Office of Long Island Sound Programs
Fact Sheet
for
STORMWATER MANAGEMENT

What is Stormwater Management?

Stormwater management is a comprehensive process to minimize potential adverse impacts to natural resources and water quality from stormwater runoff. The traditional approach to handling stormwater runoff has been to collect it from the developed area and shunt it as quickly as possible to the nearest water body to prevent flooding in upland areas. In the past, little attention had been paid to the impacts of the associated increases in both the volumes and rates discharged and the pollutants carried in the runoff. The result has been severe erosion of streams, the loss and degradation of habitat, increased flooding and associated damage, increased siltation resulting in more frequent dredging to maintain navigation, and tremendous capital expenditures to address these problems.

Proper state-of-the-art stormwater management involves many techniques including pollution prevention, minimization of impervious surfaces, on-site retention of a portion of the runoff, where appropriate, and treatment of non-retained runoff to remove contaminants such as oils, greases, suspended solids and floatable debris. One general goal is to design development in such a manner that the changes in runoff rates and volumes are minimized. This is initially accomplished through the proper siting and design of proposed structures and infrastructure.

Why is stormwater management important?

Pollution of our surface and ground waters has been a recognized problem for many years. While great strides have been made in controlling point sources of pollution, primarily through the National Pollution Discharge Elimination System (NPDES) permitting program and corresponding state regulatory programs, there is a new awareness of the importance of controlling nonpoint sources of pollution (pollution generated by many diffuse sources). Stormwater runoff is a major contributor of nonpoint source pollution.

The amount of stormwater runoff from a given site is dictated by site-specific conditions, such as the soil=s infiltration capacity, the type and extent of site cover (e.g., vegetation or pavement), the slope, and the duration and intensity of each rainfall event. Stormwater that penetrates the soil is slowed, filtered, cooled, and renovated. Renovation is a process by which bacteria and minerals in the soil treat and bind contaminants, removing them from the stormwater.

Impervious surfaces, such as pavement and buildings, reduce the area of soil into which rainfall can infiltrate, thus increasing the volume of runoff that flows over the land. As this runoff flows over impervious and pervious surfaces, it can pick up and transport floating, suspended, and dissolved constituents such as pathogens, toxic materials (heavy metals, oils, antifreeze, pesticides, etc.), high levels of nutrients (fertilizers and organic matter), eroded sediments (topsoil and road sand), and trash. This runoff flows down gradient over the land to the nearest water body or depression where it not only deposits the contaminants it carries, but it alters the temperature, pH, and/or salinity of receiving waters. It should be noted that even clean, potable freshwater can be a pollutant when introduced to a brackish or saline environment in the coastal area. Freshwater dilutes the salt concentrations in the receiving area, adversely impacting the flora and fauna that are uniquely suited to such salty environs. Over the long-term, sediment settles out of the water column and can degrade habitat in stream bottoms, tidal wetlands, and shellfish beds.

Poorly planned new development and redevelopment can result in increased stormwater discharges, and ultimately more polluted runoff reaching watercourses and wetlands. Unlike conditions in the soil, there are few natural processes available in the receiving waters to treat, reduce, or control many of the harmful constituents in the runoff; they can only be diluted by the volume of water that they reach. With constant inputs after each rainfall, concentrations of many harmful constituents have been increasing in the sediments and the water column. Additionally, increasing stormwater discharges can lead to increased risks of flooding and flood damage and to increased siltation in coastal waters which often results in habitat degradation and an increased need to dredge to maintain navigation.

Design issues relate to the topography, soil conditions, existing drainage, and natural resources on and adjacent to the site. The implementation of structural and/or non-structural best management practices (BMPs) can also be used to provide both effective erosion and sedimentation control and minimization of other pollutants including oils, greases, toxics, pathogens and floatable debris. Please refer to the manual titled *Coastal Water Protection: A Guide for Local Officials*, (DEP, 1996) for additional detailed information. A copy of the guide has been provided to the planning and zoning department in each coastal municipality.

What are the statutory policies that apply?

The Connecticut Coastal Management Act (CCMA) contains several policies that highlight the need to incorporate stormwater management into individual project reviews and long-range planning. These include the following:

> To manage estuarine embayments so as to insure that coastal uses proceed in a manner that assures sustained biological productivity, the maintenance of healthy marine populations and the maintenance of essential patterns of circulation, drainage and basin configuration; to protect, enhance and allow natural restoration of eelgrass flats except in special limited cases, notably shellfish management, where the benefits accrued through alteration of the flat may outweigh the long-term benefits to marine biota, waterfowl, and commercial and recreational finfisheries [Connecticut General Statutes (CGS) section 22a-92(c)(2)(A)].

