

RESPONSE
319 NONPOINT SOURCE POLLUTION GRANT PROGRAM
RFR #BRP 2009-02

Administrative Summary

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PROJECT TITLE: *North Reading Stormwater Infiltration Project: Reaching Out to Address Runoff (R.O.A.R.)*

WATERSHED(S)/SUBWATERSHED(S) SERVED BY THIS PROJECT: Martins Pond Watershed, Ipswich River Upper Basin, HUC12 Ipswich River-Headwaters to Wills Brook #010900010201

PROJECT TYPE(s): see Section III. A response may encompass more than one project type.

- X A. Implementation** TMDL Category 4c or 5 other
- Will restore water quality at least 40% of impaired segments in an entire HUC 12 subwatershed, for one or more impairments
 - Project focuses on bacteria impairments affecting beaches
 - Project includes implementation of pervious surfaces
 - All or part of the project area is covered under a NPDES stormwater permit
- B. Demonstration
- X C. Outreach and Education**

AMOUNT OF FUNDING REQUESTED AND AMOUNT/PERCENT OF MATCH FUNDING PROPOSED:

Federal Funds via MassDEP	\$ 190,500	
Non-Federal Match	\$ 137,835	42% of Total Budget
Total Project Budget	\$ 328,335	

PROJECT SUMMARY/OBJECTIVES:

Urbanization and suburbanization of watersheds imposes a variety of watershed-level changes that profoundly affect precipitation runoff processes, erosion, surface and groundwater hydrology and water quality. The proposed project is an effort to both capture stormwater before it reaches a conveyance system as well as to make sure that those systems are promoting recharge. In short, a key focus of this project is infiltration and source reduction. The Upper Ipswich Basin is of particular concern regarding these issues and is the geographic focus of the current proposal; the Town of North Reading is entirely located within the upper basin. The overall approach of this project is to promote infiltration of runoff closer to its source. We propose three projects that will mitigate first flush pollutant loads, allow for natural filtration and groundwater recharge, reduce the amount of runoff reaching outfalls, disconnect impervious surfaces, and restore pre-development hydrology. This project was conceptualized to **Reach Out** from the outfall to **Address Runoff** at its source. The acronym **R.O.A.R.** also represents the immediate need for outreach and education on the linkages between water quality, water quantity, and stormwater issues in the upper basin.

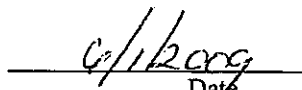
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Authorized Signatory / Title



Date

PROJECT NARRATIVE

North Reading Stormwater Infiltration Project: Reaching Out to Address Runoff (R.O.A.R.)

Statement of Problem

Urbanization and suburbanization of watersheds imposes a variety of watershed-level changes that profoundly affect precipitation runoff processes, erosion, surface and groundwater hydrology and water quality. It is well established that stormwater runoff collects in both volume and velocity as it flows over pervious surfaces, gathering pollutants, sediment, and erosive force. Rather than focusing solely on outfalls and on treating stormwater after it leaves a conveyance system, the proposed project is an effort to both capture stormwater before it reaches a conveyance system as well as to make sure that those systems are dealing with the minimum level of flow and promoting recharge. In short, a key focus of this project is infiltration and source reduction.

The Upper Ipswich Basin is of particular concern and is the focus of the current proposal; the Town of North Reading is entirely located within the upper basin. The upper basin has experienced a legacy of extensive human land use alteration, conversion and manipulation. In the past three decades, urbanization and suburbanization and the subsequent land use changes and stormwater infrastructure associated with them, have strongly impacted the hydrological patterns in the basin (Zarriello and Ries 2000). To address these issues, the overall approach of this project is to promote infiltration of runoff closer to its source. We propose three projects to disconnect pervious surfaces, mitigate first flush pollutant loads, allow for natural filtration and groundwater recharge, reduce the amount of runoff reaching the outfall and more closely mimic pre-development hydrology. This project was conceptualized with the idea to 'Reach Out' from the outfall to 'Address Runoff' at its source. The acronym R.O.A.R. also represents the immediate need for outreach and education on the linkages between water quality, water quantity and stormwater issues in the upper basin.

