

CITY OF NORWICH

STORMWATER CONTROL PLAN FOR DEVELOPERS LOW IMPACT DEVELOPMENT (LID)



THE IMPACTS OF DEVELOPMENT

The City of Norwich, like all urbanized areas, is constantly undergoing change. Population growth and new business development results in an increased demand for housing, commercial space, industry, and other related uses. As the population grows and new businesses emerge, the demand also grows for housing, office buildings, churches, factories, garages and fast food places etc... While, the City of Norwich welcomes the challenges and opportunities associated with growth, we also understand that with each new development we lose a piece of previous land. The City of Norwich understands that Low Impact Development (LID) is the way of the future. Applying LID strategies in the design process allows us to mitigate the impact of new construction. Every application for a development project, site development permit, design review, or building permit that is subject to the development runoff requirements in the City's NPDES permit shall be accompanied by a stormwater control plan.

BENEFITS OF LOW IMPACT DEVELOPMENTS

There are many potential benefits associated with the use of Low Impact Development (LID) practices. In addition to stormwater management, LID implementation can result in environmental, economic, and community benefits.

Potential Environmental Benefits

- Improved water quality
- Maintenance of predevelopment runoff volume
- Maintenance of predevelopment runoff discharge rate
- Groundwater recharge
- Terrestrial and aquatic habitat preservation
- Reduced potable water and energy demand

- Improved air quality
- Carbon sequestration
- Recycling and beneficial reuse
- Reduction in urban heat island effect

Potential Economic Benefits

- Reduced construction and maintenance costs
- Improved marketability
- Energy cost reduction and water conservation

Potential Community Benefits

- Improved aesthetic value
- Provides “green job” opportunities
- Educational opportunities
- Health benefits

The pattern of rainfall in the watershed is the primary factor to be considered when evaluating how to reduce and mitigate the impacts of stormwater.

In addition to evaluating local climatic conditions in LID selection and sizing for stormwater benefits, it is necessary to understand the local hydrologic cycle in order to maintain or mimic the natural hydrologic function of a site.

REGULATORY GOALS

Water Quality Requirements, e.g.:

- Treat the 85th percentile runoff volume.
- Treat the runoff flow rate generated by a rainfall intensity of 0.2 in/hr.

Hydro modification Requirements, e.g.:

- Reduce/Match peak runoff discharge rate
- Hydrograph matching
- Flow duration control

BE INTENTIONALLY GREEN

LID is not intended to be implemented as an afterthought, with a few Best Management Practices placed on an otherwise conventionally designed site; proper implementation of LID techniques involves specialized site planning methods which are intended to be integrated into the overall site design. On a Low Impact Development project, consideration of natural resources such as soils, vegetation, and flow paths will influence the placement of buildings and paved surfaces, and as such LID needs to be considered at the earliest planning stages of a project.

A common misstep of developers and engineers is to wait until the final stages of development planning and design to attempt to incorporate LID, which often ends up requiring the loss of planned building space - or a costly re-design of the site. When LID is considered from the beginning, many designs can adequately meet the requirements for a project without significant loss of building space.

The process of planning a Low Impact Development project begins with a comprehensive understanding of the unique features of the site to be developed, which will guide the development of goals for minimizing the impact of the project. Next, a set of LID principles are included in the site planning process, to guide the creation of a site plan that works with the natural features of the site and minimizes the generation of runoff. Once a sound site plan has been created, selected LID BMPs are included to capture and treat runoff where they are needed. The site plan is then evaluated to ensure that the stated goals have been met.