> It is found and declared that the pollution of the waters of the state is inimical to the public health, safety and welfare of the inhabitants of the state, is a public nuisance and is

> harmful to wildlife, fish and aquatic life and impairs domestic, agricultural, industrial, recreational and other legitimate beneficial uses of water and that the use of public funds and the granting of tax exemptions for the purpose of controlling and eliminating such pollution is a public use and purpose for which moneys may be expended and tax exemptions granted, and the necessity and public interest for the enactment of this chapter and the elimination of pollution is hereby declared as a matter of legislative determination [CGS section 22a-422, as referenced by CGS section 22a-92(a)(2)].

The CCMA defines adverse impacts which must be avoided or, if avoidance is not possible, must be minimized in order for a project to be lawfully approvable. The following potential adverse impacts must be considered during the coastal site plan review process and when evaluating proposed zoning regulation and map amendments.

> Degrading water quality through the significant introduction into either coastal waters or ground water supplies of suspended solids, nutrients, toxics, heavy metals, or pathogens, or through the significant alteration of temperature, pH, dissolved oxygen, or salinity [CGS section 22a-93(15)(A)];
>
> Degrading existing circulation patterns of coastal waters through the significant patterns of tidal exchange or flushing rates, freshwater input, or existing basin characteristics and channel contours [CGS section 22a-93(15)(B)];
>
> Degrading natural or existing drainage patterns through the significant alteration of groundwater flow and recharge and volume of runoff [CGS section 22a-93(15)(D)];
>
> Degrading or destroying essential wildlife, finfish or shellfish habitat through significant alteration of the composition, migration patterns, distribution, breeding or other population characteristics of the natural species or significant alteration of the natural components of the habitat [CGS section 22a-93(15)(G)]; and
>
> Degrading tidal wetlands, beaches and dunes, rocky shorefronts, and bluffs and escarpments through significant alteration of their natural characteristics and functions [CGS section 22a-93(15)(H)].

In addition, the state statutes pertaining to planning and zoning contain specific requirements for zoning regulations and plans of development that relate to the restoration and protection of coastal resources. These are:

> In any municipality that is contiguous to Long Island Sound the regulations adopted under this section shall be made with reasonable consideration for restoration and protection of the ecosystem and habitat of Long Island Sound and shall be designed to reduce hypoxia, pathogens, toxic contaminants and floatable debris in Long Island Sound. Such regulations shall provide that the commission consider the environmental impact on Long Island Sound of any proposal for development [CGS section 8-2(b)].
>
> The plan adopted under this section for any municipality that is contiguous to Long Island Sound shall be made with reasonable consideration for restoration and protection of the

ecosystem and habitat of Long Island Sound and shall be designed to reduce hypoxia, pathogens, toxic contaminants and floatable debris in Long Island Sound [excerpt from CGS section 8-23].

Proper management of stormwater will address these statutory requirements.

Are stormwater discharges regulated by the Department of Environmental Protection?

Yes. Technically, most discharges to the waters of the State Of Connecticut are regulated by the Department of Environmental Protection through either a general permit or individual permit requirement. There are several types of stormwater discharges that are covered by the issuance of a general permit. If the stormwater discharge does not qualify for coverage by the general permit because adverse impacts to the waters of the state would result, an individual permit may be required prior to discharge.

Registration is required to be submitted in order for stormwater discharges to be authorized by the following general permits issued by the Connecticut Department of Environmental Protection:

Stormwater and Dewatering Wastewaters from Construction Activities: This general permit applies to all discharges of stormwater and dewatering wastewaters from construction activities which include, but are not limited to, clearing, grading, and excavation and which result in the disturbance of *five or more acres* of total land area on a site.

Stormwater Associated with Commercial Activities: This general permit applies to all discharges from any conveyance which is used for collecting and conveying stormwater and which is directly related to retail, commercial, and/or office services whose facilities occupy *five acres or more* of contiguous impervious surface.

Stormwater Associated with Industrial Activities: This general permit applies to all discharges from any conveyance which is used for collecting and conveying stormwater and which is directly related to manufacturing, processing or material storage areas at an industrial activity site.