Project Goals

The primary goal of this project is to improve infiltration and water quality by reducing stormwater runoff through implementation of structural and non-structural Best Management Practices (BMPs). The project focuses on three specific target areas in the Upper Ipswich River Basin, all located in North Reading, MA, and includes a strong outreach and education component. Specifically, the project centers on:

- Infiltration of roadway runoff and sediment reduction on North Street through the installation of deep sump catch basins and infiltration chambers;
- Bioswale, infiltration enhancement, rain gardens and outfall rehabilitation at J. T. Hood Elementary School to capture roof and parking lot runoff;
- Rain Garden project, including a Town Common installation and a town-wide participatory program centered on planning and implementing parcel-based rain gardens to promote infiltration; and
- Outreach and education via an Elementary School education program and contest, newspaper advertising campaign, Town Hall Low Impact Development (LID) kiosk, Town Library display, Town event outreach and signage. In addition, each project will act as a potential demonstration project increasing the visibility and transferability of each individual project.

Targeted Pollutants and Waterbodies

The proposed study area is in the Upper Ipswich River Basin; most of North Reading is located within the HUC12 Ipswich River-Headwaters to Wills Brook #010900010201. Waters in the study area are classified as Category 5 waters according to the 2006 303(d) list for Massachusetts. Impairments listed for the HUC 12 sub-basin are biota, habitat alteration, low dissolved oxygen, low flow, nutrients, organic enrichment/low dissolved oxygen and pathogens. A diagnostic/feasibility study conducted on the Skug River/Martins Pond watershed reported on similar impairment issues (Lyon 2007). The latter study found that 91.2% of the sediment, 89.7% of the total P and 58.3% of the total N loading into Martins Pond came from watershed sources. These results highlighted the need to work upstream and within the watershed to implement erosion and runoff BMPs to capture and infiltrate runoff and altering stormwater outfalls.

The 2003 Ipswich River Watershed Action Plan (WAP) states in section 6-6 that in headwaters areas, such as North Reading where low flow events are the most severe, it is "essential to increase efforts to assure that stormwater is retained and absorbed to help restore baseflow to the river." Two key management alternatives identified to restore healthy streamflows in the Ipswich River are enhanced stormwater infiltration and increased water storage in the basin. This is important not only to maintain flows in the basin, but also to address stormwater runoff pollution including

sediments (organic and non-organic), nutrients (namely phosphorus and nitrogen), metals and hydrocarbons. The 2003 WAP recommendations included calls to maximize recharge of precipitation and stormwater runoff to preserve and enhance baseflow, to design stormwater remediation projects to increase infiltration and recharge and to improve storage in the groundwater reservoir by promoting infiltration of stormwater and roof runoff on both small and large-scales.

Estimated Quantity of Pollutants to Be Removed

The overall objectives of the proposed project are to increase recharge and infiltration by capturing runoff prior to it entering conveyance systems, promote low impact development BMPs, improve infiltration through outfall retrofits and ultimately promote environmental, hydrological and wetland protection. The EPA reports that in New England, rainfall totals average about 43 in/year (spread over 100 storms) with some 93% of the storms producing ≤ 1 in of rainfall yet accounting for 80-90% of the total annual precipitation volume (EPA 2009). The BMPs proposed will capture and treat these storms and associated stormwater runoff, provide necessary pollutant or impervious cover reductions to achieve water quality improvement goals (Schueler 1987; Booth et al. 1999). Estimated reductions in pollutant loads for the three proposed projects are given below (nutrient load calculations after Schueler 1987).

- *North Street* - Best management practices (BMP) selected for the North Street project are Deep sump hooded catch basins and infiltration chambers based on their limited footprint and the ability to arrange infiltration chambers within the street Right-of-Way. The estimated reductions in sediment are noted below.

Deep Sump Hooded Catch Basins	25% removal of TSS / sediment reduction of 7,000 lbs/yr
Subsurface Structures	80% removal of TSS

- *J.T. Hood School* – There are several infiltration project components at this site and also some outfall mitigation.

