

Town of Wappinger

Recommended Model Development Principles for Conservation of Natural Resources in the Hudson River Estuary Watershed

Consensus of the Local Site Planning Roundtable



A partnership among:
Town of Wappinger, Dutchess County, New York
Dutchess County Environmental Management Council
Wappinger Creek Watershed Intermunicipal Council
NYSDEC Hudson River Estuary Program
Center for Watershed Protection, Maryland



June 2006

Table of Contents

Acknowledgements.....	2
Executive Summary and Highlights	3
Introduction.....	5
Membership Statement of Support	8
Recommended Model Development Principles.....	9
Residential Streets, Parking and Lot Development	9
Principle #1: Street Width.....	9
Principle #2: Street Length	10
Principle #3: Right-of-Way Width.....	11
Principle #4: Cul-de-sacs	12
Principle #5: Vegetated Open Channels	14
Principle #6: Parking Ratios	15
Principle #7: Parking Codes.....	15
Principle #8: Parking Lot Size	16
Principle #9: Structured Parking.....	17
Principle #10: Parking Lot Runoff.....	17
Principle #11: Open Space Design	18
Principle #12: Setbacks and Frontages	19
Principle #13: Sidewalks.....	19
Principle #14: Driveways.....	20
Principle #15: Open Space Management.....	20
Principle #16: Rooftop Runoff.....	21
Conservation of Natural Areas	22
Principle #17: Buffer Systems	22
Principle #18: Buffer Management.....	24
Principle #19: Clearing and Grading	24
Principle #20: Tree Conservation	26
Principle #21: Conservation Incentives	27
Principle #22: Stormwater Outfalls	28
Appendix 1 – Model Shared Parking Agreements	31
Appendix 2 – Model Shared Driveway Agreement.....	35
Appendix 3 – Conservation Incentives	36
Appendix 4 – Plant Lists.....	39
Appendix 5 – Town of Mamaroneck Chapter 207, Trees	47
References.....	51

Cover photos: Dutchess County EMC: Wappingers Lake
Center for Watershed Protection: Rain garden, residential subdivision

Acknowledgements

The Town of Wappinger Site Planning Roundtable would not have been possible without the time and effort spent by the roundtable members and the generous support of the New York State Department of Environmental Conservation's Hudson River Estuary Program and the Dutchess County Environmental Management Council.

We would also like to thank the Town of Wappinger, the Dutchess County Department of Public Works, the Dutchess County Department of Planning and Development, and the Center for Watershed Protection (CWP) for their partnership and assistance in this Site Planning Roundtable. Special thanks to Central Hudson for providing the funding for a meeting space, materials and catering services for the initial presentation of CWP recommendations and principles at the Site Designing for Natural Resources Workshop on April 15, 2005.

Staff for the project included Barbara Kendall of the NYSDEC's Hudson River Estuary Program, David Burns, Dave Foord, Vicky Buono of the Dutchess County Environmental Management Council, and Sky Shook, intern from the Student Conservation Association.

Copies of this document are available from:

New York State Department of Environmental Conservation
Hudson River Estuary Program
21 South Putt Corners Road
New Paltz, New York 12561 Phone: 845-256-3016
email: hrep@gw.dec.state.ny.us
website: <http://www.dec.state.ny.us/website/hudson/hrep.html>

Contacts for additional information:

Town of Wappinger:
Joseph Ruggiero, Supervisor
Town of Wappinger
20 Middlebush Rd.
Wappingers Falls, NY 12590
845-297-2744

New York State implementation of Better Site Design and the Stormwater Phase II program:
Barbara Kendall, Stormwater Outreach Specialist
New York State Department of Environmental Conservation
Hudson River Estuary Program
21 South Putt Corners Road
New Paltz, NY 12561
845-256-3163

Wappinger Creek Watershed Intermunicipal Council:
Eileen Sassman, Chair
10 Clinton Street
Wappingers Falls, NY 12590
Eileen@leverageinc.biz

Dutchess County environmental programs:
David Foord, Interim Environmental Program Leader
Cornell Cooperative Extension Dutchess County
2715 Route 44, Suite 2
Millbrook, NY 12545 dmf44@cornell.edu

Better Site Design publications and information:
Center for Watershed Protection
8390 Main St., 2nd Floor
Ellicott City, MD 21043
410-461-8324 <http://www.cwp.org/>

Executive Summary and Highlights

Executive Summary

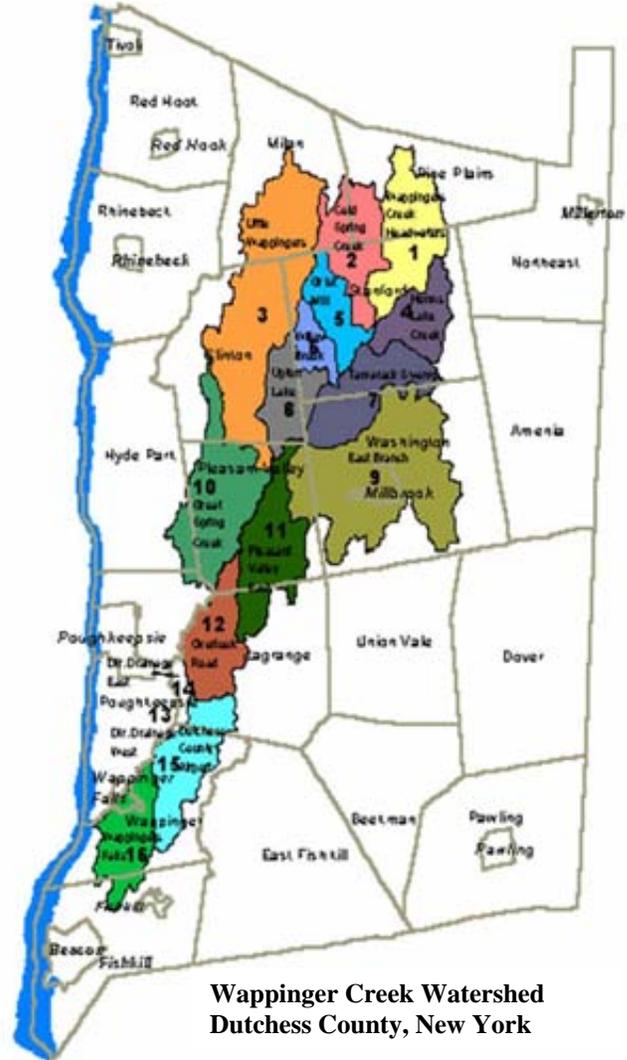
This document, a product of the Town of Wappinger Site Planning Roundtable, is the result of a year-long consensus process initiated by the Wappinger Creek Watershed Intermunicipal Council. The purpose of the project was to review existing development codes and identify regulatory barriers to environmentally sensitive residential and commercial development at the site level within the bounds of the Wappinger Creek Watershed. A cross-section of local government, non-profit, environmental, business, and community professionals formed the membership of the Roundtable. Through a consensus process, members of the Roundtable adapted 21 out of 22 Better Site Design Principles to meet the needs and current conditions within the Town of Wappinger. Roundtable recommendations include specific code and ordinance revisions for 20 of the Principles that would increase flexibility in site design standards and support the implementation of environmentally beneficial practices in accordance with the Town's current zoning, subdivision and wetland laws.

The 21 Better Site Design Principles adapted by the Town of Wappinger Site Planning Roundtable

are designed to meet the following objectives:

- (1) reduce overall site impervious cover;
- (2) preserve and enhance existing natural areas;
- (3) integrate stormwater management, and
- (4) retain a marketable product.

Code modifications and other Roundtable recommendations for 20 of the Principles were crafted to provide flexibility, support, and guidance for developers implementing Better Site Design. The Roundtable process focused on model development principles that were deemed pertinent to local conditions. While the recommendations in this document generally address new development, the Roundtable recommends that in the future the Town of Wappinger also consider incentives to encourage retrofits that incorporate the Better Site Design Principles in previously developed areas.



Highlights

Streets, Parking and Lot Development

- Discourages creation of excess impervious surface by reducing minimum required street pavement width of low-volume local roads to 20 feet using the American Association of State Highway and Transportation Officials (AASHTO) guidelines.
- Encourages efficient street and driveway layouts to reduce impervious surfaces.
- Discourages cul-de-sacs by requiring developers to demonstrate that there is no alternative to a cul-de-sac design. Where used, cul-de-sacs should incorporate center landscaped islands and stormwater management practices.
- Encourages use of vegetated swales by allowing swales as an alternative to enclosed stormwater drainage pipe.
- Promotes review and revision of current parking ratios and use of pervious materials for overflow parking.
- Encourages shared parking to reduce parking lot size and includes references for development of shared parking language.
- Encourages use of stormwater management practices in parking areas by removing the requirement that landscaping be constructed in raised landscaped islands.
- Supports more flexible design standards for sidewalks and driveways by recommending formation of a committee to review local codes and to propose amendments.
- Encourages use of shared driveways to reduce overall lot imperviousness by promoting the newly adopted Section 240-20 of the zoning law, *Required Street Frontage* and suggesting use of a Model Shared Driveway Agreement.
- Recommends better management of open space by clearly defining allowable and unallowable uses of open space in the zoning law and better defined standards for Homeowner Associations.
- Encourages on-lot stormwater treatment to reduce and infiltrate runoff.

Conservation of Natural Areas

- Supports protection of vegetated stream and wetland buffers by adding delineation and flagging of buffers to the requirements for site plan and subdivision applications.
- Recommends funding for education to local boards and the public on the newly adopted Wappinger Code Chapter 137 (Wetlands) and the importance of forested buffers for water resource protection.
- To minimize impacts of clearing and grading, recommends the adoption of a comprehensive stormwater and erosion and sediment control ordinance and use of site fingerprinting techniques.
- Promotes conservation of trees and other vegetation by recommending adoption of local code language to require re-vegetation and management of tree cutting. In addition, the definition of clear-cutting in the Wappinger Code Chapter 137 (Wetlands) should be clarified. Lists of native plants and invasive species should be provided to homeowners and developers.
- Promotes the use of conservation and open space subdivisions by allowing for review and approval of open space design through normal Planning Board procedures without additional approval required by the Town Board.
- Promotes conservation incentives through the use of stormwater credits and reduced assessments for forest and wetland property.
- Complies with the requirements for regulated Municipal Separate Storm Sewer (MS4) communities by recommending the adoption of the New York State Sample Local Law for Stormwater Management and Erosion & Sediment Control.

Introduction

Purpose

This document presents specific recommendations on how to foster more environmentally sensitive local site design within the Town of Wappinger. The recommendations were crafted in conjunction with community residents representing a wide variety of local interests, both public and private, that participated in the Site Planning Roundtable initiated by the Wappinger Creek Watershed Intermunicipal Council (WIC).

Background

Every year, more than 2 million acres of land are altered as a result of development in the United States, leading to degradation in water quality and biological integrity (NRCS, 2001). The impacts of watershed urbanization on the water quality, biology, and physical conditions of aquatic systems have been well documented (CWP, 2003). The development radius around many of our cities and smaller municipalities continues to widen at a rapid rate, far outpacing the rise in population (Leinberger, 1995). These effects are especially pronounced in coastal communities associated with river estuaries such as the Hudson. In the New York City metropolitan region, population grew only 8 percent between 1970 and 1990, while urban land area increased by 65 percent (Beach, 2002). As a result, local codes and ordinances that promote reduced impact of development on local water resources are critical to future sustainability of the Hudson River Estuary and its tributaries such as the Wappinger Creek.

Protecting water resources and landscape character under a continued growth scenario requires local governments, developers, and site designers to fundamentally change the way that land is developed. Deciding where to allow or encourage development, promote redevelopment, and protect natural resources are difficult issues that jurisdictions have to balance. While effective zoning and comprehensive planning are critical, communities should also explore measures to minimize the impact of impervious cover, maintain natural hydrology, and preserve contiguous open space on sites where development is to occur.

Toward this end, the Wappinger Creek Watershed Intermunicipal Council (WIC) established a set of goals including the following: *“With the active assistance of the development community, we will each review our municipal codes for inconsistencies and regulations that induce sprawl; and promote low impact development and green site designs to minimize the creation of new impervious surfaces by 2006.”* Using grant funds from the NYSDEC Hudson River Estuary Program and support from the Dutchess County Environmental Management Council, the WIC commissioned the Center for Watershed Protection (CWP) in Maryland to examine the codes of the two member municipalities as a pilot project to determine if they encourage or discourage the green site design principles.

The Town of Wappinger was selected by the WIC membership as one of the communities to be studied since it represents a suburban community in the watershed and most of the Town lies within the watershed. The Town of Wappinger was willing to participate in the code study since

they were in the process of updating the Comprehensive Plan. In addition, the Town of Wappinger is a regulated Municipal Separate Storm Sewer (MS4) community and so must consider municipal code changes to comply with Stormwater Phase II regulations. The Town of Clinton was selected as the second municipality to be studied since it represents a rural community in the watershed. The Center for Watershed Protection, with assistance from the planners for the Town of Wappinger, analyzed the municipal codes and presented the results at an all-day seminar sponsored by Central Hudson in April 2005.

The next phase of the project, as recommended by the Center for Watershed Protection, was to convene Roundtables in each community to determine how or if the results of the codes analysis should be implemented through a consensus-building process. The purpose of a local site planning roundtable is to adapt the 22 Better Site Design principles for local application by identifying how local codes and ordinances can be modified to meet three basic objectives:

1. Reduce overall site imperviousness.
2. Preserve and enhance existing natural areas.
3. Integrate stormwater management.

To implement this phase the WIC, in concert with the NYSDEC Hudson River Estuary Program and the Dutchess County Environmental Management Council, convened Local Site Planning Roundtables for the Town of Wappinger and the Town of Clinton, NY. This document provides the results and recommendations of the Local Site Planning Roundtable for the Town of Wappinger.

The 22 Better Site Design Principles act as benchmarks upon which more specific code and ordinance recommendations were adapted for the Town of Wappinger. The benefits of applying these principles are summarized in the following table:

Benefits of Applying the Model Development Principles	
<p>Local Government:</p> <ul style="list-style-type: none"> ▪ Increase local property tax revenues ▪ Facilitate compliance with wetlands and other regulations ▪ Assist with stormwater regulations compliance <p>Homeowners:</p> <ul style="list-style-type: none"> ▪ Increase property values ▪ Create more pedestrian-friendly neighborhoods ▪ Provide open space for recreation. ▪ Result in a more attractive landscape ▪ Reduce car speed on residential streets ▪ Promote neighborhood designs that provide a sense of community 	<p>Developers:</p> <ul style="list-style-type: none"> ▪ Flexibility in design options ▪ Reduce development costs ▪ Allow for more sensible locations for stormwater facilities ▪ Facilitate compliance with wetlands and other regulations <p>Environment:</p> <ul style="list-style-type: none"> ▪ Protect sensitive forests, wetlands, and habitats from clearing ▪ Preserve urban wildlife habitat ▪ Protect the quality of local streams, lakes, and estuaries ▪ Generate smaller loads of stormwater pollutants ▪ Help to reduce soil erosion during construction

From: Recommended Model Development Principles for East Hempfield, West Hempfield and Manor Townships, and Lancaster County, Pennsylvania

Wappinger Site Planning Roundtable Process

Wappinger Site Planning Roundtable members convened many times over an eight-month period to become familiar with the Better Site Design Principles, to review existing codes and ordinances, to work in subcommittees, and to reach consensus on a final set of recommendations. The Roundtable consisted of 19 dedicated members representing a wide range of professional backgrounds and experience related to local development issues. The process included the following steps:

Review of Local Codes – September 2004 – March 2005

Supported by a grant from the NYSDEC Hudson River Estuary Program to the Dutchess County Environmental Management Council, the Center for Watershed Protection's Code and Ordinance Worksheet was used to analyze the local codes, laws and ordinances in the Town of Wappinger in relation to 22 Better Site Design Principles.

Roundtable #1 - Joint Clinton/Wappinger Kickoff Meeting - April 15, 2005

About 75 interested people from across Dutchess County participated in this meeting and Better Site Design workshop. Almost every major stakeholder group was represented, including those from the towns of Clinton and Wappinger, members of the Wappinger Creek Watershed Intermunicipal Council, the development community, environmental agencies, government officials, and state government agencies. The kickoff meeting introduced attendees to the Better Site Design Principles, put into context the aims of the roundtable process within the Wappinger Creek watershed, and presented a comparative analysis of the Code and Ordinance Worksheets for both Clinton and Wappinger.

Wappinger Roundtable #2 – June 28, 2005

Roundtable participants from the Town of Wappinger met and reviewed the goals and objectives of the project. Roundtable members then split into two subcommittees according to expertise and interest:

- Residential Streets & Lots
- Conservation of Natural Areas

The subcommittees discussed which Principles they would accept or decline to work on and identified possible code reform to discuss in subsequent meetings.

Subcommittee Meetings and Consensus Building – June - October 2005

Both subcommittees met three to five times from June through October and came to a consensus on recommendations related to a subset of the 22 Better Site Design Principles

Wappinger Roundtable #3 – December 8, 2005 and January 12, 2006

The Wappinger Roundtable participants from the two subcommittees met together to review the subcommittee draft recommendations and recommend modifications.

Roundtable #4 - Joint Clinton/Wappinger Final Meeting – January 18, 2006

The Wappinger Roundtable participants reached consensus on the full suite of recommendations and shared experiences with the Clinton Roundtable participants.

Membership Statement of Support

This document of recommended development principles was created by a cross-section of professionals representing local government, environmental, non-profit, development, and town residents who participated in the Town of Wappinger Site Planning Roundtable.

Members of the Roundtable provided technical expertise required to craft and polish the model development principles for the Town of Wappinger. These recommendations reflect our professional and personal experience with land development and do not necessarily carry the endorsement of the organizations and agencies represented by their members. Endorsement implies support of the principles and recommendations as a package and does not necessarily imply an equal level of support among individual recommendations by all Roundtable members.

The members of the Town of Wappinger Site Planning Roundtable endorse the model development principles set forth in this document, known as the Recommended Model Development Principles for Town of Wappinger, Dutchess County, New York.

Susan Dao
Town of Wappinger Deputy Zoning Administrator

Matt McMahon
Town of Wappinger Conservation Advisory Council

Victor Fanuele
Town of Wappinger Zoning Board of Appeals

Diane Perillo
Town of Wappinger

Graham Foster
Town of Wappinger Highway Superintendent

Eileen Sassman
Chair, Wappinger Creek Watershed Intermunicipal Council

Guy Gagne
Town of Wappinger Planning Board

Joe Stankavage
Paggi, Martin & Del Bene

Florence Graff
Town of Wappinger Conservation Advisory Council

David Stolman
F.P. Clark Associates

Chris Holme
F.P. Clark Associates

Lindsay Carille
Dutchess County Department of Planning and Development

Bob Hoose
Town of Wappinger

Barbara Kendall, Facilitator
New York State Department of Environmental Conservation Hudson River Estuary Program

George Kolb
Town of Wappinger

Scott Leroy
Town of Wappinger

David Burns, Facilitator
Dutchess County Environmental Management Council

Tatiana Lukianoff
Town of Wappinger Zoning Administrator

Sky Shook, Facilitator
Student Conservation Association

Recommended Model Development Principles

Through a consensus process, members of the Town of Wappinger Site Planning Roundtable adapted 21 out of 22 Better Site Design Principles to meet the needs and current conditions within the Town of Wappinger. Roundtable recommendations include specific code and ordinance revisions for 20 of the Principles that would increase flexibility in site design standards and support the implementation of environmentally beneficial practices in accordance with the Town's current zoning and subdivision laws. The Principles are divided into two categories: Residential Streets, Parking and Lot Development; and Conservation of Natural Areas.

Residential Streets, Parking and Lot Development

Principle #1: Street Width

Design residential streets for the minimum required pavement width needed to support travel lanes; on-street parking; and emergency, maintenance and service vehicle access. These widths should be based on traffic volume.

Recommendation

The Roundtable supports this principle and endorses the following recommendations:

1. The Town of Wappinger should reduce the minimum required street pavement width for new subdivision roads to 20 feet where applicable following the design guidelines published by the Association of State Highway and Transportation Officials (AASHTO). The latest AASHTO standards (AASHTO, 2004; AASHTO, 2001) for very low volume local roads of less than 400 average daily trips support a total minimum road way width (traveled way and shoulders) of 20 feet when the design speed is 50 mph or less (Fig.1).
2. Twenty-foot wide rural roads should be designated as areas where on-street parking is not allowed. Roundtable members also suggested an amendment to the cluster development provisions in the Subdivision Regulations that would require or encourage a parking space for 5 cars at intervals along a new development road that is limited to 20 feet wide.

Rationale

Residential streets are often unnecessarily wide and these excessive widths contribute to the largest single component of impervious cover in a subdivision (Center for Watershed Protection, 1998). Narrower street widths not only reduce impervious cover, but also promote lower vehicular speeds and increased safety and can reduce construction and maintenance costs.

A minimum pavement width of 24 feet for rural and suburban roads is specified in the Town of Wappinger Highway Specifications, reduced from 28 feet through code changes

made in 1997. However, recent communication with the Cornell Local Roads Program and the Dutchess County Department of Public Works¹ has found that these agencies recommend the standards published by the American Association of State Highway and Transportation Officials (AASHTO). Using 12 for the average daily trips per house², when subdivisions of 33 lots or less are proposed, the average daily trips (12 x 33= 396) will be well under the maximum of 400 for very low volume local roads.

Figure 1. Minimum width of traveled way (feet) for specified design volume (vehicles per day)				
Design speed (miles per hour)	Under 400	400 to 1500	1500 to 2000	Over 2000
15	18	20 ¹	20	22
20	18	20 ¹	22	24 ³
25	18	20 ¹	22	24 ³
30	18	20 ¹	22	24 ³
40	18	20 ¹	22	24 ³
45	20	22	22	24 ³
50	20	22	22	24 ³
55	22	22	24 ³	24 ³
60	22	22	24 ³	24 ³
Width of graded shoulder on each side of road (feet)				
All speeds	2	5 ^{1,2}	6	8

¹ For roads in mountainous terrain with design volume of 400 to 600 vehicles/day, use 18-foot traveled way width and 2-foot shoulder width.

² May be adjusted to achieve a minimum roadway width of 30 feet for design speeds greater than 40 mph.

³ Where the width of the traveled way is shown as 24 feet, the width may remain at 22 feet on reconstructed highways where alignment and safety records are satisfactory.

From: *A Policy on Geometric Design of Highways and Streets*, (Exhibit 5-5. Minimum Width of Traveled Way and Shoulders) 2004, by the American Association of State Highway and Transportation Officials, Washington, D.C. Used by permission.

Principle #2: Street Length

Reduce total length of residential streets and driveways by examining alternative street layouts and reducing driveway lengths to determine the best option for increasing the number of homes per unit of roadway length.

Recommendation

The Roundtable supports this principle and endorses the following recommendations:

¹ Personal communication, Lynne Irwin, Director, Cornell Local Roads Program and Don Bartles, Jr., P.E., Dutchess County Department of Public Works.

² Personal communication, Chris Holme, Frederick P. Clark Associates, Town of Wappinger planning consultants

1. The Town of Wappinger should continue to encourage the use of efficient street and driveway layout.
2. Information on alternative layout designs to reduce street length and promote efficient street layout in new subdivisions should be provided to the Planning Board.

Rationale

Total street length is often a function of the frontage, number of entrances, pedestrian safety, and physical site conditions. Guidance encouraging thoughtful, flexible and practical subdivision design criteria that reduce the overall street length can reduce impervious cover while maintaining the number of desired dwelling units.

Principle #3: Right-of-Way Width

Wherever possible, residential street right-of-way widths should reflect the minimum required to accommodate the travel-way, sidewalk, and vegetated open channels. Utilities and storm drains should be located in the right-of-way wherever feasible.

Recommendation

The Roundtable supports portions of this principle within the limitations of New York State Highway Law.

1. The Roundtable recommends that utilities in new subdivisions be required to install lines underground and to minimize the number of separate trenches, while complying with the 10-foot separation between water and sewer lines required by the Dutchess County Department of Health. The existing subdivision law Section 217-23.C. supports this recommendation.
2. The Roundtable recommends that the 50-foot minimum right-of-way width in the Town Highway Specifications be retained.

Rationale

Utility trenches: Underground utilities are safer, more aesthetically pleasing, and sharing one trench will reduce the clearing and disturbance necessary to install three separate utilities.

Right-of-way width: New York State Highway Law Article 8 §171 and §180 specify that a town highway³ must not be less than three rods in width (16.5 feet per rod x 3 rods = 49.5 feet). To reduce the three-rod requirement in NYS Highway Law a local government would need to petition the Commissioner of Transportation for a certificate stating that a reduced width was necessary (NYS Highway Law Article 8 §171). In addition, both town and county highway officials have emphasized that the 50-foot right-of-way is needed for snow removal, stormwater management and maintenance of the

³ The definition of highway in NYS Highway Law Article 1 §2 includes drains, ditches, waterways, embankments, retaining walls and culverts. Therefore the definition of “highway” in NYS Highway Law encompasses the functions of the “right-of-way” as used in better site design.

right-of-way. For these reasons the Roundtable recommends that the 50-foot minimum right of way be retained in the local highway specifications.

Principle #4: Cul-de-sacs

Minimize the number of residential street cul-de-sacs and incorporate landscaped areas to reduce impervious cover. The radius of cul-de-sacs should be the minimum required to accommodate emergency and maintenance vehicles. Alternative turnarounds should be considered.

Recommendation

The Roundtable supports this principle and recommends that cul-de-sacs be discouraged and alternative turnarounds be encouraged through the following measures:

1. Developers should be required to demonstrate that there is no alternative to a cul-de-sac in the proposed subdivision plan and that the cul-de-sac or other turnaround design has minimized impervious surfaces to the maximum extent possible.
2. The most recent AASHTO guidelines should be used for cul-de-sac and alternative turnaround designs, and the design should create no more impervious surface than specified in the AASHTO guidelines (Fig. 2).
3. Section 214-74 (Cul-de-sacs) of the Town of Wappinger Streets and Sidewalks regulations should be revised to remove the requirement that states, “The circular-shaped turnaround shall be completely paved with no center island.”
4. When center islands are designed in cul-de-sacs, they should incorporate stormwater management practices designed as specified in the suggested Stormwater Management and Erosion & Sediment Control Local Law for the Town of Wappinger (see Principle #22).

Rationale

Alternatives to traditional cul-de-sacs are not encouraged in the Town of Wappinger code. The most recent AASHTO guidelines (the standard recommended by Dutchess County Department of Public Works) include dimensions for traditional and alternative cul-de-sac designs and include landscaped islands (AASHTO, 2004). Municipalities such as the Town of Wappinger that are regulated under the New York State Stormwater Phase II regulations are required to adopt a local law that regulates stormwater quantity and quality from development and incorporates measures such as bioretention areas, a type of stormwater management practice that can be installed in cul-de-sac islands. The New York State Stormwater Management Design Manual includes the most recent research on design of stormwater management practices and is the recommended technical standard for the required stormwater management local law.

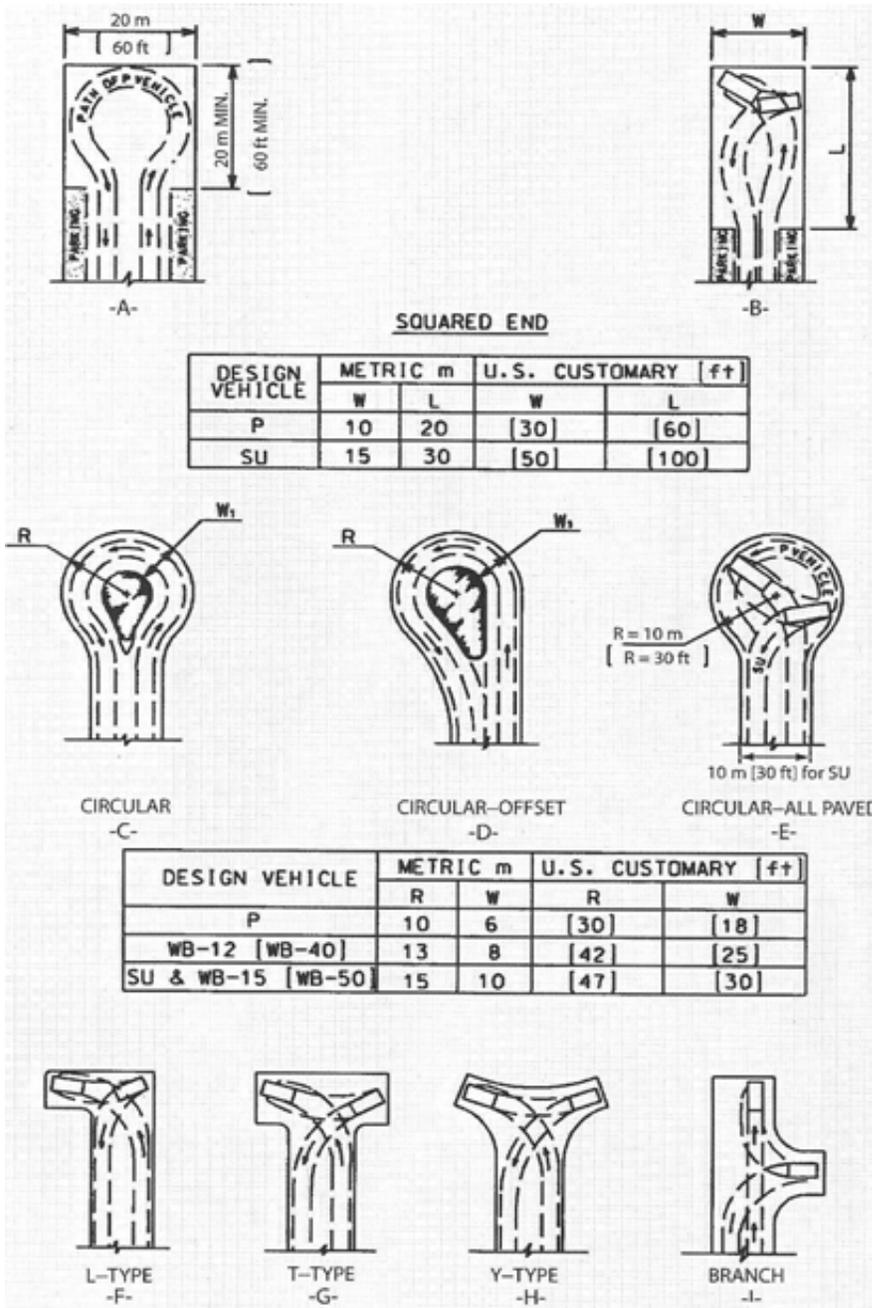


Figure 2. Types of Cul-de-sacs and Dead-End Streets
 From: *A Policy on Geometric Design of Highways and Streets*, 2004, by the American Association of State Highway and Transportation Officials, Washington, D.C. Used by permission.