What can a municipality do to minimize impacts from stormwater runoff?

- Maintain, enhance or restore the quality of coastal waters and submerged lands through the adoption and implementation of a stormwater management ordinance, either as an amendment to the municipal zoning regulations or as a "stand-alone" ordinance. In either case, it should require 1) that new development projects be designed to minimize clearing, cutting and filling in undisturbed areas to ensure that new development is consistent with the capabilities of the land to support such development; 2) soil erosion and sediment control plans for all development projects near sensitive coastal resources, even those projects with less than one-half acre land disturbance proposed, and strictly enforce appropriate sedimentation and erosion control measures during construction; and 3) that site plan and special permit/exception applications include appropriate best management practices to retain and treat on-site the runoff generated by the first inch of rainfall, remove 80% of the total suspended solids on an annual basis, and, where site conditions allow, prohibit post-development increases in the pre-development rates and volumes of stormwater discharge.

- Review zoning regulations to determine the maximum impervious cover allowed in each district and carefully consider reducing these maximums wherever possible, particularly in areas abutting coastal waters and other sensitive coastal resources, but also for areas serviced by municipal stormwater systems that discharge to coastal waters. Include buildings, paved areas, sidewalks, terraces, patios and other non-porous surfaces when calculating impervious cover.

- Update subdivision regulations to encourage cluster developments that incorporate features such as curbless roads, narrow roads, grass swales, retention ponds, and other features that reduce impervious cover, disperse and treat stormwater, and minimize the collection and transport of stormwater to surface waters.

- Update the municipality=s Plan of Conservation and Development and Municipal Coastal Program, if applicable, to encourage best management practices for stormwater for all new or substantially improved development, including improvements to municipal roads, bridges and other facilities, and for currently developed areas. Consider including the following:

  An inventory of existing storm drain outfalls to identify opportunities to retrofit roads and other municipal facilities for stormwater retention and pollutant reduction;

  Identification of illicit connections to municipal storm sewer system (anything that is not stormwater that is being discharged to the stormwater system without a permit) and recommendations to correct or mitigate adverse impacts associated with these connections;

  Adoption of a municipal ordinance that prohibits illicit connections to municipal stormwater systems;

  Consideration of (and preparation for) the use of alternatives to winter sanding and salting on roadways and parking areas;

  Planning for and implementation of appropriate snow disposal practices;

  Initiation of a storm drain stenciling program to help identify direct links to coastal waters and other waterbodies;

  Adoption of an ordinance that limits the application of fertilizers and broad-based pesticides, particularly in months with historically high or low average precipitation such as April and August; and

Recommendations for regularly scheduled street sweeping and catch basin clean-outs to minimize the amount of sediment, contaminants, and floatable debris entering coastal waters and other waterbodies through the municipal stormwater management system, and recommendations to amend the zoning regulations to require similar maintenance of private parking lots and streets.

- Develop a watershed management plan with neighboring municipalities that share your watershed boundaries, and implement a coordinated stormwater management plan.

- Develop an educational handout that: addresses the importance of stormwater management; identifies actions that individuals can take to minimize potential stormwater impacts (including, for example, the proper use of fertilizer, disposal of used motor oil and composting of lawn clippings, etc.); and includes the municipality's standards for development. Include it in every application package for land use and/or building permits and authorization.

- Develop an open space/greenways plan to create recreational opportunities and buffer sensitive and important resources, particularly streams, tributaries, and coastal resources from stormwater impacts.

- During the review process for new or redeveloping marinas, require coastal site plan conditions that incorporate the practices identified in *Best Management Practices for Coastal Marinas* (DEP-OLISP, August 1992).

- Coordinate with the Department of Environmental Protection's Stormwater Management Unit to make sure that all eligible stormwater discharges from industrial, commercial, or construction activities are covered by the appropriate general permit and to ensure compliance with Stormwater Pollution Prevention Plans.

- Refer coastal site plan review applications for waterfront sites or significant development proposals within the coastal boundary to the DEP's Office of Long Island Sound Programs for comment and technical assistance.

Connecticut Department of Environmental Protection
Inland Water Resources Division Fact Sheet
Considering Low Impact Development Principles in Site Design

In order to reduce the impact of development and address stormwater quality issues, the Department strongly encourages the use of Low Impact Development (LID) measures. LID is a site design strategy intended to maintain or replicate predevelopment hydrology through the use of small-scale controls, integrated throughout the site, to manage stormwater runoff as close to its source as possible. Infiltration of stormwater through LID helps to remove sediments, nutrients, heavy metals, and other types of pollutants from runoff.