Infiltration/Detention Basin	80% reduction in TSS / sediment reduction of 1,150 lbs/yr 60% reduction in total N / reduction of 32 lbs/yr 80% reduction in total P / reduction of 2 lbs/yr
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Grass Pavers/Water Quality Swale	80% reduction in TSS / sediment reduction of 750 lbs/yr 10-90% reduction in total N / reduction of 42 lbs/yr 20-90% reduction in total P / reduction of 3 lbs/yr
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Rain Garden/Infiltration Structures	90% reduction in TSS / sediment reduction of 200 lbs/yr 30%-90% reduction in total P / 0.5 lbs/yr 40% to 90% reduction in metals (Cu, Pb, Zn, Cd)
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- *Rain Garden Project* – The impact of these projects will depend on the specifics of each parcel-based project implemented; detailed quantifications are not possible at this time. However, based on the Massachusetts Stormwater Manual (2008), rain gardens (with adequate pre-treatment) control 90% of TSS, 30%-90% reduction in total P, and 40% to 90% reduction in metals.

Project Strategy

As noted, the overall objectives of the project are to increase recharge and infiltration by capturing runoff prior to it entering conveyance systems (Hood School), promote low impact development BMPs (Hood School and Rain Garden Project) and improve infiltration through outfall retrofits (North Street). We believe this represents a comprehensive approach to addressing runoff and stormwater issues. In addition, the projects are interlinked: the North Street component represents an example of a municipal-based conveyance retrofitting; the Hood School project represents both education and a comprehensive approach to LID stormwater management; and the Rain Garden Project will build on the Hood School project and represents a LID option for landowners and/or business owners. In totality, the three components of the project provide an excellent and timely opportunity to use the projects for outreach and education efforts in the Town of North Reading and in the entire upper basin of the Ipswich River.

NPDES Status

The Town of North Reading had a NPDES Phase II Small MS4 General Permit (Number MAR041215). The proposed projects in this proposal are in Regulated Areas (2000 Urbanized Area).

Milestones

The key project milestones related to the three key initiatives are as follows:

- *North Street* – BMP project plan completion, effective implementation/construction of BMPs; and proper BMP maintenance.
- *J.T. Hood School* - BMP project plans completion, effective implementation/construction of BMPs; teacher/student participation in project; visits to school as a BMP demonstration site; and proper maintenance of all BMPs.

- **Rain Garden Project** – Size of pool of interested landholders; number of participants engaging in rain garden planning; number of participants implementing rain garden projects; effective implementation/construction of parcel-based rain gardens; and proper maintenance of all BMPs.

Activities – Scope of Service

A detailed Scope of Services with specific Tasks and Objectives is provided in the next section of the proposal with details in Appendix A. It should be noted that the project partners have successfully partnered in a number of previous projects in the upper basin.

Project Evaluation – Environmental Indicators

The main evaluation indicators for each of the three initiatives are summarized below.

- **North Street:** Effective implementation/construction of BMPs; and proper BMP maintenance
- **J.T. Hood School:** Effective implementation/construction of BMPs; teacher/student participation in project; and proper maintenance of all BMPs
- **Rain Garden Project:** Number of participants implementing rain garden projects; effective implementation/construction of parcel-based rain gardens; and proper maintenance of all BMPs

Outreach – Technology Transfer

We call this part of the proposed project R.O.A.R. (Reaching Out to Address Runoff). This is a critical part of the project and will involve outreach at: (1) the municipal level; (2) at the level of elementary education; (3) at the community level through our rain garden program involving private landholders/businesses. We propose an extensive and coordinated outreach effort that will include a library display, a Town Hall kiosk with LID materials outside the Town Office, signage at the Town common rain garden, development of a Hood School stormwater education curriculum, Hood School site signage and poster display, a newspaper campaign, and the development of an adult and childrens web site page.

References

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- Massachusetts Stormwater Handbook. 2008. Two volumes. Massachusetts Department of Environmental Protection. Boston, MA. <http://www.mass.gov/dep/water/laws/policies.htm#storm>
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- Zarriello, P.J. and K.G. Ries. 2000. A precipitation-runoff model for analysis of the effects of water withdrawals on streamflow, Ipswich River Basin, Massachusetts. U.S.G.S. Water Resources Investigation Report 00-4029.