Conservation Development Workshop

Conservation Development is one of the most effective ways to implement the first step of Low Impact Development- avoiding the negative effects of stormwater runoff. It is a creative site design technique that allows a community to work collaboratively with developers to guide growth to the most appropriate areas within a parcel of land, in order to minimize negative impacts to the environment and preserve community character. Its compact form preserves at least 50% of a given development site as open space, with no cost to the community.
At this workshop, planners and other municipal staff and officials (3.0 AICP CM credits offered), designers, builders, non-profit staff, and other audiences:
•Learn how conservation development fits into the Rhode Island legal framework for subdivision review and how it can benefit your community
•Participate in a hands-on exercise to practice applying conservation development principles to an actual site
•Take advantage of ample discussion time to get your questions answered

Documents

Agenda
PowerPoint Presentation
RI Conservation Development Manual
Conservation Development Ordinance Status in RI
FAQs
Brochure
Visualizing Conservation Development at the Site Scale
Visualizing Conservation Development at the Regional Scale
Design Guidelines
Design Guidelines 2
“The Economics of Conservation Subdivisions”- summary
“The Economics of Conservation Subdivisions”- full article
“Changing Cost Perceptions”
"REAL ESTATE: The Benefits of Conservation Development"
"1st conservation development gets nod in Smithfield"
"Planning for Open Space in Massachusetts"
Websites

Conservation Development Workshop

AGENDA

8:30	**Sign-In and Coffee**
9:00	**Overview and Introductions** Jennifer West, Coastal Training Program Coordinator, Narragansett Bay National Estuarine Research Reserve
9:10	**Conservation Development Presentation** Scott Millar, Chief, Sustainable Watersheds Office, RIDEM
9:50	**Q&A**
10:20	**Break**
10:30	**Group exercise**
11:20	**Groups share results of exercise**
11:50	**Evaluations and wrap-up**
12:00	**Adjourn**

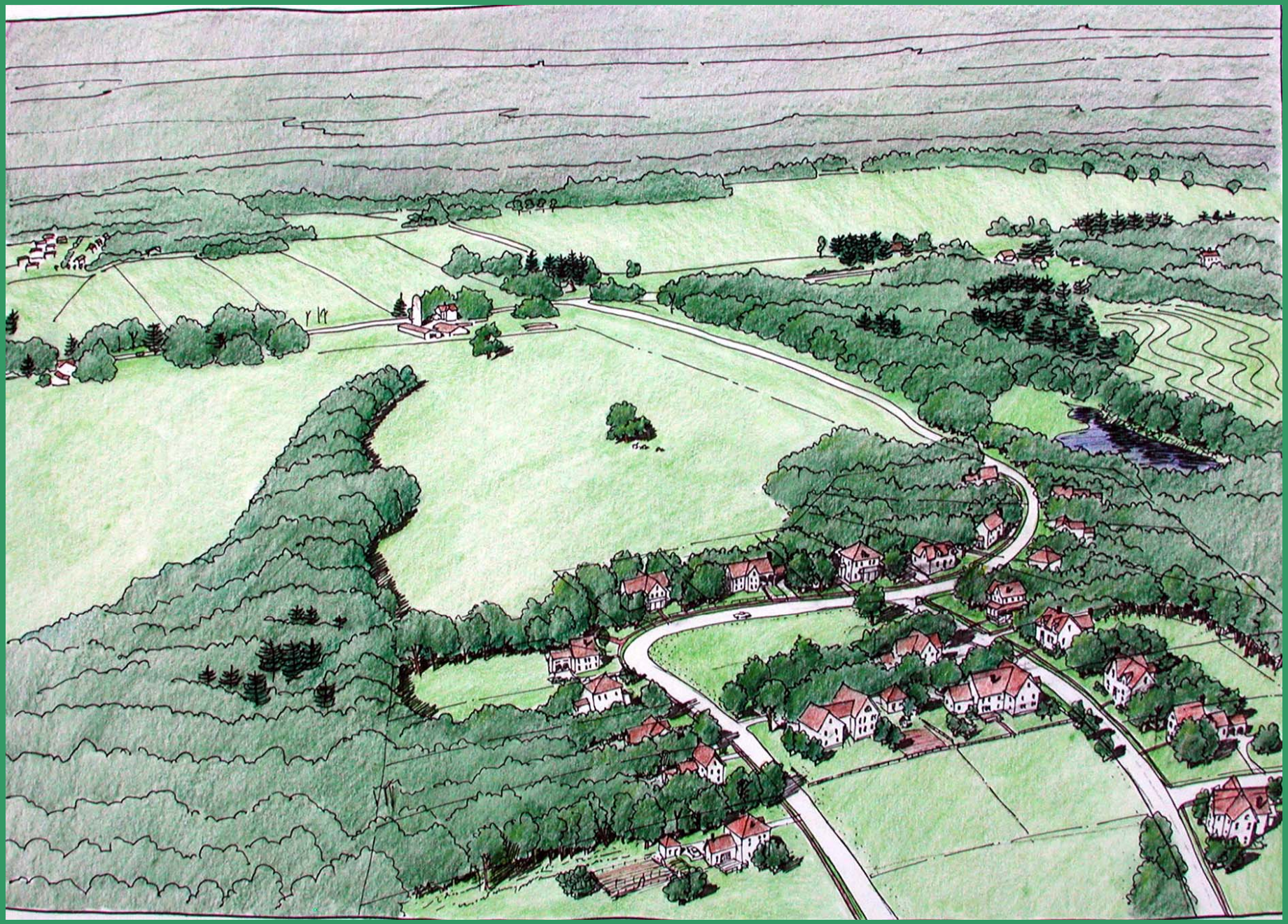
Scott Millar, Chief, Office of Sustainable Watersheds, RIDEM

Mr. Millar has over 25 years of environmental management and policy experience. In his current position he leads DEM's watershed initiative, coordinating state and federal agency participation in watershed management and assisting communities to plan for growth to avoid impacts to the environment and their community character. Mr. Millar also has 20 years of community experience as a planning board chair, community comprehensive plan coordinator, and conservation commission chair. Mr. Millar graduated from the University of Rhode Island with a BS in Natural Resources Science and a MS in Wildlife Biology.

Conservation Development

Conservation Development:

“a creative land use technique that allows a community to guide growth to the most appropriate areas within a parcel of land to avoid impacts to the environment and to protect the character-defining features of the property.”



Community Comprehensive Plan Policies

- Preserve open space
- Preserve wetlands and wildlife habitat
- Preserve farms and forests
- Provide for orderly development to preserve the community character
- Preserve the traditional visual appearance of the town
- Preserve and enhance land for outdoor recreation opportunities

Advantages of Conservation Development

ECONOMIC ADVANTAGES

- Preserves land without buying it
- Reduces town services costs for road maintenance and school transportation
- Speeds up review process by avoiding sensitive areas early on
- Increases value and marketability of site

Advantages of Conservation Development

SOCIAL AND CULTURAL ADVANTAGES

- Protects historical and other cultural sites
- Preserves aesthetic features and scenic views
- Provides both passive and active recreation areas – walking, biking, hiking, sports fields
- Promotes a neighborhood/ community atmosphere
- Provides gathering spaces for neighborhood functions – community buildings, gazebos, etc.

Advantages of Conservation Development

ENVIRONMENTAL ADVANTAGES

- Preserves vegetated buffers along wetlands, streams, and ponds to protect water quality
- Reduces stormwater runoff by cutting down on impervious surfaces like streets and driveways
- Protects critical habitat and travel corridors for wildlife
- Reduces fragmentation of forest blocks and other unique habitats

Conservation Development helps meet the requirements for…

Low Impact Development

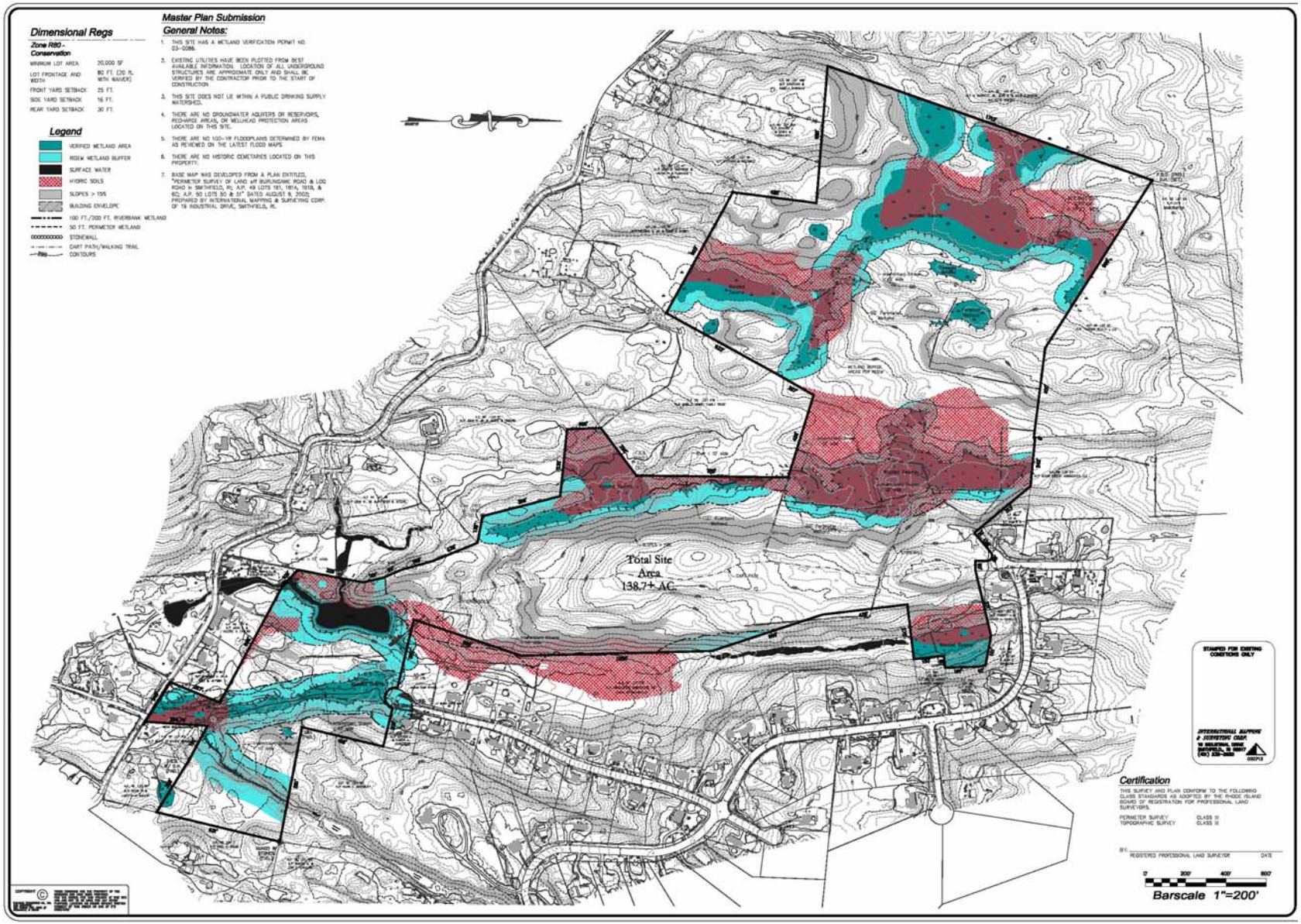
and

DEM Stormwater Permit

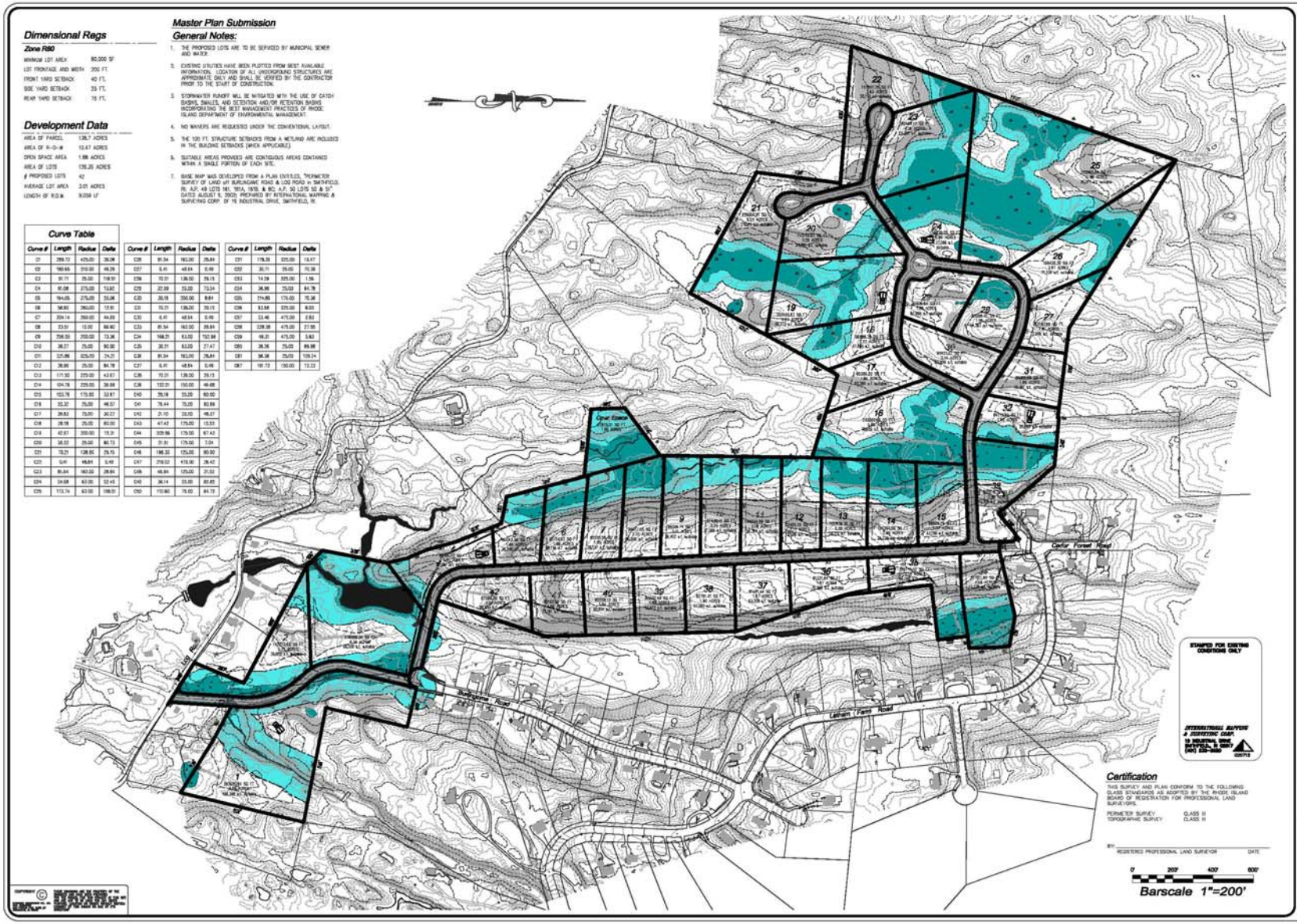
Storm Water Permit Requirements

- Protect wetlands and riparian areas
- Increase open space preservation
- Maintain buffers to surface waters
- Minimize impervious surfaces
- Reduce disturbance to soils and vegetation