Key Strategies for LID

Key strategies for effective LID include: infiltrating, filtering, and storing as much stormwater as feasible, managing stormwater close to where the rain/snow falls, managing stormwater at multiple locations throughout the landscape, conserving and restoring natural vegetation and soils, preserving open space and minimizing land disturbance, designing the site to minimize impervious surfaces, and providing for maintenance and education. Water quality and quantity benefits are maximized when multiple techniques are grouped together. In areas of compacted and/or possibly contaminated soils, soil suitability should be further investigated prior to selecting optimum treatment and/or remediation measures. Where soil conditions permit, the DEP encourages the utilization of one, or a combination of, the following measures:

- the use of pervious pavement or grid pavers (which are very compatible for parking lot and fire lane applications), or impervious pavement without curbs or with notched curbs to direct runoff to properly designed and installed infiltration areas;
- the use of vegetated swales, tree box filters, and/or infiltration islands to infiltrate and treat stormwater runoff (from building roofs, roads, and parking lots);
- the minimization of access road widths and parking lot areas to the maximum extent possible to reduce the area of impervious surface;
- the use of dry wells to manage runoff from building roofs;
- incorporation of proper physical barriers or operational procedures for special activity areas where pollutants could potentially be released (e.g. loading docks, maintenance and service areas, dumpsters, etc.);

- the installation of rainwater harvesting systems to capture stormwater from building roofs for the purpose of reuse for irrigation (i.e. - rain barrels for residential use and cisterns for larger developments);
- the use of residential rain gardens to manage runoff from roofs and driveways;
- the use of vegetated roofs (green roofs) to detain, absorb, and reduce the volume of roof runoff; and
- providing for pollution prevention measures to reduce the introduction of pollutants to the environment.

LID in Urban Areas

If the proposed site is located in a highly urbanized area, it is likely underlain by urban land complex soils. The Natural Resources Conservation Service (NRCS) Soil Web Survey (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm) provides information on soil textures, parent materials, slopes, height of seasonal high water table, depth to restrictive layer, and permeability. In highly developed areas, infiltration may be limited due to the high percentage of impervious cover. However, infiltration practices may be suitable at urban sites depending on:

• Potential contamination of soils in historically industrialized areas. The siting of areas for infiltration must consider any existing soil or groundwater contamination.

• Site specific soil conditions. NRCS mapping consists of a minimum 3 acres map unit and soils may vary substantially within each mapping unit. Test pits should be dug in areas planned for infiltration practices to verify soil suitability and/or limitations.

• Investigation of areas of compacted soils and the utilization of proper construction staging. Planning should insure that areas to be used for infiltration are not compacted during the construction process by vehicles or machinery.

Even if infiltration is limited at a site, it is still possible to implement LID practices. Specifically, potential exists for the installation of green roofs on buildings and/or the use of cisterns to capture and reuse rainwater.

LID in Areas with a High Seasonal Water Table or Hardpan Layer

- The impact of stormwater runoff to any streams and/or wetlands near the site should be considered. Water quality treatment is influenced by hydraulic conductivity and time of travel. If stormwater infiltration is limited by an impermeable layer close to the surface, the water may run laterally through the ground and discharge to the stream or wetlands, providing limited water quality treatment. However, a longer time of travel may provide sufficient treatment. Proper soil testing for infiltration potential will increase the likelihood of successful BMP design.

- In areas with a high seasonal water table, bioretention areas/rain gardens should be planted with water tolerant/wetland plants. The presence of a high seasonal water table suggests that water may drain slowly or not at all during certain parts of the year. Planting native wetland vegetation will help to ensure plant survival and increase the effectiveness of bioretention practices. Information on native plantings that are both drought tolerant and tolerant of wet conditions can be found in The UConn Cooperative Extension System's guide to building a rain garden at http://nemo.uconn.edu/publications/rain_garden_broch.pdf. Native plant lists for Connecticut can also be found at http://www.fhwa.dot.gov/environment/rdsduse/ct.htm.