P = Passenger Car

SU = Single-Unit Truck

WB = Wheel Base - applies to semitrailer

Principle #5: Vegetated Open Channels

Where density, topography, soils and slope permit, vegetated open channels should be used in the street right-of-way to convey and treat stormwater runoff.

Recommendation

The Roundtable supports this principle and endorses the following recommendations:

1. Section 214-72 of the Streets and Sidewalks regulations and Section 217-23.B. of the Subdivision Law should be revised to allow vegetated swales as an alternative to enclosed drainage pipe where density, topography, soils and slope permit.
2. The Planning Board should encourage the use of vegetated swales where practical in new subdivisions and site plans.
3. Vegetated swales should be designed as specified in the suggested Stormwater Management and Erosion & Sediment Control Local Law for the Town of Wappinger (see Fig. 3 and Principle #22).

Rationale:

Vegetated swales are beneficial for treatment of stormwater runoff before it is discharged to stormwater management practices or local water resources. Vegetated swales will

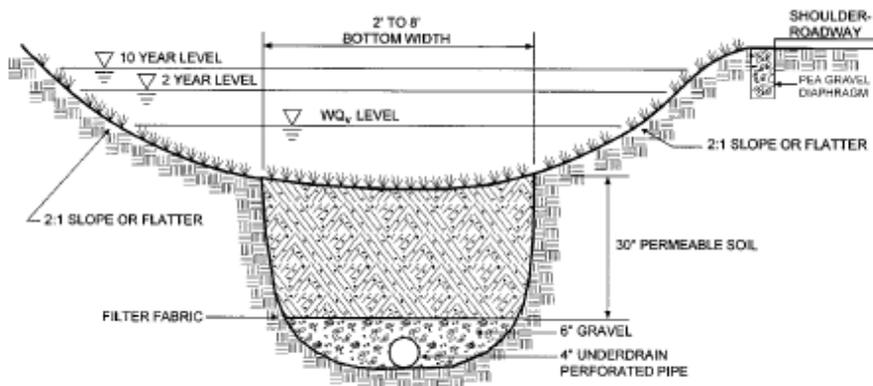


Figure 3. Dry Swale Cross-Section (NYSDEC, 2001)

reduce the pollutant load from adjacent streets, since streets contribute higher loads of pollutants to urban stormwater than any other source area in residential developments (Bannerman, et al., 1993; Steuer, et al., 1997). Vegetated swales will also reduce the volume of stormwater runoff generated from a source area before it is discharged to local waterbodies or other stormwater management practices. Municipalities such as the Town of Wappinger that are regulated under the New York State Stormwater Phase II regulations are required to adopt a local law that regulates stormwater quantity and quality from development and incorporates measures such as vegetated swales. The New York State Stormwater Management Design Manual includes the most recent research on

design of stormwater management practices and is the recommended technical standard for the required stormwater management local law.

Principle #6: Parking Ratios

The required parking ratio governing a particular land use or activity should be enforced as both a maximum and a minimum in order to curb excess parking space construction. Existing parking ratios should be reviewed for conformance taking into account local and national experience to see if lower ratios are warranted and feasible.

Recommendation

The Roundtable supports this principle and endorses the following recommendations:

The Town of Wappinger should consider revising the parking regulations in Sections 240-96.B(4) and 240-97 of the zoning regulations to include both maximum and minimum requirements for parking lots. Parking ratios from the Northwest Connecticut Council of Governments (Fitzgerald & Halliday, Inc., 2003) and the Better Site Design handbook (Center for Watershed Protection, 1998) should be compared with the present zoning regulations to develop maximum and minimum requirements.

Rationale

Parking ratios usually represent the minimum number of spaces needed to accommodate the highest hourly parking at a site (Wells, 1995). In many cases, these ratios can result in far more spaces than are actually needed. Revising the parking ratios to accurately reflect actual parking demand and include maximum parking allowances should result in reduced impervious cover from parking lots and therefore reduced stormwater impacts to local water resources.

Principle #7: Parking Codes

Parking codes should be revised to lower parking requirements where mass transit is available or enforceable shared parking arrangements are made.

Recommendation

The Roundtable supports this principle and endorses the following recommendations:

1. The Town of Wappinger should consider revising the parking regulations in Section 240-97 of the zoning regulations to include reduced requirements when shared parking is implemented. Parking ratios from the Northwest Connecticut Council of Governments (Fitzgerald & Halliday, Inc., 2003) should be compared with the present zoning regulations to develop shared parking requirements.
2. Where opportunities exist, shared parking arrangements should be promoted during the initial plan review. Developers should show that a shared parking arrangement can accommodate parking for the proposed use.
3. A model shared parking agreement should be provided to developers when shared parking is considered. Two examples are provided in Appendix 1.

Rationale

Implementation of shared parking can reduce the amount of impervious parking lot surface that is created in development projects. Depending on site conditions, parking spaces can be reduced through shared parking when peak parking demand in adjacent land uses is at different times of the day or on different days of the week. For example, a store and a church may share a parking lot since their peak occupancy times differ.

Principle #8: Parking Lot Size

Reduce the overall imperviousness associated with parking lots by minimizing stall dimensions, incorporating efficient parking lanes, and using pervious materials in spillover parking areas.

Recommendation

The Roundtable supports this principle and endorses the following recommendations:

1. Efficient parking lot layouts such as diagonal parking with a one-way aisle should be encouraged and alternative designs provided to developers to show how aisle widths can be reduced when angled parking is used. While angled parking standards are presently included in the Town of Wappinger Zoning Law Section 240-96.B.5, the Town should consider adopting the Northwest Connecticut Council of Governments (Fitzgerald & Halliday, Inc., 2003) standards for angled parking which recommend narrower aisle widths therefore providing more impervious area reduction.
2. Pervious pavement materials should be encouraged for overflow parking areas. The Northwest Connecticut Council of Governments (Fitzgerald & Halliday, Inc., 2003) has developed code language to encourage pervious pavement materials for parking areas.⁴

Rationale

Parking lots are the largest component of impervious cover in most commercial and industrial zones. Since the size of a parking lot is driven by stall geometry, alternative parking lot designs can result in smaller parking lot sizes where site conditions are appropriate.

⁴ The definition of “Pervious Surface” in the Northwest Connecticut study is as follows: “Ground cover through which water can penetrate at a rate comparable to that of water through undisturbed soils.” The study notes that there are limitations to pervious parking materials, “Alternative pavers and semi-permeable surfaces are not recommended for high traffic volume areas (e.g. generally more than 500 average daily trips or ADT), or for parking that is located near public or private drinking water wells. They are also not suitable for handicap parking spaces, as they do not provide a smooth flat surface for wheelchairs and those with limited mobility. Finally, pervious parking surfaces can be more challenging for snow removal and use of sand (which has a clogging effect) and salt (that can contaminate groundwater) should be minimized on those surfaces.” (Fitzgerald & Halliday, Inc., 2003)

Principle #9: Structured Parking

Provide meaningful incentives to encourage structured and shared parking to make it more economically viable.

The Roundtable felt that this Principle was not applicable to the Town of Wappinger due to the suburban nature of the Town.

Principle #10: Parking Lot Runoff

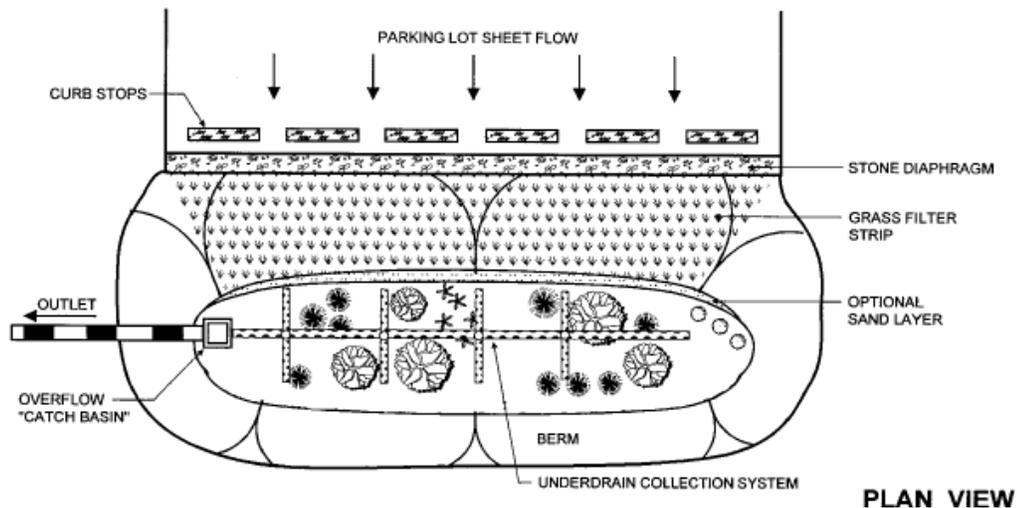
Wherever possible, provide stormwater treatment for parking lot runoff using bioretention areas, filter strips, and/or other practices that can be integrated into required landscaping areas and traffic islands.

Recommendation

The Roundtable supports this principle and endorses the following recommendation:

1. The Town of Wappinger should revise Section 240-96.C of the zoning law to remove the requirement that landscaping be constructed in “raised landscaped islands.” As an alternative, at-grade or below-grade landscaped islands with stormwater management practices such as bioretention areas (Fig. 4), swales and sand filters should be

Figure 4.
Bioretention
Area – Plan View
(NYSDEC, 2001)



encouraged. Forty-five degree angled parking lots should also be encouraged as they provide more opportunities for below-grade landscaped islands incorporating stormwater management practices.

2. The Town of Wappinger should adopt the New York State Sample Local Law for Stormwater Management and Erosion & Sediment Control (NYSDEC & NYSDOS, 2004, revised 2006). This local law requires that commercial, industrial and multi-family housing projects of more than one acre of disturbance control the quality and quantity of stormwater runoff. Standards for this local law are based on the New York State Stormwater Management Design Manual (NYSDEC, 2001) which

provides technical specifications for bioretention areas (Fig. 4), swales (Fig. 3), and sand filters.

3. The NYS Sample Local Law includes a Sample Maintenance Agreement that the Town of Wappinger should use to ensure that stormwater management practices are maintained by the property owner or homeowner's association. The Town Attorney should review the Sample Maintenance Agreement and recommend any appropriate changes.

Rationale

National studies have shown that parking lots contribute considerable amounts of pollutants in stormwater including suspended solids, phosphorus, copper and zinc, especially in commercial and industrial land uses (Bannerman & Dodds, 1992). Stormwater treatment practices installed adjacent to or within parking lots can reduce the pollutant loads of stormwater discharged from the paved surfaces.

Concerns about standing water can be alleviated by noting that the NYS standards require that there be no more than 48 hours of ponding in a wet or dry swale. Mosquitoes require 5 to 7 days of standing water to mature to the adult hatching stage.

Principle #11: Open Space Design

Advocate open space development that minimizes total impervious area, reduces total construction costs, conserves natural areas, provides community recreational space, and promotes watershed protection.

Recommendation:

The Roundtable supports this principle and endorses the following recommendations:

The standards for conservation and open space subdivisions in Section 240-19 of the zoning law should be revised as outlined in Principle #21 (Conservation Incentives). These revisions will make conservation and open space subdivisions "by right," meaning that these subdivisions can be proposed based on standards outlined in the zoning law and in most cases there are no additional approvals required beyond normal Planning Board procedure.

Rationale

Open space or cluster development is a compact form of development that concentrates density on one portion of the site in exchange for more open space elsewhere (Fig. 5). This type of development meets the objectives of minimizing impervious area, conserving natural areas, providing community recreational space, and promoting watershed protection.

Requiring additional reviews or approvals by or requests to the Town Board for open space subdivisions discourages the use of this tool because the process is more expensive and time consuming, especially for small development projects. Adopting these

recommended changes to make open space subdivisions by-right levels the playing field for review and approval of all types of development.



Figure 5: Example of an Open Space or “Cluster” Subdivision
(Source: Georgia Stormwater Manual, 2001)

Principle #12: 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 overall lot imperviousness.

The Roundtable supports this principle; however, the members felt that the Town of Wappinger Zoning Law Section 240-19 (Modification of Lot Requirements) provides enough support for the Planning Board to vary setbacks when appropriate; therefore further changes are not needed.

Principle #13: Sidewalks

Promote more flexible design standards for residential subdivision sidewalks. Where practical, consider locating sidewalks on only one side of the street and providing common walkways linking pedestrian areas.

Recommendation

The Roundtable supports this principle and endorses the following recommendations:

1. The Town of Wappinger should create a committee to look at developing amendments to the local code to establish when and where sidewalks are and are not required along with maintenance provisions. The new code language should be based on criteria such as average daily trips, zoning density and site design.

2. Pedestrian pathways (paved or non-paved) should be encouraged where feasible as an alternative to sidewalks.

Rationale

Sidewalk requirements are an important element of many subdivision codes and are intended to protect pedestrians and address liability concerns. However, requirements should be flexible enough to meet pedestrian demands while minimizing the amount of impervious cover.

Principle #14: Driveways

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

Recommendation

The Roundtable supports this principle and endorses the following recommendations:

1. The Planning Board should encourage shared driveways where appropriate using the requirements in the recently adopted amendments to Section 240-20 of the zoning law, *Required Street Frontage*. The Planning Board may also wish to provide to applicants the Model Shared Driveway Agreement in Appendix 2.
2. The Planning Board should encourage installation of pervious materials that are appropriately constructed to support delivery and emergency vehicles for the 50-foot by 12-foot pull-offs that are required by the Zoning Law Section 240-100.E(1) when driveways are more than 500 feet long.

Rationale

Studies have shown that 20% of the impervious cover in residential subdivisions can consist of driveways (Center for Watershed Protection, 1998). Flexible local codes can allow developers the ability to address this concern while minimizing impervious surfaces and increasing design efficiencies.

Principle #15: Open Space Management

Clearly specify how community open space will be managed and designate a sustainable legal entity responsible for managing both natural and recreational open space.