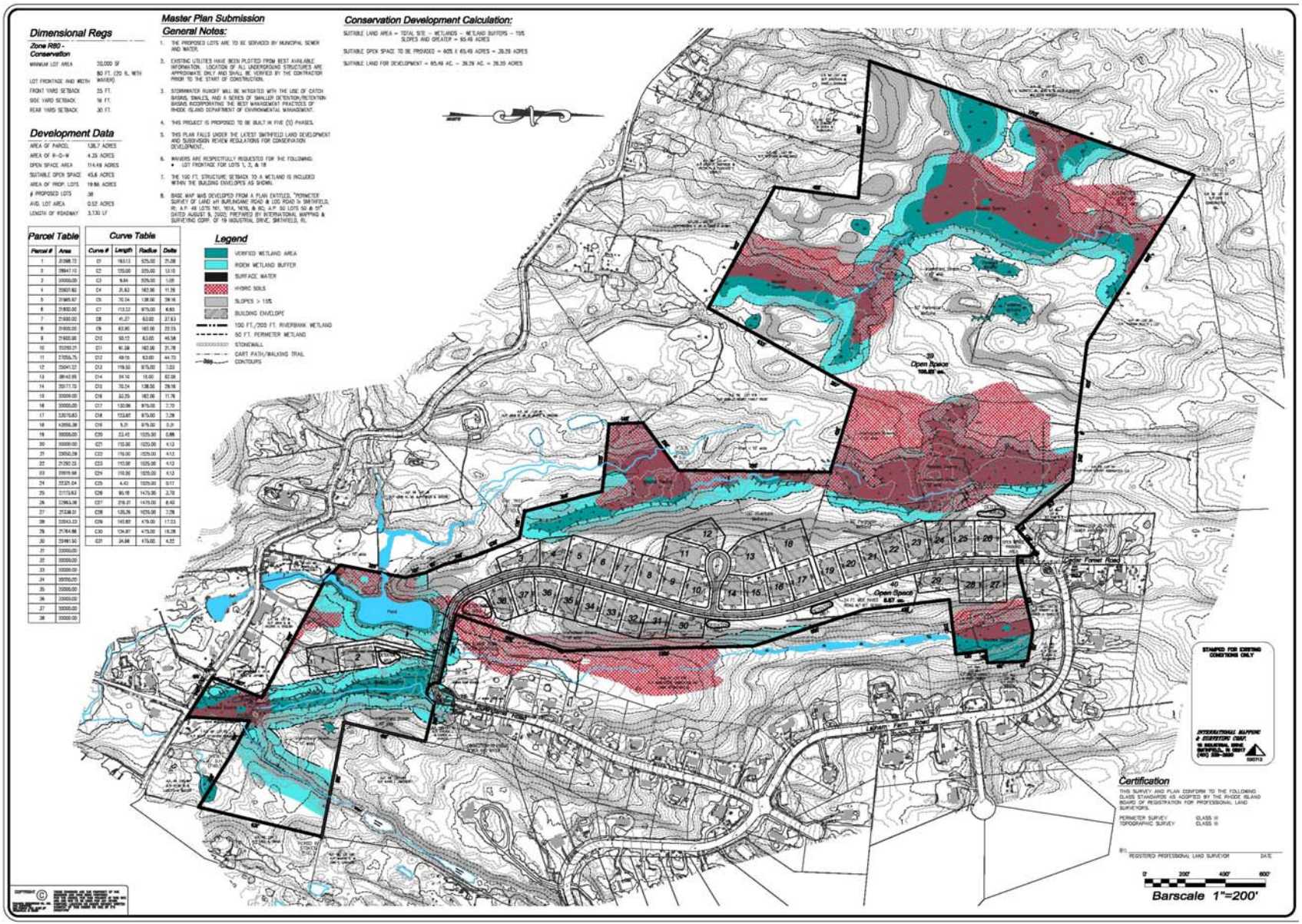
Existing Conditions



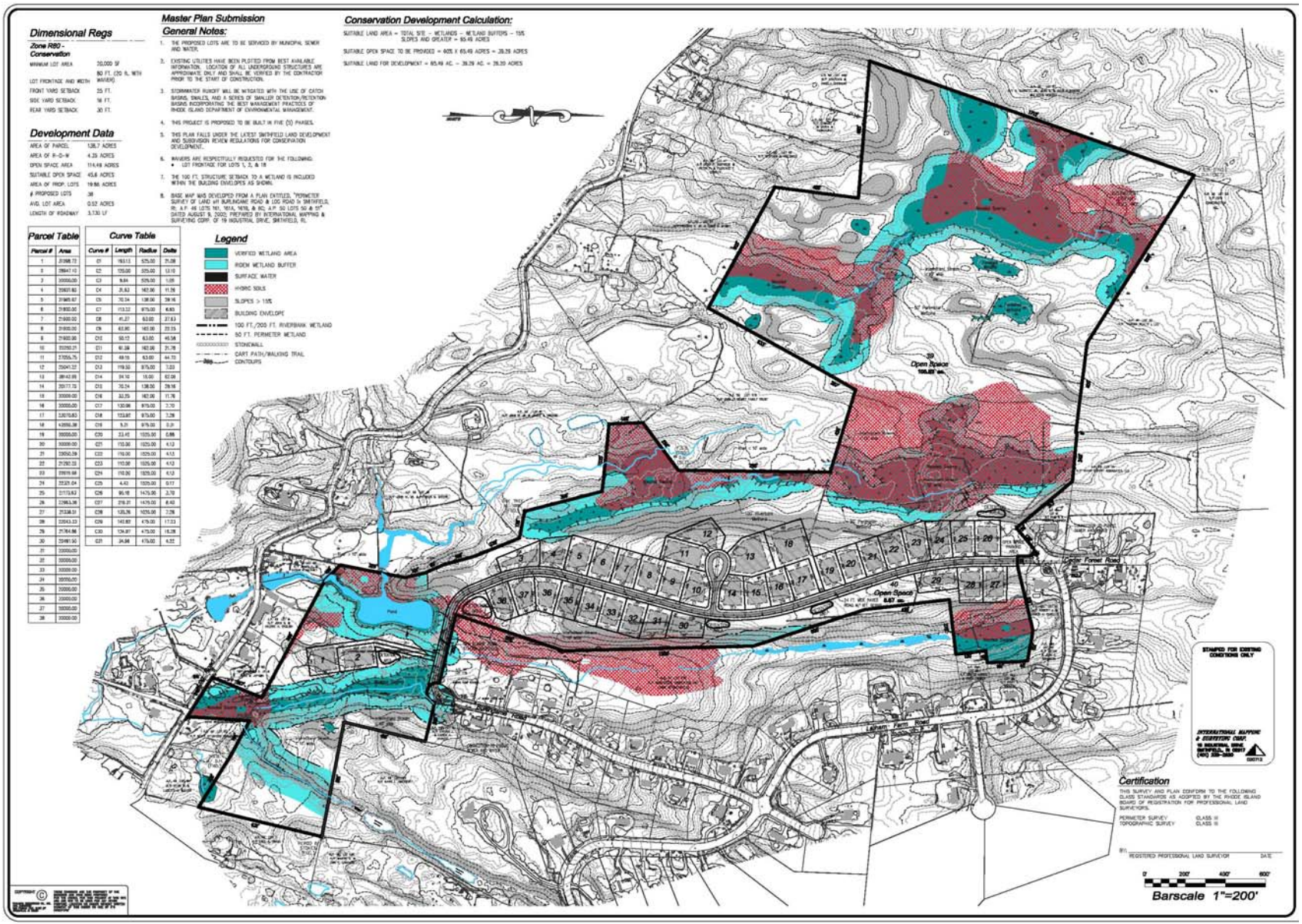
Yield Plan


Dimensional Regs
Zone R80
MINIMUM LOT AREA 80,000 SF
LOT FRONTAGE AND WIDTH 200 FT.
FRONT YARD SETBACK 40 FT.
SIDE YARD SETBACK 25 FT.
REAR YARD SETBACK 75 FT.
Development Data
AREA OF PARCEL 126.7 ACRES
AREA OF R-O-W 10.47 ACRES
OPEN SPACE AREA 1.88 ACRES
AREA OF LOTS 176.25 ACRES
PROPOSED LOTS 42
AVERAGE LOT AREA 3.01 ACRES
LENGTH OF R.O.W 9,059 LF
Master Plan Submission
General Notes:
1. THE PROPOSED LOTS ARE TO BE SERVICED BY MUNICIPAL SEWER AND WATER.
2. EXISTING UTILITIES HAVE BEEN PLOTTED FROM BEST AVAILABLE INFORMATION. LOCATION OF ALL UNDERGROUND STRUCTURES ARE APPROXIMATE ONLY AND SHALL BE VERIFIED BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION.
3. STORMWATER RUNOFF WILL BE MITIGATED WITH THE USE OF CATCH BASINS, SWALES, AND SCENTION AND/OR RETENTION BASINS INCORPORATING THE BEST MANAGEMENT PRACTICES OF RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT.
4. NO WAIVERS ARE REQUESTED UNDER THE CONVENTIONAL LAYOUT.
5. THE 100 FT. STRUCTURE SETBACKS FROM A WETLAND ARE INCLUDED IN THE BUILDING SETBACKS (WHICH APPLICABLE).
6. SUITABLE AREAS PROVIDED ARE CONTIGUOUS AREAS CONTAINED WITHIN A SINGLE PORTION OF EACH SITE.
7. BASE MAP WAS DEVELOPED FROM A PLAN ENTITLED, "PERIMETER SURVEY OF LAND AT BURLINGAME ROAD & LOS ROAD IN SMITHFIELD, RI; A.P. 48 LOTS 161, 161A, 161B, & 8C; A.P. 50 LOTS 50 & 51" DATED AUGUST 5, 2005; PREPARED BY INTERNATIONAL MAPPING & SURVEYING CORP. OF 16 INDUSTRIAL DRIVE, SMITHFIELD, RI.
Curve Table
Cedar Forest Road
Lehigh Farm Road
Burlingame Road
Los Road
STAMPED FOR EXISTING CONDITIONS ONLY
Certification
THIS SURVEY AND PLAN CONFORM TO THE FOLLOWING CLASS STANDARDS AS ADOPTED BY THE RHODE ISLAND BOARD OF REGISTRATION FOR PROFESSIONAL LAND SURVEYORS.
PERIMETER SURVEY: CLASS III
TOPOGRAPHIC SURVEY: CLASS III
REGISTERED PROFESSIONAL LAND SURVEYOR
DATE
0 200' 400' 800'
Barscale 1"=200'

Conservation Plan

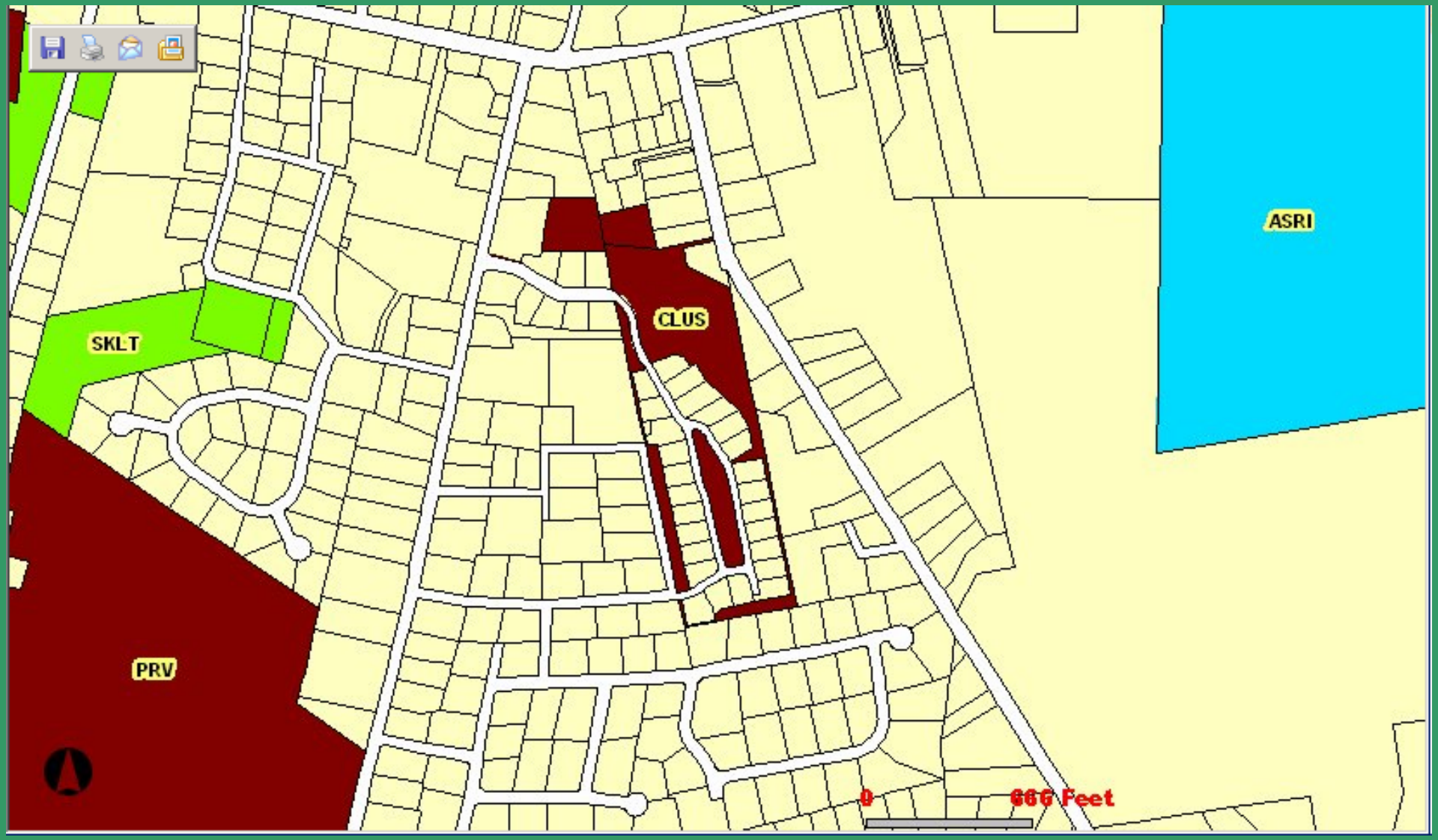


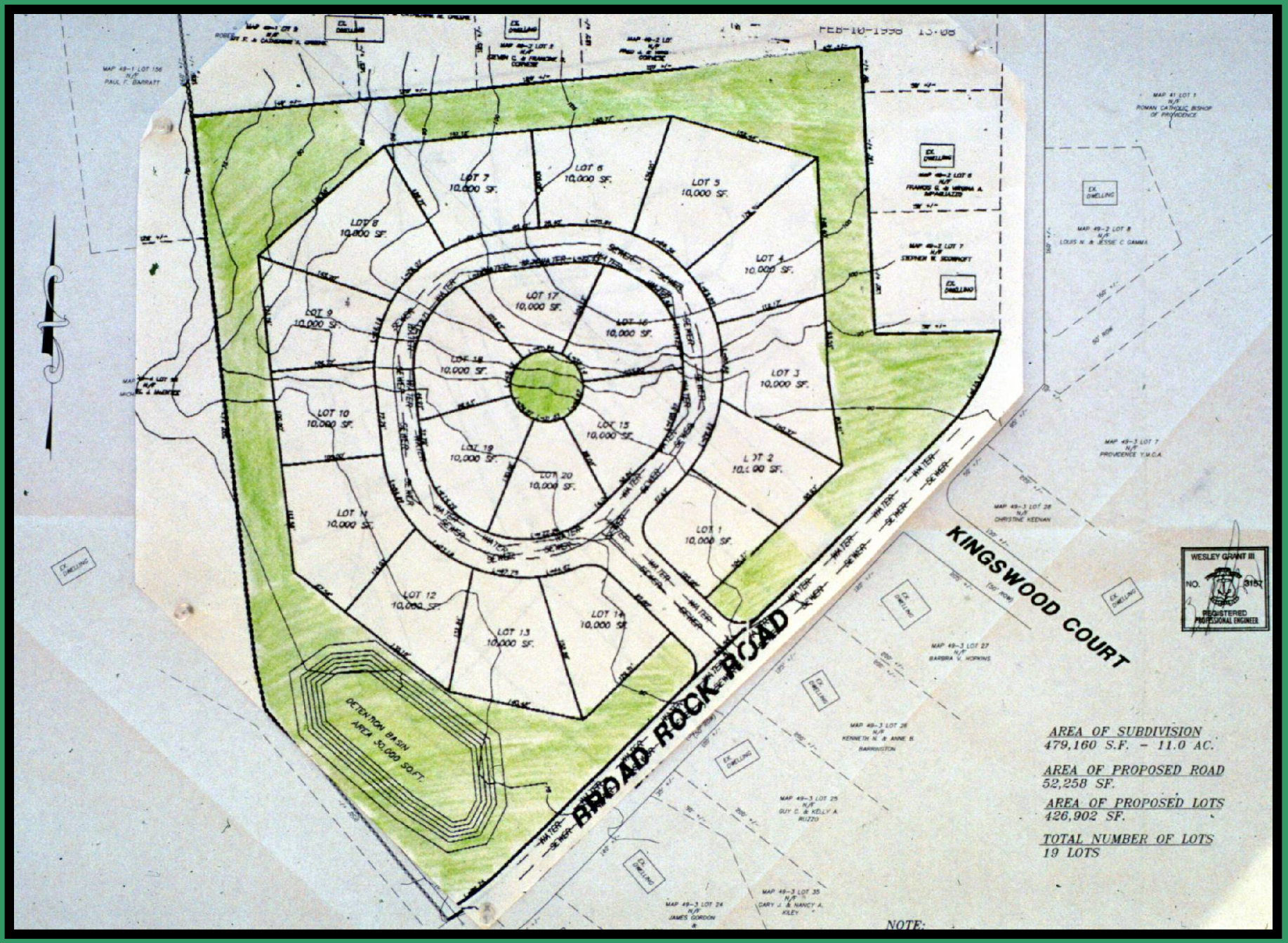
Conservation Plan



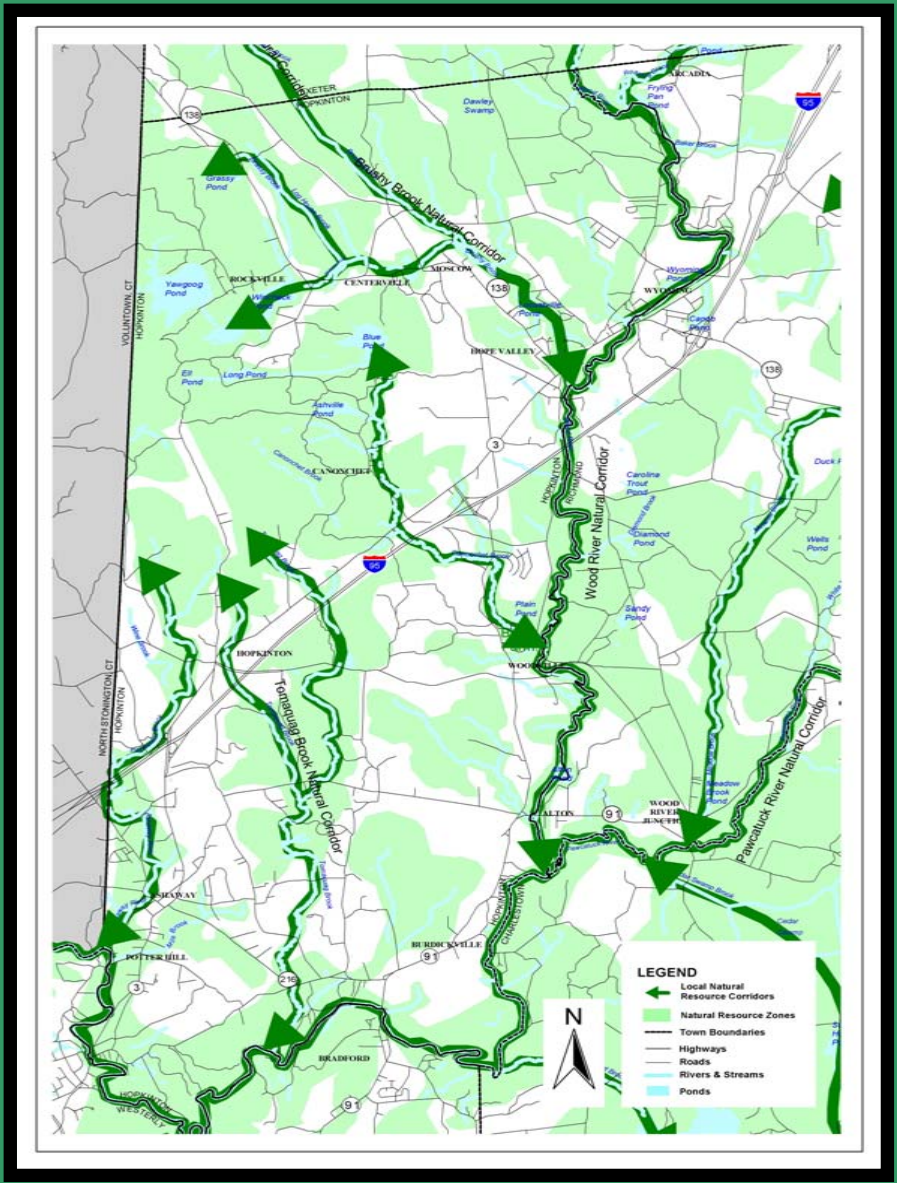
Comparisons

	Conventional	Conservation
Wetland Lots:	24	0
Average Lot:	3 acres	.52 acres
Street Length:	9,059	3,720
Open Space:	1.4%	82%