LID Guidance for Federal Projects

- LID techniques have been utilized by Department of Defense (DoD) agencies during the last several years. The effectiveness of these projects in managing runoff as well as reducing construction and maintenance costs has created significant interest in LID. The DoD has created a Unified Facilities Criteria document, Low Impact Development, that provides guidelines for integrating LID planning and design into a facility's regulatory and resource protection programs. It is available on-line at: http://www.wbdg.org/ccb/DOD/UFC/ufc_3_210_10.pdf.

- Section 438 of the Energy Independence and Security Act (EISA) of 2007 requires federal agencies to reduce stormwater runoff from federal development projects to protect water resources. In December 2009, the EPA developed a technical guidance document on implementing the stormwater runoff requirements for federal projects under Section 438 of EISA. The document contains guidance on how compliance with Section 438 can be achieved, measured and evaluated and can be found at: http://www.epa.gov/owow/NPS/lid/section438/pdf/final_sec438_eisa.pdf.

For more information contact the CT DEP Watershed Management/Low Impact Development Program:

Name	Area	Telephone
MaryAnn Nusom Haverstock	Program Oversight	(860) 424-3347
Chris Malik	Watershed Manager	(860) 424-3959
Susan Peterson	Watershed Manager	(860) 424-3854
Eric Thomas	Watershed Manager	(860) 424-3548
Jessica Morgan	Low Impact Development Coordinator	(860) 418-5994

What's Happening to the Water Cycle?

As we develop our land and increase the amount of paved surfaces and buildings, known as impervious cover, the water cycle is changed. Less rainfall and snowmelt sinks into the ground and more water flows rapidly over the land into our lakes, rivers and estuaries. Stormwater runoff can lead to increased flooding, erosion, pollution and decreased groundwater recharge during dry periods.

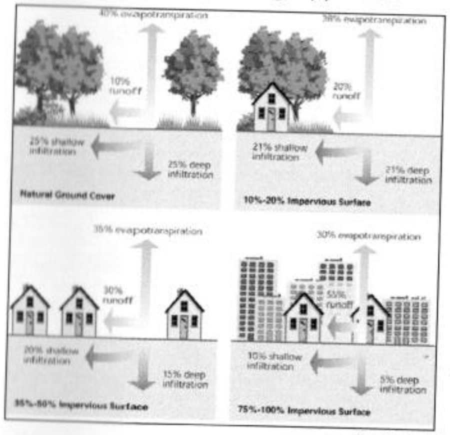

Photo: FISRWG

As impervious surfaces increase, the problems associated with stormwater also increase. Stormwater can contain pollutants such as sediment, nutrients, bacteria and chemicals that can threaten aquatic health, and contribute to the loss of water dependent recreational activities. Stormwater is recognized nationally as the leading cause of water pollution today.

Conventional methods of land development collect and convey stormwater quickly into a series of drains and pipes that flow directly into the closest waterbody with little or no water quality treatment.

How can we fix it? LID!

Low Impact Development (LID) techniques manage stormwater runoff by imitating the natural movement of water in the environment. LID decreases the volume of runoff and improves water quality by infiltrating, filtering, storing and evaporating stormwater. LID transforms stormwater from a nuisance that must be disposed of quickly into an asset that nourishes ground water resources. Ground water is an important source of drinking water supply, and also helps to maintain stream flow during critical dry weather periods when fish and aquatic life are most vulnerable.

The primary goals of LID are to:

- Manage and treat stormwater starting at its source and at multiple locations throughout the landscape
- Protect natural systems and processes (water movement, vegetation, native soils, sensitive/important features)
- Incorporate natural features (wetlands, stream corridors, mature forests) as design features into development plans
- Re-evaluate the cost and use of traditional building techniques and infrastructure (lots, streets, curbs, sidewalks, storm drains)
- Preserve open space and minimize land disturbance

LID techniques can be utilized both within your community and around your home. Practices can be applied singly or in a sequence. When multiple techniques are grouped together, water quality and quantity benefits are maximized.

Low Impact Development Practices

Rain Barrels – Low cost collection devices connected to your downspout that store roof runoff for later use. Using rain water for watering plants or washing your car can lower your water bill and decrease demand during times of drought.

Rain Gardens – Also called bio-retention areas, are depressed perennial or shrub gardens with both water and drought-tolerant plants. Rain gardens manage runoff by collecting rain water from rooftops and lawns into the garden, where it can infiltrate into the ground. Rain gardens are designed to hold water for only a few hours after a storm, so there is limited opportunity for mosquitoes to breed.

