

THE NRG REPORT

Stormwater BMPs

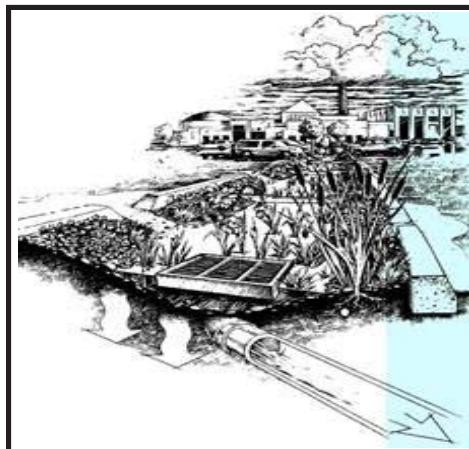
Norfolk Ram Group, LLC (Norfolk) has been working as the Town of Cohasset Water Department's watershed consultant since 1998. Norfolk completed a Surface Water Supply Protection Plan (2002) that identified stormwater non-point source pollution as a leading cause of nutrient loading and eutrophication of Lily Pond (which is presently the Town's sole drinking water supply). The need to control stormwater from developed areas of the watershed was further supported by a limnology study of the Pond, which was completed in 2003. With this supporting background work in hand, Norfolk applied for State Department of Environmental Protection (DEP) Section 319 Grant Funding on behalf of the Town for implementation of a Stormwater Best Management Practice (BMP) "retro-fit" project for several developed areas of the watershed, with the objective of greatly improving the quality of stormwater, within the Lily Pond watershed. A grant of \$255,000 was awarded, and with local matching funds (much of this borrowed via the State Revolving Fund), a total project worth \$480,000 became possible.

A Low Impact Development (LID) project is currently being implemented, that incorporates stormwater remediation, bioretention basins, rain gardens and vegetated swales, to be constructed within the existing Town right-of-way and retrofitted into the existing stormwater drainage system. Norfolk is currently in the process of completing the permitting and design phases of the project, which call for a suburban stormwater collection system utilizing LID. The design of the system will include the construction of 47 rain gardens (bioretention cells) and 200 linear feet of vegetated swales, that will intercept and treat the stormwater prior to release into the existing drainage system. Norfolk will oversee the construction phase of the project, including preparing as-built drawings, and operation and maintenance plans. Norfolk's team of professionals will also perform pre- and post-implementation surface water run-off samplings and analysis to evaluate the effectiveness of the program. To speak with a Norfolk professional about LID and BMPs, please contact Mark S. Bartlett, P.E., or Michael F. Clark, P.E. at (508) 747-7900, extensions 131 and 193, respectively. Norfolk can also be accessed at www.norfolkram.com.

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A CLOSER LOOK AT LOW IMPACT DEVELOPMENT



Low Impact Development (LID) is an innovative approach to stormwater management, that designs a site to duplicate the hydrologic regime of the undeveloped watershed. LID is implemented by engineering a site, to provide post-development hydrologic functions that remain close to those which existed prior to the site's development. Minimal disturbance techniques, known as site fingerprinting, are used to minimize the clearing and grading impacts to the area. LID is an integrated design management concept based upon the following principles: **Conservation & Minimization, Storage, Landscaping, Infiltration & Conveyance.**

LID engineering compensates for the reduced infiltration and storage characteristics of the developed site and includes Integrated Management Practices (IMPs) which are distributed throughout the site to mitigate the impact of development on the hydrologic cycle. IMPs minimize impervious surfaces, create on-site storage, maximize opportunities for infiltration, slow down the flow of surface run-off, detain, and/or retain water, and remove pollutants. Primarily applicable to new site developments for residential, commercial, industrial, and transportation land uses, IMPs can also be incorporated into existing developments utilizing retrofit design. Each of the key LID principles is reviewed below.

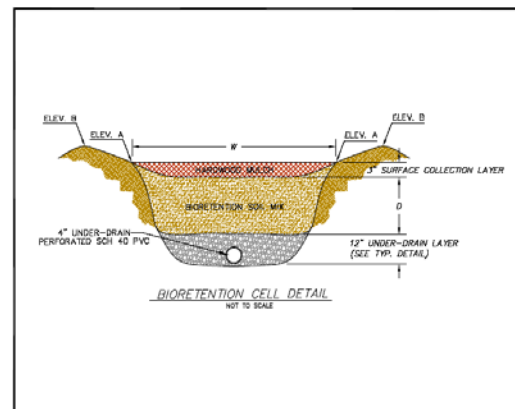
CONSERVATION & MINIMIZATION

Description: Conservation and minimization IMPs encompass a variety of practices applied at several scales, to alter or reduce the impervious surface area of a development, while maintaining the safety and usability features involved in current design practices.

Purpose: Less impervious areas maintain a site's natural hydrologic characteristics, including groundwater recharge, peak flow rates and stormwater volumes and improved stormwater quality. Reductions in impervious areas translate into less managed run-off to be conveyed off-site more opportunities for storage and infiltration, as well as cost savings in the construction and maintenance of stormwater infrastructure.