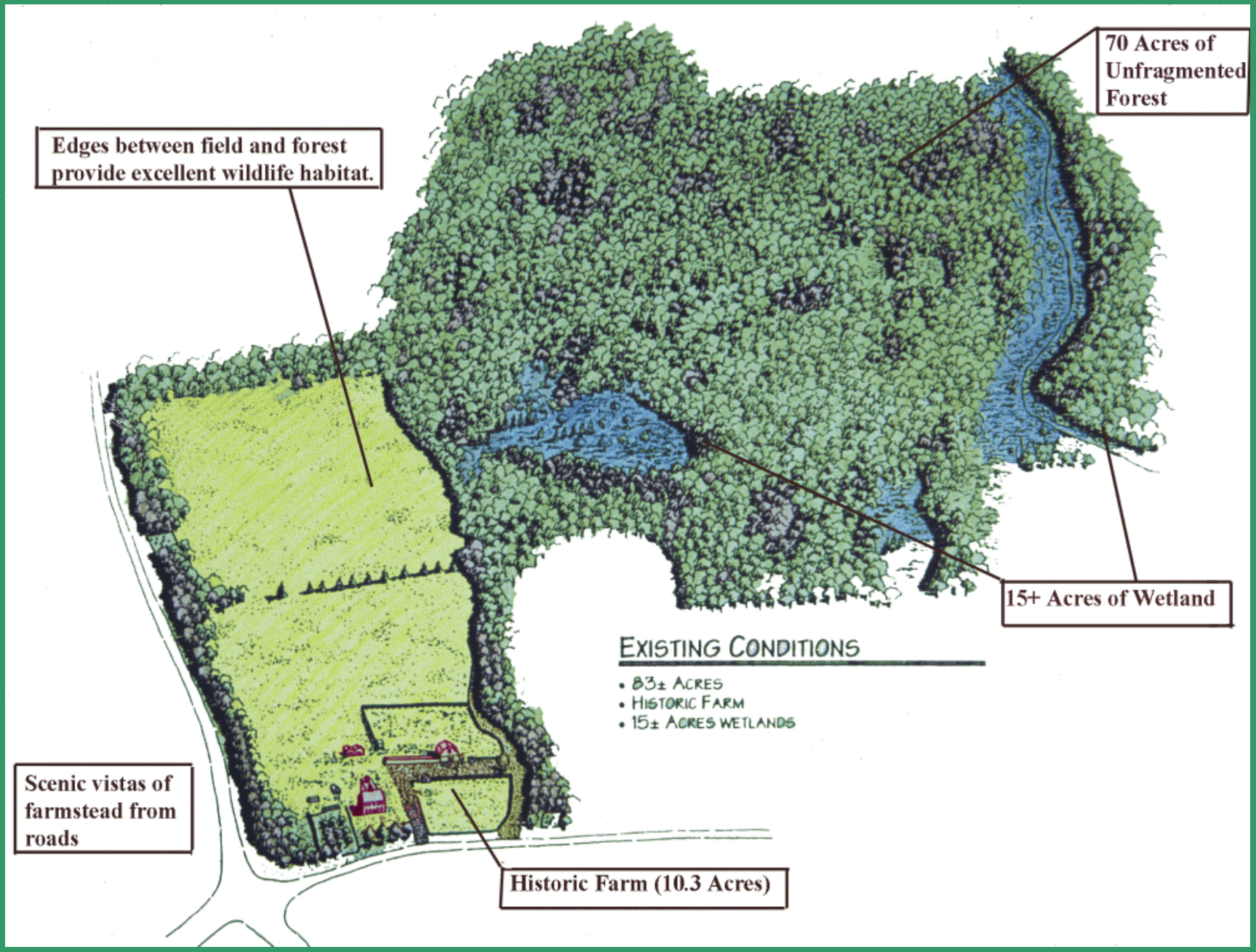

ASRI
CLUS
SKLT
PRV
0
666 Feet

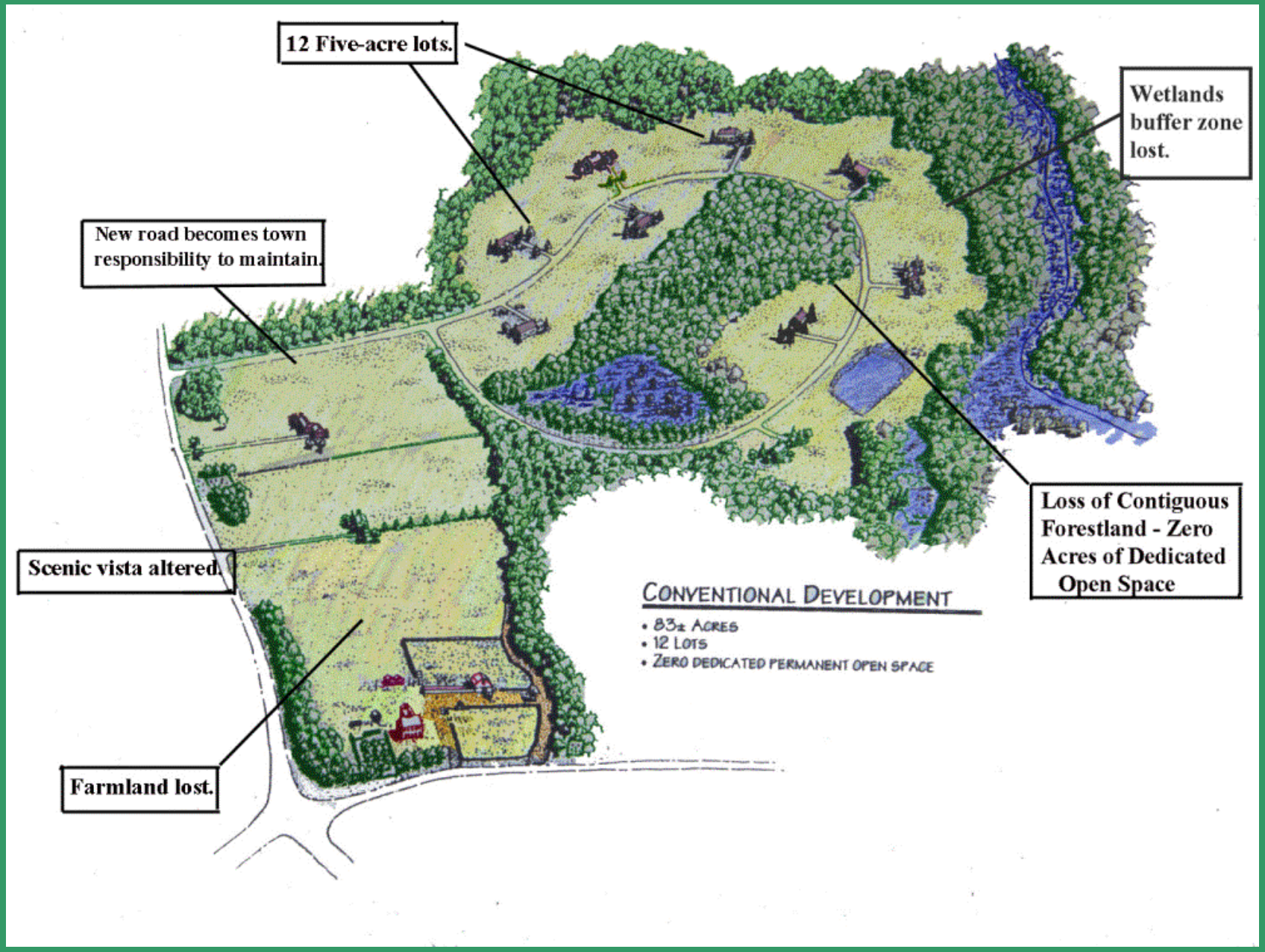

BROAD ROCK ROAD
KINGSWOOD COURT
LOT 1 10,000 SF.
LOT 2 10,000 SF.
LOT 3 10,000 SF.
LOT 4 10,000 SF.
LOT 5 10,000 SF.
LOT 6 10,000 SF.
LOT 7 10,000 SF.
LOT 8 10,000 SF.
LOT 9 10,000 SF.
LOT 10 10,000 SF.
LOT 11 10,000 SF.
LOT 12 10,000 SF.
LOT 13 10,000 SF.
LOT 14 10,000 SF.
LOT 15 10,000 SF.
LOT 16 10,000 SF.
LOT 17 10,000 SF.
LOT 18 10,000 SF.
LOT 19 10,000 SF.
LOT 20 10,000 SF.
DETENTION BASIN AREA 30,000 SQ.FT.
EX. DWELLING
MAP 49-1 LOT 156 N/F PAUL F. BARRATT
MAP 41 LOT 3 N/F ROMAN CATHOLIC BISHOP OF PROVIDENCE
MAP 49-2 LOT 8 N/F LOUIS N. & JESSIE C. GAMMA
MAP 49-3 LOT 7 N/F PROVIDENCE Y.M.C.A.
MAP 49-3 LOT 28 N/F CHRISTINE KEENAN
MAP 49-3 LOT 27 N/F BARBRA V. HOPKINS
MAP 49-3 LOT 26 N/F KENNETH N. & ANNE B. BARRINGTON
MAP 49-3 LOT 25 N/F GUY C. & KELLY A. RIZZO
MAP 49-3 LOT 24 N/F JAMES GORDON
MAP 49-3 LOT 35 N/F GARY J. & NANCY A. KILEY
WESLEY GRANT III
NO. 3187
REGISTERED PROFESSIONAL ENGINEER
AREA OF SUBDIVISION
479,160 S.F. - 11.0 AC.
AREA OF PROPOSED ROAD
52,258 SF.
AREA OF PROPOSED LOTS
426,902 SF.
TOTAL NUMBER OF LOTS
19 LOTS
NOTE:

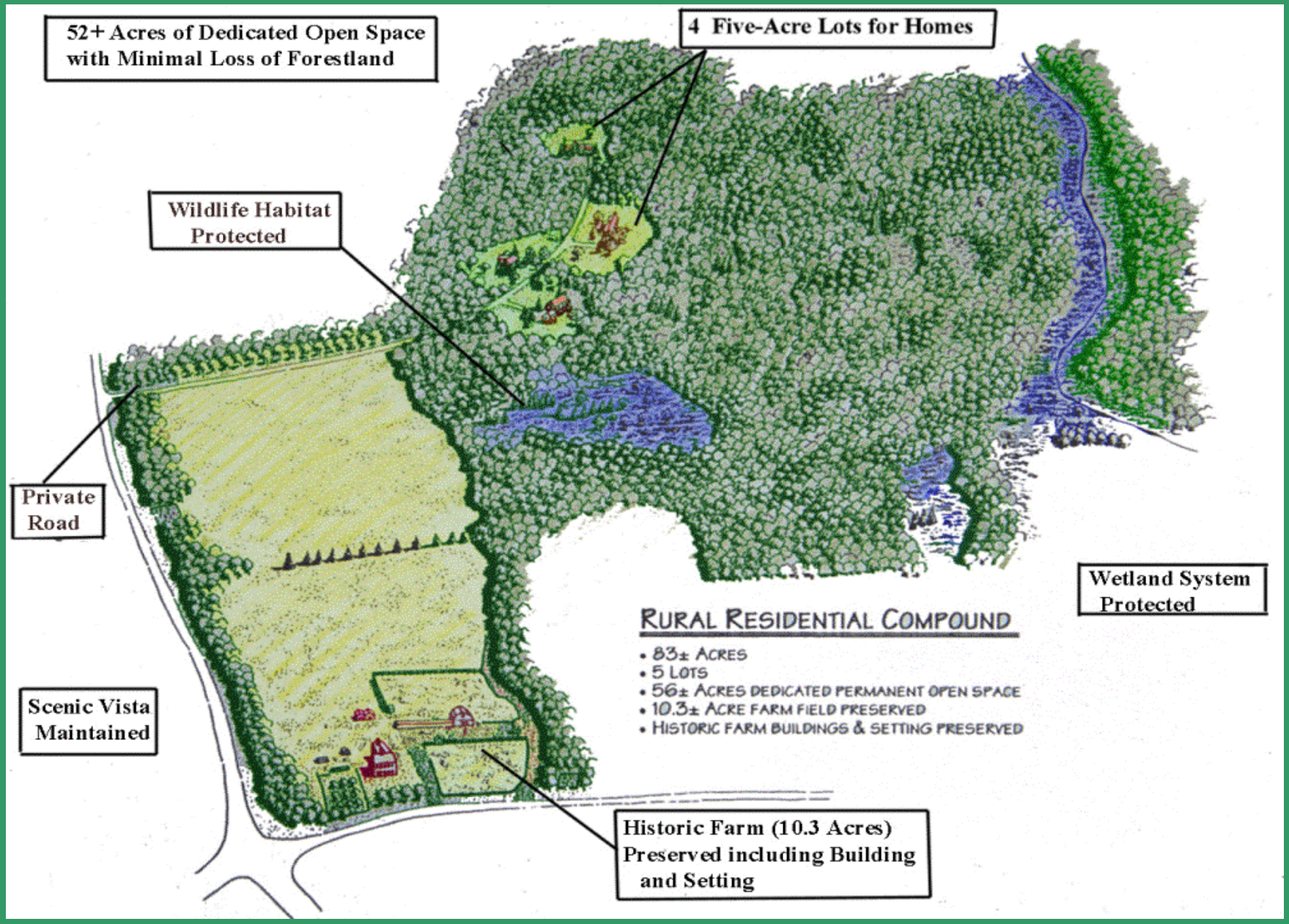
Hopkinton Natural Resource Protection Priorities

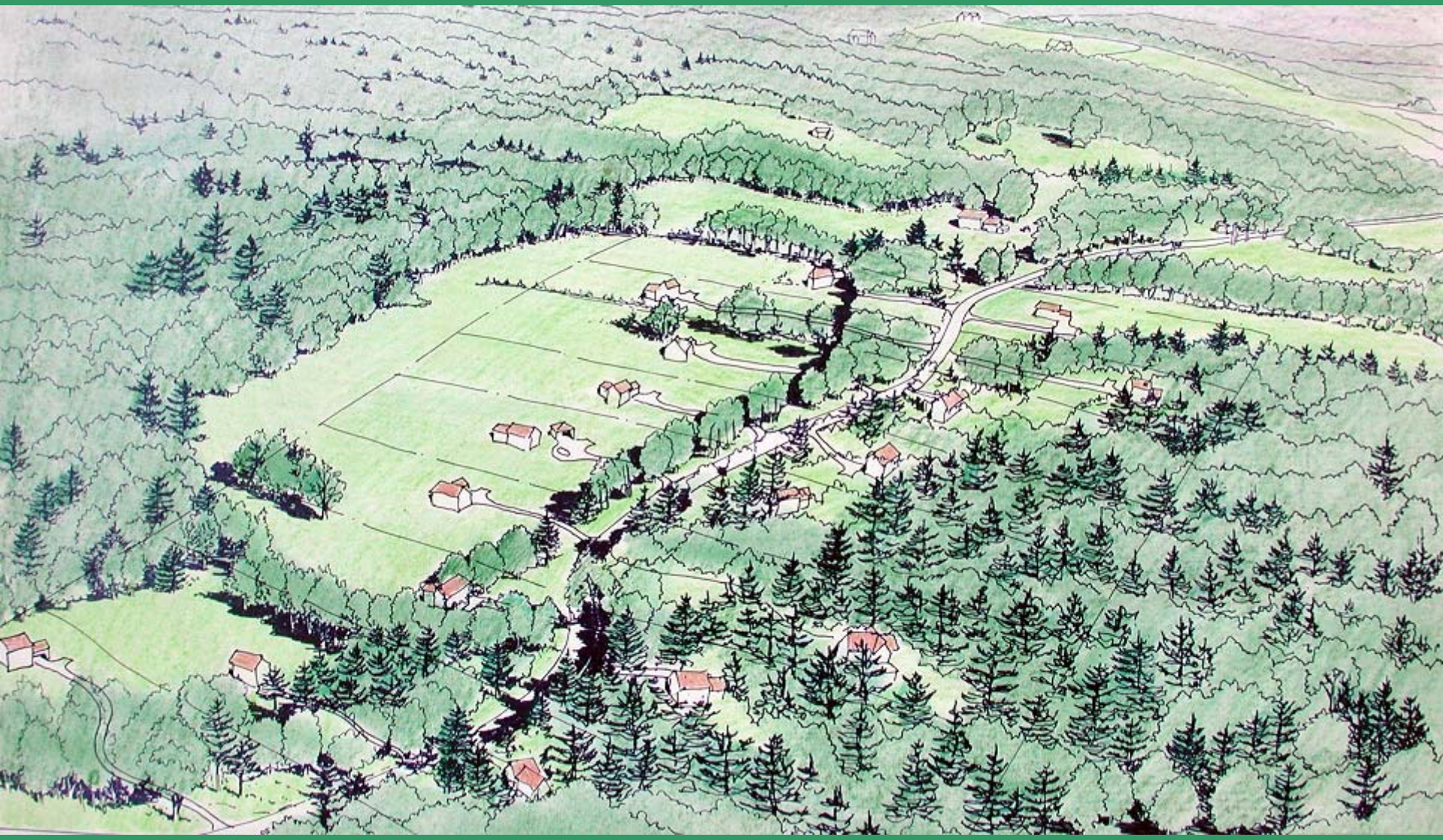


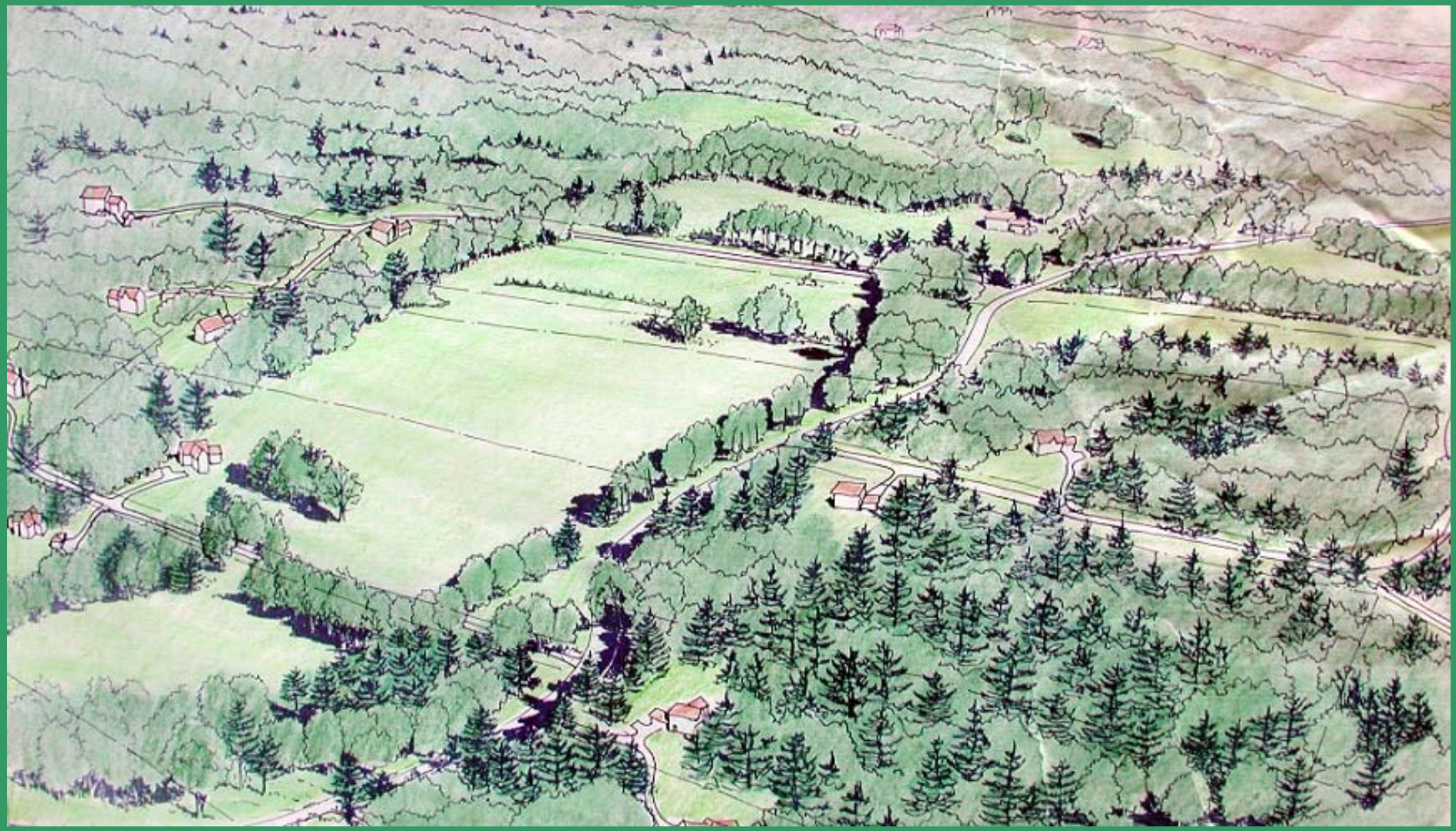
South County Greenspace Project


70 Acres of Unfragmented Forest
Edges between field and forest provide excellent wildlife habitat.
15+ Acres of Wetland
EXISTING CONDITIONS
• 83± ACRES
• HISTORIC FARM
• 15± ACRES WETLANDS
Scenic vistas of farmstead from roads
Historic Farm (10.3 Acres)


12 Five-acre lots.
Wetlands buffer zone lost.
New road becomes town responsibility to maintain.
Loss of Contiguous Forestland - Zero Acres of Dedicated Open Space
Scenic vista altered.
Farmland lost.
CONVENTIONAL DEVELOPMENT
• 83± ACRES
• 12 LOTS
• ZERO DEDICATED PERMANENT OPEN SPACE