Swales – Broad, shallow channels planted with dense vegetation along roads, driveways and parking lots. Properly designed and maintained swales can trap pollutants, increase groundwater recharge and slow the flow of runoff, reducing erosion.

Photo: US FHWA

Buffers – Natural or landscaped areas used to separate a body of water from an area of intensive land use, preventing sediment and other pollutants from reaching the water.

Permeable Pavements – Surfacing materials such as gravels, concrete pavers, and porous asphalt/concrete which allow rainwater and runoff to infiltrate into the ground, instead of running into the storm drain.

Photo: UCONN NEMO

GreenRoofs – Engineered systems of soil and plants that detain, absorb and filter rain, and reduce the volume of roof runoff. Green roofs may be applied to many existing flat roofs and new construction. Some green roof companies will work with a homeowner to supply a "do-it-yourself" kit that is appropriate for a residence.

Photo: City of Seattle, WA

Narrowed Roads – Reduce runoff by decreasing the amount of paved area. This will increase infiltration into the ground and decrease the volume of water sent into the storm sewer system. These roads also calm traffic and can add to neighborhood aesthetics.

Low Impact Development and You

Every resident can promote the use of LID in their community. Ways that you can be proactive include:

- Incorporate one or more LID practices in your own yard
- Educate others in your neighborhood about the benefits of LID
- Encourage your municipal officials to implement LID demonstration projects in public areas
- Promote discussion of community-wide LID goals
- Participate with your local government to amend existing zoning and/or subdivision regulations to allow the use of LID

All LID features require some maintenance to work properly over their lifespan, but are often less work than traditional landscaping practices.

Low Impact Development Working for You

A number of Connecticut communities are starting to use LID practices. Shown below is a drainage swale created along a busy road in Wallingford designed to capture and filter runoff before it enters a local lake.

Photos: USDA NRCS

The Benefits of Low Impact Development

For Your Town:

- Can preserve features that are important to a town's character
- Helps balance the need for growth with environmental protection
- Reduces the costs of infrastructure maintenance (streets, curbs, sidewalks, storm drains)
- Slows/calms traffic and provides an attractive and pleasing environment for residents through narrower streets and street side plantings
- Can be applied to residential, commercial and even industrial properties
- Is consistent with environmental responsibility while increasing marketability.

For Your Environment:

- Helps maintain the natural hydrology of the site and the health of our surface and ground water supplies
- Preserves the ecological and biological balance of the natural system
- Protects water quality by reducing sediments, nutrients, and other pollutants
- Preserves trees and other natural vegetation
- Provides habitat for wildlife

Want to Know More? Click to Explore!

UCONN's Nonpoint Education for Municipal Officials (NEMO) website provides tools, resources, publications and more:
www.nemo.uconn.edu

For NEMO's LID elements, site design and more:
http://nemo.uconn.edu/tools/stormwater/index.htm

For NEMO's guide to building a rain garden:
http://www.nemo.uconn.edu/tools/publications.htm

The USDA Natural Resource Conservation Service has information about rain gardens at:
http://www.ct.nrcs.usda.gov/eln-educational_materials.html

Jordan Cove Urban Watershed Project discusses the creation of a LID neighborhood in CT:
http://jordancove.uconn.edu/

The CT DEP Stormwater Quality Manual provides guidance on including LID in development:
www.ct.gov/dep/stormwater

Boston Metropolitan Area Planning Council, LID Toolkit provides information and resources:
http://www.mapc.org/LID.html

U.S. EPA LID website offers information:
http://www.epa.gov/owow/nps/lid/

First Brochure of the LID Series

For more information contact CT DEP's Watershed Management Program:
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860-418-5994
http://www.ct.gov/dep/watershed

Updated 04/09 This document was printed on recycled paper.

Rainfall as a Resource

A Resident's Guide to Low Impact Development In Connecticut

This neighborhood in Waterford, CT was constructed using multiple Low Impact Development techniques. Photo: Jordan Cove Urban Watershed Project, UCONN.