Examples of Applicable IMPs:

- Site fingerprinting & use of porous pavements
- Narrow residential roads & pedestal sidewalks
- Grated infiltration trenches & sidewalk reductions



STORAGE

Description: Storage IMPs are designed to capture and temporarily detain specific volumes of stormwater run-off. Stored water is eventually released slowly after the storm event, reducing the peak discharge rate. Storage IMPs can be used alone or in conjunction with infiltration practices to increase the effectiveness of the stormwater management practice.

Purpose: Adding storage helps to preserve a site's natural hydrologic patterns (i.e., increase groundwater recharge and decrease run-off generation). Storage IMPs minimize the need for off-site conveyance, reducing the construction, maintenance, and costs for the infrastructure.

Examples of Applicable IMPs:

- Roof water cisterns & roof top detention basins
- Green roofs & subsurface storage units
- Bioretention cells & Raingardens

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ENGINEERING THE ENVIRONMENT

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CONVEYANCE

Description: Conveyance IMPs can be combined with a range of infiltration and filtering components. As IMPs convey on-site run-off, the quality and/or quantity of stormwater is improved. Site specific conditions such as slope, soil type, drainage area, and site constraints must be considered in the selection of a suitable option. Some of these IMPs make use of vegetation, which must be tolerant of the hydrologic regime.

Purpose: As stormwater moves through the site, conveyance IMPs provide additional treatment and volume control, to reduce the quantity and enhance the quality of the stormwater. These IMPs help to preserve a site's natural hydrologic regime and to reduce the size of the stormwater management facilities.

Examples of Applicable IMPs:

- Grassed swales & bioretention channels
- Leaching Trenches
- Disconnection of impervious areas
- Interior & Exterior pipe systems

LANDSCAPING

Description: Landscape IMPs cover a range of practices that can be incorporated into the overall landscaping plan for a site. Through sedimentation, infiltration, filtering, and grading, these practices enhance the quality and reduce the quantity of stormwater using landscaping. Site specific conditions such as slope, soil type, drainage area and site constraints must be considered in the selection of control options. The vegetation used for the landscaping must be tolerant of the hydrologic regime. For example, some IMPs may expose vegetation to conditions that are continuously or intermittently wet.

Purpose: Creating on-site self-supporting systems using native vegetation reduces the quantity and enhances the quality of the stormwater. The use of these IMPs helps to preserve a site's natural hydrologic features promoting groundwater recharge and reducing stormwater volumes, and helps reduce nutrients and other pollutants present in stormwater.



Examples of Applicable IMPs:

- Bioretention gardens
- Rain gardens
- Wetlands restoration
- Wetlands enhancement
- Preservation and re-vegetation of riparian buffers

INFILTRATION

Description: Infiltration IMPs are designed to capture stormwater and allow it to infiltrate into the soil. Dispersion and storage practices can be used alone or in conjunction with infiltration practices to increase on-site effectiveness.

Purpose: Enhanced infiltration IMPs help to preserve a site's natural hydrologic features, promoting groundwater recharge and maintaining pre-construction run-off volumes and peak discharge rates. These IMPs reduce the amount of surface run-off and help to minimize the need for conveyance and stormwater management practices. These reductions represent direct savings in infrastructure construction and maintenance costs.

Examples of Applicable IMPs:

- Below-pavement infiltration basins & pocket infiltration devices
- Infiltration trenches & perimeter sand filters
- Small infiltration basins
- Infiltration/exfiltration pipe systems

NORFOLK EMPLOYEES...IN THE NEWS

Senior Project Manager, Jonathan Kitchen has earned his Licensed Site Professional license effective February 22nd, 2005. With over ten years of experience as an environmental professional, Mr. Kitchen has managed hazardous waste site remediation projects throughout the northeastern United States. Mr. Kitchen has overseen the investigation and remediation of a variety of sites, ranging from heating oil releases at single family residences to abandoned chemical manufacturing facilities and industrial landfills. The LSP license will allow Mr. Kitchen to render opinions regarding the remediation of hazardous waste sites under Massachusetts' privatized clean-up program.

Associate Michael Clark, P.E., has earned his Certified Professional in Erosion Control and Sedimentation (CPECS[®]) certification effective 02/15/05. With over twenty years of experience as a civil engineer, Mr. Clark has managed engineering, designs, permitting, and construction projects throughout the northeastern United States. Since joining the Norfolk team, Mr. Clark's projects have included residential and commercial site developments, landfill closures, stormwater improvements, and Brownfield Projects. Mr. Clark has recently overseen the closure of the North Carver Landfill, utilizing a non-traditional approach that resulted in an estimated \$2 million cost savings to the Town. The CPECS[®] is a nationally recognized certification that demonstrates Mr. Clark's expertise in erosion and sedimentation control.

Norfolk Ram Group, LLC is a full-service environmental and civil engineering consulting firm, which specializes in environmental compliance, permitting, assessment, design/build remediation, and civil engineering.

The NRG Report is published by Norfolk Ram Group, LLC.

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