DISCONNECT IMPERVIOUS AREAS

Runoff from 'connected' impervious surfaces commonly flows directly to a stormwater collection system with no opportunity for infiltration into the soil. For example, roofs and sidewalks commonly drain onto parking lots, and the runoff is conveyed by the curb and gutter to the nearest storm inlet. Runoff from numerous impervious drainage areas may converge, combining their volumes, peak runoff rates, and pollutant loads. Disconnecting impervious areas from conventional stormwater conveyance systems allows runoff to be collected and managed at the source or redirected onto pervious surfaces such as vegetated areas. This reduces the amount of directly connected impervious area (DCIA), and will reduce the peak discharge rate by increasing the time of concentration (T_c), maximize the opportunity for infiltration by reducing the velocity of flows and providing for greater contact time with the soil, and maximize the opportunity for evapotranspiration during transport.

Disconnection practices may be applied in almost any location, but impervious surfaces must discharge into a suitable receiving area for the practices to be effective. Information gathered during the site assessment will help inform the determination of appropriate receiving areas. Typical receiving areas for disconnected impervious runoff include landscaped areas and/or other LID Mitigation BMPs (i.e. filter

strips or bio retention). Runoff must not flow toward building foundations or be redirected onto adjacent private properties. Setbacks from buildings or other structures may be required to ensure soil stability, particularly for practices that are designed to concentrate and infiltrate runoff. Consult with the project geotechnical engineer to identify areas where infiltration can be accommodated.

Discharge areas must be located down gradient from runoff discharges. In a residential setting, this could mean that roof runoff discharges to either the front yard or the back yard, depending on the site configuration. As compared to conventional development, some potential techniques for redirecting flows to vegetated areas may require local design standards to be revisited.

IMPLEMENTING LID PRINCIPLES

Once the site assessment has been performed and goals for implementing LID on the project have been defined, specific LID strategies can be selected and implemented to address the potential impacts of development discussed in Section 1 of this manual.

LID strategies can be broadly divided into two types:

- LID Principles that minimize the causes (or drivers) of project impacts.
- LID BMPs that help mitigate unavoidable impacts.

Incorporating LID Principles at the beginning of the development planning process is the most cost effective way to implement LID successfully. When properly done, such measures can greatly reduce the extent of impacts that must be mitigated with BMPs. As such, a project proponent should exhaust all available and applicable measures to minimize impacts, before moving on to mitigating the remaining impacts.

It is important to note that LID Principles apply to each of the phases of a project, including: planning, design, construction and occupation.

Table of LID BMP Functions.

BMP	Capture and	Infiltration	Filtration
Bioretention (infiltration design)		✓	✓
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Porous Pavement (infiltration design)		✓	✓
Porous Pavement (filtration design)			✓
Rain Barrel	✓		✓
Vegetated Roofs			✓
Soil Amendments		✓	✓
Downspout Disconnection		✓	✓
Filter Strips			✓
Vegetated Swales			✓
Infiltration (Retention) Basins		✓	✓
Infiltration Trenches		✓	✓
Dry Wells		✓	✓
Dry Ponds (Extended Detention Basins)			✓
Rain gardens		✓	✓
Tree Wells		✓	✓
Constructed Wetlands			✓
Wet Ponds			✓
Media Filters / Filter Basins			✓
Proprietary Devices			✓
* depends on design			
Many filtration BMPs can result in substantial runoff reduction via infiltration or			

The selection of an appropriate set of BMPs for a given site should be based on the project goals and site capabilities and constraints. Several factors must be taken into account:

- LID goals (peak flow reduction, storage volume needed, pollutant removal)
- Site configuration (e.g. space available)
- Site constraints (e.g. slopes, depth to groundwater)
- Operation and maintenance requirements
- Cost

Examples of LID BMP projects



Rain Garden at Moriarty School, Norwich CT
 Source: JP Laguerre



Bio Retention Cell/ Rain Garden. Source: Bill DePoto



Previous concrete sidewalk, Source Bill DePoto



Residential rain barrel: Source LA Rain Harvesting Program



Downspout Disconnection



Vegetated Swale with curb cuts: Source: Bill DePoto



Pervious pavement walkways

Source: Jeff Endicott



Pervious Asphalt in Portland Oregon

Source: Cahill Associates

Materials and Pictures generously provided by the Low Impact Development Center.