Connecticut Department of Environmental Protection
Bureau of Water Protection and Land Reuse
Planning and Standards Division
79 Elm Street, Hartford, Connecticut 06106

Date:____________________

Project:____________________

Reviewer:____________________

STORMWATER/LID REVIEW CHECKLIST

Part 1: General Information

Definitions for terms used throughout this document can be Found in the *2004 CT Stormwater Quality Manual

1. Development Details

☐ Redevelopment of existing developed footprint. (no increase in impervious surface)
☐ Redevelopment of existing developed site with expansion of developed footprint
☐ New proposed developed site

2. Development Type

☐ Residential ☐ Commercial ☐ Industrial ☐ Mixed Use ☐ Other____________

3. Proposed Site Development:

Acreage of site: __________ac.

Acreage of existing impervious surfaces: __________ac. __________% of site

Acreage of site proposed to be disturbed: __________ac. __________% of site

Acreage of total impervious surfaces: __________ac. __________% of site

4. Waterbody and Watershed Information:

Named waterbodies on or adjacent to the site:____________________

Regional and subregional watersheds site is located in:____________________

Are any waterbodies included on the CT Impaired Waters List?____________________

If yes, name the impairment____________________

and possible identified cause(s) and source (s):____________________

Part II: Site Planning and Design

1. Stormwater Objectives for Surface Flows *(check all that apply)*

☐ Water Quality Treatment
☐ Peak flow control
☐ Run-off volume reduction
☐ Stream channel protection

2. Stormwater Objectives for Groundwater Recharge *(check all that apply)*

☐ Run-off volume reduction
☐ Peak flow control
☐ Stream channel protection
☐ Maintain groundwater resources

Storm event(s) used for #1 and #2: ____________________

2. Proposed site planning and Low Impact Design concepts used to minimize stormwater impacts: *(check all that are addressed)*

Development Designed to Minimizes Impacts to Natural Features

- ☐ Preservation of large areas of land in a natural vegetated state
- ☐ Vegetated buffers have been provided and enhanced.
- ☐ Designed to fit the terrain. Natural drainage patterns maintained
- ☐ Stormwater treatment designed to reduce the impact on natural wetlands and vernal pools.
- ☐ Stormwater management conducted at multiple locations
- ☐ Designed to limit land disturbance/impervious surfaces.
  - ☐ reduced parking
  - ☐ reduced or zero lot line setbacks
  - ☐ shared driveways
  - ☐ cluster/open space subdivision
- ☐ Conservation and/or restoration of native soils. Compacted soils addressed.
- ☐ Creation of steep slopes has been minimized.
- ☐ Landscaping practices promote native/drought resistant/non-invasive plantings
- ☐ Lawn areas are minimized and use of organic lawn care practices promoted.

Development Reduces and Addresses Stormwater Impacts

- ☐ Impervious areas have been reduced and infiltration increased
  - ☐ Reduced street widths and lengths
  - ☐ Alternative cul-de-sac design and parking lot islands
  - ☐ Reduced parking lot size
  - ☐ Elimination or reduction of sidewalk widths or placement on only one side
  - ☐ Driveway alternatives incorporated; (shared, two track, permeable)
  - ☐ Removal or breaks in curbing where feasible
  - ☐ Use of permeable materials on roads, parking lots, sidewalks, driveways and patios
  - ☐ Use of vegetated green roofs
  - ☐ Infiltration of run-off through use of dry wells, infiltrators and permeable surfaces
- ☐ Impervious surfaces disconnected where possible; roof drains, pipe flow, curb openings
- ☐ Development has been designed to diffuse flow concentration by sheet flow, curbless design, perimeter swale/level spreader, etc.
- ☐ The Water Quality Volume (WQV) has been identified and appropriately treated.
  - ☐ Treatment of "first flush", 1" of rainfall
  - ☐ Incorporation of rain gardens
  - ☐ Soil amendments/filters
  - ☐ Use of Bioretention
    - ☐ Manmade wetland systems
    - ☐ Tree box filters
    - ☐ Grassed swales
    - ☐ Shallow vegetated depressions
  - ☐ Other initiatives/emerging technology________________________________
- ☐ Source controls and pollution prevention measures have been incorporated to minimize pollutant levels. Oil, grease and debris traps/separators have been used where needed.
- ☐ Methods for the control of increases in the peak flows, volume and flood control addressed.
- ☐ Use of cisterns and/or rain barrels for rainwater harvesting

