

# MEETING NOTICE AND AGENDA

## MANSFIELD PLANNING AND ZONING COMMISSION REGULATORY REVIEW COMMITTEE

Special Meeting

**Wednesday, February 8, 2012 ■ 1:15 PM**

Audrey P. Beck Municipal Building ■ 4 South Eagleville Road ■ Council Chambers

1. Call to Order
2. Approval of Minutes: December 14, 2011 and January 11, 2012 Meetings
3. Consideration of Potential Zoning and Subdivision Regulations
  - a. **Low Impact Development Regulations**

Presentation from Michael Dietz, Director of Connecticut NEMO Program  
See attached proposal from Center for Land Use Education and Research (CLEAR) and NEMO Guide to Developing a Sustainable Community
  - b. **Review/Acceptance of Proposed Regulations Pertaining To:**
    - Driveway standards
    - Playground equipment
    - Special event signs
    - Fences/walls on corner lots
    - Temporary Storage Containers
    - Donation Drop-Off Boxes
    - Event/Program Registration Signs
    - Additions to Non-Conforming Structures
    - Storrs Center Subdivision Requirements
  - c. **Overview of PA 11-79 regarding Bonding Provisions**
  - d. **Tentative schedule for review of proposed changes by Planning and Zoning Commission**
4. Next Meeting and Agenda Items
  - a. **February 15, 2012:** Does the Committee want to hold regularly scheduled meeting or cancel? If cancelled, the next meeting will be February 29, 2012.
  - b. **Agenda items for future meetings**
    - Low Impact Development
    - Live Music
    - Bonding Provisions
    - Companion Animal Training/Rescue Shelters
5. Adjourn

*DRAFT*  
MINUTES

**PLANNING & ZONING COMMISSION REGULATORY REVIEW COMMITTEE**

Wednesday, January 11, 2012

Conference Room B, Audrey P. Beck Municipal Building

Members present: M. Beal, K. Rawn

Others present: L. Painter, Director of Planning and Development

**Call to Order**

Chairman Beal called the meeting to order at 1:18 p.m.

**Approval of Minutes**

11-30-11: Rawn MOVED, Beal SECONDED approval of the minutes as written. Motion was approved unanimously. (This approval action was undertaken as Rawn and Beal were the only two members present at the 11-30-11 meeting).

12-14-11: No action was taken as three of the four members present at the 12-14-11 meeting were not present.

**Zoning and Subdivision Regulation Issues Under Consideration**

Review of Draft Regulations

Painter distributed a handout with proposed text changes related to the following based on discussion at the prior meeting:

- Permit requirements for children's playground equipment (changes from last meeting highlighted in yellow)
- Portable storage containers (changes from last meeting highlighted in yellow)
- Donation collection boxes (changes from last meeting highlighted in yellow)
- Subdivision requirements for Storrs Center

After discussion, the members present recommended the changes/clarifications:

- *Donation drop-off boxes.* Retain prohibition against locating donation boxes in landscape areas. Basis for recommendation was to minimize impact on impervious cover.
- *Subdivision requirements for Storrs Center.* Painter provided an overview of the issues driving the proposed amendments:
  - Current subdivision requirements assume that the project is for a single family subdivision, as such, many of the requirements are duplicative of items that are reviewed through other processes such as special permits when project is not a single-family subdivision.
  - In the case of Storrs Center, many of the requirements have been reviewed and approved either as part of the overall Storrs Center master plan or through individual zoning permits issued pursuant to the master plan.

The amendments as suggested would preclude the need for the Commission to address individual waivers for many of the requirements, specifically as they relate to Storrs Center. After discussion, it was determined that it may be worthwhile to take a broader approach that would address the duplicative requirements for all projects. However, if timing is an issue, the

Storrs Center developer may want to request an amendment that applies solely to their project.

#### Update/Discussion on live music/recorded music/entertainment regulations

Painter presented an overview of the town's existing noise and nuisance ordinances. Based on the existing ordinance requirements, two alternatives were presented for initial discussion:

- Retaining the special permit requirement for live music with changes to reference noise ordinance, addition for provision of reconsideration if specific number of noise and/or nuisance violations issued to business, patrons or employees, and elimination of annual renewal
- Eliminating the special permit requirement and allowing live music as a permitted accessory use subject to compliance with noise ordinance and provision that specific number of violations of noise and/or nuisance ordinance would trigger need for special permit approval.

After discussion, Painter agreed to further research the following items:

- Whether any enforcement concerns exist with noise ordinance (discuss with Resident Trooper)
- Whether it is possible to require a special permit only if certain conditions have been violated (discuss with Town Attorney)

#### Initial Discussions on Changes to Lighting Regulations to Address 'Dark Skies' Objectives

Painter presented the members with a copy of the draft recommendations on changes to lighting regulations prepared by Leo Smith and Bill Shakalis. After discussion, Beal and Rawn determined that this issue was more complex than originally thought and requested additional education. Painter also suggested that lighting issues may be better addressed as part of the development of the Sustainable Design and Green Building Action plan that will be completed as part of the HUD grant. Rawn requested that Painter research state statutes to determine how the proposed regulations fit into the overall regulatory context, and the extent of the authority granted to the Commission to adopt regulations such as those proposed.

#### **Next Meeting and Agenda Items**

After discussion, Beal and Rawn requested that the focus of the next meeting be on Low Impact Development. They also requested that Michael Dietz address issues related to low impact development such as parking, maximum impervious cover requirements and standards for retrofitting existing facilities.

Beal also requested that the 2012 schedule of meetings be placed on the agenda for reconsideration with additional dates added through the end of December.

The overview of how existing noise and animal control regulations address potential noise and health issues from animal rescue shelters and companion animal training will be scheduled for another meeting.

#### **Adjournment**

The meeting was adjourned at approximately 3:45 p.m.

Respectfully submitted,  
Linda M. Painter, AICP



April 8, 2011

Town Council  
Town of Mansfield, CT  
Audrey P. Beck Municipal Building  
4 South Eagleville Road  
Mansfield, CT 06268

Dear Council Members,

As you most likely are aware, Eagleville Brook in Mansfield has been identified by CT DEP as an "impaired stream," due to a number of water quality and quantity issues related to urban runoff. As a result, a Total Maximum Daily Load (TMDL) analysis was initiated to reduce impacts to aquatic life in the stream, which drains much of the UConn campus and is part of the Willimantic River system.

For the past two years, the University of Connecticut Center for Land Use Education and Research (CLEAR) has been working in collaboration with CTDEP, various departments of the University, and your Town staff on a project to improve the health of the watershed. Much of the focus of the project is on the highly urbanized core campus area, and involves identifying and implementing opportunities to install "Low Impact Development" (LID) practices that reduce the impacts of stormwater on the Brook.

However, Mansfield is also a key part of the solution, so over the past year educators from CLEAR have been working with Greg Padick on how to integrate these same LID concepts into various Town documents and standards. Specifically, we reviewed subdivision regulations, the Plan of Conservation and Development, and Engineering Plans and Specifications. Additionally, Mr. Padick reviewed and commented on the Watershed Management Plan that has been drafted for Eagleville Brook. The attached document contains a summary of these recommendations, and the relevant section from the draft Watershed Management Plan.

We have enjoyed working with Mr. Padick, Mr. Hultgren and others from the Town of Mansfield, and we look forward to continuing this relationship into the future. We hope that the Council and the land use boards of Mansfield will support the recommendations of the project, and stand ready to help if further assistance is needed. Finally, we would be glad to hold an informational meeting for the Council, the commissions and the public in which we describe the study, our progress to date, future plans, and the critical role that the Town can play in protecting Eagleville Brook. Please contact Mike Dietz (860-345-5225) with any questions, or to discuss such a meeting.

Sincerely,

Handwritten signature of Michael Dietz in black ink.

Michael Dietz  
Department of Extension  
UConn Center for Land Use Education and Research

Handwritten signature of Bruce Hyde in black ink.

Bruce Hyde

Handwritten signature of Chester Arnold in black ink.

Chester Arnold

cc: Greg Padick, Lon Hultgren, Planning and Zoning Commission, Inland Wetland Agency, Conservation Commission, Town of Mansfield; Eric Thomas, CT DEP

# **Town of Mansfield, CT**

**April 2011**

**Recommendations for Modifications to Include Low Impact  
Development Practices**

**Prepared By:  
Center of Land Use Education and Research  
University of Connecticut Extension**

**Bruce Hyde  
Michael Dietz  
Chester Arnold, Jr.**

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## Recommendations for Modifications to Planning and Engineering Documents

### *Plan of Conservation and Development Recommendations*

While a number of recommendations in the POCD under Policy Goal #2, Objective a (shown below in bold) generally support the concept of Low Impact Development (LID), a specific LID recommendation should be included at the time of the next POCD revision or amendment. This will reinforce Mansfield's commitment to LID as well as provide a foundation for inclusion of LID requirements in the regulations.

**Policy Goal #2- To conserve and preserve Mansfield's natural, historic, agricultural and scenic resources with emphasis on protecting surface and groundwater quality, important greenways, agricultural and interior forest areas, undeveloped hilltops and ridges, scenic roadways and historic village areas.**

#### **a. Objective**

**To protect natural resources, including water resources, geologic/topographic resources and important wildlife habitats and plant communities, by refining the Zoning Map, land use regulations and construction standards, considering new municipal ordinances and capital expenditures, and considering other actions**

Consider including language similar to the following as a Recommendation under this objective: Revise the Zoning Regulations, Subdivision Regulations and Engineering Standards and Specifications to support and encourage the use of Low Impact Development practices and design strategies to preserve a site's predevelopment hydrology, to the maximum extent practicable. These revisions should include a system by which developers will be required to employ LID practices or demonstrate why specific practices are not feasible.

### *Zoning Regulations Recommendations*

The addition of a Low Impact Development Checklist to be completed by a developer is recommended for inclusion in the Zoning Regulations. The checklist will provide applicants, site designers and regulatory boards and agencies with guidance in the application of LID practices to development projects. An applicant seeking land development approval from a regulatory board should be

required to identify LID practices that have been incorporated into the project's design. If an applicant contends that it is not feasible to incorporate any of these practices into the projects design, particularly for engineering, environmental or safety reasons, the applicant should be required to provide a justification for that contention.

Definitions-The following definitions of should be added:

Predevelopment Hydrology- The water balance between runoff, infiltration, storage, groundwater recharge, and evapotranspiration prior to the development of a site.

Low Impact Development: The integration of site ecological and environmental goals and requirements into all phases of urban planning and design that ranges in size from the individual residential lot to an entire watershed.

Article Six, Section B (4), Performance Standards, in bold below, could be modified to include references to LID in the following sections (suggestions are underlined):

#### **4. Performance Standards**

**m. Aquifer Areas - To prevent or minimize detrimental effects on the groundwater quality within aquifer areas, which are existing or potential sources of significant quantities of potable water, land use activities on or within 500 feet of identified aquifer areas must be carefully reviewed and appropriately regulated.**

**Accordingly the following requirements shall apply to all land use activities on or within 500 feet of aquifer areas as identified in Mansfield's Plan of Conservation and Development, Mansfield's Water Supply Plan, an October, 1979 map entitled GROUNDWATER RECHARGE AREAS, prepared by the Connecticut Areawide Waste Treatment Management Planning Board, sheets 40, 41, 55 and 56, (on file in the Mansfield Planning Office and the Town Clerk's Office), and any additional information obtained from the State Department of Environmental Protection, federal agencies or on-site investigation.**

**5. All commercial, industrial or multi-family developments and other land uses with cumulatively**

more than 1/2 acre of impervious surface shall incorporate best management practices for storm water controls in accordance with the Low Impact Development (LID) principles as outlined in the checklist shown in Appendix XX of these regulations, as well as the State Department of Environmental Protection Best Management Guidelines as set forth in the 2004 Connecticut Stormwater Quality Manual, and shall prohibit or restrict the use of salts and chemicals for ice removal in order to minimize the risks of ground water contamination. A storm water management plan and a LID Checklist detailing efforts to reduce the amount of storm water runoff and minimize its impacts shall be submitted for Commission approval.

p. Road and Drainage Standards - All road and drainage improvements, including private roads, driveways and parking and loading areas, must be designed and constructed to promote vehicular and pedestrian safety and the proper discharge of storm water runoff. Appropriate separation of pedestrian and vehicular traffic and adequate sightlines for all intersections, including those within a private parking or loading areas, must be incorporated into development plans. All road and drainage improvements, with the possible exception of roadway width, should conform with the standards and specifications of the Mansfield Public Works Department (~~available in the Mansfield Engineering Office~~) and, to the maximum extent practicable, conform with LID principles. As appropriate, peak storm water discharges should be retained on site to minimize or prevent downstream impacts.

r. Site Development Principles

1. Intent - Through the establishment of specific site development principles, this section will serve to protect, maintain, and enhance public health, safety environment, and general welfare by encouraging a more sustainable approach to development. Requirements and procedures established in this section reduce damages from soil erosion and sedimentation, reduce downstream flooding and, in general, ensure proper storm drainage management in a

manner consistent with Low Impact Development (LID) principles, where appropriate. It is the intent of these regulations that, to the maximum extent practicable, there will be no onsite or offsite impacts from changes in storm water that result from development activities. In addition to the site development principles below, applicants for projects that will disturb more than XXX square feet are required to complete the LID Site Planning and Design checklist attached as Appendix X to these regulations. This checklist will insure that the applicant has considered LID strategies in the design of the development. (Also see Article VI, Section B.4.s. - Erosion and Sediment Control Plans)

2. Site Development Principles - Earth-moving, grading or land-disturbing activities including the removal of trees and other vegetative cover, the development of haul roads and logging decks for forestry operations, and all cut and fill activities shall (as applicable to the specific site and development) comply with the following site development principles:

g. To the extent practicable, the predevelopment hydrology of the site, with respect both to peak flow rates and total volume of runoff, shall be preserved. Where the predevelopment hydrology of the site is not maintained, drainage provisions shall be made to effectively regulate any increased runoff caused by changed soil and surface conditions during and after development. Stormwater runoff shall be minimized and retained on site wherever possible to help prevent downstream flooding and erosion problems. Wherever possible, erosion control or storm water management measures shall be used to prevent water from entering and running over disturbed areas. Drainage easements shall be obtained whenever necessary. Where runoff computations are necessary for proper review of existing and proposed drainage facilities, said computations shall be in accordance with Chapter 9 of the Connecticut Guidelines for Soil Erosion and

Sediment Control, 1985, as amended, unless an alternative is approved by the Town Engineer or his designee.

Besides the recommendations above, there are likely to be other changes needed in the body of the regulations for the sake of consistency.

### *Subdivision Regulation Recommendations*

Section 3.0 Definitions- The following definitions should be added:

Predevelopment Hydrology- The water balance between runoff, infiltration, storage, groundwater recharge, and evapotranspiration prior to the development of a site.

Low Impact Development: The integration of site ecological and environmental goals and requirements into all phases of urban planning and design that ranges in size from the individual residential lot to an entire watershed.

Section 4.0 General Provisions: add, Low Impact Development (LID)- The applicant shall demonstrate to the satisfaction of the Planning and Zoning Commission that he/she has considered, in designing the submitted subdivision plan, the use of LID practices which preserves, to the extent practicable, a site's predevelopment hydrology.

Section 5.2 Suggested Information: add a section recommending a description of potential LID practices to be utilized.

Section 6.8 Construction and Public Improvement Plans: add a reference to LID requirements in the Zoning Regulations.

Section 7.10 Common Driveways: Encourage common driveways as part of LID practices, etc.

Section 8.1 Street Planning: Include a reference to LID practices in the planning of streets.

Section 10.0 Drainage: Include references to LID and methods to reduce stormwater runoff.

As with the Zoning Regulations, there are likely to be several areas where modifications will be needed for continuity purposes or which will strengthen the LID requirements.

### *Engineering Standards and Specifications Recommendations*

Note: Sections of the existing Engineering Standards and Specifications are shown in **Bold** below.

#### **Page 5 Section II- Reference to Related Codes, etc.**

Recommendation: Include a reference to the CT Stormwater Quality Manual which can be found at <http://ct.gov/dep/cwp/view.asp?a=2721&q=325704>.

#### **Section IV-Town Roads and New Subdivision Construction**

##### **Page 8 #5. Width of Surfacing, Shoulder and Roadway**

Recommendation: Consider modifying the residential standards for roadway width to 20'-24'. A simple rule of thumb regarding traffic volume is the fewer vehicles, the narrower the road may be. Research shows that 20 to 24 foot widths (two 10 to 12 foot travel lanes are adequate for most local roads.

Source: 2004 CT Stormwater Manual.

Make modifications, as appropriate, to the detail sheets shown on pp. 39 and 40.

##### **Page 10 #7. Curbing**

Recommendation: Consider modifying this section to allow for curbless streets. We recommend that curbs be used only where needed, such as steep slopes or to protect downhill properties. Curbless street design will allow open drainage through sheet flow off the street to grass drainage channels or dry swales.

##### **# 8. Required Intersection and Cul-de-sac Geometry**

Recommendation: Add a statement that encourages the use of a vegetated island as part of the as part of the cul-de-sac design. The vegetated island would be used as a bioretention area, with the ability to accept road runoff.

This would entail curbless design, with the landscaped area being lower than the surrounding road.

#### **Page 15 Section VI- Drainage Requirements**

Recommendation: Include a reference to the CT Stormwater Manual.

**A. Basis of Design--**It is suggested that a reference to LID be made in this section. For example, Appendix A of the LID manual (referenced in the preamble of checklist, but available here: <http://www.epa.gov/owow/NPS/lidnatl.pdf>) can be referenced here, as it has an example hydrologic calculation adapting LID practices in a new development, using standard TR-55 calculations. It may also be helpful to state in here that all efforts should be made to AVOID concentrating flow in the first place, such as encouraging sheet flow from impervious surfaces to pervious areas. This also relates to the curbing issue referenced earlier.

#### **Page 18 Section VIII-Property Transfers and Easements**

Recommendation: There may be a need to add some language relative to drainage easements if the LID practice will result in drainage being directed to other than town owned property. The Town's attorney should be consulted relative to the easement question. It is possible that the existing language will be sufficient to protect the Town.

#### **Page 32 Section IX- Highway Permits**

##### **Q. Driveways**

Recommendation: Add language to this section that will encourage, to the extent practicable, the construction of driveways using LID practices such as minimizing and disconnecting impervious surfaces. There are a number of provisions in this section that may require modification to incorporate LID and still allow for construction under the existing specifications. Also consider reducing the maximum driveway width for residential to something much less than 40'.

**General Comment-** Consider allowing the use of permeable pavements (paver blocks, porous asphalt, porous concrete, etc.) if the applicant can demonstrate appropriate use of the treatment. Consider allowing porous paving materials on sidewalks, or mandating that they drain to pervious areas such as lawns.

## Guidance Document for Low Impact Development Best Management Practices

Similar to many towns in Connecticut, Mansfield has seen increased interest in balancing community growth and environmental conservation. When an undeveloped site is converted into residential housing or commercial areas, roads, roofs, parking lots and driveways replace the native vegetation and soils that were on the site. As would be expected, much more water runs off developed sites in response to rain storms. Pollutants, such as oil from vehicles, bacteria, nitrogen and phosphorus collect on the impervious surfaces and are washed off during precipitation events. Typical development approaches do not provide adequate treatment for this stormwater, and receiving waters suffer a variety of impairments due to these human induced changes in the landscape. Stormwater runoff has been identified as one of the biggest causes of stream quality degradation.

Low impact development (LID) is an approach that will help to minimize the impacts of traditional development, while still allowing for growth. Pioneered in Maryland<sup>1</sup>, this approach is being successfully utilized throughout the country. LID has also been adopted as the preferred method of site design in the 2004 Connecticut Stormwater Quality Manual<sup>2</sup>. In addition to protecting ecosystems and receiving waters, the LID approach can often result in cost savings on projects<sup>3</sup>.

The following areas of focus will help guide planning for your project:

1. *Assessment of natural resources.* Ideally, LID is considered early in the site planning process. The objective is to allow for development of the property, while maintaining the essential hydrologic functions of the site. A thorough assessment of the existing natural resources on the site needs to be performed, so that essential features can be preserved, and suitable sites for development can be identified.
2. *Preservation of open space.* Cluster subdivision design can complement the LID approach. Cluster subdivisions provide a key way to protect natural resources while still providing landowners with the ability to develop their property. In most cases, the number of residential units allowed in a cluster subdivision equals the number allowed under conventional subdivision regulations.
3. *Minimization of land disturbance.* Once the development envelope is defined, the goal is to minimize the amount of land that needs to be disturbed. Undisturbed

forest, meadow, and wetland areas have an enormous ability to infiltrate and process rainfall, providing baseflow to local streams and groundwater recharge. Construction equipment causes severe compaction of soils, so after development, even areas that are thought to be pervious such as grass, can be quite impervious to rainfall.

4. *Reduce and disconnect impervious cover.* With careful planning, the overall percentage of impervious cover in a proposed project can be minimized. Roads, driveways, sidewalks, parking lots, and building footprints can be minimized to reduce impacts, but still provide functionality. Additionally, not all impervious surfaces have the same impact on local waterways. With proper planning, runoff from impervious surfaces can be directed to pervious areas such as grass or forest, or to LID treatment practices. It should be noted that every project is unique, and not every LID practice will be appropriate. For example, sidewalks or bike paths may be an asset to a new subdivision, if there is some connection to existing pedestrian travel routes. However, sidewalks may not be needed in other settings, and would add unnecessary costs and impervious cover. The objective is to evaluate each site individually and determine the most appropriate management techniques to reduce impacts to waterways.

5. *LID practices installed.* There are a variety of practices that can be used to maintain the pre-development hydrologic function of a site. For more detail on the following practices, see the references below:

-Bioretention areas or rain gardens are depressed areas in the landscape that collect and infiltrate stormwater.

-Vegetated swales can be used to convey runoff instead of the typical curb and gutter system, and they can also infiltrate and filter stormwater.

-Water harvesting techniques can be employed, so that stormwater can be a resource rather than a waste product.

-Pervious pavements allow rainfall to pass through them, and can be installed instead of traditional asphalt or concrete.

-Green roofs can reduce stormwater runoff through evaporation and transpiration through plants, and they also can help save on heating/cooling costs.

LID represents a change from typical design approaches. Proper installation and maintenance of LID practices is critical to their performance. Therefore, installation should be performed by someone with LID experience to avoid costly mistakes.

With proper design and installation, LID can provide multiple benefits including decreased construction costs, reduced impacts to receiving waters, increased habitat for wildlife, beautiful landscape features, and increased property values.

## References

- <sup>1</sup>Prince George's County, Maryland. 1999. Low-Impact Development Design Strategies: An Integrated Design Approach. MD Department of Environmental Resources, Programs and Planning Division.
- <sup>2</sup>CT DEP. 2004. Connecticut Stormwater Quality Manual. Department of Environmental Protection. 79 Elm St., Hartford CT. Available at Mansfield Town Hall, or online at [http://www.ct.gov/dep/cwp/view.asp?a=2721&q=325704&depNav\\_GID=1654](http://www.ct.gov/dep/cwp/view.asp?a=2721&q=325704&depNav_GID=1654)
- <sup>3</sup>US EPA. 2007. Reducing Stormwater Costs through Low Impact Development (LID), Strategies and Practices. EPA Publication number 841-F07-006.

## Low Impact Development (LID) Site Planning and Design Checklist

Items listed below need to be considered by developers when submitting plans for subdivisions. Due to individual site differences, not all items will apply to each individual property. Check items that have been applied, or explain why the items have not been used. For more information on LID practices and how to implement them please refer to the 2004 Connecticut Stormwater Quality Manual.

### 1. Assessment of Natural Resources

- Natural resources and constraints have been indicated and are identified on the plans (wetlands, rivers, streams, flood hazard zones, meadows, agricultural land, tree lines, slopes [identified with 2 foot contours], soil types, exposed ledge & stone walls.
- Is the property shown on the latest copy of CT DEP State and Federal Listed Species and Significant Natural Communities Map as listed in the Natural Diversity Data Base (NDDDB)? If so, provide a copy of the CT DEP NDDDB request form and CT DEP reply letter.
- Development is designed to avoid critical water courses, wetlands, and steep slopes.
- Soils suitable for septic & stormwater infiltration have been identified on plans.
- Soil infiltration rate/permeability has been measured and listed on plan:  
**See sheet#** \_\_\_\_\_
- Onsite soils have been assessed to determine suitability for stormwater infiltration.
- Natural existing drainage patterns have been delineated on the plan and are proposed to be preserved or impacts minimized.

*For items not checked, please use the space below to explain why that item was not appropriate or possible for your project, or any other pertinent information:*

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→ may not apply during permits

**2. Preservation of Open Space**

- Percent of natural open space calculation has been performed.  
Percent= \_\_\_\_\_
- An open space or cluster subdivision design has been used.
- Open space/common areas are delineated.
- Open space is retained in a natural condition.
- Reduced setbacks, frontages, and right-of-way widths have been used where practicable.
- For items not checked, please use the space below to explain why that item was not appropriate or possible for your project, or any other pertinent information:*

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**3. Minimization of Land Disturbance**

- The proposed building(s) is/are located where development can occur with the least environmental impact.
- Disturbance areas have been delineated to avoid unnecessary clearing or grading.
- Native vegetation outside the immediate construction areas remains undisturbed or will be restored.
- Plan includes detail on construction methods and sequencing to minimize compaction of natural and future stormwater areas.
- For items not checked, please use the space below to explain why that item was not appropriate or possible for your project, or any other pertinent information:*

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#### 4. Reduce and Disconnect Impervious Cover

- Impervious surfaces have been kept to the minimum extent practicable, using the following methods (check which methods were used):
  - Minimized road widths
  - Minimized driveway area
  - Minimized sidewalk area
  - Minimized cul-de-sacs
  - Minimized building footprint
  - Minimized parking lot area
- Impervious surfaces have been disconnected from the stormwater system, and directed to appropriate pervious areas, where practicable. Pervious areas may be LID practices, or uncompacted turf areas.

*For items not checked, please use the space below to explain why that item was not appropriate or possible for your project, or any other pertinent information:*

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#### 5. LID Practices Installed

- Sheet flow is used to the maximum extent possible to avoid concentrating runoff.
- Vegetated swales have been installed adjacent to driveways and/or roads in lieu of a curb and gutter stormwater collection system.
- Rooftop drainage is discharged to bioretention/rain gardens.
- Rooftop drainage is discharged to drywell or infiltration trench.
- Rain water harvesting methods such as rain barrels or cisterns have been installed to manage roof drainage.
- Driveway, roadway, and/or parking lot drainage is directed to bioretention/rain gardens.
- Cul-de-sacs include a landscaped bioretention island.
- Vegetated roof systems have been installed, if appropriate.
- Pervious pavements have been installed, if appropriate.

*For items not checked, please use the space below to explain why that item was not appropriate or possible for your project, or any other pertinent information:*

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# Developing A Sustainable Community

A Guide to Help Connecticut Communities Craft Plans and Regulations that Protect Water Quality



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Written by John Rozum, Connecticut NEMO Program, October 2009. Connecticut NEMO is an educational program of the University of Connecticut Center for Land Use Education and Research (CLEAR). Land, Sea and Space Grant, cooperating. This publication was funded, in part, by the CT DEP through an EPA Clean Water Act Section 319 Nonpoint Source Grant. CLEAR publication number 091215.1.

## Introduction

Many communities around Connecticut are interested in a more sustainable approach to development. Though there are many considerations, the protection of natural resources, particularly water resources, is a key component to attaining a more sustainable community. The specific practices you need to implement to protect these resources, and how you integrate them into your town's regulations, is challenging. It is often hard to know where to start.

This guide is meant as a way to take the information you have gotten from NEMO education and help you focus on where these practices can be integrated into your town's regulations. The guide is general in nature and we leave it to you, your town attorney and, ultimately, the public to decide on the standards for your community. The key is to start identifying areas of the regulations you would like to target.

## An approach to stormwater management: The Runoff Reduction Method

Water is the great integrator. It ties how we use the land to the quality and health of our town's aquatic resources. As your town's landscape moves from its natural land cover of trees and fields to a more developed land of parking lots and rooftops, the quality of your local streams and ponds become degraded. This is tied to the increased surface runoff from the impervious surfaces that are an integral part of the developed landscape.

How do you manage this increased runoff? The NEMO program suggests a three-step approach to managing stormwater. This approach is based on the work of stormwater professionals over several decades (CWP, 2008) and is called the Runoff Reduction Method. It focuses first on the site planning process and only secondarily on the use of best management practices:

1. *Site-Sensitive Design* – The first step in minimizing runoff is to reduce the impact of development on the natural landscape. Minimize soil disturbance and conserve or replace tree cover to the maximum extent possible. The pre-development landscape knows how to deal with precipitation and limits the amount of runoff generated. Protecting and preserving as much of that original landscape, therefore, means you will not have to deal with as much stormwater from the site.
2. *Runoff Reduction Practices* – Reducing the total quantity of stormwater runoff coming off a site, reduces the impacts of “peak flow” discharges on local streams and reduces the total amount of pollutants leaving the site. Simple practices, like disconnecting impervious surfaces from the stormwater drainage system by diverting runoff to open, pervious areas on the site, have huge benefits. Newer site design/stormwater management techniques, such as low impact development (LID), can also reduce total runoff significantly.

3. *Pollutant Removal Practices* – For runoff that does come off the site, a set of treatment practices should be designed to capture and treat pollutants. A number of engineered practices can be utilized, such as stormwater wetlands, gravel wetlands or wet ponds. LID practices also have a high degree of pollutant treatment. So emphasizing LID in your stormwater management strategy can give your town a real leg up in developing sustainable development practices.

## What needs to be changed?

Certainly changing regulations is important if you want to effect long-term change in your community. But that isn't necessarily the place to start...or finish. When looking to make changes in your community we suggest the below approach:

1. *Plan of Conservation and Development* – Your town's plan is the basis for all decision making in your town. Therefore it is a good idea to make sure that the sustainable goals you wish to achieve are articulated in the plan. By state statute the plan must be reviewed at least every 10 years, but this should not preclude changes to be made before the deadlines elapse. Make sure you get a copy of your town's plan and see what it says for natural resources, such as water. It could well be the specific goals are already articulated.

2. *Land use regulations* – The primary regulations you will review are the **zoning** and **sub-division** regulations. They provide the standards by which new development must abide. Your town may also have other ordinances that are important. For example, some communities have separate **road ordinances** or **stormwater management ordinances** that will be important in addressing water quality issues. Generally, any town regulation and/or ordinance that provides standards for development and the generation of impervious surfaces should be considered.

3. *Town Practices and Facilities* – Beyond the plan and regulations, how the town "does business" and maintains its facilities and infrastructure has an enormous impact on water and natural resource quality. Make sure you include key town departments in the discussion and incorporate their concerns into your planning and regulatory processes. Advocate for adequate funding for longterm maintenance. And encourage continuing education for all town staff so they can learn about new techniques and practices that protect water quality and public safety.

## Using this Guide

This guide outlines specific practices that will help protect water quality and natural resources. Each practice provides a brief description, specific recommendations, rationale and potential concerns. The specific regulation (i.e. zoning, subdivision) where the standards for this practice would be found is mentioned, though there can be variability between towns. Also, towns who have addressed this practice in their regulations will be listed. Example regulations for many towns can be found in the NEMO's Low Impact Development (LID) Regulation Database (<http://nemo.uconn.edu/tools/lidregs/>). This should help you get started to make these important changes in your community.

Good luck!

# Recommended Site Planning & Development Practices

## 1. Residential Streets and Parking

### Practice #1: Street Width

Design residential streets for the minimum required pavement width needed to support travel lanes, on-street parking, emergency services and maintenance access.

#### Rationale

Residential streets are often designed to be overly wide. This excessive width is one of the chief components of impervious cover in a new residential developments (Center for Watershed Protection, 1998). Encouraging the use of narrower streets can reduce total impervious cover in a development significantly, while promoting lower vehicular speeds and increased safety.

Many Connecticut towns have tied the width of residential streets to the amount of vehicular traffic generated by a development. The latest AASHTO standards for Local Roads and Streets of less than 400 average daily trips allow for a total minimum width of the traveled way of 20 feet and a shoulder width of 2 feet when the design speed is 50 mph or less (see Figure 1).

#### Recommendation

1. Reduce the minimum required street pavement width for new subdivision roads to follow the latest American Association of State Highway and Transportation Officials (AASHTO) standards for local roads (Figure 1). Road width should be related to the volume of traffic and traffic speed.

<b>Figure 1. Minimum width of traveled way (feet) for specified design volume (vehicles/day)</b>				
Design Speed (miles per hour)	Under 400	400 to 1500	1500 to 2000	Over 2000
15	18	20	20	22
20	18	20	22	24
25	18	20	22	24
30	18	20	22	24
40	18	20	22	24
45	20	22	22	24
50	20	22	22	24
55	22	22	24	24
60	22	22	24	24
Width of graded shoulder on each side of road (feet)				
All Speeds	2	5	6	8

From: *A Policy on Geometric Design of Highways and Streets*, 2004, by the American Association of State Highway and Transportation Officials, Washington, D.C.

2. New roads should include shoulders designed to AASHTO standards that are a minimum of 2 feet. Road shoulders will be designed to be able to support parked vehicles.

### **Things to Consider**

1. On-street parking may be an issue on roads less than 24 feet, particularly with emergency vehicles. Curbless road design with graded and supported shoulders could address this issue (see Practice #4).
2. Areas with steep slopes would need curb to protect downhill properties.
3. Lots with steep driveways may need area for on-street parking.
4. Transition areas between curbed/non-curbed roads need to be carefully designed to accommodate snow plowing.

### **Case Studies**

From the CT LID Regulation Inventory ([http://clear.uconn.edu/tools/lid\\_reg/](http://clear.uconn.edu/tools/lid_reg/) )

- East Haddam- Subdivision, Section 5.10 (Street Specifications)
- Tolland – LID Design Manual, Section II (Section II - Road and General Drainage Standards)

## Practice #2: Cul-de-Sacs

Minimize the number of residential cul-de-sacs and, where they do exist, incorporate landscaped areas to reduce impervious cover and encourage infiltration of stormwater runoff. The radius should be the minimum required to accommodate emergency/maintenance vehicles. Alternative turnarounds should be considered.

### Rationale

The most recent AASHTO (2004) guidelines include dimensions for traditional and alternative cul-de-sac designs for single-unit delivery trucks, that include landscaped islands. Landscaped islands designed for stormwater management can be used for snow storage, stormwater infiltration and treatment.

### Recommendation

1. Consider revising road standards to allow the use of alternative turnarounds and cul-de-sac design (see Figure 3 as example). In Connecticut the “tear drop” design was used in the Glen Brook Green subdivision in Waterford.



Figure 2. The “tear drop” cul-de-sac design used in the Glen Brook Green Subdivision

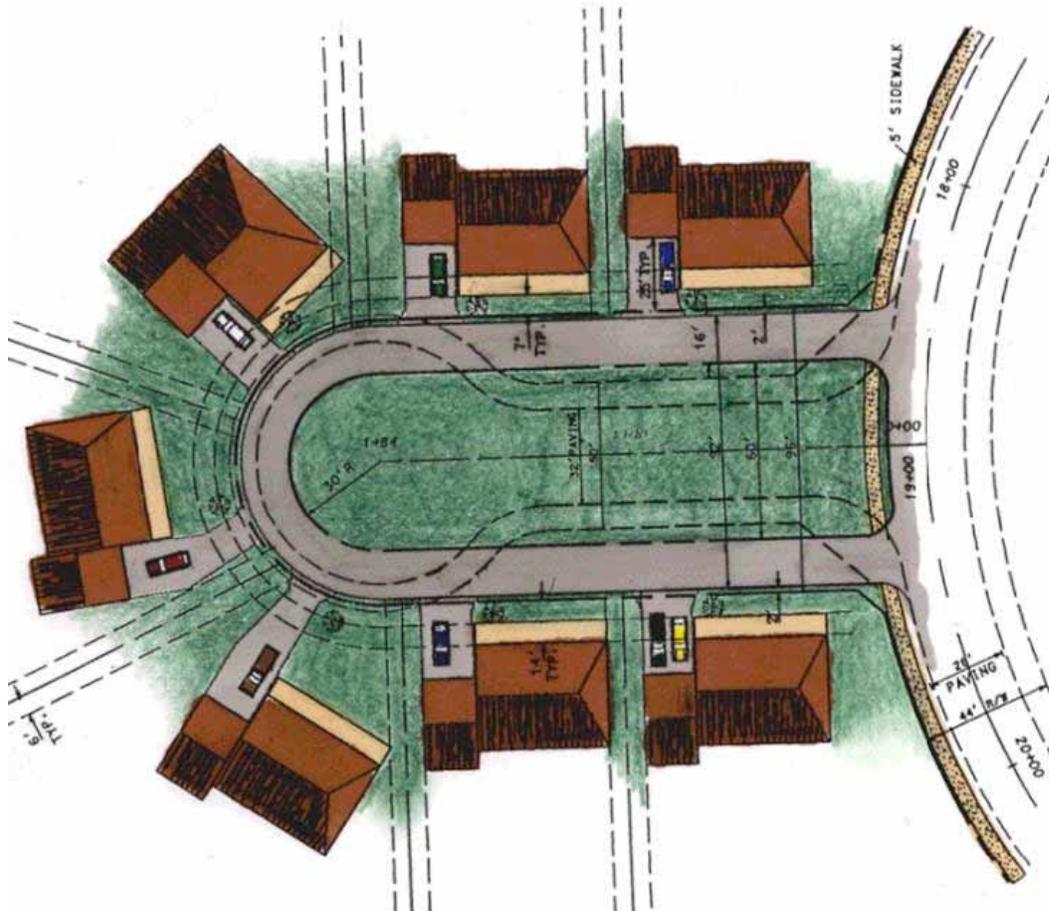


Figure 3. An alternative cul-de-sac design, termed a “loop de lane,” is designed to be a one way loop roads. A conventional cul-de-sac design is shown with dotted lines. Source: Center for Watershed Protection, 2000.

This design, with a vegetated center island that accepts stormwater, provides for the needs of both emergency services and public works. (See Figure 2)

2. The standards should emphasize the reduction in cul-de-sac width and installation of a “sunken” vegetated center island. Where feasible, stormwater management practices, such as bioretention, should be used in these areas. Design of bioretention areas, including sizing and planting, should follow the guidance of the 2004 CT Stormwater Quality Manual, as amended.

### **Things to Consider**

1. Placement of fire hydrants within the cul-de-sac is critical and should be specified within the road standards.
2. Responsibility for the care of the landscaped turnarounds should be clearly determined.

### **Case Studies**

From the CT LID Regulation Inventory ([http://clear.uconn.edu/tools/lid\\_reg/](http://clear.uconn.edu/tools/lid_reg/) )

- Tolland – LID Design Manual, Section II (I. Road Design)
- Jordan Cove Project, Waterford, CT (<http://jordancove.uconn.edu>)

### Practice #3: Road Drainage

Where density, topography, soil and slopes permit, vegetated swales should be used in the street right-of-way to convey and treat stormwater runoff, replacing curb and gutter drainage systems.

#### Rationale

Vegetated swales are beneficial for treatment of stormwater runoff. According to research, residential streets contribute higher loads of pollutants than any other source area (Bannerman, et al., 1993). Swales can reduce the pollutant loads from road runoff considerably, while reducing the quantity of stormwater by allowing infiltration into the ground. The use of a water quality swale design that encourages infiltration of runoff into the ground would also reduce the number and size of detention basins.

Swales can also save money, both during development through the avoidance of costly infrastructure and during long-term maintenance that no longer requires expensive equipment for sediment removal from storm drains.

#### Recommendation

1. Change the town's subdivision and/or road standards to allow the use of vegetated swales where practical.
2. The design of these swales should be of a level to include primary stormwater quality treatment, and should follow the standards set forth for water quality swales in the 2004 CT Stormwater Quality Manual (see Figure 4).

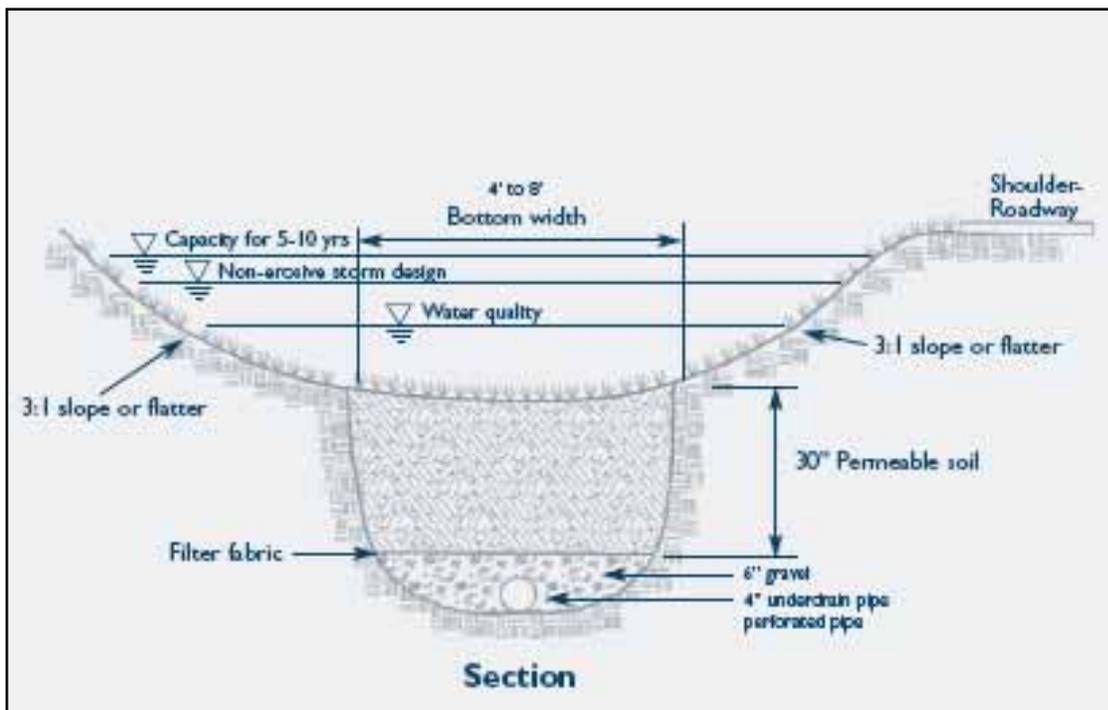


Figure 4. Cross-section of a dry water quality swale from the 2004 CT Stormwater Quality Manual.

#### Things to Consider

1. Design of the roadway/shoulder interface should limit the likelihood of vegetation creating a "grassed curb" that will inhibit roadway drainage from entering the swale. Proper roadside pitch or the use of a gravel diaphragm should be used.

2. A determination should be made of how much “credit” a design engineer can get in terms of reduced detention requirements when they incorporate these LID practices.

### Case Studies

From the CT LID Regulation Inventory ([http://clear.uconn.edu/tools/lid\\_reg/](http://clear.uconn.edu/tools/lid_reg/))

- East Haddam- Subdivision, Section 5.10 (Street Specifications)
- Tolland – LID Design Manual, Section II (Section II - Road and General Drainage Standards)



*Figure 5. Road swale in a subdivision in Old Saybrook, CT*

## **Practice #4: Parking Ratios/ Parking Lot Size**

Required parking ratios governing a particular land use or activity should be enforced as both a maximum and a minimum in order to curb excess parking construction. Existing regulations should be reviewed for conformance with local/regional standards. Further, reduce the overall imperviousness associated with parking lots by minimizing stall dimensions and incorporating efficient parking lanes.

### **Rationale**

Parking is by far the largest component of impervious coverage in commercial and industrial land uses. Designing parking lots to their peak efficiency will, therefore, both satisfy the parking needs of the given land use, while minimizing the impact of the resulting impervious surface on water resources.

A recent study, “Model Zoning Regulations for Parking for Northwestern Connecticut” (Fitzgerald & Halliday, 2003), has provided specific recommendations and standards based on a parking utilization study of 20 towns in northwestern Connecticut. This study found that parking in that region was considerably overbuilt with utilization rates below 50%. Given that parking lots contribute significantly to the impervious cover of a region, matching parking ratios to actual usage would lower the impacts of these land uses on water quality and quantity.

### **Recommendation**

1. Review and revise the zoning requirements based on the locally derived parking ratios.
2. The review of parking ratios should consider including both minimum and maximum parking standards for each land use.
3. Consider a review of drive-up window standards to assure that the designed queue length is not overly long.
4. Review the parking requirements and standards in the zoning regulations. The Northwestern CT parking study has specific recommendations for parking layouts that recommend the use of angled parking with narrower aisle widths.

### **Case Studies**

From the CT LID Regulation Inventory ([http://clear.uconn.edu/tools/lid\\_reg/](http://clear.uconn.edu/tools/lid_reg/) )

- East Haddam- Zoning Regulations, Section 11 (Parking)
- Enfield Zoning Regulation, Section 10.10.6 (Parking Design, Layout, and Location)
- Tolland – LID Design Manual, Section II (Section II - Road and General Drainage Standards)
- Model Zoning Regulations for Parking for Northwestern CT (available at [http://nemo.uconn.edu/tools/stormwater/parking\\_lots.htm](http://nemo.uconn.edu/tools/stormwater/parking_lots.htm))

## **Practice #5: Parking Lot Runoff/Alternative Surfaces**

Wherever possible, provide stormwater treatment for parking lot runoff using bioretention areas, filter strips and/or other practices that can be integrated into required landscaping areas and traffic islands

### **Rationale**

Research has found that parking lots contribute high levels of contaminants in runoff and produce high quantities of runoff. Stormwater treatment in landscaped areas can reduce the impacts of these water quality and quantity impairments on local water resources, without significantly affecting the cost of construction. Pervious pavements can reduce the overall volume of stormwater runoff, while preserving valuable land area on the site.

### **Recommendation**

1. Applicable sections of the zoning regulations should set standards for landscaping that ensure that landscape islands or areas are either at-grade or below-grade, to accept parking lot runoff, using stormwater practices such as bioretention, swales and sand filters.
2. Pervious pavements materials have been used in several projects in Connecticut. The continued use of these products in primary and overflow parking areas should be encouraged. The Northwestern CT parking study has developed code language to encourage pervious pavement materials for parking areas.
3. The Northwestern Connecticut parking study (Fitzgerald & Halliday, 2003) provided code language on stormwater management and landscaping for parking lots.

### **Case Studies:**

From the CT LID Regulation Inventory ([http://clear.uconn.edu/tools/lid\\_reg/](http://clear.uconn.edu/tools/lid_reg/) )

- East Haddam Zoning Regulations, Section 11.8.c (Landscaping Standards for Parking Lots Stormwater Management)
- Deep River Zoning Regulations, Section 11.12 Stormwater Management in Parking Lots
- Northwestern CT Parking Study (available at [http://nemo.uconn.edu/tools/stormwater/parking\\_lots.htm](http://nemo.uconn.edu/tools/stormwater/parking_lots.htm))



*Figure 6. Bioretention practices used to accept and treat stormwater from parking areas in Portland, Oregon (left) and Evergreen Walk Mall in Manchester, CT (Right).*



*Figure 7. Overflow lot at L&M Hospital out-patient facility in Old Saybrook.*



*Figure 8. A porous asphalt parking lot at the University of Connecticut. This 106 car lot significantly reduces runoff that would come off a traditional asphalt lot.*



*Figure 9. A bioretention area at the Waterford Town Hall parking lot. Simple landscaping practices such as these can treat parking lot runoff while reducing stormwater volume leaving the site.*

## 2. Lot Development Practices

### Practice #6: Conservation Subdivision Design

Encourage development designs that minimize total impervious area, reduce total construction costs, conserve natural areas, provide community recreational space and promote watershed protection.

#### Rationale

Conservation subdivisions provide a key way to protect natural resources while still providing land owners the ability to use the development potential of their lands. These subdivisions have been in wide usage in Connecticut and have been found to be beneficial to both developers and the environment. To be effective, however, the regulations need to be carefully crafted to ensure that the full benefit of this technique is realized. In particular, allowing conservation subdivisions “by right” and/or allowing the commissions the ability to decide the type of subdivision (conservation vs traditional) will greatly expand the usage of these subdivisions.

#### Recommendation

1. Clearly define a conservation design process that identifies and preserves key natural or cultural resources on the property through the use of a site inventory.

2. A review of the mathematical process for the determination of lots needs to be done to assure that the number of lots approved for cluster subdivision does not exceed the traditional subdivision allowance. A lot yield plan should be equitable for both types of development.

3. Include a goal of reducing the amount of impervious surface and protecting water resources in the purpose section of your regulations.

4. Potentially include both minimum and maximum lot sizes in the cluster subdivision regulations.

5. Flag lots are often allowed in cluster subdivision, but can reduce the value of these designs. Flag lots should be used only where they would minimize the impact on the overall open space.

6. Be clear in your regulation when the conservation design process will and will not be used. Determine who makes this choice, the commission or the applicant.

#### Things to Consider

1. The ownership responsibilities of the resulting open space needs to be carefully considered, and any town acceptance should be tied to the town’s open space plan.

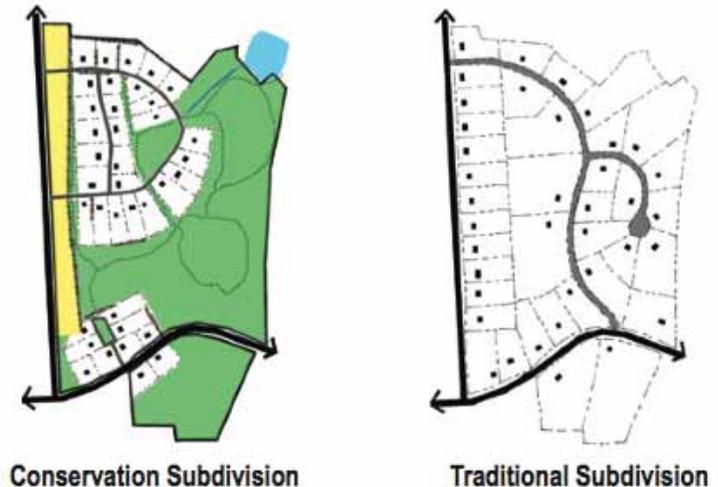


Figure 10. Conservation subdivision design conserves open lands and protects natural resources. Drawing by Green Valley Institute, UConn

2. Lots can be cluster only insofar as the land can accept the increased density. In areas without public sewer and water, this means that adequate area exists for both on-site utilities, or the development of a community system.

### **Resources and Case Studies**

To find out more about the conservation subdivision design process, refer to Randall Arendt's series on conservation design:

Arendt, Randall. 1996. Conservation Design for Subdivisions: A practical guide to creating open space networks. Island Press. 184pp

Arendt, Randall. 1999. Growing Greener: putting conservation into local plans and ordinances. Island Press. 236pp

Many towns in Connecticut are using a modified conservation subdivision design process. Below are a few who have taken different approaches to the process:

- Haddam – any subdivision over 5 lots must be a conservation subdivision.  
<http://www.haddam.org/landuse/zon%204.pdf>
- East Haddam – any subdivision over 4 lots must submit both a preliminary traditional and conservation design for an informal review. The commission can then choose which design the applicant should pursue.
- Woodstock – only conservation subdivisions permitted as of right; no legal challenge to date.  
<http://www.townofwoodstock.com/Portals/0/Docs/Woodstock%20Zoning%20Regs%20Effective%2008-17-2007.pdf> see pg. 43
- Ledyard can choose to mandate cluster subdivisions depending on the circumstances.
- Mansfield retains a right to require a cluster subdivision but each submission is reviewed on a case by case basis.
- South Windsor mandates cluster subdivisions if the property to be subdivided is shown in one of the town's master plans as desired for conservation/preservation.
- Farmington mandates cluster if the property contains certain natural or man-made resources found on a list contained in our regulations.  
<http://www.farmington-ct.org/downloads/Zoning%20Regulations.pdf> see pg 71
- Somers adopted an Open Space Subdivision Zoning and Subdivision Regulation that allows open space subdivisions as of right. The Planning Commission determines whether the applicant should revert back to conventional subdivision if there are mitigating circumstances. The application is a regular subdivision application, no Special Permits.

## Practice #7: Setbacks and Frontages

Relax side yard setbacks and allow narrower frontages to reduce total road length in the community and overall site imperviousness. Relax front setback requirements to minimize driveway lengths and reduce lot imperviousness.

### Rationale

Lot dimension and size are set by the zoning regulations and can have a profound effect on the design of subdivisions and the amount of impervious surface. Minimum setbacks and frontages can increase impervious cover by dictating how far houses are from the street thus determining driveway length, or by dictating lot width thus determining the length of road needed to serve the lot. Smaller setbacks and frontage distances can reduce the overall imperviousness of a site and provide more flexibility to site designers.

### Recommendations

1. Review existing zones to see if frontages and setbacks can be relaxed. All reviews must consider the importance of including some on-site parking.
2. The zoning regulations that govern development in historic village areas need revisions to encourage infill in the historic areas. The town should consider a flexible setback/frontage regulation that focuses on matching the existing lot dimensions of the area.

### Things to Consider

1. Adequate room must be provided on each lot for on-site parking

### Case Studies

Connecticut Village District Zoning - adopted by the Connecticut General Assembly in 1998, this zoning tool allows you to develop flexible setback and frontage requirements for designated zones. Village Districts are specifically designed for "historic" areas and have many other design-based standards, however, the concepts used for dimensional lot requirements could be applied to other zones in your town.

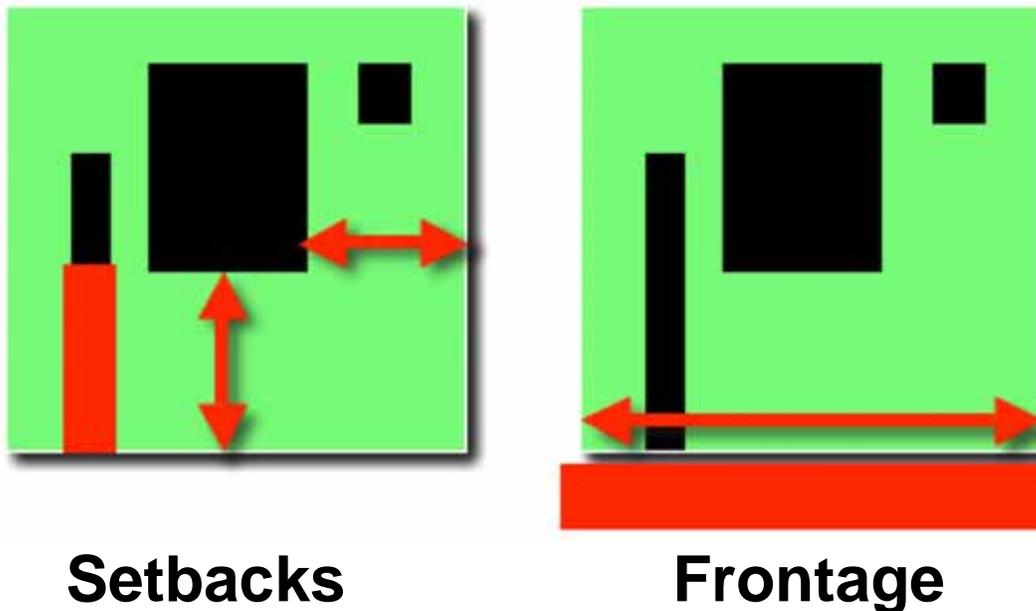


Figure 11. Diagram showing the setback and frontages of a typical house lot.

**Practice #8: Sidewalks**

Promote more flexible design standards for residential sidewalks on only one side of the street and provide common walkways linking pedestrian areas.

**Rationale**

Sidewalks are a necessary component of a residential area, tying residents to critical cultural centers and reducing dependence on automobiles. Sidewalks are, however, a component of the impervious budget of a development so have a clear sidewalk plan that eliminates isolated and duplicative walkways is important to reducing the overall imperviousness of a site.

**Recommendation**

1. Consider creating or revising a sidewalk master plan . Ensure connectivity of pedestrian pathways and avoid the creation of isolated, unnecessary sidewalks.
2. Separate pedestrian pathways (paved or non-paved) from established road ROW should be encouraged where feasible as an alternative to sidewalks
3. Encourage the use of pervious pavement where practical, or divert sheet flow from sidewalks to pervious areas.

## Practice #9: Driveways

Reduce overall lot imperviousness by promoting alternative driveway surfaces and shared driveways that connect two or more homes together.

### Rationale

Studies by the Center for Watershed Protection (1998) have shown that 20% of the impervious cover in residential subdivisions can consist of driveways. Flexibility in the codes allow site designers the ability to address this concern while minimizing impervious surfaces.

### Recommendation

1. Allow for the use of shared parking as an option, particularly in areas where reducing impervious cover is a concern.
2. Allow for the installation of pervious pavements that are appropriately constructed to support delivery and emergency vehicles.

### Things to Consider

1. Driveways need to provide emergency vehicle access to homesites
2. Many driveways have slopes greater than 10% which could be a challenge to the proper function of pervious pavements. The performance of pervious pavements in these conditions should be demonstrated.
3. The long-term maintenance of shared driveways need to be considered and included in the property documents of the homeowners in order to avoid neighbor-to-neighbor conflicts.



*Figure 12. Unilock paver driveway in Middletown, CT. The space between the pavers allows water to infiltrate to a stone base that allows the storage and infiltration of water.*



*Figure 13. A two track driveway design, once common in early residential development, reduces the total imperviousness of the drive, while preserving the function.*

## Practice #10: Roof Runoff

Direct roof runoff to pervious areas such as yards, open channels or vegetated areas and avoid routing rooftop runoff to the roadway and the stormwater conveyance system.

### Rationale

Rooftop runoff contributes significantly to the quantity of stormwater leaving a site. Bioretention areas, infiltration practices and rain barrels installed on individual lots can reduce the annual volume from residential development by up to 50%.

### Recommendation

1. Where practical and feasible, require that drainage of rooftop runoff be directed into rain gardens or a suitable designed and landscaped area on the property.
2. Encourage the use of on-lot stormwater treatment practices such as bioretention areas and rain gardens, vegetated swales, infiltration practices and rain barrels or cisterns.

### Things to Consider

1. Developers and engineers should be referred to the 2004 Connecticut Stormwater Quality Manual for design specifications.
2. Management responsibility and management schedules for these on-lot stormwater practices should be included with the approved plans.



*Figure 14. Use of a rain garden, or bioretention basin, to accept roof runoff from two homes in the Glen Brook Green subdivision in Waterford. Other techniques include the use of rain barrels and cisterns for water storage and use for landscape watering.*

## **Practice # 11: Stormwater Management Plans**

As a minimum, a stormwater management plan (SMP) should be required for sites that have disturbance equal to or greater than 1 acre, as proposed by the CT Stormwater Quality Manual. The purpose of the plan is to identify potential water quality and quantity impacts of the proposed development, and to propose selected source controls and treatment practices to mitigate against those impacts.

### **Rationale:**

Stormwater contains pollutants that have detrimental effects on ecological processes and coastal habitats. In order to preserve these habitats and processes, new development and redevelopment must delineate a specific plan on how water resources will be protected from the deleterious effects of stormwater in both the short- and long-term.

### **Recommendation:**

1. The regulations, particularly subdivision and uses requiring a site plan or a erosion and sedimentation plan, should lower the threshold of land disturbance for triggering a SMP to 0.5 acres.
2. SMPs should also be required for: greater than 5 residential units, residential development involving the construction or reconstruction of a road, stormwater discharges to wetlands/watercourses or less than 500-feet from a tidal wetlands, and land uses with a potential for higher pollutant loadings such as industrial or certain commercial uses.
3. The SMP should follow the goals, criteria and suggested content found in the 2004 Connecticut Stormwater Manual.
4. The SMP can be enacted by inclusion in subdivision and zoning, or by enacting a separate stormwater ordinance. Regardless, the SMP should be prepared by a licensed civil engineer.

### **Case Studies:**

From the CT LID Regulation Inventory ([http://clear.uconn.edu/tools/lid\\_reg/](http://clear.uconn.edu/tools/lid_reg/) )

- East Haddam Zoning Regulations, Section 11.8 (Stormwater Management)
- Guilford Zoning Regulations, Section 273-75 F.3
- Torrington Subdivision Regulations, Section 7.0 (Stormwater Management)

### 3. Conservation of Natural Areas

#### Practice # 12: Buffer Systems and Management

Create a naturally vegetated buffer system along all water resources that also encompasses critical environmental features such as the 100-year floodplain, steep slopes and wetlands. The riparian stream buffer should be preserved or restored with native vegetation. The buffer system should be maintained through the plan review, delineation, construction and post-development stages.

#### Rationale:

Riparian buffers provide a number of ecological, water quality and economic benefits, including:

1. Filter sediments, nutrients, pesticides and other pollutants in runoff.
2. Provide for infiltration of stormwater runoff.
3. Reduce erosion and stabilized both the stream banks and bed.
4. Provide flood control.
5. Increase property values.
6. Provide shade, which helps keep summer water temperatures cool. This is of importance to a number of native fish and other aquatic species.
7. Provide food and habitat for a number of terrestrial and aquatic life.
8. Protect quality of drinking water supplies.
9. Helps maintain stream flows in summer.
10. Provide linear natural areas which provide valuable habitat for mammals, reptiles, amphibians and birds.
11. Support recreation and tourism industries by providing pleasant areas to fish and enjoy streams.
12. Allow for future restoration of stream banks.

To be truly effective buffer management must be more than a physical setback line. Effective management will provide strategies that help to maintain a healthy riparian ecosystem, and allow for good communication between land owners, developers and the town commissions and staff.

#### Recommendation:

A study of the town's riparian and coastal buffers should be conducted by the town's environmental staff or a consultant. The study should detail the existing condition of these buffer systems and will make recommendations on how to protect and/or restore these systems.

#### References and Case Studies:

To learn the status of riparian buffers in your town or local watersheds, visit NEMO's Habitat website tools (<http://nemo.uconn.edu/tools/>)

Eightmile River Watershed Buffer Recommendations (<http://www.eightmileriver.org>)

### **Practice # 13: Clearing and Grading**

Clearing and grading of forests and native vegetation at a site should be limited to the minimum amount needed to build lots, allow access, and provide fire protection.

#### **Rationale:**

Conservation of natural areas and existing hydrology within a development site through site fingerprinting and LID techniques can reduce erosion and sedimentation as well as clearing and grading costs, while maintaining natural features of the site and protecting environmentally sensitive areas. LID integrates site ecological and environmental goals and requirements into all phases of planning and design from the individual residential lot level to the entire watershed. LID is based on maintaining or restoring the hydrologic integrity and functions of each site using small-scale source controls that are designed to address specific water quality objectives.

#### **Recommendation:**

- 1.Ensure that clearing, grading and tree preservation requirements are delineated both on project plans and in the field.
- 2.The cluster/conservation subdivision regulations should be reviewed to ensure they protect natural areas and to the extent practical promote “site fingerprinting.” All subdivisions should first clearly identify environmentally sensitive areas (wetlands, streams, steep slopes) and second confine ground disturbance to areas where structures, roads, rights-of way and other infrastructure will be completed.
- 3.Low impact development (LID) techniques (as discussed earlier) should be encouraged within the building envelope so as to minimize additional clearing or grading.

## **Practice # 14: Tree Conservation & Use of Native Plants**

Conserve trees and other vegetation at each development by protecting trees and other vegetation during construction and by planting additional vegetation, clustering tree areas, minimizing native vegetation disturbance, and promoting the use of native plants.

### **Rationale:**

Trees and native grasses help to mitigate the effects of urban runoff, air pollution and noise. Native trees, shrubs and grasses generally are better adapted to Connecticut's climate than non-native species and do not have a deleterious effect on the environment. This can, in turn, provide direct economic benefits to developers and homeowners by reducing runoff and keeping houses cool in the summer.

### **Recommendation:**

1. Review all pertinent sections of the regulations that require landscaping and require the use of native tree and shrub species as outlined in the CT DEP Stormwater Quality Manual or from urban forestry experts.
2. Provide an invasive species plant list to homeowners and developers to discourage the use of invasive plant and/or non-native species in landscape design. The list should be in compliance with the Connecticut Invasive Plant Working Groups amended list of invasive plants.
3. Ensure that your regulations provide guidance on the protection of specimen trees. Contact the UConn or DEP Urban Forestry programs for further information.

### **Case Study:**

Torrington, Subdivision Regulations, Sections 5.6 (Street Trees) and 5.7 (Preservation of Natural Features) ([http://clear.uconn.edu/tools/lid\\_reg/](http://clear.uconn.edu/tools/lid_reg/))

## Regulation Checklist

Use the table below to assess your town regulations compliance with the proceeding practices. If the practice exists in your regulations, note the section number. If not, note where it could be inserted and make any comments you feel with help to improve your town's regulations.

Practice #	Practice Description	How Regulated*	Addressed?/ Reference	Comments
1	Street Width	Subdivision or Street Ordinance		
2	Cul-de-Sacs	Subdivision or Street Ordinance		
3	Road Drainage	Subdivision or Street Ordinance		
4	Parking	Zoning		
5	Parking Runoff	Zoning		
6	Conservation Subdivision	Zoning and Subdivision		
7	Setbacks/Frontages	Zoning		
8	Sidewalks	Subdivision		
9	Driveways	Subdivision		
10	Roof Runoff	Subdivision or Stormwater Ordinance		
11	Stormwater Management Plans	Subdivision or Stormwater Ordinance		
12	Buffer Systems	Zoning and Subdivision		
13	Clearing and Grading	Zoning and Subdivision		
14	Tree Conservation	Zoning and Subdivision		

\*Regulations vary from town-to-town, so some of the practices may be addressed in other sections of your regulations or in separate ordinances.

## References and Further Reading

- American Association of State Highway and Transportation Officials (AASHTO). A Policy on Geometric Design of Highways and Streets, Washington, D.C., 2004
- Arnold, C. and C.J. Gibbons. 1996. Impervious Surface: The Emergence of a Key Environmental Indicator. Journal of the American Planning Association,
- Bannerman, et al. 1993. Sources of Pollutants in Wisconsin Stormwater. Water Science Technology, 28(3-5): 241-259.
- Center for Watershed Protection. Technical Memorandum: The Runoff Reduction Method. Ellicott City, MD. 2008
- Center for Watershed Protection. Impacts of Impervious Cover on Aquatic Systems. Ellicott City, MD. 2003.
- Center for Watershed Protection. Better Site Design: A Handbook for Changing Development Rules in Your Community. Ellicott City, MD. 1998.
- Connecticut Department of Environmental Protection. Connecticut Stormwater Quality Manual. Hartford, CT. 2004
- Fitzgerald & Halliday, Inc. Model Zoning Regulations for Parking for Northwestern Connecticut. Northwestern Connecticut Council of Governments and Litchfield Hills Council of Elected Officials. 2003. *(available on the Planning for Stormwater website, below, or the Fitzgerald & Halliday website).*
- Nonpoint Education for Municipal Officials (NEMO). Addressing Imperviousness in Plans, Site Design and Land Use Regulations. 1998

## Websites

- Planning for Stormwater (<http://nemo.uconn.edu/tools/stormwater/>)
- Connecticut LID Inventory (<http://nemo.uconn.edu/tools/lid>)
- Connecticut LID Regulations Inventory ([http://nemo.uconn.edu/tools/lid\\_regs](http://nemo.uconn.edu/tools/lid_regs))
- Connecticut Habitat Tools: (<http://nemo.uconn.edu/tools/habitat/>)
- Jordan Cove Website (<http://jordancove.uconn.edu>)
- Center for Watershed Protection (<http://www.cwp.org>)