Recommendation

The Roundtable supports this principle and endorses the following recommendations:

1. The allowable and unallowable uses of open space should be clearly defined in Section 240-19 of the zoning law.
2. When a Homeowner's Association is proposed for management of open space, the Planning Board should approve the articles of incorporation, charter, uses of open space, and management standards before the subdivision plat is approved and include use and management standards directly on the plat.

3. The Homeowner's Association should be part of the deed for every lot in the subdivision.
4. The Planning Board and Town Attorney should research the option of Open Space Districts that has been used in other municipalities.

Rationale

While the Town of Wappinger has some language in the zoning law to regulate open space subdivisions, at least three subdivisions that were approved in the past have never formed homeowner's associations and therefore the management of the open space is in question. Clear language in the zoning law as well as well-defined procedures enforced by the Planning Board will ensure that important open space lands are managed for the benefit of future generations.

Principle #16: Rooftop Runoff

Direct rooftop 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.

Recommendation

The Roundtable supports this principle and endorses the following recommendation:

Where practical and feasible, require that drainage of rooftop runoff be directed into rain gardens or a suitably designed and landscaped area on the property. Encourage the use of on-lot stormwater treatment practices such as bioretention areas (Fig. 6) and rain gardens, vegetated swales, infiltration practices, and rain barrels. Developers and engineers should be referred to the New York State Stormwater Management Design Manual for detailed specifications. Management responsibility and management schedules for these on-lot stormwater practices should be included on the approved plans.

Rationale

Bioretention areas and "rain gardens" (a type of bioretention area), infiltration practices, and rain barrels installed on individual lots can result in a 50% annual reduction in runoff volume from residential development projects and can reduce the amount of pollutants entering local water resources (Pitt, 1987).

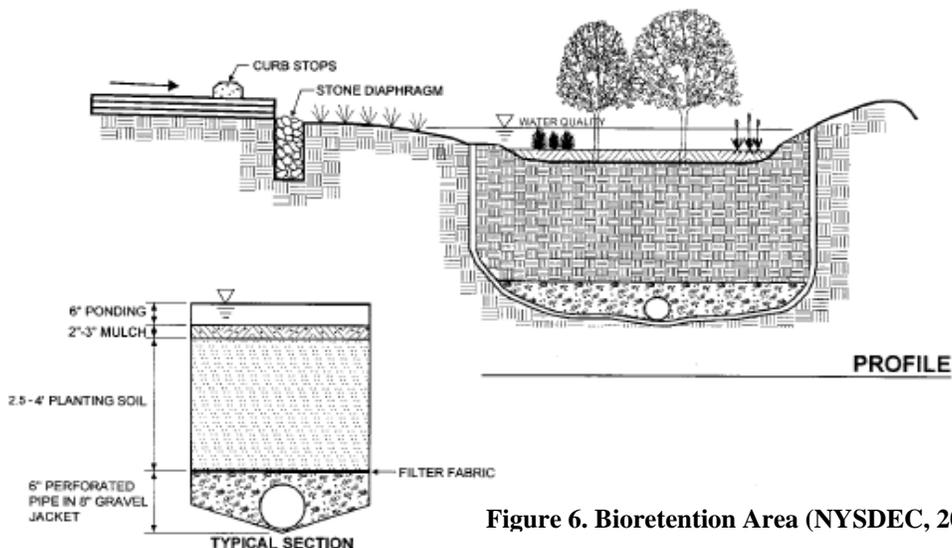


Figure 6. Bioretention Area (NYSDEC, 2001)

Conservation of Natural Areas

Principle #17: Buffer Systems

Create a naturally vegetated buffer system along all water resources that also encompasses critical environmental features and supports the Town's commitment as a Greenway Community (Greenway Guide D2). The buffer system should be designed to protect the Town of Wappinger's water quality and quantity.

Recommendation

The Roundtable supports this principle and endorses the following recommendations:

1. Provide education to local boards and the public on the recently adopted Chapter 137 of the Town of Wappinger Code, which now regulates wetlands and watercourses of any size. Wetlands in Chapter 137 are determined based on the US Army Corps of Engineers definition of what constitutes a wetland (USACOE, 1997).
2. Stream and wetland buffer delineation should be added to the list of requirements for site plan (Zoning Law §240-84) and subdivision applications (Subdivision Law §217 Attachment 1) that are brought before the Planning Board.
3. Stream and wetland buffers should be flagged during the construction phase in order to mark the boundary of the buffer for construction personnel.
4. A three-zone buffer system is recommended, as described below and in Figure 7.

Three Zone Buffer Approach

A riparian buffer is an area contiguous to a water body that is managed to reduce the impacts of adjacent land uses. The riparian buffer typically consists of the floodplain and a portion of the upland area adjoining the floodplain; and usually connects the aquatic ecosystem with a human induced land use.

A three-zone riparian buffer system is recommended (Figure 7). Zone one (streamside zone) is closest to the stream and is the most sensitive to change. This zone should remain undisturbed and consists of trees and shrubs. Zone two (middle zone) consists of managed forest and can be used for outdoor recreation, wildlife habitat, or timber harvesting. Zone three (outer zone) consists of grasses and usually adjoins some sort of human induced land use. Adjoining zone three could be urban/suburban development or agricultural cropland employing best management practices. The USDA Forest Service recommends minimum widths of 15 feet for zone one, 60 feet for zone two, and 20 feet for zone three. These recommendations can be used to further define the 100-foot buffer that is required by the Town of Wappinger Chapter 137.

Rationale

Riparian buffers restore and maintain the chemical, physical and biological integrity of water resources such as streams, lakes, wetlands or vernal pools. The vegetation in zone one of a three-zone system shades the stream and keeps the water cool; and the tree roots help stabilize the stream banks. In zone two, trees use excess nutrients before they reach the stream, soil particles trap pollutants, and the organic soils remove nitrogen. Porous grass-covered land in zone three can increase infiltration and water storage, absorb

nutrients, control concentrated runoff, and evenly spread surface flow. The benefits of riparian buffers can be summarized as follows:

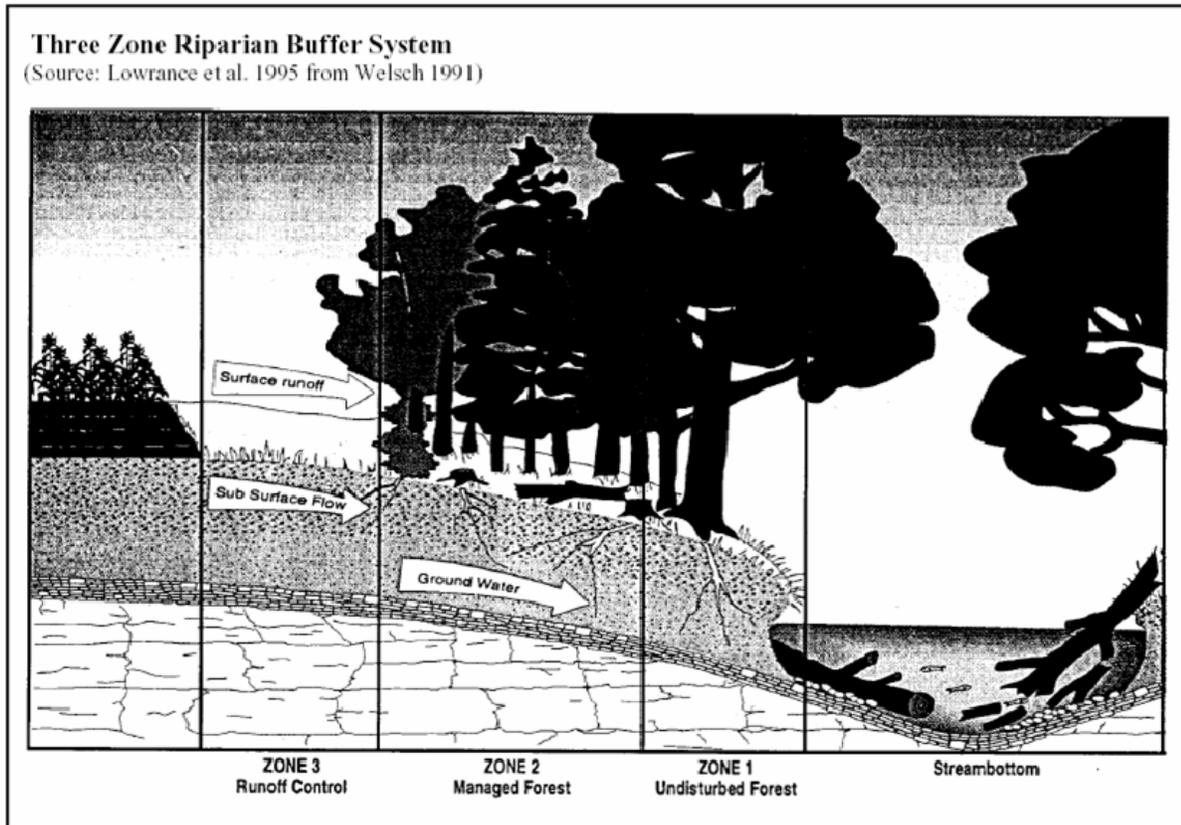


Figure 7. Three Zone Riparian Buffer System

Benefits of Riparian Buffer Protection

1. Filtration of sediments, nutrients (phosphorus and nitrogen), pesticides, and other pollutants in runoff.
2. Stabilize stream banks and bed, and reduce erosion.
3. Increase community-wide property values.
4. Provide shade, which helps keep summer water temperatures cool. This is of critical importance for native brook trout as well as the introduced brown trout. Together these species account for most of the recreational stream fishing in Dutchess County. In a normal water year, direct and indirect expenditures on fishing and related activities in and near the Wappinger Creek contribute \$1.2 million annually to the Dutchess County economy (Black & Winne, 1998).
5. Provide food and habitat for terrestrial and aquatic life.
6. Reduce flood damage and flood damage claims.
7. Protect quality of public drinking water supplies.
8. Help maintain stream flows in summer.
9. Provide linear natural areas which provide valuable habitat for mammals, reptiles, amphibians and birds.
10. Provide for infiltration of storm water runoff.

11. Support recreation and tourism industries by providing pleasant areas to fish and enjoy the streams.
12. Help maintain the "rural character" of Dutchess County.

Principle #18: Buffer Management

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.

Recommendation

The Roundtable supports this principle and endorses the following recommendations:

1. The Roundtable recommends that a pre-construction meeting with the town engineer be arranged prior to commencement of construction. At this meeting the engineer would outline the 100-foot buffer protections as required in Wappinger Town Code Chapter 137 (Wetlands) and request that the buffers are properly marked on site. Adopted in July 2005, Wappinger Town Code Chapter 137 (Wetlands) prohibits, "Removal or cutting of any vegetation except as permitted in 137-6.B." 137-6.B. allows for normal grounds maintenance including mowing and trimming of vegetation but prohibits removal of vegetation that may cause erosion of sediment into a wetland, waterbody or watercourse.
2. The wetland and stream buffers should be flagged by the owner, contractor or consultant prior to any construction activity in order to show the equipment operators where to stop. If a permit is issued pursuant to Chapter 137 the approved clearing limits should be flagged.
3. Develop a plan for more effective enforcement of the Chapter 137 regulations for stream and wetland buffers.
4. Educational funding should be included in the town budget to provide an annual mailing to new residents about the importance of forested buffers to the town's biological, aesthetic and water resources. In addition, town personnel should be trained on the importance of forested buffers and how to successfully implement the program.

Rationale

In many communities that have stream buffer ordinances, the buffer is merely a line drawn on a map, which is virtually invisible to contractors and landowners. The key to effective preservation and management of local buffer program is development and enforcement of a strong buffer ordinance that outlines the legal rights and responsibilities of the local entity that is responsible for the long-term management of the buffer.

Principle #19: 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. A fixed portion of any community open space should be managed as protected green space in a consolidated manner.

Recommendation

The Roundtable supports this principle and endorses the following recommendations:

1. Although a portion of this principle is covered by the Town of Wappinger's existing Erosion & Sedimentation Ordinance, the subcommittee supports the adoption of a comprehensive stormwater and erosion and sediment control ordinance based on the NYS Sample Local Law for Stormwater Management and Erosion & Sediment Control (Sample Law) (NYSDEC & NYSDOS, 2004, revised 2006) to adequately address all aspects of this principle and meet the mandate of a regulated Municipal Separate Storm Sewer (MS4) community. The Sample Law Article 5 (Erosion & Sediment Control Law Amendment), Article 1 and Article 2 (zoning law amendments), and Article 3 (subdivision law amendment) should be adopted for proper implementation.
2. Site fingerprinting should be used when development plans are proposed and reviewed by local agencies. Through site fingerprinting (Figure 8), environmentally sensitive areas (wetlands, steep slopes, etc.), future open spaces, tree save areas, future restoration areas, and temporary and permanent vegetative forest buffer zones are delineated on site plans and in the field as areas for protection and/or management. Ground disturbance is confined to areas where structures, roads, and rights-of-way will exist after construction is complete. By adopting the Sample Law, the Town of Wappinger will enact standards for site fingerprinting because *New York Standards and Specifications for Erosion and Sediment Control* (Empire State Chapter SWCS, 2005),

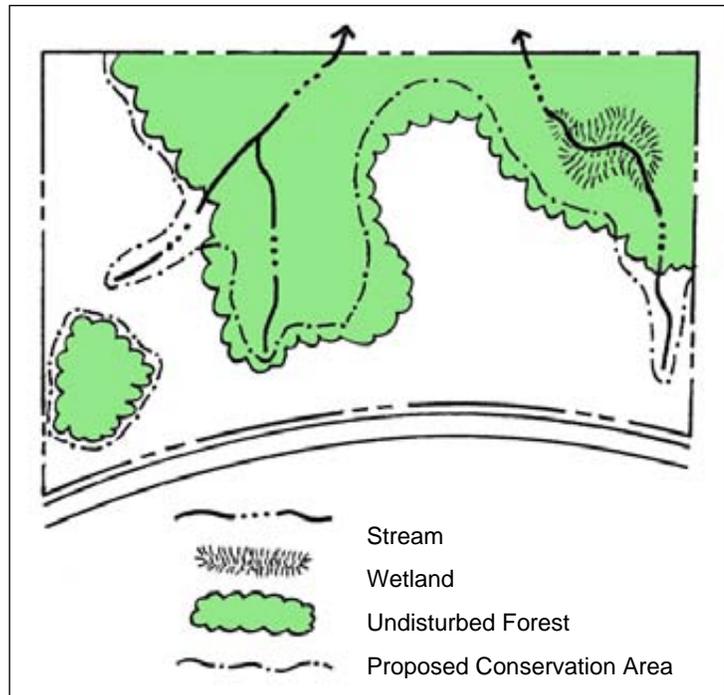


Figure 8. Site Fingerprinting (Source: Georgia Stormwater Manual, 2001)

- cited as the technical standards for the Sample Law, includes site fingerprinting techniques in Chapter 2, Section II (Site Plan Design Steps).
3. Low-Impact Development (LID) practices should be promoted by local boards. LID is an integrated management approach to landscape design and environmental protection that focuses on how the developed site is planned and designed to minimize hydrological impacts. LID techniques incorporate and go beyond

stormwater management requirements by using conservation design, riparian buffers and on-lot treatment measures such as rain-gardens and swales to reduce impervious area, increase infiltration and provide natural stormwater treatment. Where soils and land uses are suitable, infiltration of stormwater contributes to recharge of groundwater supplies.

Rationale

Conservation of natural areas within a development site can reduce erosion and sedimentation as well as clearing and grading costs, while maintaining natural features of the site and contributing to groundwater recharge.

Principle #20: Tree Conservation

Conserve trees and other vegetation at each development site by planting additional vegetation, clustering tree areas, minimizing native vegetation disturbance, and by promoting the use of native plants. Wherever practical, manage community open space, street right-of-way, parking lot islands, and other landscaped areas in a manner that conserves native trees and vegetation.

Recommendation

The Roundtable supports this principle and endorses the following recommendations:

1. Adopting local code language to require re-vegetation and management of tree cutting on both private and town-owned land would assist in accomplishing the aims of this principle as well as contributing to the protection of wildlife habitat and connecting vegetative corridors (Greenway Guide D-1). The Town of Mamaroneck Chapter 207 (Trees) (see Appendix 5) provides a straightforward approach to managing tree cutting for trees greater than 6 inches diameter at breast height (DBH).
2. To regulate clearing of trees along streams and in wetlands, the new Wappinger Town Code Chapter 137 (Wetlands) regulates clear-cutting, however there is no definition of clear-cutting provided in Chapter 137. In order to make this provision self-explanatory, a definition should be added such as, "Clear cutting: The removal of more than ten (10) trees with a DBH of six (6) inches or greater in a given lot, within any twelve-month period."(from Town of Ossining Tree Protection Ordinance). This definition would provide consistency with the 6 inch DBH requirement between the Chapter 137 (Wetlands) and a proposed Tree Protection law such as the Mamaroneck example in #1 above.
3. New plantings should use appropriate native species as recommended in Appendix H (Table H.5) of the NYS Stormwater Management Design Manual, (NYSDEC, 2001), a copy of which is provided in this document in Appendix 4 (Plant Lists).
4. A Do-Not-Plant list should be provided to homeowners and developers to discourage the incorporation of invasive and/or non-native species in landscaping design. See Appendix 4 for a list of invasive plant list references for New York State.
5. Consider conservation incentives (Principle #21) to encourage replanting and preservation of naturally forested areas.

Rationale

Native trees, shrubs and grasses are important contributors to the overall quality and viability of the environment. In addition, they can provide noticeable economic benefits to developers and homeowners.

Principle #21: Conservation Incentives

Incentives and flexibility in the form of density compensation, property tax reduction, stormwater credits, and by-right open space development should be encouraged to promote conservation of stream buffers, forests, meadows, and other areas of environmental value. In addition, off-site mitigation consistent with locally adopted watershed plans should be encouraged.

Recommendation

The Roundtable supports this principle and endorses the following recommendations:

1. While the Town of Wappinger Zoning Law, Section 240-19 includes some provisions for conservation and open space subdivisions, there are a few changes that are recommended to streamline the review and approval of alternative subdivision plans.
 - a. Section 240-19 (B), Conservation subdivisions, should be amended to remove the requirement that the applicant file a written request with the Town Board for a conservation subdivision that modifies lot area and dimensions in one-family residence districts. This would make it more attractive for developers to propose conservation subdivisions by removing this additional step and placing the review and approval authority entirely with the Planning Board.
 - b. Section 240-19 (C), Mandatory open space subdivisions, should be amended to remove the requirement that the Planning Board request authorization from the Town Board to require an open space subdivision. This would streamline the conservation subdivision review process by removing the Town Board approval step and placing the review and approval authority entirely with the Planning Board.
2. Consider the use of “stormwater credits” when open space and conservation subdivisions are proposed.
 - a. New York State Regulation – NYSDEC is presently working on a Stormwater Credits document that will allow for reduced stormwater sizing requirements when certain techniques are used. (See Appendix 3: Conservation Incentives Used in New York State - #3. Stormwater Credits)
 - b. Local Regulation – As mentioned under Principles 10, 19 and 22, it is recommended that the Town of Wappinger adopt the NYS Sample Local Law for Stormwater Management and Erosion & Sediment Control as amendments to zoning, site plan, and subdivision laws. This Sample Law takes into account the EPA and NYSDEC Stormwater Phase II requirements and uses the NYSDEC Stormwater Management Design Manual as the technical standards for the local law. To incorporate stormwater credits that promote low-impact site design, the Town of Wappinger could also adopt all or portions of the “Stormwater Credits” document mentioned above as part of a local stormwater management law.

3. Consider reducing property tax assessments for wetland property to encourage wetland protection (See Appendix 3: Conservation Incentives Used in New York State - #4. Property Tax Reduction).
4. Promote the use of NYS Forest Tax Law, Section 480-A of the Real Property Tax Law, to provide landowners with 50 or more acres of forest land with a reduced assessment and potential property tax exemption. Section 480-A requires that a forest management plan be prepared by a qualified forester and that the land remain in forest management for 10 years.

Rationale

Conservation and protection measures that require excessive administrative requirements, such as lengthy plan reviews, additional upfront costs to developers and unclear appeal procedures can create a major barrier to implementation. Incentives and flexibility are an effective way to promote adoption of conservation and protection measures.

Principle #22: Stormwater Outfalls

New stormwater outfalls should not discharge unmanaged stormwater into wetlands regulated by federal, state or local government, sole-source aquifers, or other water bodies. Both the quantity and quality of stormwater should be controlled to prevent impacts from stormwater pollution and flooding.

Recommendation

The Roundtable supports this principle and endorses the following recommendations:

1. The Roundtable supports the adoption of a comprehensive stormwater and erosion and sediment control ordinance based on the NYS Sample Local Law for Stormwater Management and Erosion & Sediment Control (Sample Law) to adequately address all aspects of this principle and meet the mandate of a regulated Municipal Separate Storm Sewer (MS4) community by the 2008 deadline. Through adoption of the Sample Law, construction site owners and operators are required to prepare a site-specific Stormwater Pollution Prevention Plan (SWPPP) that includes design and installation details for stormwater management practices such as wet ponds (Fig. 9), bioretention areas (Fig. 4&6), and swales (Fig. 3) to prevent flooding and discharge of untreated stormwater into streams and jurisdictional wetlands during and after construction. The following recommendations pertain to adoption of the Sample Law:
 - a. Article 1 and Article 2 (zoning law amendments), Article 3 (subdivision law amendment) and Article 5 (erosion & sediment control law amendment) of the Sample Law should be adopted for proper implementation in the Town of Wappinger.
 - b. In the Findings and Purpose section, language should be added stating one of the purposes of the law is to reduce the impact of stormwater runoff from the Town of Wappinger to Wappinger Creek and Wappingers Lake. Wappingers Lake is on New York State's 303(d) list of impaired waterbodies due to impacts from pollutants in stormwater. Construction projects that discharge to 303(d) listed waterbodies are

subject to certain additional criteria as defined in Article 2, Section 2.2.2 of the Sample Law.

c. The Findings and Purpose section should also state that flooding has historically been a problem when several Town of Wappinger subdivisions were initially built due to soils, drainage patterns and lack of adequate stormwater management controls.

2. Through the better site design (also known as LID) techniques recommended in this document, on-site stormwater infiltration should be encouraged and required where necessary.

Rationale

1. Pollutants in untreated stormwater can damage natural ecological processes and result in the loss of benefits provided by lakes, ponds, streams and wetlands. Flooding from major storms damages property, endangers lives and destroys stream and wetland habitat. Under New York State's SPDES General Permit for Stormwater Discharges for Regulated Municipal Separate Storm Sewer (MS4s) (GP-02-02), regulated communities such as the Town of Wappinger must put in place a local Stormwater Management Program by 2008 that includes six minimum measures of control. Under minimum control measures #4 and 5, regulated municipalities must adopt a local law or other regulatory mechanism to require erosion and sediment control on construction sites and manage stormwater from impervious surfaces after development.

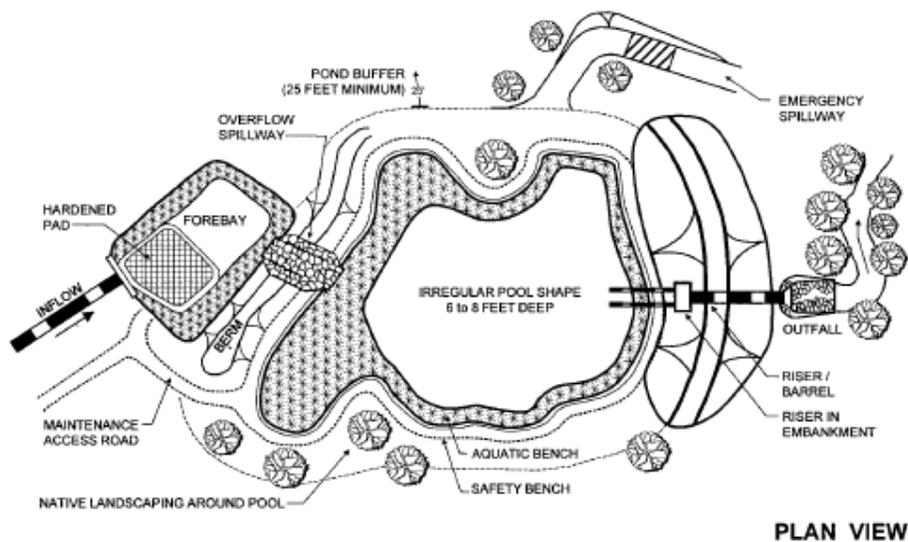


Figure 9. Wet Pond for Stormwater Management (NYSDEC, 2001)

2. Better site design (BSD), also known as LID, is an integrated management approach to landscape design and environmental protection that focuses on how the developed site is planned and designed to minimize hydrological impacts. BSD/LID techniques incorporate and go beyond stormwater management requirements by utilizing conservation design, riparian buffers and on-lot treatment measures such as rain-gardens and swales to reduce impervious area, increase infiltration and provide

natural stormwater treatment. Where soils and land uses are suitable, infiltration of stormwater can contribute to recharge of groundwater supplies.

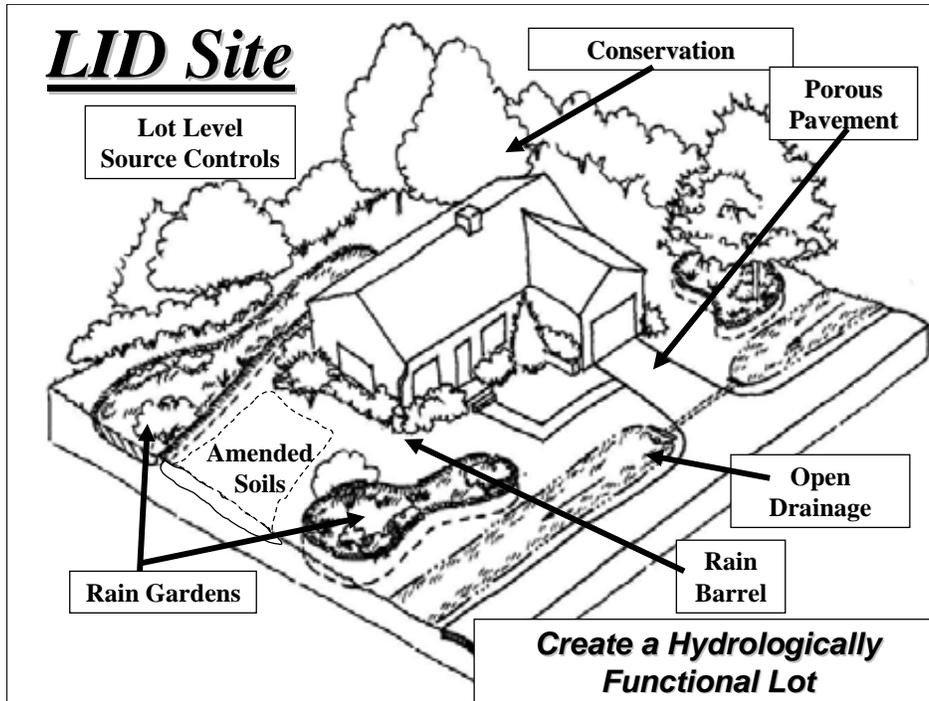


Figure 10. Residential Development using Low Impact Development /Better Site Design Techniques (Coffman, 2003)

Appendix 1 – Model Shared Parking Agreements

Example 1: Model Legal Shared Parking Agreement

EASEMENT FOR SHARED PARKING

WHEREAS, the parties to the easement wish to take advantage of the shared parking provisions of Chapter _____ of the (*City, Town Village*) of _____ Municipal Code.

1. For consideration of Ten Dollars (\$10.00) paid in hand, present and future benefits to be derived by Grantor and other good and valuable consideration, receipt of which is hereby acknowledged, Grantor, _____,

(Name)

doing business as _____,

(Name)

hereby conveys and warrants to Grantee, _____.

(Name)

doing business as _____,

(Name)

its successors, heirs and assigns, a nonexclusive, perpetual easement for motor vehicle parking on the following described real property:

[Legal Description of Servient Estate]

situated in the (*City, Town Village*) of _____, _____ County, New York for the benefit of Grantee's property described as:

[Legal Description of Dominant Estate]

situated in the (*City, Town Village*) of _____, _____ County, New York.

Such parking easement shall be applicable only to the following parking lot(s) located on the above-described servient estate. *[Include a map or sketch of the lots or parking facilities applicable to this easement, should more than one exist upon the subject property.]*

SUBJECT TO THE FOLLOWING:

1. This easement shall not be altered or terminated without the express written permission of the *[Pick one but should match the local code language: Planning Board, Code Enforcement Officer]* of the (*City, Town, Village*) of _____ or his/her designee.

2. Grantor covenants that there are ____ (#) ____ of motor vehicle parking spaces on the above-described property and that Grantor shall not decrease that number of parking spaces without the express written permission of the *[Pick one but should match the local code language: Planning Board, Code Enforcement Officer]* of the (*City, Town, Village*) of _____ or his/her designee.

3. Grantee shall post and maintain signage on the dominant and servient estates directing its customers and employees to parking.

4. Grantor may temporarily close the subject parking lot(s) for maintenance and repair. Cost of repair and maintenance shall be paid by _____.

5. Neither Grantee nor Grantor shall change, alter or expand the use of their respective properties described above so as to require additional parking under the provision of the (*City, Town, Village*) of _____ Municipal Code in excess of existing parking spaces without the express written permission of the [*Pick one but should match the local code language: Planning Board, Code Enforcement Officer*] or his/her designee.

DATED this _____ day of _____, 20____.

GRANTOR

(Signature)

(Print Name)

GRANTEE

(Signature)

(Print Name)

Adapted for New York from the *Better Site Design Handbook* (Center for Watershed Protection, 1998) and Wells, 1995.

Example 2: Model Shared Use Agreement for Parking Facilities

Effective: _____

This Shared Use Agreement for Parking Facilities, entered into this ___ day of _____, between _____, hereinafter called lessor and _____, hereinafter called lessee.

In consideration of the covenants herein, lessor agrees to share with lessee certain parking facilities, as is situated in the (*City, Town, Village*) of _____. County of _____ and State of _____, hereinafter called the facilities, described as:

[Include legal description of location and spaces to be shared here, and as shown on attachment 1 - map].

The facilities shall be shared commencing with the ___ day of _____, 20___, and ending at 11:59 PM on the ____ day of _____, 20___, for *[insert negotiated compensation figures, as appropriate]*. The lessee agrees to pay at *[insert payment address]* to lessor by the ___ day of each month *[or other payment arrangements]*. Lessor hereby represents that it hold legal title to the facilities.

The parties agree:

1. USE OF FACILITIES

Lessee shall have exclusive use of the facilities between the hours of ___ *[AM/PM]* _____ *[day]* through _____ *[AM/PM]* _____ *[day]*. Lessor shall have exclusive use of the facilities between the hours of *[AM/ PM]* _____ *[day]* through _____ *[AM/PM]* _____ *[day]*.

2. MAINTENANCE

Lessor shall provide, as reasonably necessary asphalt repair work. Lessee and Lessor agree to share striping, seal coating and lot sweeping at a 50%/50% mutual split based upon mutually accepted maintenance contracts with outside vendors. Lessor shall maintain lot and landscaping at or above the current condition, at no additional cost to the lessee. *[Revise as necessary to meet local needs]*

3. UTILITIES and TAXES

Lessor shall pay all taxes and utilities associated with the facilities, including maintenance of existing facility lighting as directed by standard safety practices. *[Revise as necessary to meet local needs]*

4. SIGNAGE

Lessee may provide signage, meeting with the written approval of lessor and the *[City, Town, Village]* of _____, designating usage allowances. *[Revise as necessary to meet local needs]*

6. ENFORCEMENT

Lessee may provide a surveillance officer(s) for parking safety and usage only for the period of its exclusive use. Lessee and lessor reserve the right to tow, at owners expense, vehicles improperly parked or abandoned. All towing shall be with the approval of the lessor. *[Revise as necessary to meet local needs]*

6. COOPERATION

Lessee and lessor agree to cooperate to the best of their abilities to mutually use the facilities without disrupting the other party. The parties agree to meet on occasion to work out any problems that may arise to the shared use.

7. INSURANCE

At their own expense, lessor and lessee agree to maintain liability insurance for the facilities as is standard for their own business usage. *[Revise as necessary to meet local needs]*

8. INDEMNIFICATION

[This section should describe indemnification as applicable and negotiated. Legal counsel should be consulted for appropriate language to every agreement].

9. TERMINATION

If lessor transfers ownership, or if part or all of the facilities are condemned, or access to the facilities is changed or limited, lessee may, in its sole discretion, terminate this agreement without further liability by giving Lessor not less than 60 days prior written notice. Upon termination of this agreement, Lessee agrees to remove all signage and repair damage due to excessive use or abuse. Lessor agrees to give lessee the right of first refusal on subsequent renewal of this agreement. *[Revise as necessary to meet local needs]*

10. SUPPLEMENTAL COVENANTS

[This section should contain any additional covenants, rights, responsibilities and/or agreements.]

IN WITNESS WHEREOF, the parties have executed this Agreement as of the Effective Date Set forth at the outset hereof.

[Signature and notarization as appropriate to a legal document and as appropriate to recording process negotiated between parties.]

Adapted for New York from the Model – Shared Use Agreement for Parking Facilities developed by Stein Engineering, 1997, in the document: *Model Zoning Regulations for Parking for Northwest Connecticut, Northwest Connecticut Parking Study – Phase II*. Northwestern Connecticut Council of Governments, 2003.

Appendix 2 – Model Shared Driveway Agreement

SHARED DRIVEWAY AND MAINTENANCE AGREEMENT

Background of Agreement

Users are owners of adjacent properties in the (*City, Town, Village*) of _____. New York.
User One: _____ is owner of the property at _____ (address) _____ (tax parcel number). User Two: _____ is owner of the property at _____ (address) _____ (tax parcel number). The Users own properties that abut each other and have access from _____. There is a driveway that serves both properties. The Users have determined that it is in their mutual interest to have executed and recorded an agreement for sharing the costs of maintenance and repair of the driveway. The purpose of this Agreement is to place into writing the mutual rights and obligations of the Users of the jointly used driveway.

Agreement

NOW THEREFORE, in consideration of their mutual promises and intending to be legally bound, the Users (parties) agree as follows:

1. **Grant of Easement.** Each party grants to the other a permanent easement over and across their respective properties for the purpose in ingress and egress to their adjoining properties.

2. **Sharing of Costs and Expenses.** The parties shall share the expenses as follows: _____, his/her successors and assigns shall pay one-half of the maintenance and repair of the driveway that is jointly used. _____, their successors and assigns shall pay one-half of the costs of maintenance and repair of the jointly used driveway that is used solely by them.

3. **Binding Effect.** This Shared Driveway Agreement shall not be modified except in writing signed by the parties, their successors or assigns. This Agreement and its obligations and benefits shall run with the land and shall be binding upon and inure to the benefit of the parties hereto and their respective successors and assigns.

This Agreement dated this _____ day of _____, 20__.

(Signature – User One)

(Print Name – User One)

(Signature – User Two)

(Print Name – User Two)

Adapted for New York State municipalities from the Township of Halfmoon, Centre County, Pennsylvania.

Appendix 3 – Conservation Incentives

Conservation Incentives Used in New York State

1. Open Space Development and Density Bonuses

- Enabling legislation in New York State:
 - Incentive Zoning – “A system of zoning incentives to land developers in exchange for the provision of community benefits by those developers,”¹ such as open space or parks, affordable housing, day care or elder care. The developer is allowed to build a greater number of homes than otherwise permitted by the zoning law. To implement, the local legislature (Town Board, Village Board of Trustees, City Council) must show that the adoption of incentive zoning in certain zoning districts is still in conformance with the comprehensive plan; districts must be designated in the zoning map; the local legislature must find that each of the districts have the capacity to absorb the development, as well as other requirements. NYS Town Law § 261-b, NYS Village Law § 7-703, NYS General City Law § 81-d
 - Cluster Development – A subdivision “in which the applicable zoning ordinance or local law is modified to provide an alternative permitted method for the layout” and design of lots, infrastructure, parks and landscaping “in order to preserve the natural and scenic qualities of open lands.”² Cluster development “may not allow greater density than if the land were subdivided into lots conforming to the minimum lot size and density of the zoning district in which the property is located.”³ NYS Town Law § 278, NYS Village Law § 7-738, NYS General City Law § 37.
 - Local governments also have separate authority in NYS Municipal Home Rule Law to supersede or “go beyond” general state law statutes for zoning, subdivision or the cluster and incentive zoning provisions cited above. These provisions allowed for incentive zoning even before the Incentive Zoning provisions were adopted in the early 1990's into NYS Town, Village and City Law. NYS Municipal Home Rule Law § 10(1)(ii)(d)(3) (Authority) and § 22(1) (Procedures).
 - Implementation - Common provisions incorporated in the zoning law –
 - Increased density allowed on one portion of a site in exchange for protected open space elsewhere on the site (usually 50% open space required)
 - Zoning law specifies which districts open space development is allowed in and the standards for this type of development (By-right), therefore additional variances or approvals beyond the normal process are not required.

2. Transfer of Development Rights (TDR)

- Enabling legislation in New York State:
 - Transfer of Development Rights – “The process by which development rights are transferred from one lot, parcel, or area of land in a sending district to another lot, parcel,

¹ Well-Founded: Shaping the Destiny of the Empire State by John R. Nolon, 1999.

² Well-Founded: Shaping the Destiny of the Empire State by John R. Nolon, 1999.

³ Well-Founded: Shaping the Destiny of the Empire State by John R. Nolon, 1999.

or area of land in one or more receiving districts.”⁴ The local legislature must identify the “sending district” and “receiving district.” The purpose is to protect the natural, scenic or agricultural qualities of open lands, to enhance special sites, and encourage flexibility of design. TDR potentially allows a community to grow in a more cost-effective manner. Town Law § 261-a, Village Law § 7-701, General City Law § 20-f.

- Local governments also have separate authority in NYS Municipal Home Rule Law to supersede or “go beyond” general state law statutes for zoning, subdivision or the TDR provision cited above. These provisions allowed for TDR even before the TDR provisions were adopted in the early 1990's into NYS Town, Village and City Law. NYS Municipal Home Rule Law § 10(1)(ii)(d)(3) (Authority) and § 22(1) (Procedures).

3. Reduced stormwater management requirements for environmentally sensitive development – “Stormwater Credits”

- New York State Regulation – NYSDEC requires preparation of a full stormwater pollution prevention plan (SWPPP) under SPDES General Permit GP-02-01 at multi-family, commercial, industrial, and institutional project development sites that disturb one acre or more of soil; and single-family home project development sites and subdivisions that disturb five or more acres of soil. Single-family home projects between one and five acres require a basic SWPPP (erosion and sediment control only) unless they are in certain watersheds, in which case the project requires a full SWPPP. The required minimum technical standards for stormwater practice design are in the New York State Stormwater Management Design Manual (SWDM). NYSDEC has also developed a “Stormwater Credits” guidance document. The “Stormwater Credits” document provides suggested guidance to developers and engineers, and state and local agencies to allow for reduced stormwater sizing requirements when certain techniques are used:
 - Natural Area Conservation
 - Stream and Wetland Buffers
 - Vegetated Open Channels
 - Overland Flow Filtration to Groundwater Recharge Zones
 - Environmentally Sensitive Rural Development
 - Riparian Reforestation

- Local Regulation – Some municipalities in New York State already have in place Stormwater Management ordinances or local laws. If municipalities do not have a Stormwater Management local law, or if the municipality is interested in updating existing Stormwater Management local laws, it is recommended that the “Sample Stormwater Management and Erosion and Sediment Control Local Law” developed by NYSDEC and NYS Department of State be adopted as amendments to zoning, site plan, and subdivision laws. This Sample Law takes into account the EPA and NYSDEC Stormwater Phase II requirements and uses the NYSDEC Stormwater Management Design Manual as the technical standards for the local law. To incorporate stormwater credits that promote low-impact site design, local governments are encouraged to adopt all or portions of the “Stormwater Credits” document mentioned above as part of a local stormwater management law.

⁴ Well-Grounded: Shaping the Destiny of the Empire State by John R. Nolon, 1999.

4. Property Tax Reduction

- Local governments may consider reducing property tax assessments for wetland property to encourage wetland protection. For wetlands regulated under the NYS Freshwater Wetlands Act, Section 24-0905 of the Act (Tax Abatement), states:
 - *“Any freshwater wetland subject to land-use regulations pursuant to section 24-09-3 of this article or subject of a cooperative agreement pursuant to section 24-0901 of this article shall be deemed subject to a limitation on the use of such wetlands for the purpose of property tax evaluation in the same manner as if an easement or right had been acquired pursuant to the general municipal law. Assessment value shall be based during the duration of such agreement or regulations on the uses remaining to the owner thereof.”*

While Section 24-0905 does not provide a direct tax exemption, it does recognize that the constraints of the NYS Freshwater Wetlands Act may influence allowed land use which should be a consideration during real property valuation. See the NYSDEC publication, “Wetlands and Real Property Valuation: What does it mean for your property taxes?” for more information.

- NYS Forest Tax Law, Section 480-A of the Real Property Tax Law, provides landowners with 50 or more acres of forest land with a reduced assessment and potential property tax exemption. Section 480-A requires that a forest management plan prepared by a qualified forester be prepared and that the land remain in forest management for 10 years.

Appendix 4 – Plant Lists

Invasive Species Plant Lists

The following websites provide invasive species plant lists for New York State:

United States Department of Agriculture –
http://plants.usda.gov/cgi_bin/noxious.cgi#state

Brooklyn Botanic Garden –
http://www.bbg.org/gar2/pestalerts/invasives/worst_nym.html

Invasive Plant Council of NYS –
<http://www.ipcnys.ene.com/sections/about/>

New York State Invasive Species Task Force –
<http://www.dec.state.ny.us/website/dfwmr/habitat/istf/index.html#Final>

Native Plant Lists

Table H.5. *Native Plant Guide for Stormwater Management Areas (NY)* from Appendix H of the New York State Stormwater Management Design Manual is provided in this document (SEE FOLLOWING PAGES) and may also be found on the following website:
<http://www.dec.state.ny.us/website/dow/toolbox/swmanual/#Downloads>

Additional sources of native plant lists can be found at the New York State Department of Transportation website:
<http://www.fhwa.dot.gov/environment/rdsduse/ny.htm>

Table H.5 Native Plant Guide for Stormwater Management Areas (NY)

Plant Name	Zone	Form	Available	Inundation Tolerance	Wildlife Value	Notes
Trees and Shrubs						
American Elm <i>(Ulmus americana)</i>	4,5,6	Dec. Tree	yes	Irregular-seasonal saturation	High. Food (seeds, browsing), cover, nesting for birds & mammals	Susceptible to disease (short-lived). Sun to full shade, tolerates drought and wind/ice damage.
Arrowwood Viburnum <i>(Viburnum dentatum)</i>	3,4	Dec. Shrub	yes	yes	High. Songbirds and mammals	Grows best in sun to partial shade
Bald Cypress <i>(Taxodium distichum)</i>	3,4	Dec. Tree	yes	yes	Little food value, but good perching site for waterfowl	Forested Coastal Plain. North of normal range. Tolerates drought.
Bayberry <i>(Myrica pensylvanica)</i>	4,5,6	Dec. Shrub	yes	yes	High. Nesting, food, cover. Berries last into winter	Coastal Plain only. Roots fix N ₂ . Tolerates slightly acidic soils.
Black Ash <i>(Fraxinus nigra)</i>	3,4,5	Dec. Tree	yes	Irregular-seasonal saturation	High. Food (seeds, sap), cover, nesting for birds & mammals. Fruit persists in winter	Rapid growth. Requires full sun. Susceptible to wind/ice damage & disease. Tolerates drought and infrequent flooding by salt water.
Black Cherry <i>(Prunus serotina)</i>	5,6	Dec. Tree	yes	no	High. Food	Moist soils or wet bottomland areas
Blackgum or Sourgum <i>(Nyssa sylvatica)</i>	4,5,6	Dec. Tree	yes	yes	High. Songbirds, egrets, herons, raccoons, owls	Can be difficult to transplant. Prefers sun to partial shade
Black Willow <i>(Salix nigra)</i>	3,4,5	Dec. Tree	yes	yes	High. Browsing and cavity nesters.	Rapid growth, stabilizes stream-banks. Full sun
Buttonbush <i>(Cephalanthus occidentalis)</i>	2,3,4,5	Dec. Shrub	yes	yes	High. Ducks and shorebirds. Seeds, nectar and nesting.	Full sun to partial shade. Will grow in dry areas.
Common Spice Bush <i>(Lindera benzoin)</i>	3,4,5	Dec. Shrub	yes	yes	Very high. Songbirds	Shade and rich soils. Tolerates acidic soils. Good understory species

Table H.5 Native Plant Guide for Stormwater Management Areas (NY)

Plant Name	Zone	Form	Available	Inundation Tolerance	Wildlife Value	Notes
Eastern Cottonwood (<i>Populus deltoides</i>)	4,5	Dec. Tree	yes	yes	Moderate. Cover, food.	Shallow rooted, subject to windthrow. Invasive roots. Rapid growth.
Eastern Hemlock (<i>Tsuga canadensis</i>)	5,6	Conif. Tree	yes	yes	Moderate. Mostly cover and some food	Tolerates all sun/shade conditions. Tolerates acidic soil.
Eastern Red Cedar (<i>Juniperus virginiana</i>)	4,5,6	Conif. Tree	yes	no	High. Fruit for birds. Some cover.	Full sun to partial shade. Common in wetlands, shrub bogs and edge of stream
Elderberry (<i>Sambucus canadensis</i>)	3,4,5,6	Dec. Shrub	yes	yes	Extremely high. Food and cover, birds and mammals.	Full sun to partial shade.
Green Ash, Red Ash (<i>Fraxinus pennsylvanica</i>)	4,5	Dec. Tree	yes	yes	Moderate. Songbirds.	Rapid growing streambank stabilizer. Full sun to partial shade.
Hackberry (<i>Celtis occidentalis</i>)	5,6	Dec. Tree	yes	some	High. Food and cover	Full sun to partial shade.
Larch, Tamarack (<i>Larix laricina</i>)	3,4	Conif. Tree	no	yes	Low. Nest tree and seeds.	Rapid initial growth. Full sun, acidic boggy soil.
Pin Oak (<i>Quercus palustris</i>)	3,4,5,6	Dec. Tree	yes	yes	High. Tolerates acidic soil	Gypsy moth target. Prefers well drained, sandy soils.
Red Choke Berry (<i>Pyrus arbutifolia</i>)	3,4,5	Dec. Shrub	no	yes	Moderate. Songbirds.	Bank stabilizer. Partial sun.
Red Maple (<i>Acer rubrum</i>)	3,4,5,6	Dec. Tree	yes	yes	High seeds and browse. Tolerates acidic soil.	Rapid growth.
River Birch (<i>Betula nigra</i>)	3,4,5	Dec. Tree	yes	yes	Low. Good for cavity nesters.	Bank erosion control. Full sun.
Shadowbush, Serviceberry (<i>Amelanchier</i>)	4,5,6	Dec. Shrub	yes	yes	High. Nesting, cover, food. Birds and	Prefers partial shade. Common in forested

Table H.5 Native Plant Guide for Stormwater Management Areas (NY)

Plant Name	Zone	Form	Available	Inundation Tolerance	Wildlife Value	Notes
<i>canadensis</i>)					mammals.	wetlands and upland woods.
Silky Dogwood (<i>Cornus amomium</i>)	3,4,5	Dec. Shrub	yes	yes	High. Songbirds, mammals.	Shade and drought tolerant. Good bank stabilizer.
Slippery Elm (<i>Ulmus rubra</i>)	3,4,5	Dec. Tree	rare	yes	High. Food (seeds, buds) for birds & mammals (browse). Nesting	Rapid growth, no salinity tolerance. Tolerant to shade and drought.
Smooth Alder (<i>Alnus serrulata</i>)	3,4,5	Dec. Tree	no	yes	High. Food, cover.	Rapid growth. Stabilizes streambanks.
Speckled Alder (<i>Alnus rugosa</i>)	3,4	Dec. Shrub	yes	yes	High. Cover, browse for deer, seeds for bird.	
Swamp White Oak (<i>Quercus bicolor</i>)	3,4,5	Dec. Tree	yes	yes	High. Mast	Full sun to partial shade. Good bottomland tree.
Swamp Rose (<i>Rosa Palustris</i>)	3,4	Dec. Shrub		Irregular, seasonal, or regularly saturated	High. Food (hips) for birds including turkey, ruffed grouse and mammals. Fox cover.	Prefers full sun. Easy to establish. Low salt tolerance.
Sweetgum (<i>Liquidambar styraciflua</i>)	4,5,6	Dec. Tree	yes	yes	Moderate. Songbirds	Tolerates acid or clay soils. Sun to partial shade.
Sycamore (<i>Platanus occidentalis</i>)	4,5,6,	Dec. Tree	yes	yes	Low. Food, cavities for nesting.	Rapid growth. Common in floodplains and alluvial woodlands.
Tulip Tree (<i>Liriodendron tulipifera</i>)	5,6	Dec. Tree	yes	no	Moderate. Seeds and nest sites	Full sun to partial shade. Well drained soils. Rapid growth.
Tupelo (<i>Nyssa sylvatica vari biflora</i>)	3,4,5	Dec. Tree	yes	yes	High. Seeds and nest sites	Ornamental

Table II.5 Native Plant Guide for Stormwater Management Areas (NY)

Plant Name	Zone	Form	Available	Inundation Tolerance	Wildlife Value	Notes
White Ash (<i>Fraxinus americana</i>)	5,6	Dec. Tree	yes	no	High. Food	All sunlight conditions. Well drained soils.
Winterberry (<i>Ilex verticillata</i>)	3,4,5	Dec. Shrub	yes	yes	High. Cover and fruit for birds. Holds berries into winter.	Full sun to partial shade. Seasonally flooded areas.
Witch Hazel (<i>Hamamelis virginiana</i>)	4,5	Dec. Shrub	yes	no	Low. Food for squirrels, deer, and ruffed grouse.	Prefers shade. Ornamental.
Herbaceous Plants						
Arrow arum (<i>Peltandra virginica</i>)	2,3	Emergent	yes	up to 1 ft.	High. Berries are eaten by wood ducks.	Full sun to partial shade.
Arrowhead, Duck Potato (<i>Sagittaria latifolia</i>)	2,3	Emergent	yes	up to 1 ft.	Moderate. Tubers and seeds eaten by ducks.	Aggressive colonizer.
Big Bluestem (<i>Andropogon gerardi</i>)	4,5	Perimeter	yes	Irregular or seasonal inundation.	High. Seeds for songbirds. Food for deer	Requires full sun.
Birdfoot deervetch (<i>Lotus Corniculatus</i>)	4,5,6	Perimeter	yes	Infrequent inundation	High. Food for birds.	Full sun. Nitrogen fixer.
Blue Flag Iris (<i>Iris versicolor</i>)	2,3	Emergent	yes	Regular or permanently, up to ½ ft or saturated	Moderate. Food muskrat and wildfowl. Cover, marshbirds	Slow growth. Full sun to partial shade. Tolerates clay. Fresh to moderately brackish water.
Blue Joint (<i>Calamagrotis canadensis</i>)	2,3,4	Emergent	yes	Regular or permanent inundation up to 0.5 ft.	Moderate. Food for game birds and moose.	Tolerates partial shade
Broomsedge (<i>Andropogon virginicus</i>)	2,3	Perimeter	yes	up to 3 in.	High. Songbirds and browsers. Winter food and cover.	Tolerant of fluctuation water levels & partial shade.
Bushy Beardgrass (<i>Andropogon glomeratus</i>)	2,3	Emergent	yes	up to 1 ft.		Requires full sun.
Cardinal flower (<i>Lobelia cardinalis</i>)	4,5,6	Perimeter	yes	Some. Tolerates saturation up to 100% of season.	High. Nectar for hummingbird, oriole, butterflies.	Tolerates partial shade

Table H.5 Native Plant Guide for Stormwater Management Areas (NY)

Plant Name	Zone	Form	Available	Inundation Tolerance	Wildlife Value	Notes
Cattail (<i>Typha sp.</i>)	2,3	Emergent	yes	up to 1 ft.	Low. Except as cover	Aggressive. May eliminate other species. Volunteer. High pollutant treatment
Coontail (<i>Ceratophyllum demersum</i>)	1	Submergent	no	yes	Low food value. Good habitat and shelter for fish and invertebrates.	Free floating SAV. Shade tolerant. Rapid growth.
Common Three-Square (<i>Scirpus pungens</i>)	2	Emergent	yes	up to 6 in.	High. Seeds, cover. Waterfowl and fish.	High metal removal.
Duckweed (<i>Lemna sp.</i>)	1,2	Submergent/ Emergent	yes	yes	High. Food for waterfowl and fish.	High metal removal.
Fowl mannagrass (<i>Glyceria striata</i>)	4,5	Perimeter	yes	Irregular or seasonal inundation	High. Food for waterfowl, muskrat, and deer.	Partial to full shade.
Hardstem Bulrush (<i>Scirpus acutus</i>)	2	Emergent	yes	up to 3 ft.	High. Cover, food (achenes, rhizomes) ducks, geese, muskrat, fish. Nesting for bluegill and bass.	Quick to establish, fresh to brackish. Good for sediment stabilization and erosion control.
Giant Burreed (<i>Sparganium eurycarpum</i>)	2,3	Emergent	rare	Regular to permanently inundated. up to 1 ft.	High. Food (seeds, plant) waterfowl, beaver & other mammals. Cover for marshbirds, waterfowl.	Rapid spreading. Tolerates partial sun. Good for shoreline stabilization.. Salinity <0.5 ppt
Lizard's Tail (<i>Saururus cernuus</i>)	2	Emergent	yes	up to 1 ft.	Low, except wood ducks.	Rapid growth. Shade tolerant
Long-leaved Pond Weed (<i>Potamogeton nodosus</i>)	1,2	Rooted submerged aquatic	yes	up to 1-6 ft. depending on turbidity	High. Food (seeds, roots) waterfowl, aquatic furbearers, deer, moose. Habitat for fish	Rapid spread. Salinity <0.5 ppt. Flowers float on surface, Aug.-Sept.

Table H.5 Native Plant Guide for Stormwater Management Areas (NY)

Plant Name	Zone	Form	Available	Inundation Tolerance	Wildlife Value	Notes
Marsh Hibiscus (<i>Hibiscus moscheutos</i>)	2,3	Emergent	yes	up to 3 in.	Low. Nectar.	Full sun. Can tolerate periodic dryness.
Pickerelweed (<i>Pontederia cordata</i>)	2,3	Emergent	yes	up to 1 ft.	Moderate. Ducks. Nectar for butterflies.	Full sun to partial shade.
Pond Weed, Sago (<i>Potamogeton pectinatus</i>)	1	Submergent	yes	yes	Extremely high. Waterfowl, marsh and shorebirds.	Removes heavy metals.
Redtop (<i>Agrostis alba</i>)	3,4,5	Perennial	yes	Up to 25% of season	Moderate. Rabbits and some birds.	Quickly established but not highly competitive.
Rice Cutgrass (<i>Leersia oryzoides</i>)	2,3	Emergent	yes	up to 3 in.	High. Food and cover.	Full sun although tolerant of shade. Shoreline stabilization.
Sedges (<i>Carex spp.</i>)	2,3	Emergent	yes	up to 3 in.	High waterfowl, songbirds.	Many wetland and upland species.
Tufted Hairgrass (<i>Deschampsia caespitosa</i>)	3,4,5	Perennial	yes	Regular to irregular inundation.	High.	Full sun. May become invasive.
Soft-stem Bulrush (<i>Scirpus validus</i>)	2,3	Emergent	yes	up to 1 ft.	Moderate. Good cover and food.	Full sun. Aggressive colonizer. High pollutant removal.
Smartweed (<i>Polygonum spp.</i>)	2,3,4	Emergent	yes	up to 1 ft.	High. Waterfowl, songbirds. Seeds and cover.	Fast colonizer. Avoid weedy aliens such as <i>P. perfoliatum</i> .
Soft Rush (<i>Juncus effusus</i>)	2,3,4	Emergent	yes	up to 3 in.	Moderate.	Tolerates wet or dry conditions.
Spatterdock (<i>Nuphar luteum</i>)	2	Emergent	yes	up to 3 ft.	Moderate for food but high for cover.	Fast colonizer. Tolerant of fluctuating water levels.
Switchgrass (<i>Panicum virgatum</i>)	2,3,4,5,6	Perennial	yes	up to 3 in.	High. Seeds, cover for waterfowl, songbirds.	Tolerates wet/dry conditions.

Table H.5 Native Plant Guide for Stormwater Management Areas (NY)						
Plant Name	Zone	Form	Available	Inundation Tolerance	Wildlife Value	Notes
Sweet Flag <i>(Acorus calamus)</i>	2,3	Herbaceous	yes	up to 3 in.	Low.	Tolerant of dry periods. Not a rapid colonizer. Tolerates acidic conditions.
Waterweed <i>(Elodea canadensis)</i>	1	Submergent	yes	yes	Low.	Good water oxygenator. High nutrient, copper, manganese and chromium removal.
Wild Celery <i>(Valisneria americana)</i>	1	Submergent	yes	yes	High. Food for waterfowl. Habitat for fish and invertebrates.	Tolerant of murky water and high nutrient loads.
Wild Rice <i>(Zizania aquatica)</i>	2	Emergent	yes	up to 1 ft.	High. Food for birds.	Prefers full sun
Wool Grass <i>(Scirpus cyperinus)</i>	2,3	Emergent	yes	Irregularly to seasonally inundated	Moderate. Cover, Food.	Requires full sun. Can tolerate acidic soils, drought. Colonizes disturbed areas, moderate growth.

Source:
New York State Stormwater Management Design Manual, Appendix H (NYSDEC, 2001)

Appendix 5 – Town of Mamaroneck Chapter 207, Trees

Code of the Town of Mamaroneck, New York - Chapter 207, Trees

[HISTORY: Adopted by the Town Board of the Town of Mamaroneck 7-17-1985 as L.L. No. 10-1985 (Ch. 76A of 1975 Code). Amendments noted where applicable.]

§ 207-1. Findings, purpose.

The destruction or damage to shade, ornamental and evergreen trees and plants and the indiscriminate and excessive cutting of these trees in subdivisions and on private property causes barren and unsightly conditions, creates increased surface drainage problems, increases municipal costs to control drainage, impairs the stability and value of improved and unimproved real property and causes deterioration to the community which adversely affects the health, safety, environment, ecosystems and general welfare of the inhabitants of the Town of Mamaroneck. This chapter seeks to correct these conditions.

§ 207-2. Cutting or destruction of trees restricted; exceptions.

A. No person, firm or corporation or individual connected with such firm or corporation shall either purposely or negligently cut down, kill or otherwise destroy or commit any act which will lead to the eventual destruction of any tree exceeding six inches in diameter at a height of four feet measured from the ground on any private property unless he is in the possession of a permit to do so issued by the Tree Preservation Commission pursuant to § 207-4. Permits issued for any other purpose by the Town shall not be valid for this purpose. A lot of 20,000 square feet or less substantially developed with improvements and a structure or structures situated thereon shall be exempt from this section. [Amended 7-17-1996 by L.L. No. 14-1996]

B. Notwithstanding any other provision of this chapter, any property owner applying for subdivision or site plan approval whose plans would require the removal of any tree on said property shall make application to the Planning Board of the Town of Mamaroneck, which shall have sole jurisdiction regarding the proposed removal of such trees. The Planning Board may grant or deny such application on such terms and conditions as it may prescribe, it being understood that there must, in any event, be full compliance with Chapter 190, Subdivision of Land, and Chapter 177, Site Plan Review, of the Code of the Town of Mamaroneck. In the event that a property owner, subsequent to the filing of a final plat or site plan, shall require the removal of any trees which deviates from the plans approved by the Planning Board, application must be made to the Tree Preservation Commission and all the requirements of this chapter shall be applicable.

§ 207-3. Additional duties of Tree Preservation Commission. [Amended 11-28-1990 by L.L. No. 6-1990; 9-25-1991 by L.L. No. 8-1991; 5-15-1996 by L.L. No. 12-1996; 4-22-2003 by L.L. No. 12-2003.]

In addition to its other duties as provided for in this chapter, the Tree Preservation Commissions shall advise the Town Board in its selection, purchases, placement, and planting of trees and shrubs on municipal property and shall maintain an inventory and management plan for the continued maintenance and improvement of municipal plantings.

§ 207-4. Criteria for removal of trees.

A. Permits for the removal of trees may be granted under the following circumstances:

- (1) If the presence of trees would cause hardship or endanger the public or the person or property of the owner.
- (2) On property to be occupied by buildings or structures, within a distance of ten (10) feet around the perimeter of such building or structure, depending upon tree species and conditions to be determined by the Tree Preservation Commission.

(3) If the trees substantially interfere with a permitted use of the property, and the removal of the trees shall be performed in a selective manner.

(4) If the property shall have an approved cut or fill of land deemed by the Tree Preservation Commission to be injurious or dangerous to the trees.

(5) Where the trees to be removed are dead or so substantially diseased that, in the opinion of the Tree Commission, the tree constitutes a potential danger. [Amended 2-6-1991 by L.L. No. 1-1991].

B. The determination of the Tree Preservation Commission shall be final and shall depend upon the species of the tree, the degree of injury and the likelihood of the survival of the tree and consideration of the general welfare and the overall environment of the area, except that it shall be subject to such review as is authorized by § 207-6H.

§ 207-5. Immediate removal.

In the event that the Tree Preservation Commission determines that a tree or trees are hazardous to life or property or substantially interfere with a permitted use of the property, the Tree Preservation Commission shall have the right to grant immediate approval for the removal of said tree or trees, waiving all notices as required under this chapter. In the event that such approval is granted, the Tree Preservation Commission, subsequent to the cutting of said tree or trees, shall have the authority to require complete compliance with all other provisions of this chapter as applicable thereto.

§ 207-6. Tree removal procedure; bond.

A. All applications for permits hereunder shall be made in writing and verified under oath upon forms prescribed by the Tree Preservation Commission and approved by the Town Board of the Town of Mamaroneck. The fee for each application shall be set by a resolution of the Town Board, payable upon submission of the application.

B. The applicant shall submit plans showing existing and proposed contours at two-foot intervals on a map or plan, at a scale no smaller than one (1) inch equaling fifty (50) feet. Where trees are to be removed or destroyed, existing trees, specifying types and sizes, shall be shown and the reasons for removing or destroying said trees shall be set forth. The plans shall provide for new trees to be planted and shall specify their location and type to replace the existing trees in kind. When the existing trees are so large and mature that they cannot be replaced, the Tree Preservation Commission may require planting of multiple trees instead. On substantially wooded lots [lots containing thirty (30) or more trees per acre meeting the requirements of § 207-2A], the Tree Commission shall have the discretion of waiving the requirement of replacement of each tree in kind or payment of a fee. [Amended 2-6-1991 by L.L. No. 1-1991]

C. The Tree Preservation Commission may require additional information such as the design of walls, disposition and design of storm drainage and any other information pertinent to the individual circumstances.

D. Where extensive tree cutting is planned, the Tree Preservation Commission may require the applicant to pay for an Inspector to be assigned by the Commission to supervise the orderly development of the land and ensure the protection of the trees.

E. The Tree Preservation Commission shall require that the applicant or applicant's representative who shall be performing the work shall furnish the town with a performance bond as approved by the Counsel to the Town in an amount sufficient to cover ninety percent (90%) of the planting and restoration work to be completed in accordance with the plans accompanying the application. The remaining ten percent (10%) of the cost of restoration and replanting shall be in cash, deposited in a special tree preservation escrow account. The total amount of the bond and cash deposit shall reflect all restoration and protection costs and shall be in accordance with each set of individual circumstances. Upon completion of all planting and restoration work to the satisfaction of the Tree Preservation Commission, the performance bond shall be canceled and replaced with a maintenance bond to be approved by the Counsel to the Town and to run for a term of two (2) years. The ten-percent cash in escrow shall remain on deposit with the town until the maintenance bond is canceled.

F. The Tree Preservation Commission, within twenty (20) days from the date the application is submitted in final form, shall approve or disapprove the application for permit. No trees shall be cut pursuant to a validly issued permit

for a period of ten (10) days from the date of the issuance of said permit. The failure to act upon the application for permit within said twenty (20) days shall be deemed a granting of automatic approval by the Tree Preservation Commission of the application for permit.

G. All decisions or determinations made by the Tree Preservation Commission approving applications pursuant to this chapter shall be sent to property owners within a two-hundred-fifty-foot radius of the area in question and to the Planning Board.

H. Any person, firm, organization or corporation aggrieved, affected or interested in the determination or decision of the Tree Preservation Commission shall have the right, within ten (10) days from receipt of the decision of the Tree Preservation Commission, to appeal to the Town Board, which shall review the decision. Any decision or determination of the Tree Preservation Commission which is appealed to the Town Board shall be stayed pending review by the Town Board.

I. Any decision or determination of the Commission sustained, revoked or modified by the Town Board may be appealed by any person, firm, organization or corporation aggrieved, affected or interested in the determination or decision of the Town Board by application to the Supreme Court of the State of New York within thirty (30) days of filing of such decision with the Town Clerk.

J. The Tree Preservation Commission may revoke any permit if the work is not proceeding according to permit.

§ 207-7. Tree removal; restoration.

A. All persons who remove or cause to be removed trees with or without a permit, as required, shall restore the area by backfilling all holes and by creating an acceptable grade and covering, subject to approval by the Tree Preservation Commission. Any tree damaged during construction or development of the property shall be either replaced in kind or, where existing trees are so large and mature that they cannot be replaced, the Tree Preservation Commission may require the planting of multiple trees instead. Minor tree damage shall be repaired in accordance with accepted tree surgery practice.

B. Tree stumps shall be removed, not cut flush. After the planting of trees, removal of all debris in the disturbed area shall be made immediately. The property where such planting is done must be left in a neat and orderly condition with good and acceptable planting and tree surgery practice. On substantially developed lots, the Tree Commission shall have the discretion, when it is not reasonably feasible to maneuver stump removal equipment to the location of a stump or where the stump is in close proximity to existing structures, to modify the provisions of this subsection with regard to stump removal. [Amended 2-6-1991 by L.L. No. 1-1991]

C. All trees which fail to survive for a period of two (2) calendar years following planting shall be replaced by the permit holder at no expense to the town or the owner of the land, if other than the holder of the permit. Said replacement shall be within sixty (60) days following written demand for such replacement from the Tree Preservation Commission or within an extended period of time as may be specified. Should the permit holder fail to replace the trees pursuant to demand within the required period of time, the Tree Preservation Commission shall have the right to declare the maintenance bond in default and apply the escrow cash deposit and the proceeds of the bond to replace the required trees.

D. All tree planting, tree dressing and associated restoration work must be substantially completed within six (6) months from the date of issuance of the permit except that the permit may be extended by the Tree Preservation Commission, which shall have the sole discretion to grant such an extension. Under all circumstances, the performance bond obtained by the permit holder shall continue in full force and effect until there has been full compliance and approval of all restoration work by the Tree Preservation Commission. In the event that planting and restoration work has not been substantially completed within six (6) months and no permit extension has been applied for or granted, the Tree Preservation Commission shall have the right to consider the site abandoned and declare the performance bond in default and may apply the escrow deposit and the proceeds of the bond to perform all required planting and restoration work. By accepting a permit, the holder thereby agrees to this procedure and grants unconditional access to the land for such restoration purposes.

§ 207-8. Certificate of occupancy. [Amended 10-16-2002 by L.L. No. 10-2002]

No certificate of occupancy shall be issued by the Director of Building Code Enforcement and land use Administration until all tree planting, tree dressing and associated restoration work shall be completed to the satisfaction of the Tree Preservation Commission except that, where a certificate of occupancy is applied for between October 31 and April 1, the permit holder shall submit an agreement, in writing, to the Town signed by the permit holder to ensure compliance with all planting and restoration work to the satisfaction of the Tree Preservation Commission on or before the first day of May next following the making of the agreement. The escrow cash deposit and the bond obtained by the permit holder shall continue in full force and effect until the planting and restoration work has been completed. Should the permit holder fail to complete the restoration work on or before May 1 next following the execution of the agreement, the Tree Preservation Commission shall have the right to declare said performance bond in default and apply the escrow cash deposit and the proceeds of the bond to restore the land.

§ 207-9. Enforcement. [Amended 10-16-2002 by L.L. No. 10-2002]

The Director of Building Code Enforcement and land use Administration of the Town of Mamaroneck shall enforce this chapter.

§ 207-10. Removal of trees on town-owned land.

A. No department, agency, commission or authority in the Town of Mamaroneck, employee of the Town of Mamaroneck or any firm or individual retained by the Town shall propose to or shall cut down, kill or otherwise destroy more than five trees, each exceeding six inches in diameter at a height of four feet measured from the ground, within an area of 2,500 square feet, or any single tree exceeding 18 inches in diameter at a height of four feet measured from the ground on Town property, with the exception of Town highways within the town of Mamaroneck, without first filing a statement with the Town Board.

(1) The statement required hereunder shall be made, in writing, to the Town Board on a form approved by the Town Board. Such statement shall specify the particular type of work to be performed, the exact location, a general description of the tree or trees that shall be removed and a sketch plan, if appropriate and required, together with the reasons for the removal of said tree or trees.

(2) Upon filing said statement with the Town Board, notification shall be sent to owners of record of land within a radius of 250 feet from the tree or trees that are to be removed. In addition thereto, notice of the proposed removal of said tree or trees shall be published in the official newspaper of the Town of Mamaroneck.

(3) The Town Board shall be stayed from making any decision or determination for a period of 10 days from the date of publication. In the event that any person, firm, organization or corporation aggrieved, affected or interested in the removal of said tree or trees shall file an objection with the Town Board, in writing, five days prior to the Town Board meeting, said Town Board shall not make any decision or determination until its next regular or special Town Board meeting following the filing of said objection.

B. All contracts entered into by the Town with firms or individuals for work to be performed on town-owned land, excluding Town highways, shall contain a provision that there shall be complete compliance with § 207-10A of this chapter.

§ 207-11. Penalties for offenses.

A. Any person, firm or corporation violating any of the provision of this chapter shall be guilty of an offense, the fine for which shall not exceed \$1,000. [Amended 7-17-1996 by L.L. No. 14-1996]

B. Civil penalty. In addition thereto, any person, firm or corporation violating any provision of this chapter shall be subject to a civil penalty enforceable and collectible by the Town in the amount of \$100 each and every day that the violation continues, for each and every tree. In addition thereto, the violator will be required to replace each and every tree so taken down in accordance with § 207-7.

References

American Association of State Highway and Transportation Officials (AASHTO). *A Policy on Geometric Design of Highways and Streets*, p.384, 395. Washington, D.C., 2004.

Bannerman, et. al. "Sources of Pollutants in Wisconsin Stormwater." *Water Science Technology*, (1993) 28(3-5):241-259.

Bannerman, R. and R. Dodds. *Sources of Pollutants in Wisconsin Stormwater*. Wisconsin Department of Natural Resources, Madison, WI. 1992.

Beach, Dana and the South Carolina Conservation League. *Coastal Sprawl: The Effects of Urban Design of Aquatic Ecosystems in the United States*. Pew Oceans Commission. Citing: *Land Use in America*, H.L. Diamond and P.F. Noonan, 1996.

Black, Geoffrey, and Peter Winne. *Recreational Use and Economic Impact of the Wappingers Creek Watershed*. Bureau of Economic Research, School of Management, Marist College, Poughkeepsie, NY. 1998.

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. August 1998.

Coffman, Larry S. *LID Overview -PowerPoint Presentation*. Presented at Let Nature Do the Work II: On-Site Stormwater Management Conference sponsored by Westchester County Department of Planning and others, October 17, 2003, Westchester County Center.

Dutchess County Department of Planning and Development. "Greenway Guides - A1: Fitting into the Landscape; D2:Stream Corridor Protection; .E1:Landscaping; and E3:Parking Lots." In *Greenway Connections: Greenway Compact Program and Guides for Dutchess County Communities*. Poughkeepsie, NY. 2000.

Empire State Chapter of the Soil & Water Conservation Society. *New York Standards and Specifications for Erosion and Sediment Control*. 2005.

Environmental Laboratory. *Corps of Engineers Wetland Delineation Manual*, Technical Report Y-87-1, US Army Engineer Waterway Experiment Station, Vicksburg, Miss. 1987.

Fitzgerald & Halliday, Inc. *Model Zoning Regulations for Parking for Northwestern Connecticut*. Northwestern Connecticut Council of Governments and Litchfield Hills Council of Elected Officials. September 2003.

American Association of State Highway and Transportation Officials (AASHTO). *Guidelines for Geometric Design of Very Low-Volume Local Roads (ADT \leq 400)*, Washington, D.C. 2001.

Leinberger, C. "Metropolitan Development Trends of the Late 1990s: Social and Environmental Implications." *Land Use in America*, H.L. Diamond and P.F. Noonan, 1996, editors. Island Press, Washington, D.C. 1995.

Natural Resource Conservation Service. *Natural Resources Inventory*. United States Department of Agriculture. Natural Resources Conservation Service. January 2001.

New York State Department of Environmental Conservation. *New York State Stormwater Management Design Manual*. 2001 or most recent version.

Nolon, John R. *Well Grounded: Shaping the Destiny of the Empire State – Local Land Use Law and Practice*. Pace University School of Law, White Plains, NY. March 1999.

Pitt, Robert E. *Small Storm Urban Flow and Particulate Washoff Contributions to Outfall Discharges*. Doctorate Thesis. University of Wisconsin-Madison. 1987.

Sample Local Law for Stormwater Management and Erosion & Sediment Control, in the Stormwater Management Guidance Manual for Local Officials, NYSDEC and NYS Department of State, 2004, *Sample Local Law* revised 2006.

Steuer, et. al. *Sources of Contamination in an Urban Basin in Marquette, Michigan and an Analysis of Concentrations, Loads, and Data Quality*. U.S. Geological Survey Water Resources Investigation Report No. 97-4242. 1997.

Town of Dover, Dutchess County, New York, *Zoning Law*, Section 145-19.F. 1999.

Wells, C. *Impervious Surface Reduction Study: Final Report*. City of Olympia Public Works Department. Water Resources Program. Olympia, WA. 1995.