Short and Long Term Best Management Practices Addressed

- ☐ Site maintenance for stormwater treatment controls during and post construction included.
- ☐ Maintenance access for all stormwater treatment practices included.
- ☐ Responsible party for implementation, maintenance and correction of stormwater treatment practices has been designated and appropriate contact documentation submitted.
- ☐ Treatment practices designed to minimize the potential for nuisance insects and vectors.
- ☐ Incorporation of additional barriers, collection and treatment systems for regulated substances or other uses of concern; (dumpsters, loading docks, service areas)
- ☐ Water quality monitoring of stormwater treatment practices addressed

3. Critical Resources and Details Included: Existing and proposed resources and details, on or adjacent to the site, affecting stormwater treatment and design which are included on the plan and/or in support documentation as appropriate *(check all which are addressed)*

Existing and proposed modifications to Natural Features

- ☐ Wetlands, streams, ponds, vernal pools, shorelines and coastal resources
- ☐ Flood hazard, flood zones and flood ways
- ☐ Surface and groundwater quality classification of on-site and adjacent water bodies
- ☐ Site vegetative patterns, existing and proposed (including native tree cover)
- ☐ Site topography
- ☐ Soils as defined by USDA/NRCS web soil surveys, including names and descriptions

Existing and Proposed Development, Infrastructure and Utilities

- ☐ Existing development and neighboring land uses
- ☐ Sub-grade walls, retaining walls, underground utilities and filled or excavated areas
- ☐ Wells, aquifers and public drinking water supplies
- ☐ Septic tanks and leach fields

Sebacks and Overlay Zones

- ☐ Regulated setbacks overlay zones, critical areas and greenways established by authorities

Stormwater

- ☐ A summary narrative explaining; overall stormwater management plan, changes to pre-and post-development peak runoff rates, volume and water quality for the site is provided.
- ☐ Drainage patterns and flow paths
- ☐ Watershed divides (pre and post) on map with associated acreages
- ☐ Impervious area and run-off coefficient
- ☐ Time of concentration flow paths and impervious coverage in each watershed are included.
- ☐ Deep test holes, soil borings, infiltration percolation and/or permeability tests used for the design of bioretention/infiltration practices have been conducted and data/findings included.
- ☐ Potential pollutant sources (including erosive soils, landscaped area, commercial operations)
- ☐ Type of anticipated stormwater pollutants and removal percentages
- ☐ Other stormwater management infrastructure

Waivers

- ☐ Waivers from local commissions for any stormwater and Low Impact Development (LID) practices have been identified. Include details:________________________________

____

Municipal Comments:

Additional LID practices that should be considered:

Additional stormwater design information required:

Additional site plan information that should be submitted:

Additional information necessary:

Part III: Stormwater Treatment Practices

1. Provide a diagram of the treatment train showing the practices used, their location, and how they are connected. Attach and label a separate sheet to checklist.

A. Practices Used *(check all that apply)*	
Primary Treatment	**Secondary Treatment**
☐ Stormwater Pond	**Conventional**
☐ Micropool extended detention pond	☐ Dry detention basin
☐ Wet pond	☐ Underground detention facilities
☐ Wet extended detention pond	☐ Deep sump catch basins
☐ Multiple pond system	☐ Oil/particle separators
☐ Pocket wetland	☐ Dry wells
☐ Stormwater Wetlands	☐ Permeable pavement
☐ Shallow wetland	☐ Vegetated filter strips
☐ Extended detention wetland	☐ Grass drainage channels
☐ Pond/wetland system	**Innovative/Emerging Technologies**
☐ Infiltration Practices	☐ Catch basin inserts
☐ Infiltration trench	☐ Hydrodynamic separators
☐ Infiltration basin	☐ Media filters
☐ Filtering practices	☐ Underground infiltration systems
☐ Surface sand filter	☐ Alum injectors
☐ Underground sand filter	
☐ Perimeter sand filter	
☐ Organic filter	
☐ Bioretention	
☐ Water Quality Swales	
☐ Dry swales	
☐ Wet swales	

1. If no primary treatment practice is used, explain why.

2. If treatment is not provided for all stormwater run-off, explain why.

3. Are other innovative emerging technologies proposed that are not listed? If yes, please describe technologies and provide appropriate information.

C. Stormwater Pollutants Generated and Removed *(check and report rates on all that apply)*	
Type of Pollutant Generated	**Percent removal expected per treatment train (attach additional sheets if necessary)**
☐ Sediment	
☐ Phosphorus	
☐ Nitrogen	
☐ Metals	
☐ Hydro-carbons	
☐ Bacteria	
☐ Other; specify	

Source(s) of removal rates: