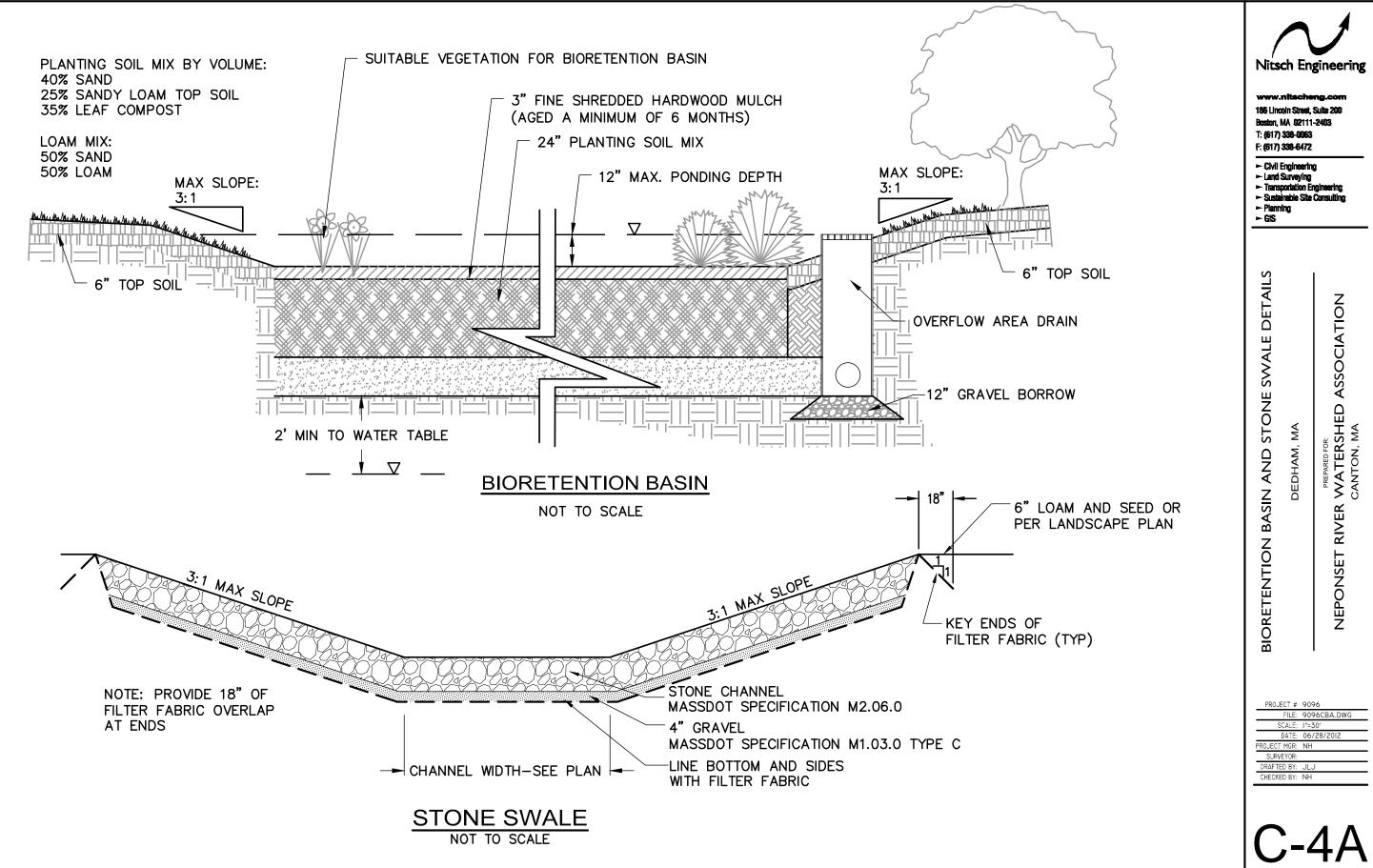


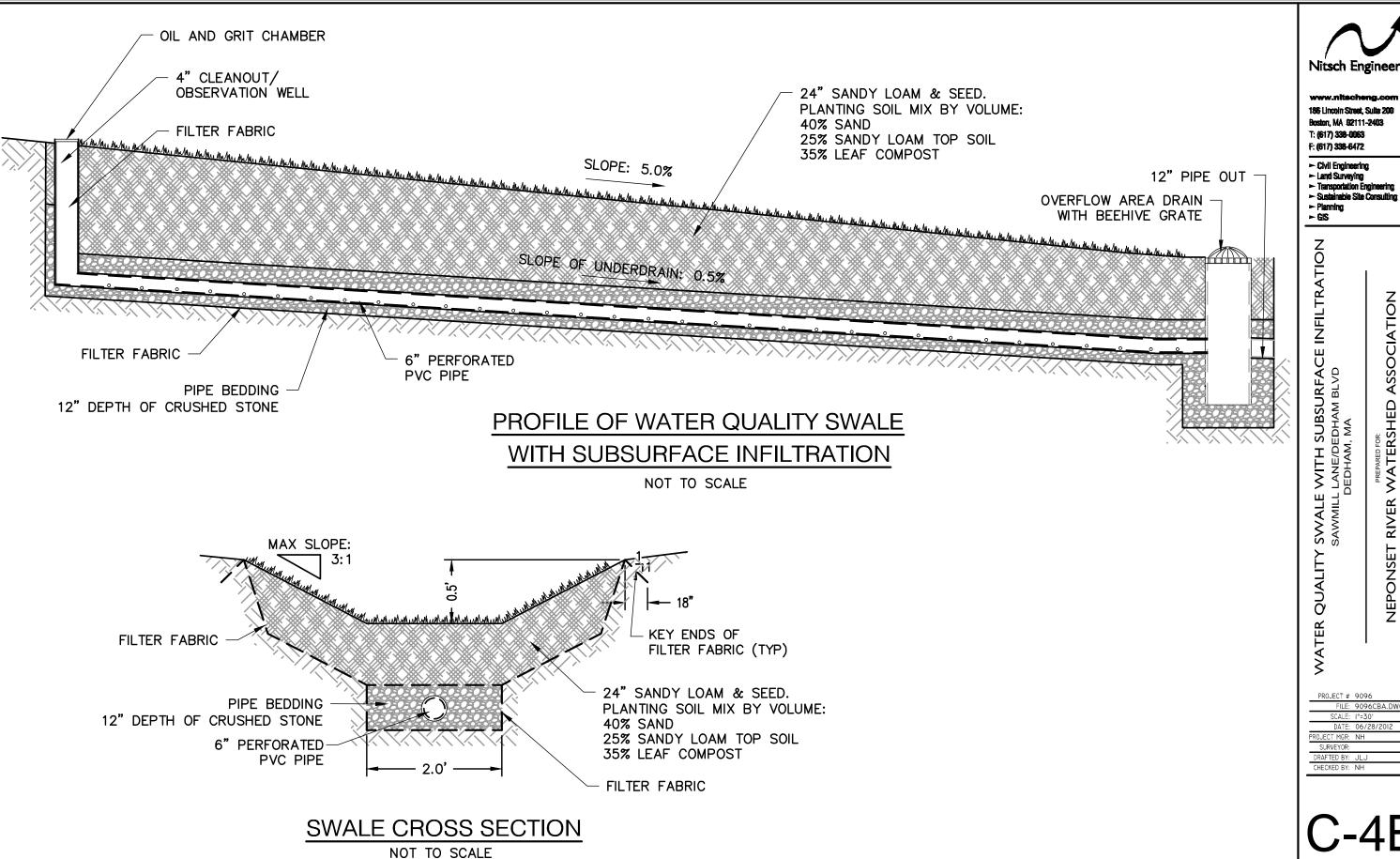












Nitsch Engineering

Boston, MA 02111-2403

ASSOCIATION PREPARED FOR:
WATERSHED A
CANTON, MA RIVER NEPONSET

C-4B

Low Priority Sites - Construction Cost Estimate Dedham Stormwater Retrofits 6/28/2012



Rank	Site Location	Site ID	ВМР Туре	Construction Cost Estimate	Annual O&M Estimate	
4	Fire Station	30	Bioretention Basin	\$20,000	\$1,000	
5	Brookdale Ave	20	Bioretention Basin	\$55,000	\$1,000	
6	High School 2	17	Tree Box Filters (4)	\$25,000	\$800	
7	Whiting Ave	15	Leaching Catch Basins (10)	\$60,000	\$1,000	
8	Commerce Way	14	Bioretention Basin	\$195,000	\$1,500	
9	Eastern Ave	27	Tree Box Filters (6) /	\$6E,000	¢1 F00	
9	Eastern Ave	27	Bioretention Basin	\$65,000	\$1,500	
10	Dedham Blvd	6	Bioretention Basin	\$78,000	\$1,500	