52+ Acres of Dedicated Open Space with Minimal Loss of Forestland
4 Five-Acre Lots for Homes
Wildlife Habitat Protected
Private Road
Wetland System Protected
RURAL RESIDENTIAL COMPOUND
• 83± ACRES
• 5 LOTS
• 56± ACRES DEDICATED PERMANENT OPEN SPACE
• 10.3± ACRE FARM FIELD PRESERVED
• HISTORIC FARM BUILDINGS & SETTING PRESERVED
Scenic Vista Maintained
Historic Farm (10.3 Acres) Preserved including Building and Setting





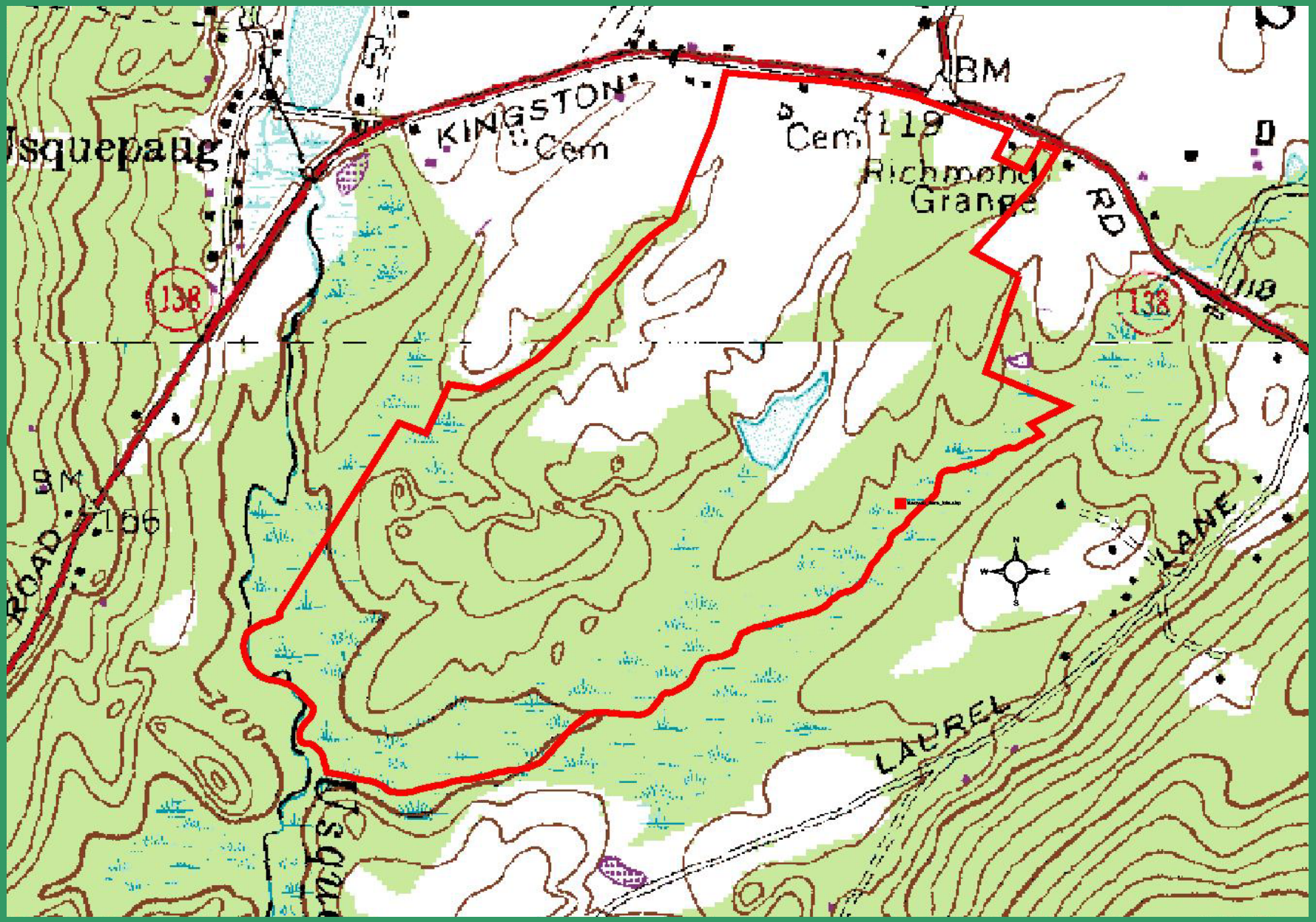
Rhode Island Rural Design Manual

The Conservation Development Design Process

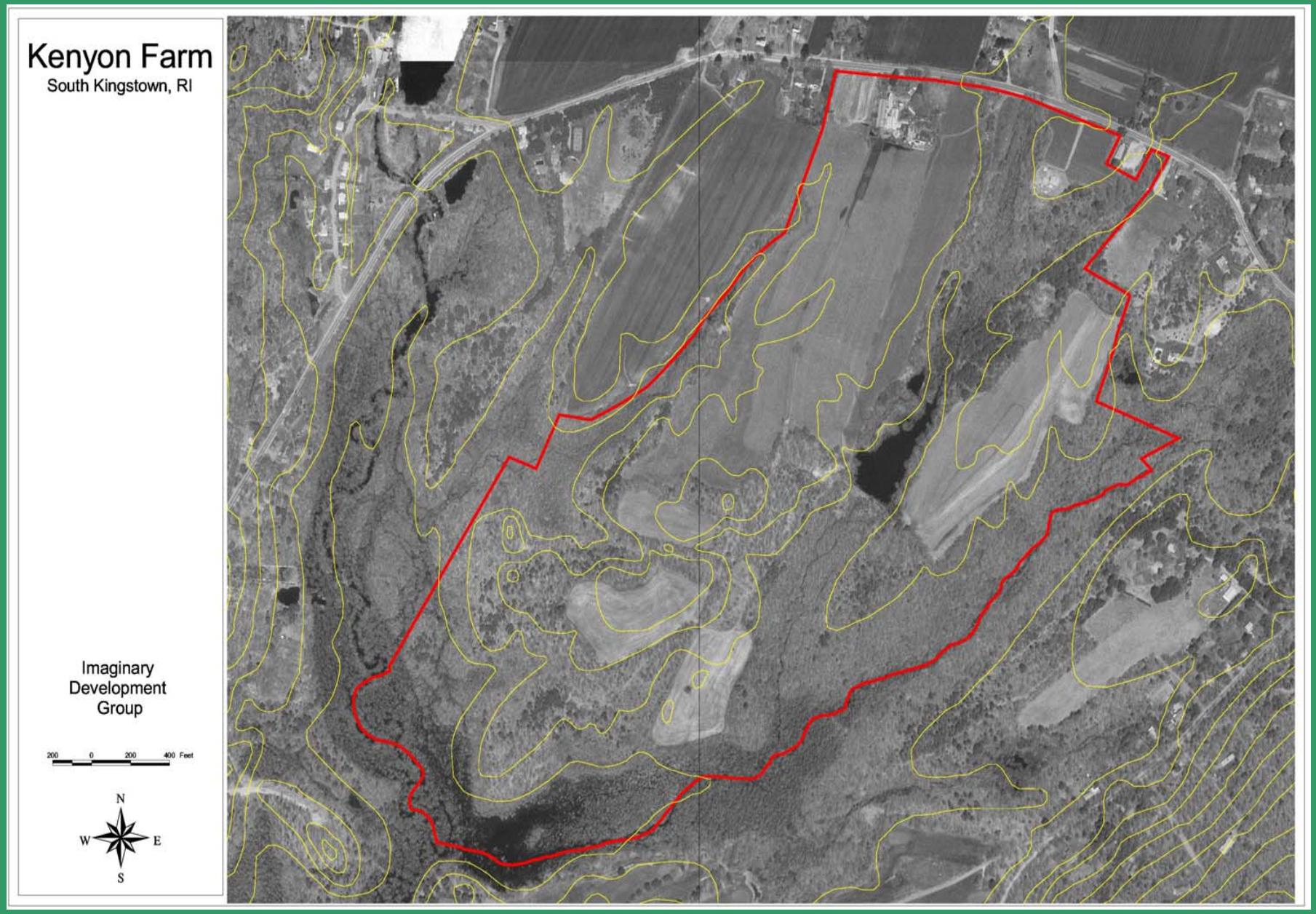
- Step 1: Analyze the Site
- Step 2: Evaluate Site Context
- Step 3: Designate Potential Conservation Areas
- Step 4: Determine the Maximum number of units
- Step 5: Locate Development Areas and Explore Conceptual Alternatives
- Step 6: Locate House Sites
- Step 7: Layout Streets, Trails and Other Infrastructure
- Step 8: Draw in the Lot Lines
- Step 9: Design and Program Open Space
- Step 10: Establish Ownership and Management of Open Space and Other Shared Amenities

Review and Inspection Fee Ordinance

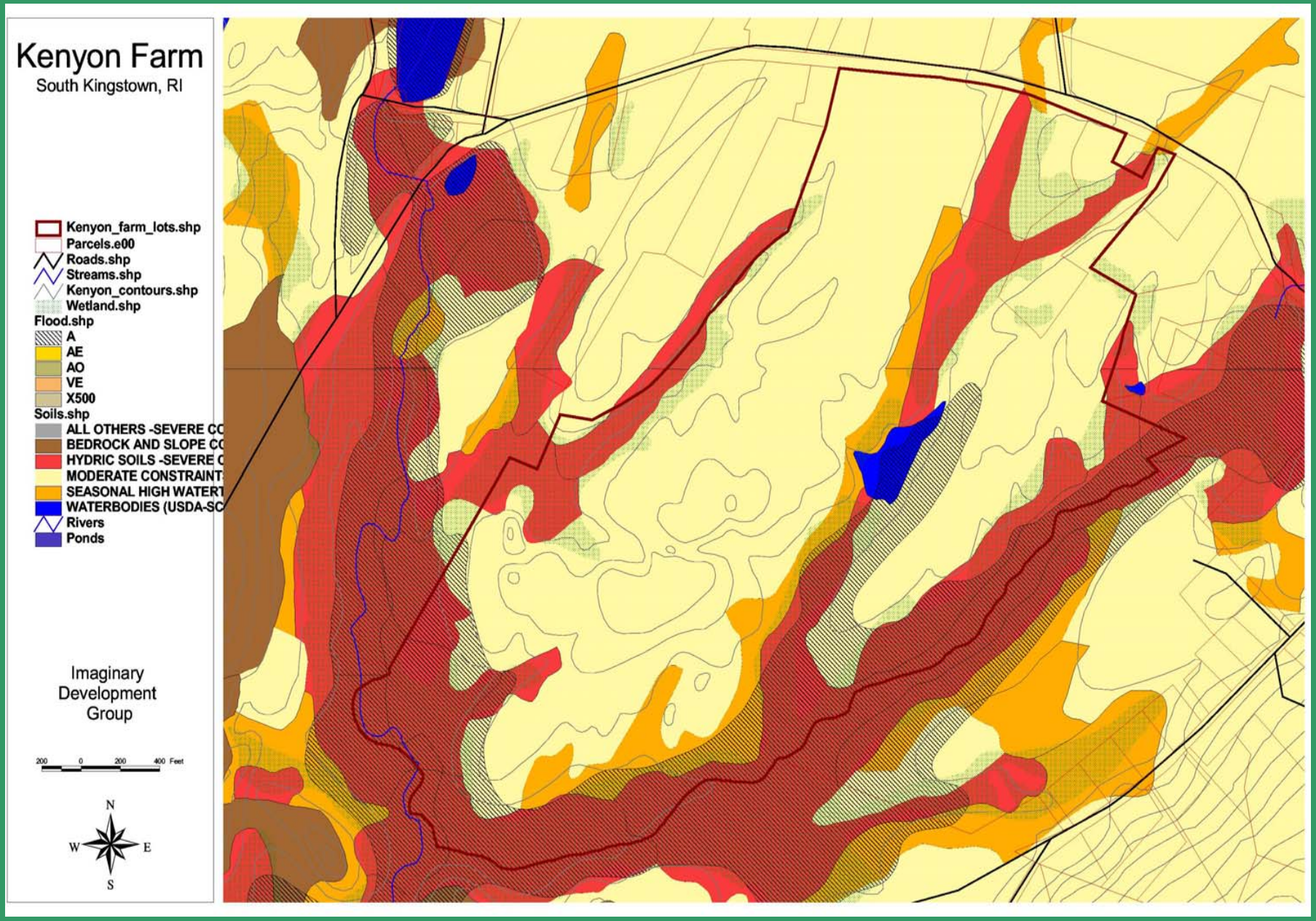
Step 1. Analyze the site: Base Mapping



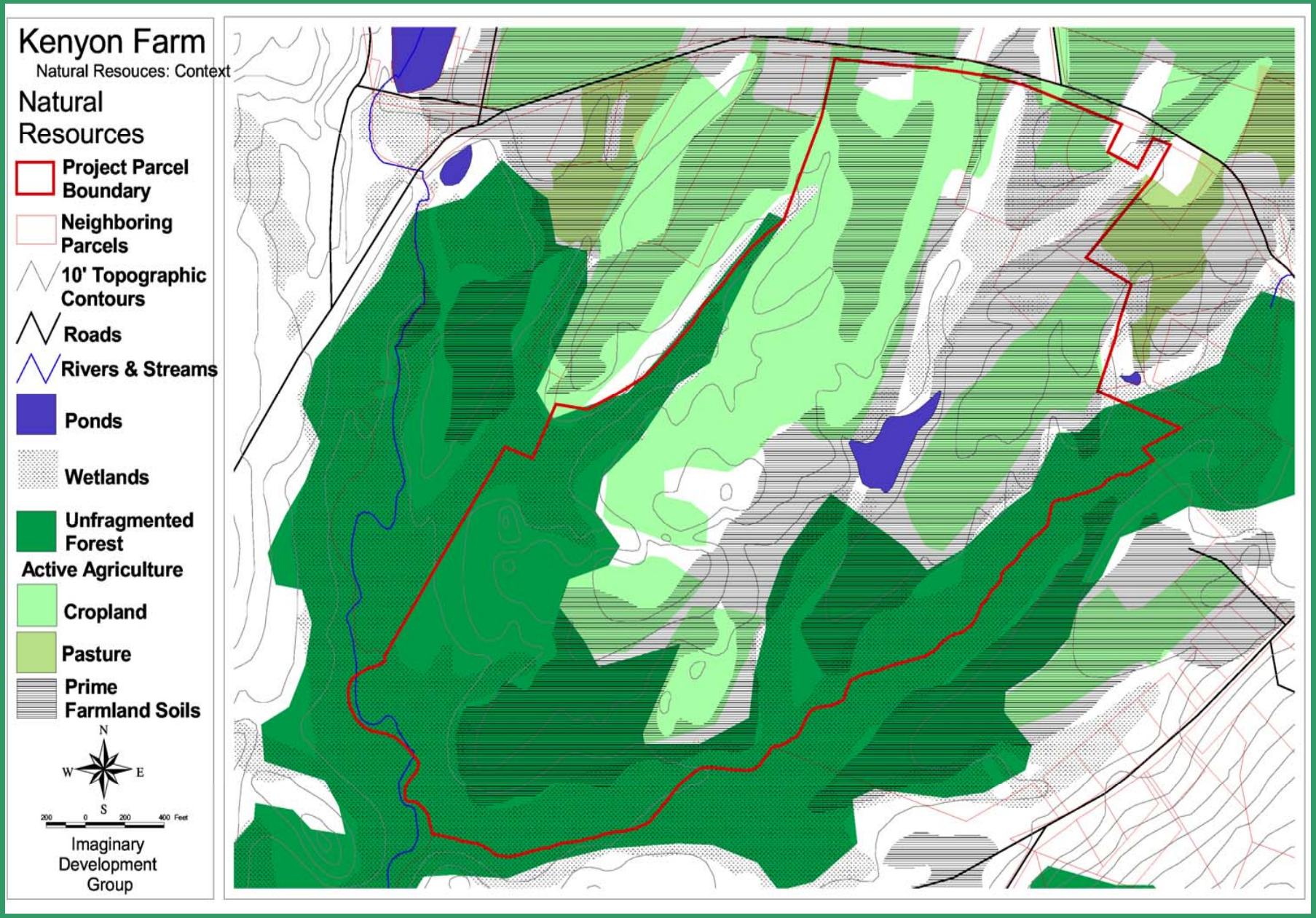
Step 1. Analyze the site: Base Mapping



Step 1. Analyze the site: Soil Constraints



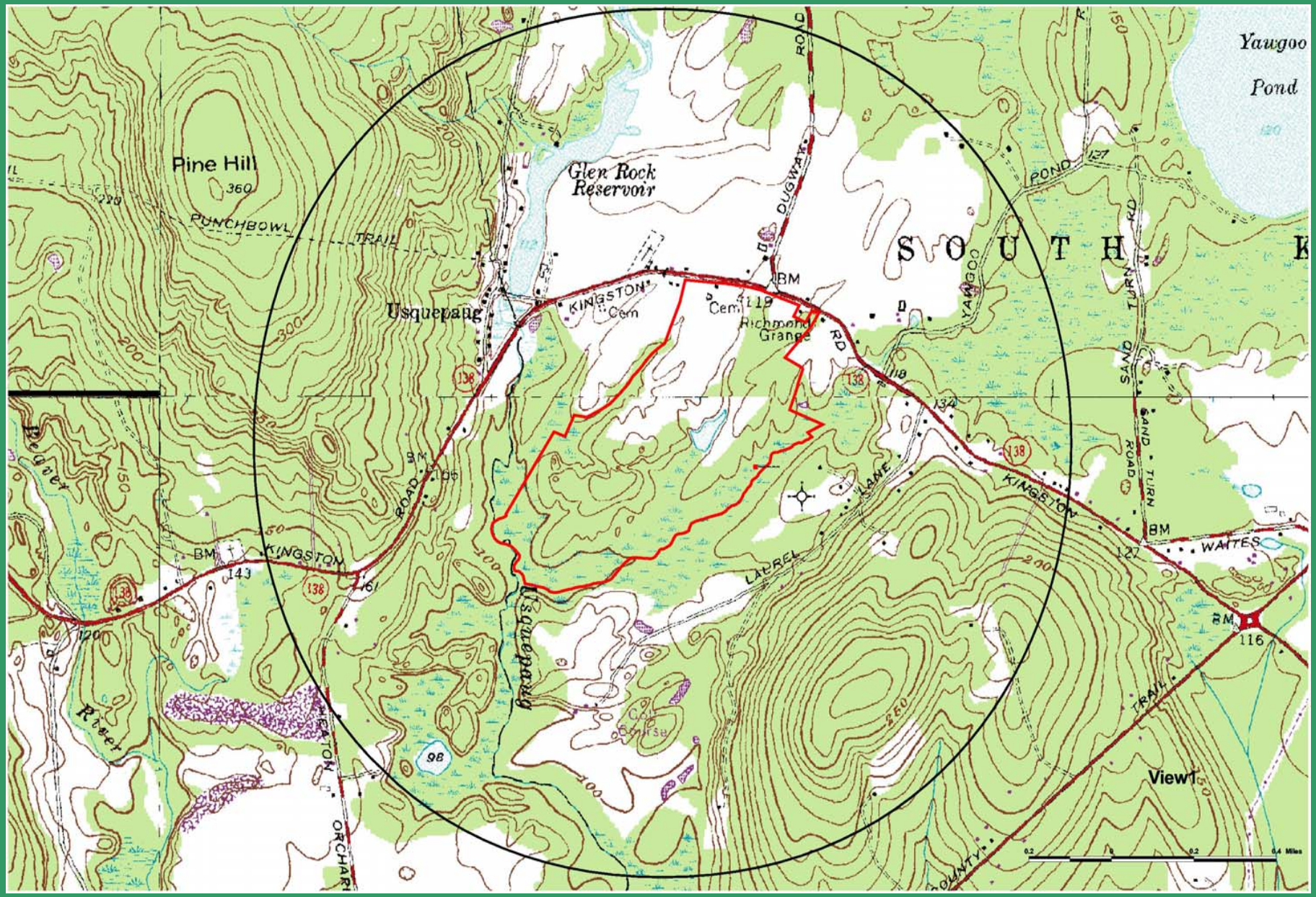
Step 1. Analyze the site: Natural Resources



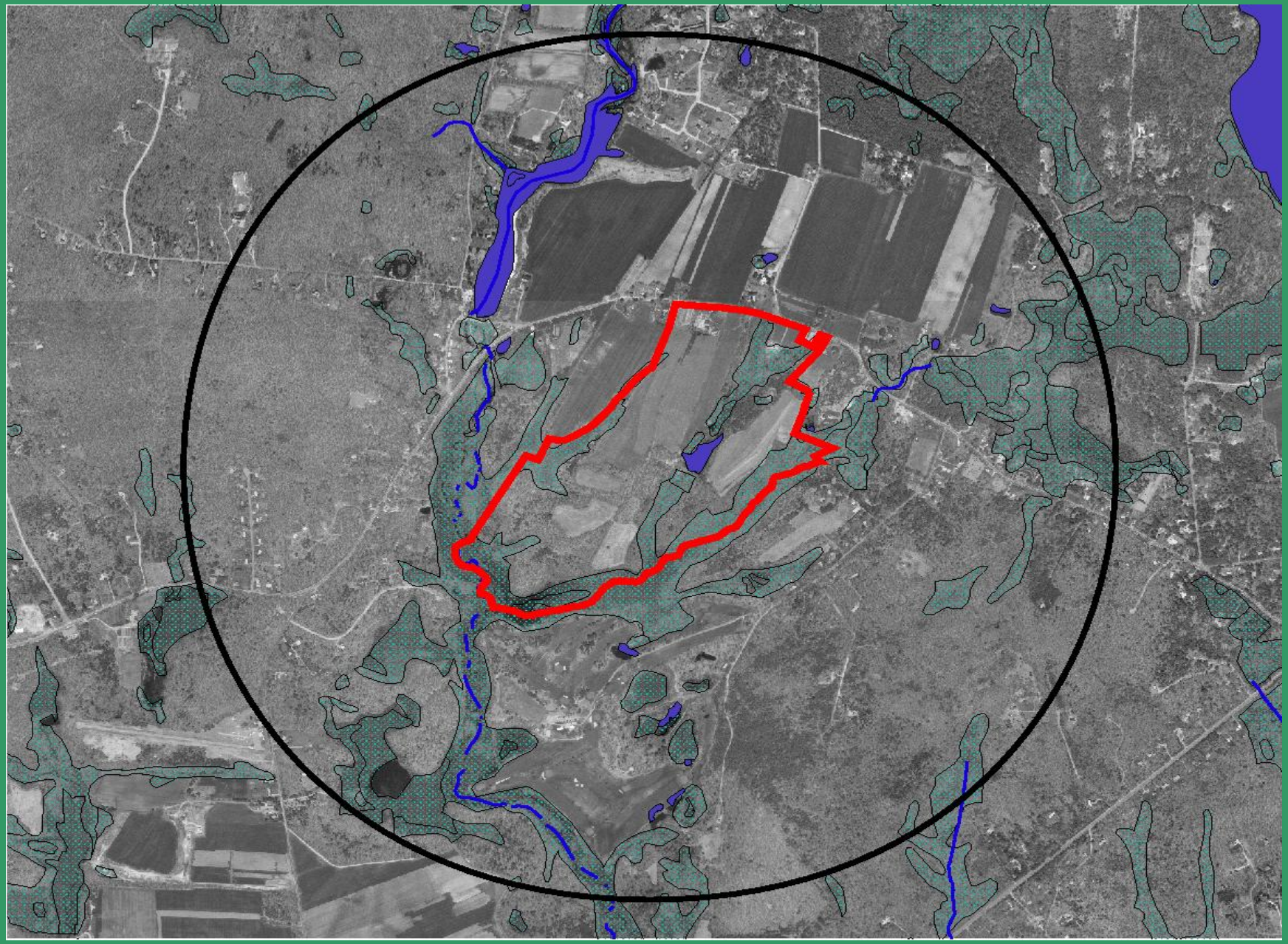
Step 1. Analyze the site: Cultural Resources

Step 2. Evaluate Site Context

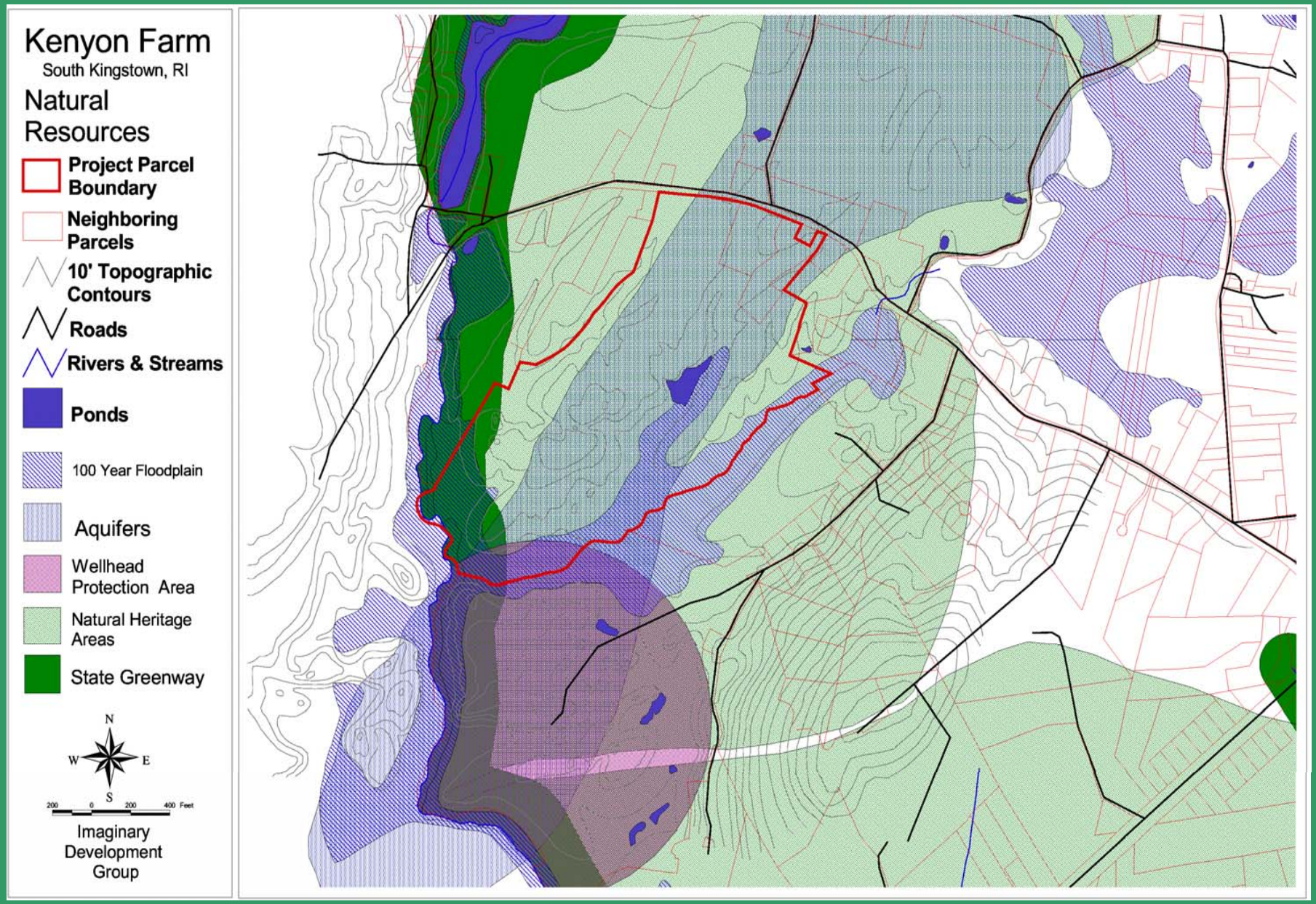
Step 2. Evaluate Site Context: Base Mapping



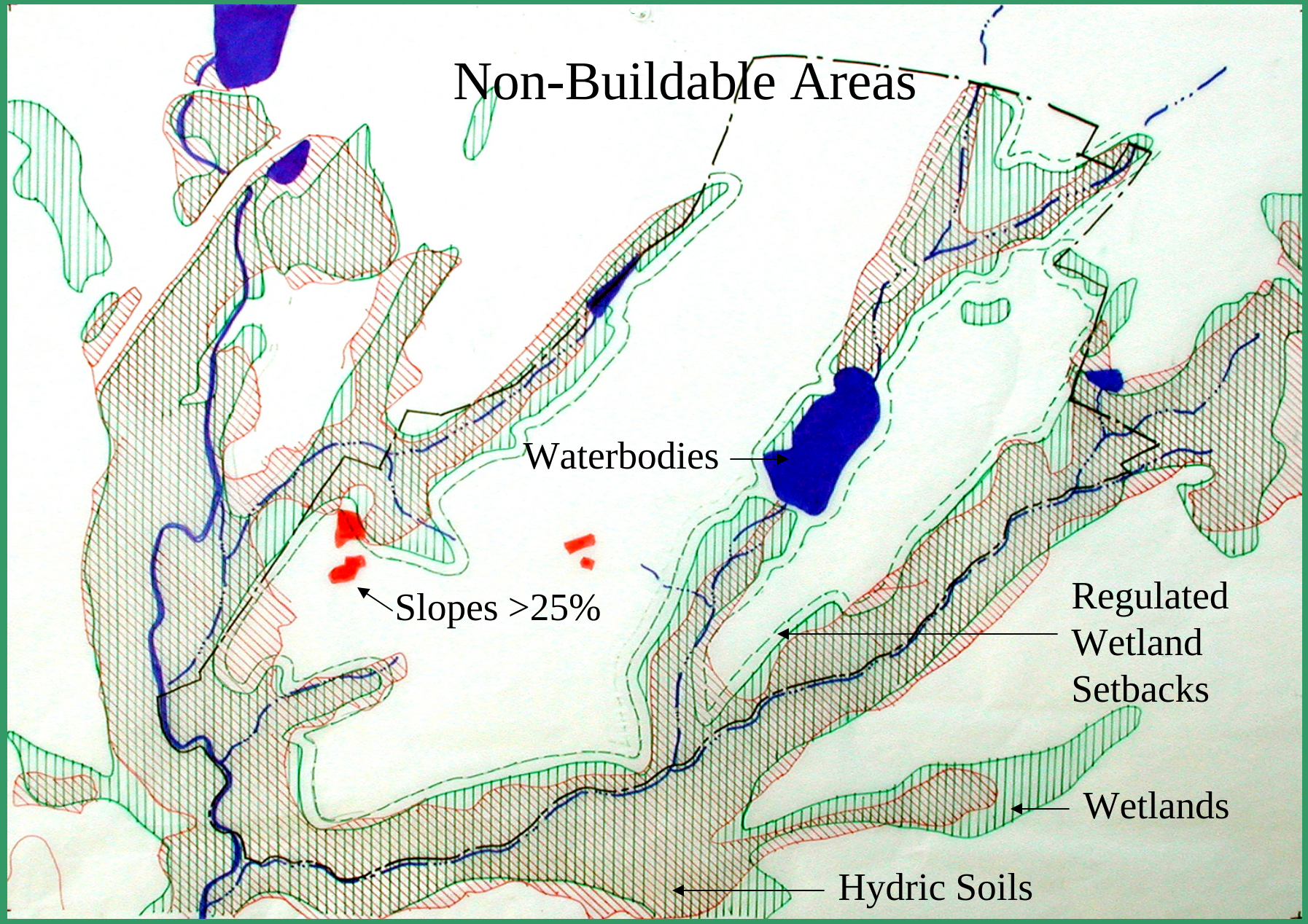
Step 2. Evaluate Site Context: Base Mapping



Step 2. Evaluate Site Context: Natural Resources



Step 3. Designate Potential Conservation Areas



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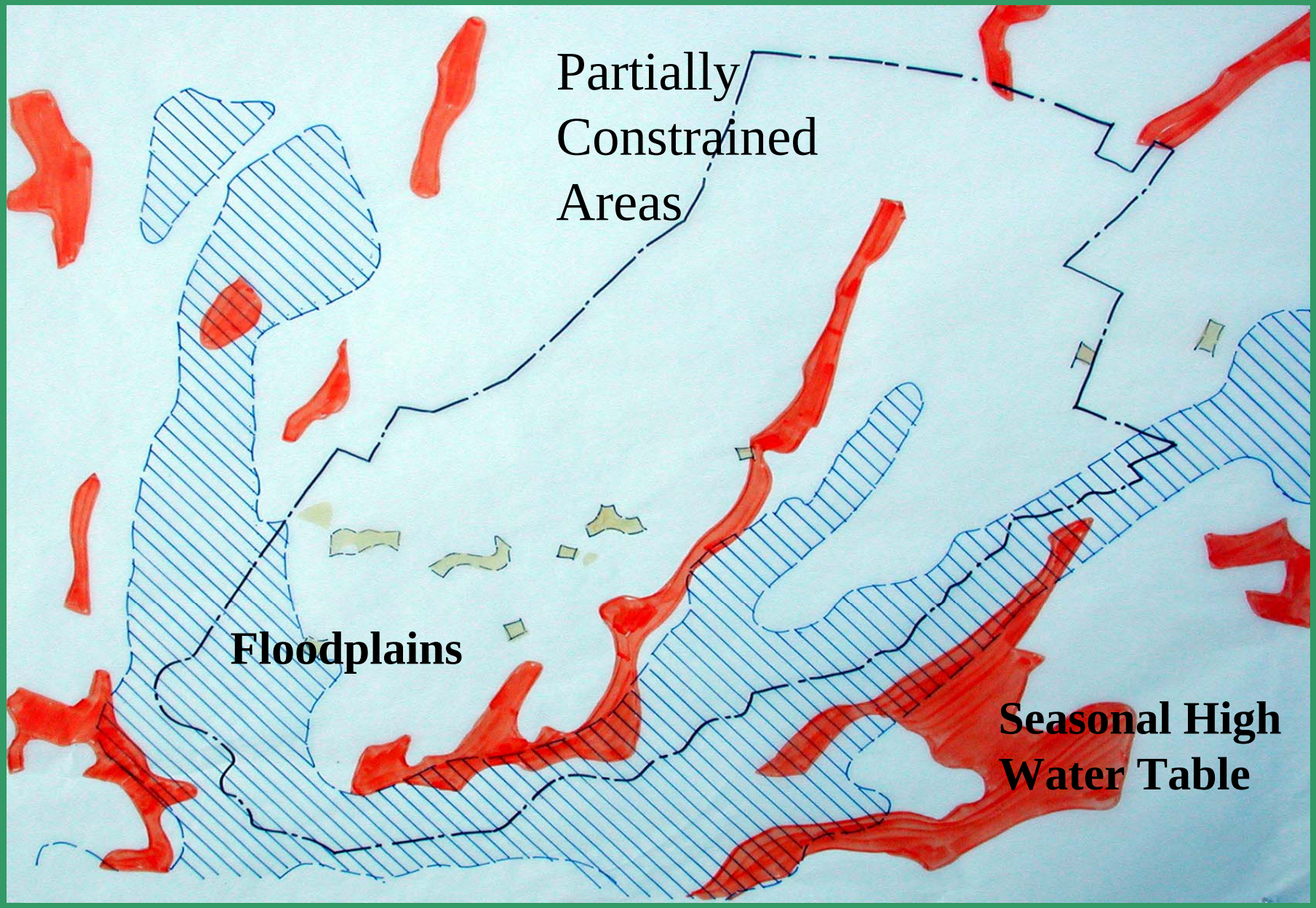

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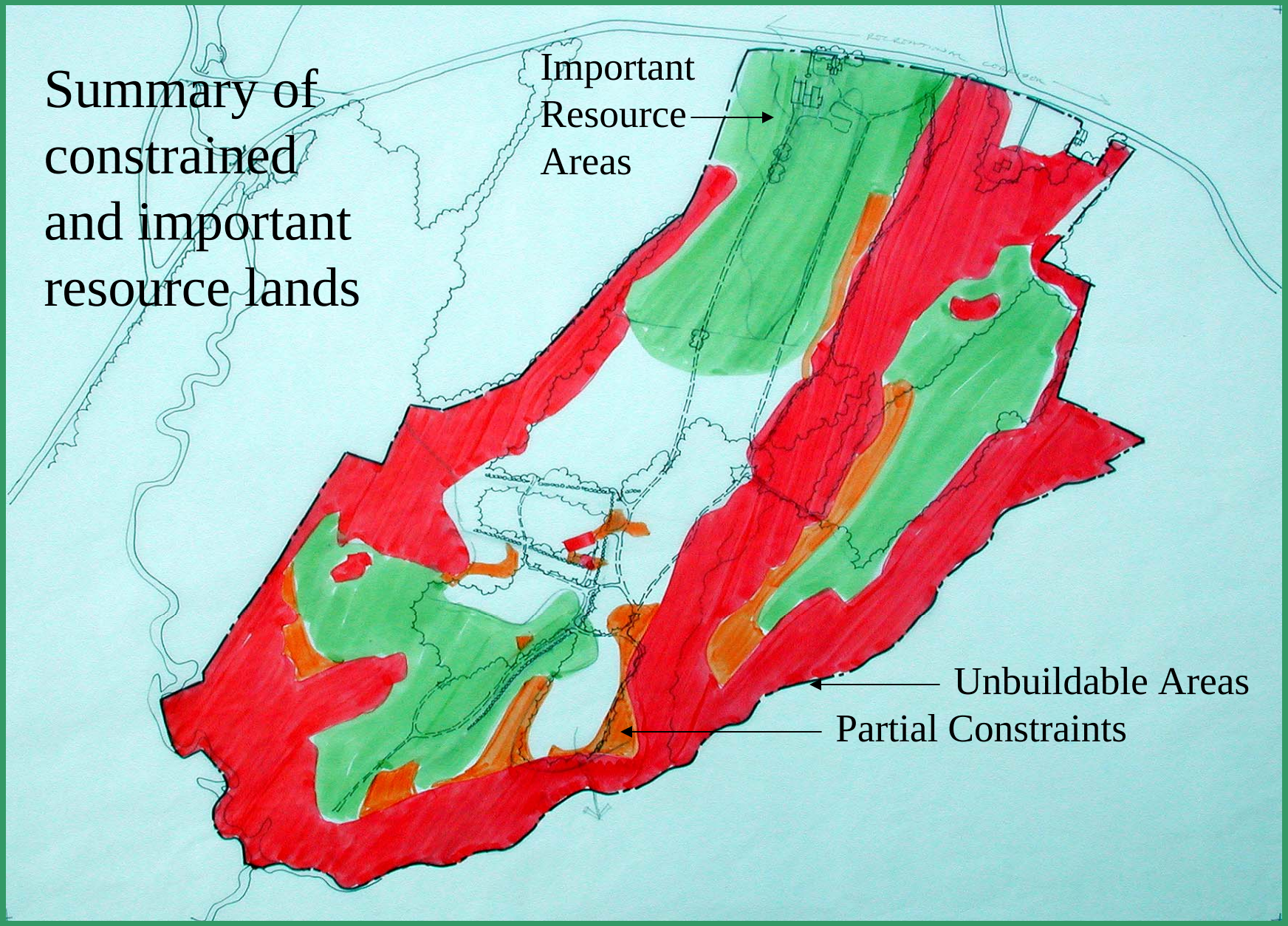
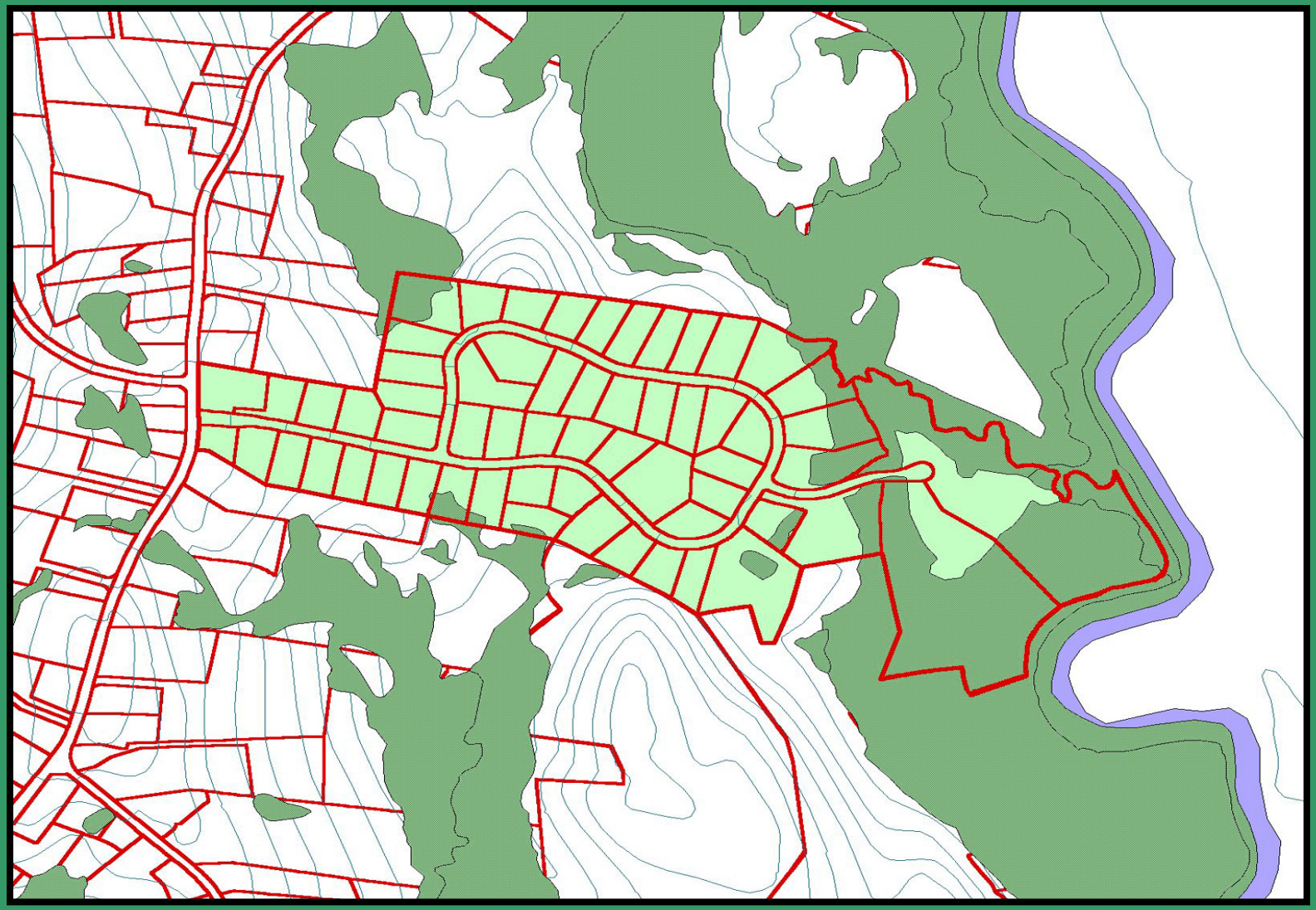
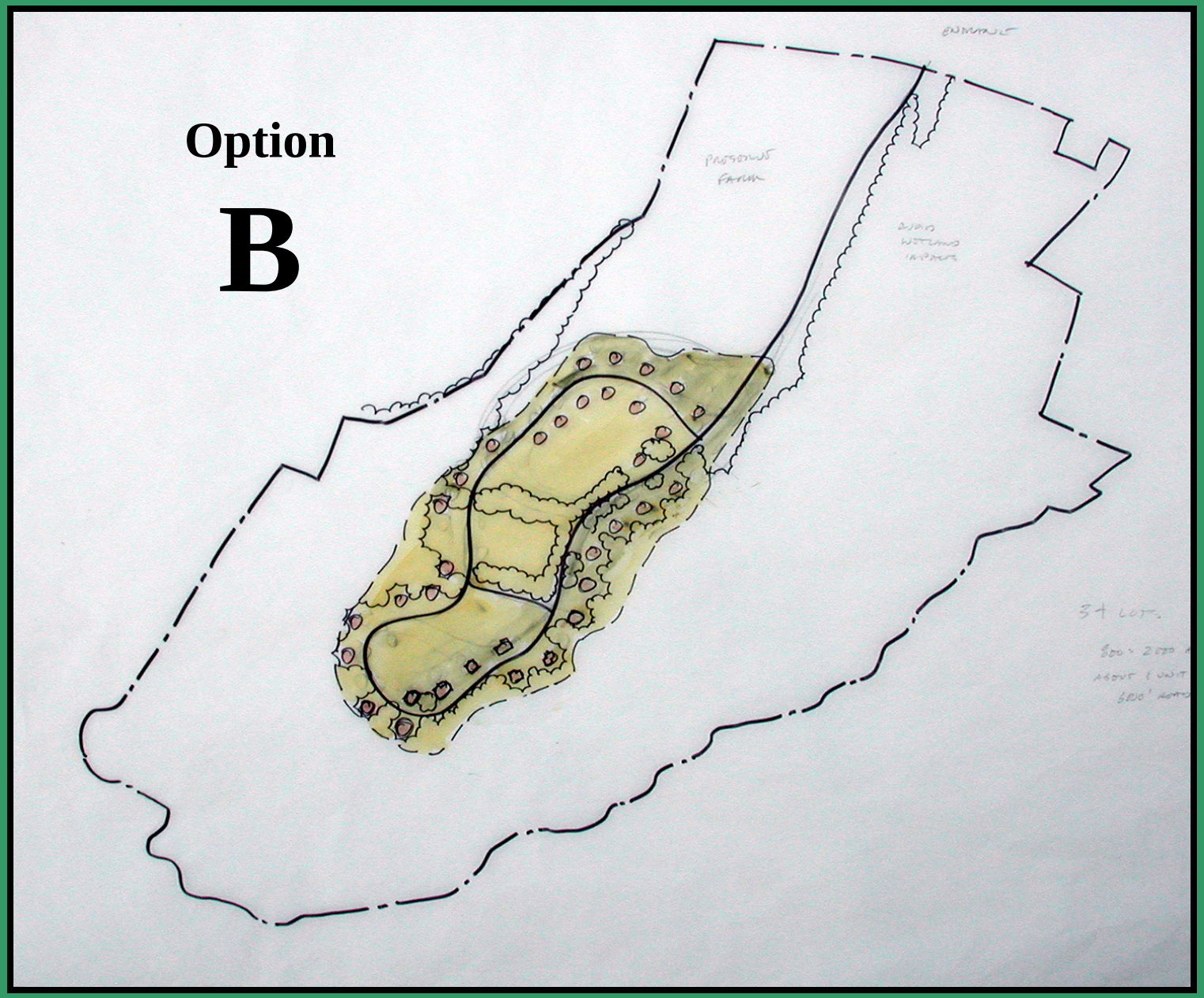


Step 4. Determine the Maximum Number of Units

Yield Plan Approach



Step 5. Locate Development Areas and Explore Conceptual Alternatives



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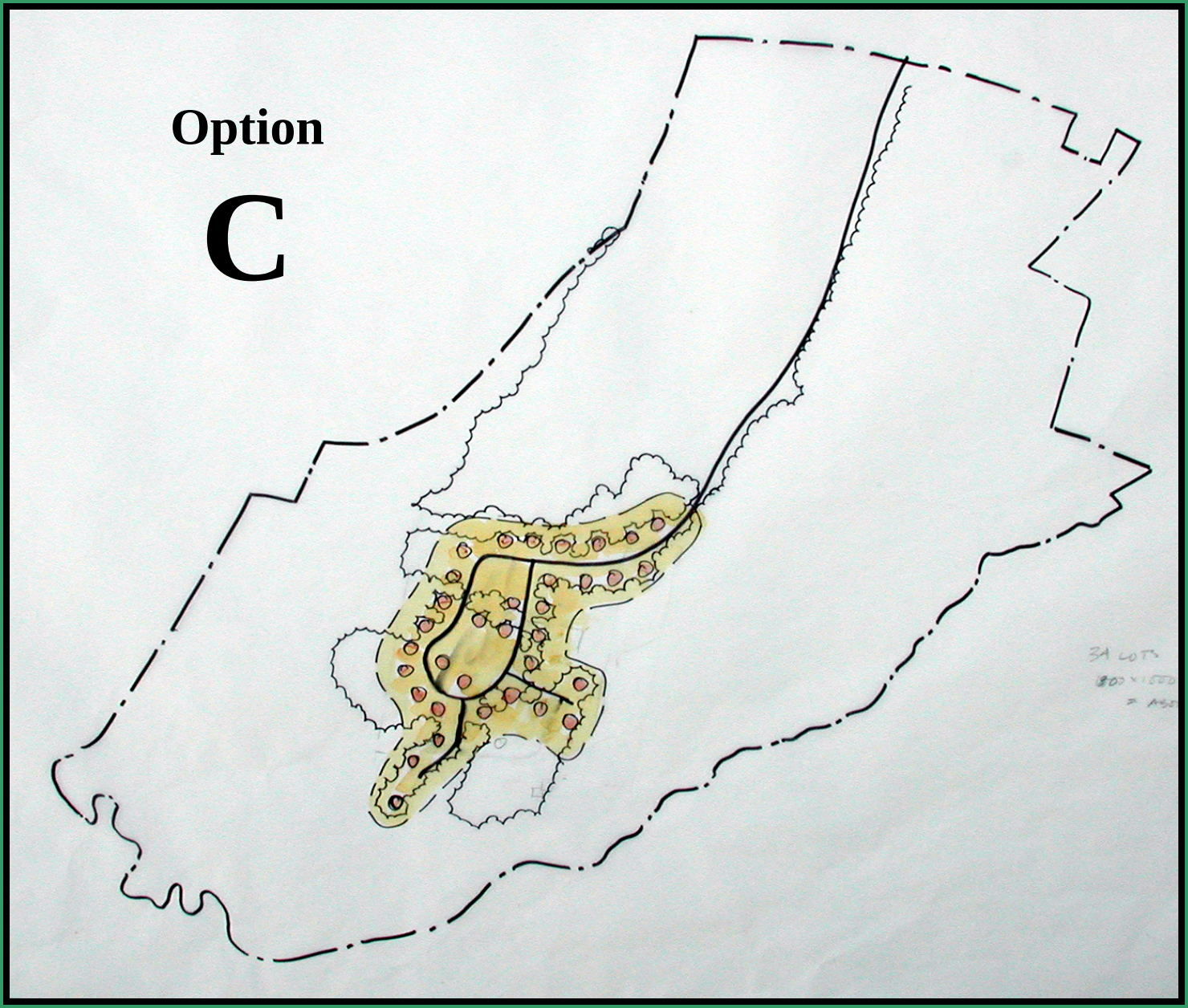
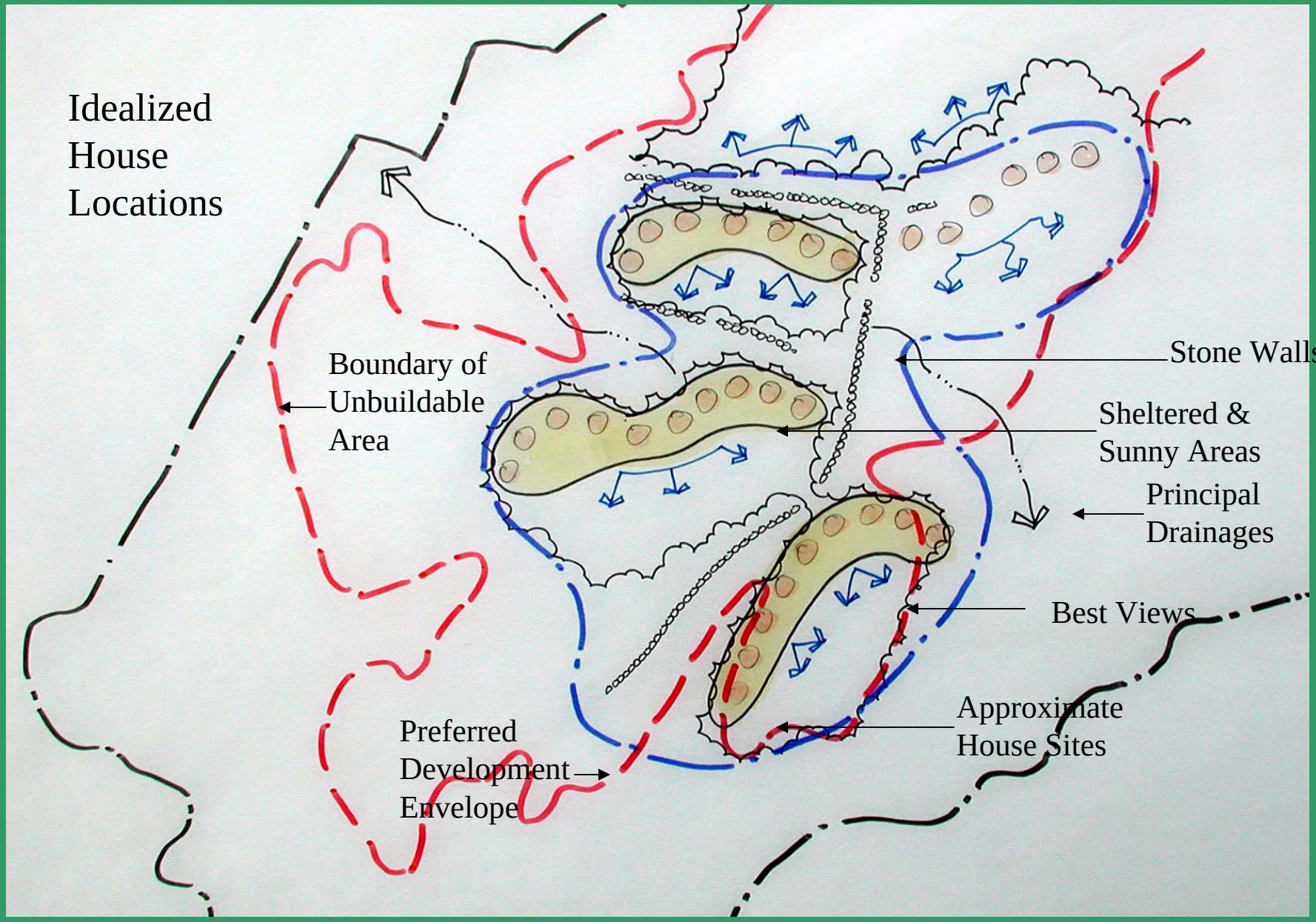
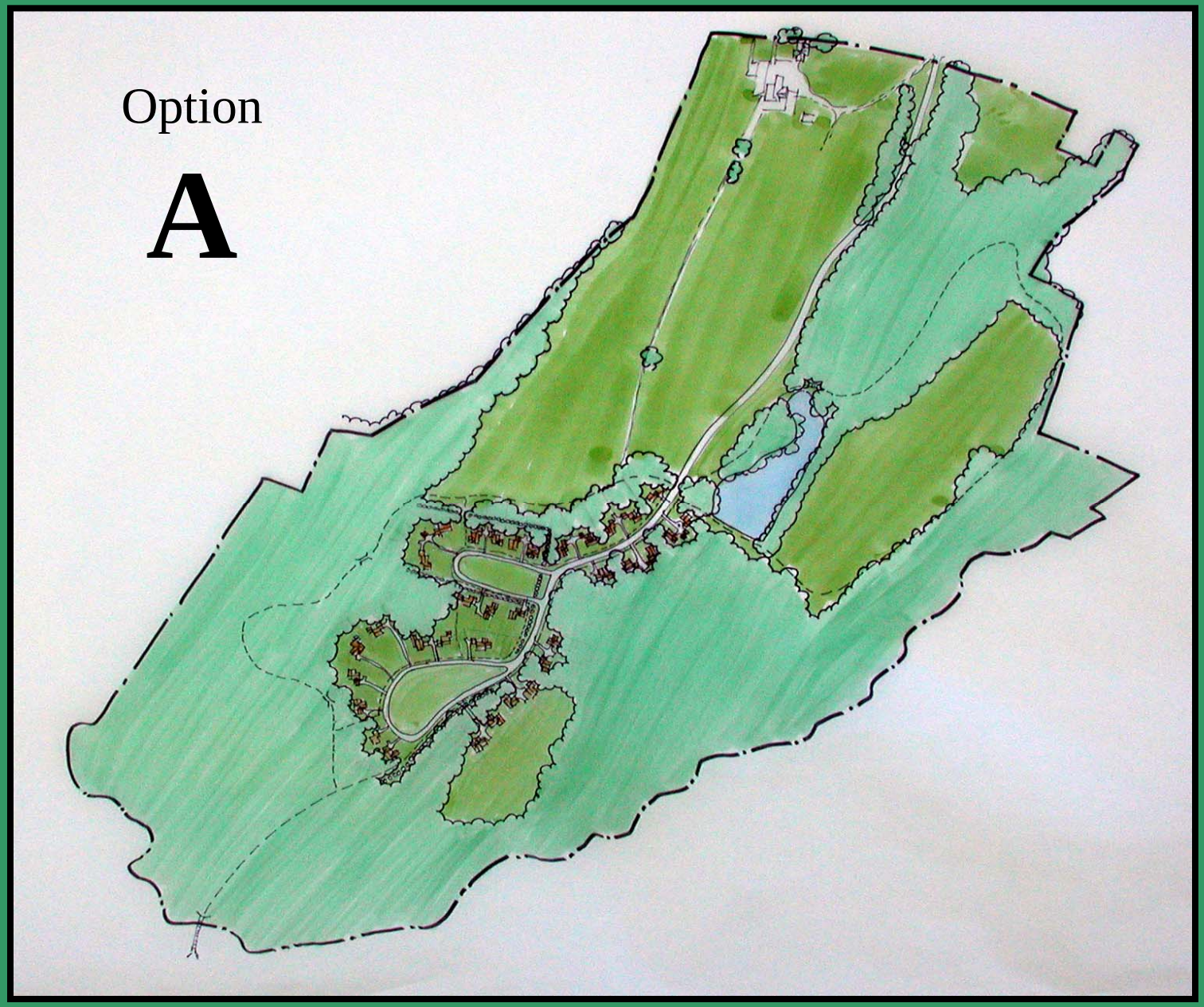


Step 6. Locate House Sites



Step 7. Layout Streets, Trails and Other Infrastructure



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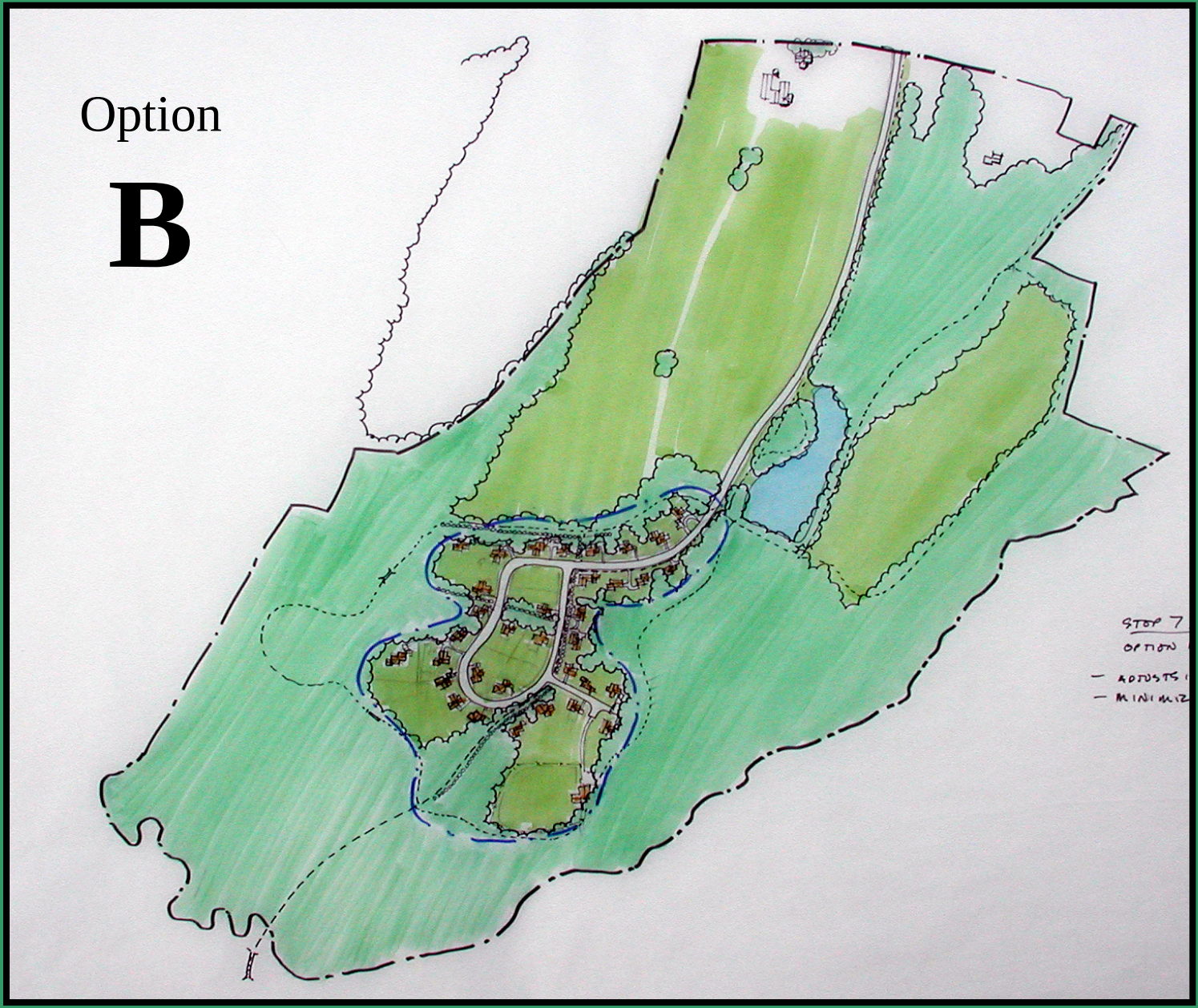
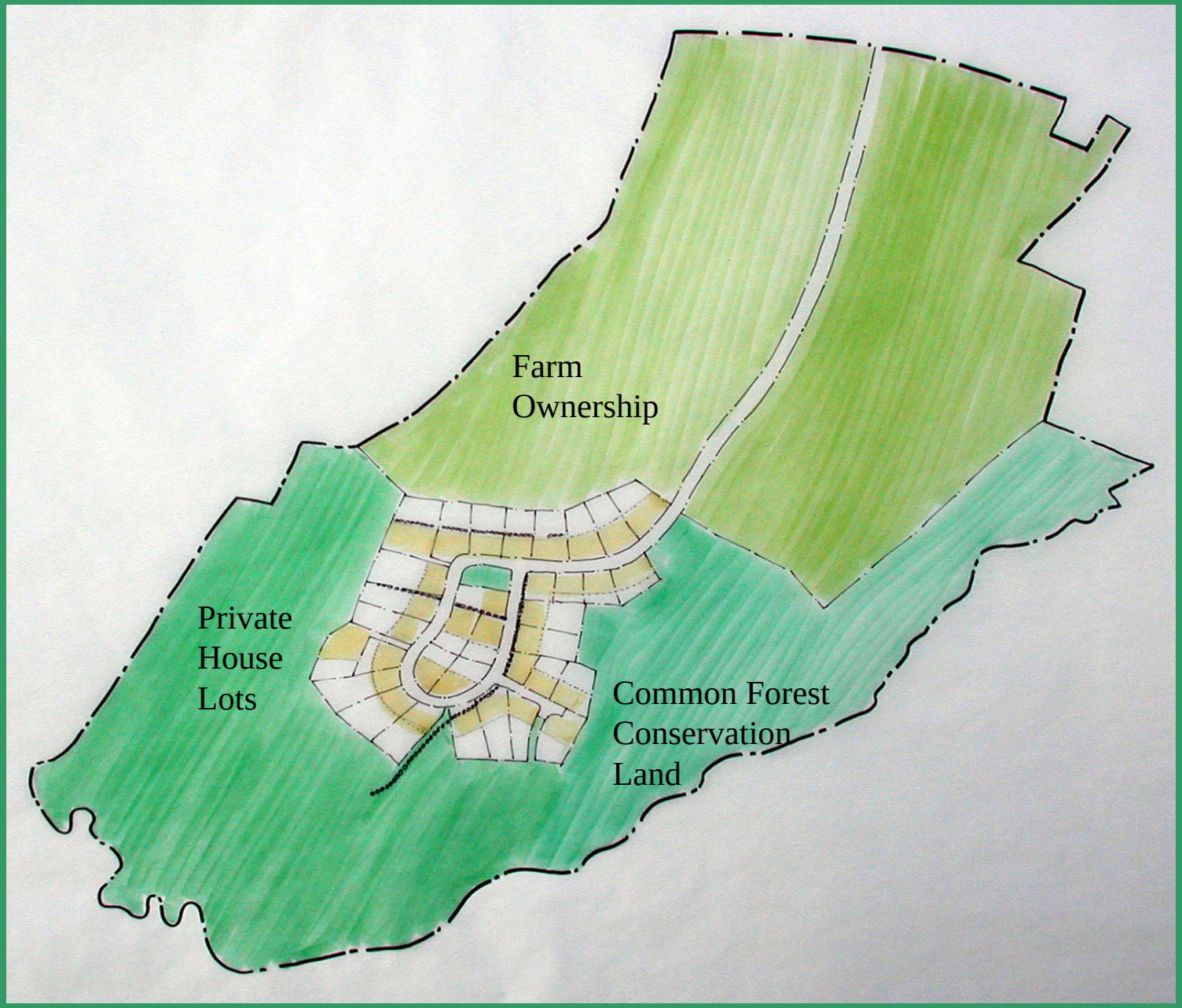
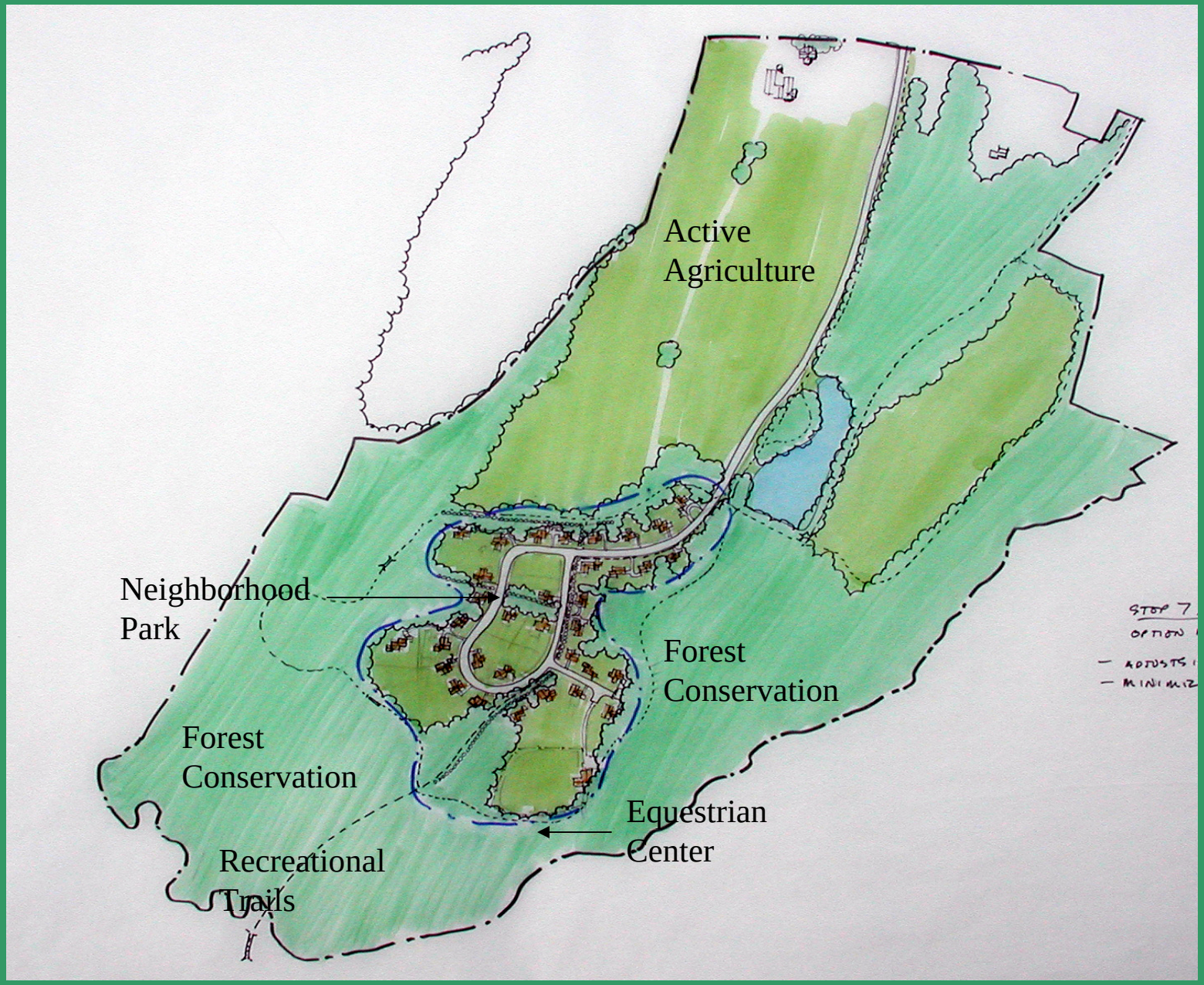


Photo by Stew Comstock, Maryland Dept. of the Env.

Step 8. Draw in the Lot Lines



Step 9. Design and Program Open Space



Step 10. Ownership and Maintenance of Open Space

Four Options:

1. Ownership by City or Town
2. Ownership by Non-profit Group
3. Ownership by Homeowner's Association
4. Private Ownership for Farm, Forest or Habitat Use

Rhode Island Conservation Easement Guidance Manual

Audubon Society of Rhode Island

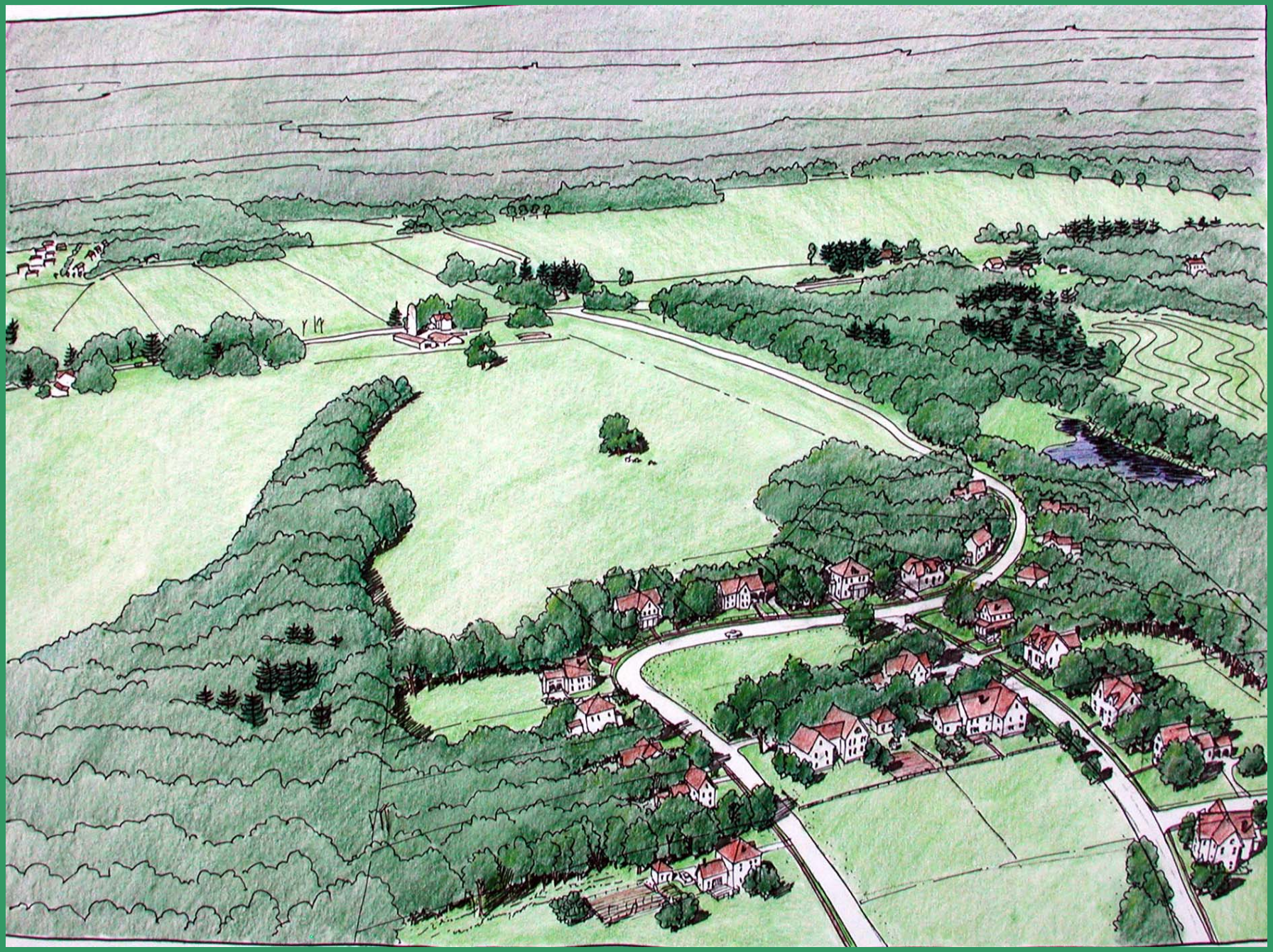
D·E·M

National Estuarine Research Reserve System

Narragansett Bay Research Reserve Coastal Training Program

NOAA

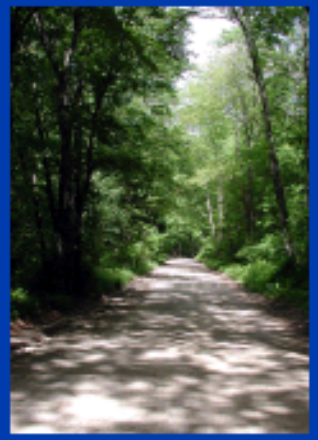
The Rhode Island Foundation

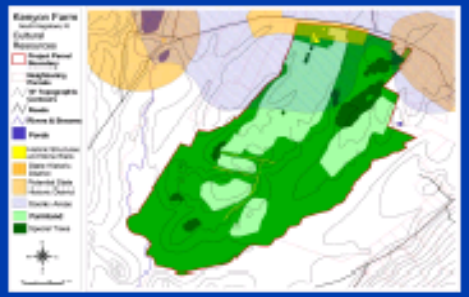


The Rhode Island Conservation Development Manual







A Ten-Step Process for Planning and Design of Creative Development Projects

The usgs map and aerial photograph can be traced to create a simple base map. Using pens and colored markers on tracing paper, important features of the site can quickly be highlighted, such as forest, agricultural land, water bodies, roads, and buildings.

Step 1: Site Analysis Maps

During Site Analysis, information about natural and cultural factors is collected and mapped, creating an objective basis of facts to inform discussions and support fair decisions. In this first step, the focus is on the site itself, its features and capabilities. The Site Analysis process is described in detail in Part 3, Step 1 of this manual. The number of Site Analysis maps required will vary with the complexity of each site. The following maps should be prepared as separate overlays, which can be combined in different ways to better understand the interaction of the various site features and resource types.

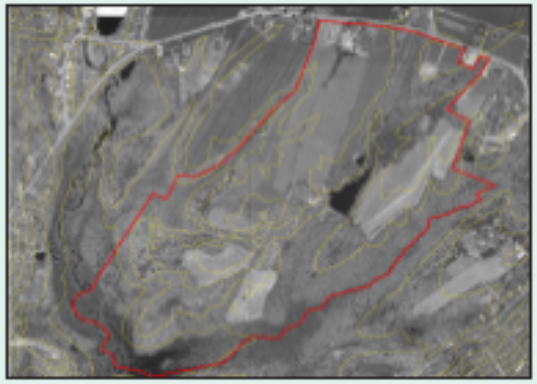
Topography and Slopes

The form of the land is fundamental to understanding both natural systems and suitability for construction. USGS topographic maps provide 10' contours (elevation lines); these can be traced manually or digitized for use as an overlay. In addition, a slope map provides a general assessment of development suitability, or potential hazards, based on slope.

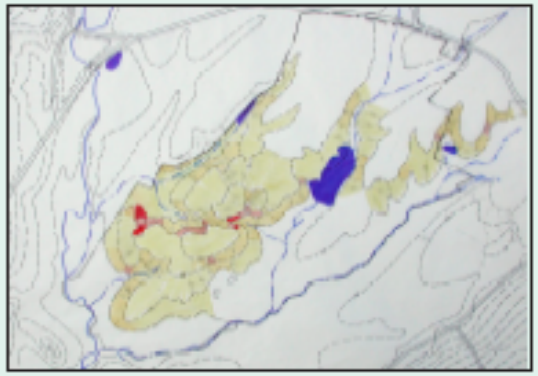
13.____Topography with 10' contour lines.

14.____Slope map, with slopes grouped according to five categories based on development suitability: 0-3%, 3-8%, 8-15%, 15-25%, and over 25%. Steeper slopes should be shown in progressively darker colors or shades of gray.

15.____Existing drainage and drainage structures, such as culverts and pipes, etc.



If more detailed site surveys are not available, the 10 foot contours from the USGS survey are suitable for basic slope analysis. These can be traced, by hand or using a CAD or GIS program, and overlaid with other information such as the orthophoto (above). Slopes can be calculated by measuring the distance between adjacent contour lines (below).



Natural Resource Inventory

Unique features and local priorities for natural resources can be found in the Comprehensive Plan. Smaller parcels in particular may contain only a portion of a resource area or buffer zone, which may be shown more clearly on a separate map showing the site within a larger district or watershed. Subsurface groundwater aquifers and surface water supplies should be indicated in a gradation of blue colors, tones or hatching where the surface water supply reservoir or aquifer is darkest and its watershed or recharge areas are progressively lighter. Farmland and forested land should be shown in light and dark green, respectively, with an indication of underlying soil types with hatching and/or labels. Natural Heritage areas can be shown with a red outline around the designated area.

16.____Name and location of surface watershed, water quality classification and existing condition of nearest surface water(s). See RI DEM Water Quality Regs.

17.____Groundwater aquifers, recharge areas and wellhead protection areas.

18.____State-designated Natural Heritage Sites

19.____Unfragmented forest tracts.

20.____Prime farmland soils.

21.____Land in active agricultural use.

22.____State, regional, or community greenways and greenspace priorities.

23.____100-year floodplains as shown on federal flood protection maps.

Conservation Development - Ordinance Status in Rhode Island Communities

14 Towns have Adopted CD Ordinances – *Bristol, Burrillville, Cumberland, Exeter, Glocester, Johnston, Middletown, North Kingstown, North Smithfield, Richmond, Smithfield, South Kingstown, Tiverton & West Greenwich*

8 Towns have Draft CD Ordinances – *Charlestown, Coventry, Foster, Hopkinton, Jamestown, Little Compton, Scituate, & Westerly*

22 out of 28 Eligible* RI Communities *(Non-Urban and Not Fully Developed)

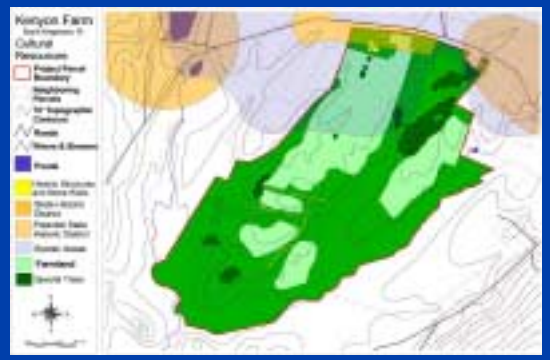
Questions?

The Rhode Island Conservation Development Manual










A Ten-Step Process for Planning and Design of Creative Development Projects

The Rhode Island Conservation Development Manual

June, 2003

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Acknowledgements

Thanks to:

Ray Levesque and **James Sculley** of the Burrillville Planning Board; **Heidi Colwell**, **Richard Grant**, **Helen Hardy**, **Fred Huse**, **Joe McGinn**, **Julia Parmentier**, and **Gail Sherman** of the Foster Planning Board; **Richard Blodgett** of the Providence Water Supply Board; **Sheila Brush** of Grow Smart Rhode Island; **Thomas D'Angelo** of the Rhode Island Builders Association; **Warren Ducharme**, former planner of the Town of Foster; Glocester Planner **Ray Goff**; **Michael Gray** of the Glocester Planning Board; **Lorraine Joubert** and **James Lucht** of the University of Rhode Island Cooperative Extension; **Tom Kravitz**, Burrillville Town Planner; **Chris Modisette**, Executive Director of the Southern New England Forest Consortium; and Scituate Town Engineer **David Provonsi**l.

Special thanks to **Derry Riding**, Principal Planner with the Rhode Island Department of Administration, Office of Municipal Affairs, **Jim Riordan**, Non-point Coordinator for RIDEM, and **Robert Adler**, Watershed Coordinator for the New England Region, U.S. EPA, each of whom reviewed the manual in detail and provided many useful comments and suggestions. Additional consultants who assisted the project advisory committee included: **Randall Arendt, Casby Harrison, III, Esq., Don Leighton**, **Samual Shamoon**, and **Andrew Teitz**.

Rhode Island Department of Environmental Management

EPA New England

RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
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Dear Rhode Islander,

Rhode Island is blessed with many special places. The diversity of these natural, cultural and recreational resources defines the character of our communities and adds immeasurably to our quality of life. The Department of Environmental Management has many programs to assist communities in protecting these resources. However, we neither have the funds to buy up all the special places, nor think of that as our goal. We cannot ignore that many of our communities continue to grow, and that growth can be desirable if we are smart about it. Increasingly, therefore, DEM has focused on providing communities with the tools to plan for growth in a way that preserves their sense of place.

There are three basic strategies to preserve special places. First, each community should inventory, map and prioritize all their important natural, cultural, and recreational resources. Strategies to protect resources cannot succeed if a consensus has not been reached as to what is important to protect. Second, good design guidelines need to be in place on how to accommodate growth while minimizing impacts to the environment and community character. Third, communities should learn to use more creative land use techniques that can preserve open space, avoid environmental impacts, and accommodate the desired type and amount of growth.

The Greenspace projects that DEM initiated in South County and the Woonasquatucket Watershed have helped communities identify and map all their important natural, cultural and recreational resources. They also produced specific recommendations on how each community could use conservation development to more effectively preserve land as it is developed. The South County Planning Assistance Project developed design guidelines and model ordinances that can be used by towns to encourage new growth to blend into their community character.

Many towns have adopted and are now implementing these strategies. In particular, communities have expressed a great interest in conservation development. The concept of using conservation development to guide growth to the most appropriate portions of a site and to preserve open space in a meaningful way, consistent with communities' greenspace priorities, makes a lot of sense. However, this is often more easily said than done. Therefore, in partnership with EPA, URI, Grow Smart Rhode Island, Statewide Planning, the Rhode Island Builders Association and the towns of Burrillville, Foster, Glocester, and Scituate, DEM developed the Conservation Development Guidance Manual as a practical tool for community officials and developers. The manual establishes a flexible, ten step design process that is integrated into the Rhode Island subdivision and land development review procedure. This helps applicants prepare more creative development projects and provides local officials guidance on how to participate in a more collaborative design and review process. The manual also contains many references and recommendations for the proactive assessment of the best locations for development.

The successful completion of this manual is a tribute to the partnerships that have formed to move us from talk to action. I am pleased that DEM was able to assist in developing this guidance and hopeful it will be used to plan for growth in a way that protects what is dear to us.

Sincerely,

Jan H. Reitsma

Table of Contents

Every week, it seems, we read about new subdivisions proposed for undeveloped land on the outskirts of our cities and towns. Driving to work, we pass the new houses down the street, visit the strip malls and shopping centers on the edge of town, and give little thought, perhaps, to the reasons this development is occurring, or why it looks the way it does. Over the years, areas that were once farms and forest land fill up with house lots, even as our urban neighborhoods and mill villages seem to empty out. And because these changes happen a little bit at a time on many separate parcels, we often don't see what's happening until it's too late.

The resulting pattern has been called "suburban sprawl," defined by Grow Smart Rhode Island as "scattered, low-density growth characterized by an inefficient development pattern." This process is marked by waste, consuming large amounts of natural resources, requiring redundant investments in public facilities and infrastructure, and forcing permanent dependence on the automobile. The result is characterized by farmland and forest lost to large-lot subdivision development; degradation of natural habitat and water quality; destruction of traditional small town character; and growth of commercial strips and parking lots in an ever-widening circle where new projects kill off older ones, leaving downtowns stripped of vitality and rural roads choked with traffic. What this adds up to is emphasized by a definition of sprawl put forward by planner Ed Risse: a "dysfunctional settlement pattern."

It is not the individual developer or development project that is at fault. They are just doing their job according to the rules. The problem lies in development decisions that are made on a site-by-site basis, with no mechanism to tie everything into a functional whole. While the local comprehensive plan is designed to serve that coordinating function, as a practical matter implementation happens on the site level. Local rules rarely require developers to work with their neighbors, let alone fit into a coordinated master plan.

Virtually all land in Rhode Island that is not already protected is zoned for development, and of that, the vast majority is zoned for residential house lots at fairly low densities.

Sprawl has become the dominant mode of development for many different reasons: the emergence of the automobile as the principal mode of transportation; preference of most people to live in a single-family house in a pleasant setting; availability of building sites that are less expensive the further you travel from existing centers; tax and mortgage policies that favor single-family homes in the suburbs, etc. What these all add up to are immediate financial benefits for the individual land owner or developer (and indeed purchaser of the product), with many of the costs shared by the larger society over the long term. It is a simple cost-benefit ratio that inevitably results in continuation of individual decisions that promote sprawl, even at the expense of the community.

Is sprawl all bad? From the perspective of the developer, landowner or individual, the "sprawl system" is an efficient and profitable way to provide housing – recent studies have even shown a benefit in terms of providing affordable housing and integration of minorities in suburban communities -- where it breaks down is in the long-term cost of maintaining an inefficient and dysfunctional pattern of development.

These same social and economic forces are at work in Rhode Island, as described by a recent report by Grow Smart Rhode Island called *The Costs of Suburban Sprawl and Urban Decay in Rhode Island*. Figures from the report include:

- Since 1961, land has been developed at nine times the rate of population growth.
- Five cities have almost 11,000 vacant lots.
- The fastest growing towns are in rural and suburban areas.
- In 20 years, 3 more rural towns will be converted to suburban communities and all remaining rural towns will be gone within 80 years.

The reasons for sprawl in Rhode Island mirror those at work throughout the country:

- Local zoning ordinances tend to require lots that are unnecessarily large in town centers while surrounding them with subdivisions of 1- or 2-acre lots.
- Land development and subdivision regulations require most roads to be wide and flat, designed for the greatest possible amount of traffic and/or the largest trucks and emergency vehicles that might need to be accommodated.
- Federal, state and local investment in roads and highways makes it possible to commute from rural areas to urban centers, which makes rural land and housing more marketable.
- Homes and businesses in town centers subsidize the cost of services to outlying areas, which generally pay no more for such services as school busing, snow plowing, or even overnight shipping.
- Federal tax deductions and other subsidies for home mortgages that reward homeowners, but not apartment renters.
- Local bank lending patterns that, understandably, can favor the predictable returns from new subdivisions and office parks over redevelopment of older centers.
- The real estate and development industry, where entrenched patterns of planning, building, and marketing commercial and residential properties have created self-fulfilling assumptions about "what works."
- Cultural traditions, supported by the US Constitution, that protect private property rights and limit the community's power to restrict development.

The forces that promote sprawl are also at work at the level of individual sites. Conventional development as practiced in most towns follows a few simple models for the design of streets, subdivision lots, houses and other uses. Outdated street design standards can produce streets that are wider than necessary. Local ordinances and real estate markets promote large frontages and set-backs. As required by most zoning ordinances, lots are stamped out, cookie-cutter style, with as little variation or leftover land as possible.

As a result, most development projects contain a single size and quality of home. This is partly a result of practical considerations: permitting, marketing and management are all simplified by "single-use" plans, even if the results are much more sterile and inflexible than traditional mixed use neighborhoods. Meanwhile, both design and marketing revolve around private open space within individual yards, rather than the shared open space of parks and playgrounds found in traditional towns. Developers and realtors know that a larger lot will bring a higher price, but are not sure if community amenities will do the same. The upshot of this is that most new development follows the model of the large single-family home in a conventional subdivision. Like the larger patterns of sprawl, this is driven by an entrenched system of design, public permitting, construction practices, financing, and real estate marketing that favors the single-family house on a large lot.

Failed Attempts to Deal with Sprawl: Cluster Zoning

During the 1960s planners began to struggle with the impact of the suburban development machine invented in the 1940s and 50s. New roads and highways were opening up rural tracts

A large house in a rural setting is many people's ideal, but many Rhode Island zoning ordinances allow little else to be built. This results in a monotonous monoculture of suburban tract homes.

to development, many of which were in towns with no zoning to speak of. For many such towns, decades were spent in the struggle to institute basic controls on density and land use. Most such zoning was based on the assumption that all towns could and should develop into balanced suburban communities, with a mix of jobs, housing and commerce. Where comprehensive plans were prepared as part of the process, most took the approach of channeling commercial and industrial growth to areas with the best access – i.e., out by the new interstate highway interchange – while limiting residential densities to half, 1, or 2 acres per unit. Then as now, virtually all undeveloped lands were mapped out

Older cluster projects like this one were successful in creating permanent open space, but the usefulness of those areas was diluted by several factors, including a required buffer strip around the perimeter of the project, lack of coordination with neighboring properties, and a fragmentation of both natural habitat and potential recreation areas into many small pieces.

for some level of development. As most towns began to enact basic controls on the number of homes that could be built, it was becoming apparent – especially in towns closer to cities – that virtually all farms, forests and other open space would eventually be used up. In fact, open space was being used up faster, since larger lots were now required.

As an alternative, planners in the early 1960s developed the first cluster ordinances to make it possible to build the same number of units on a tract allowed by base zoning densities, but to do so on smaller lots, with the balance of the land permanently preserved as open space.

The trouble is that traditional cluster zoning doesn't always work. Building lots are smaller, allowing some of the property to be preserved as open space, but all too often the development plan is prepared as a mechanical exercise in geometry, based on a few simple rules, rather than a design process. The layout still follows the simple suburban theme of a house and drive surrounded by lawns. There is no coordination of architecture and other details. Open space that is set aside is often taken up with buffer zones around the periphery of the property, or useless leftovers between houses. And most significantly, the design of individual cluster subdivisions rarely is coordinated with townwide goals for protecting larger areas or connecting corridors of open space. As a result, when you drive into an older cluster development, what you see is a typical suburban subdivision, only with smaller lots. Little wonder that most people aren't in favor of cluster zoning.

The Argument for Something New: Conservation Development

Despite a promising beginning, and numerous successes, cluster zoning has become hopelessly tied to images of ugly, uncoordinated suburban development, and the process has too often been reduced to a series of unhappy compromises. Yet the flexibility that lies at the core of the cluster concept is still valid. It is still the single most promising approach to allowing development to continue while preserving the essential structure of the landscape. There are many towns, for example, where a significant amount of open space has been preserved through clustering -- providing parks, protecting stream corridors, and creating neighborhood trails connections where there might have been only private house lots.

Meanwhile, most towns still have relatively large lot zoning, even though the housing market trends increasingly favor smaller lots: families are shrinking, the baby-boomers are becoming empty-nesters, and people are marrying later and having fewer children. As a result, the large lot subdivisions that comprise the majority of the available residential market are less suited to meet the demand for smaller lots that will be the trend in the marketplace in the next decades.

While most people still prefer to live in a detached, single-family home, owning (and maintaining) a large individual yard will likely be less important to an older, more mobile society. Opportunities for active recreation, especially trails and bike path connections, conservation of natural areas, and preservation of traditional rural character will increase in value. Conservation Development is among the only zoning tools that provides the flexibility to meet this increasing demand in the marketplace.

Decades before "cluster zoning" was invented, progressive designers were experimenting with flexibility of small individual lots surrounded by shared open space. Radburn, New Jersey, designed in the 1920's by Clarence Stein and Henry Wright, has houses on short cul-de-sac streets for automobile access, with the center of each "superblock" devoted to a continuous park system (above and right). Each house has direct access to a pedestrian system (lower right) that connects the entire town. Schools, playgrounds and swimming pool can all be reached without crossing any streets.

Four decades of experiments with the cluster design concept have produced many successful projects, which serve as the inspiration for new forms of creative development and regulatory schemes developed over the last ten to fifteen years. Examples that succeed on all counts are relatively rare, resulting more from the creative work of an enlightened planning and development team than from any particular regulatory scheme. By studying these successful examples – and in particular the design process involved in reaching the best solution – planners and developers can learn how to achieve better design. Recently, planners around the country have put forth various regulatory systems that take advantage of the flexibility that clustering provides, while focusing the subdivision design process on open space conservation and other public benefits. To highlight this change in emphasis, as well as to shed the baggage that the term "cluster" carries, many planners have experimented with terms that focus on fitting development into a site and its context, while preserving existing resources. Some of the better-known models include Flexible Development, Open Space Subdivision, and Conservation Subdivision Design. Among the best known is Conservation Development, popularized by Randall Arendt in a series of books and manuals. The following chapters describe Conservation Development in detail, with a step-by-step guide to the practical aspects of designing successful Conservation Subdivisions.

Introduction

Conservation Development is a creative land use technique that allows a community to guide growth to the most appropriate areas within a parcel of land to avoid impacts to the environment and to protect the character-defining features of the property. The goal is to accommodate growth while preserving at least 50% of the parcel as meaningful open space in perpetuity. There need be no reduction in the number of lots that could be supported by conventional development; instead the lots are carefully situated to protect natural and cultural resources. (The exception is the "rural residential compound," where towns reduce road widths and other standards if the developer builds fewer units.) The result is a common-sense antidote to cookie cutter subdivisions that fragment the landscape and obliterate special features that add immeasurably to our quality of life.

As such, Conservation Development can become a valuable tool for implementing town plans for open space protection. If planning officials, land owners, and developers know ahead of time which areas and corridors of open space are the most important for public use or protection of resources, the Conservation Development process provides the means for their protection, even as development continues. It is not a panacea: the number of families moving into a neighborhood remains the same, perhaps, as allowed under conventional development, along with the implications of increased traffic, demand for town services, school children, and so on. The visual character of rural communities will inevitably continue to evolve to a more typically suburban appearance. Yet if 50% of every parcel in a neighborhood is permanently protected, hundreds of acres of open space can be set aside for public use, agriculture, and wildlife conservation.

The creation of a conventional subdivision plan in most towns follows a process prescribed by Rhode Island state law, generally organized as a series of review steps: Pre-application, Master Plan, Preliminary Plan and Final Plan. At each stage, the state statutes lay out specific minimum submission requirements (which the town can supplement), designed to provide town oversight of development while guaranteeing the constitutional rights of the landowner to use the land. In many towns, however, the emphasis is more on the *legal* process of planning and review than on the *design* process – with predictable results. Typically, engineers and surveyors concentrate on meeting the strict legal requirements of the regulations: use, lot size and frontage requirements as established by the zoning ordinance; road design and construction standards as described by the Land Development and Subdivision Regulations. Rarely is there a clear place in the process for discussions about how best to fit the proposed development into the surrounding ecological structure or social fabric of the community. As a result, Planning Boards tend to react with a thumbs up or down, and send applicants on their way. Developers are frustrated by not knowing what town officials are really after, and suspect mere obstructionism. Planning Boards, meanwhile, feel they often have to "rubber stamp" poorly-designed plans which meet all the technical requirements but don't fit in with the natural resources or visual character of the town.

Occasionally, experienced developers and planning boards and their consultants get better results – but it's not because they're better at following the rules – rather, they follow a separate design process which looks at the overall site plan, as well as details of architecture, roadway design, landscaping etc., in the context of the town's natural, cultural and recreational resources. This kind of design process can improve any development, but it is fundamental to the success of Conservation Development. Described by Randall Arendt in four steps, the process is really a continuous effort that goes from understanding the site and its context to final implementation and management. For that reason, this manual breaks it down into ten steps that describe the who, what, where, when and how of each part of the process.

Overview of the Ten-Step Design Process

Step 1. Analyze the Site

During Site Analysis, information about natural and cultural factors is collected and mapped, creating an objective basis of facts from which discussion and decisions on both sides can flow. In this first step, the focus is on the site itself, its features and capabilities.

Step 2. Evaluate Site Context

In step two, attention shifts to what's around the site in the larger context of the neighborhood and town. Objective data is collected for natural and cultural resource systems that surround the site, as well as the social structure and visual character of the neighborhood.

Step 3. Designate Potential Conservation Areas

This is the first step in making design decisions -- going from an understanding of the site and its context to conclusions about what areas are most important to preserve, and how these connect to each other and related features outside of the parcel. Thus, while the first two steps consist of a straightforward inventory of resources, opportunities and constraints, in designating con-

servation areas planners must reach clear conclusions about which areas have the highest value for conservation.

Step 4. Determine the Maximum Number of Units

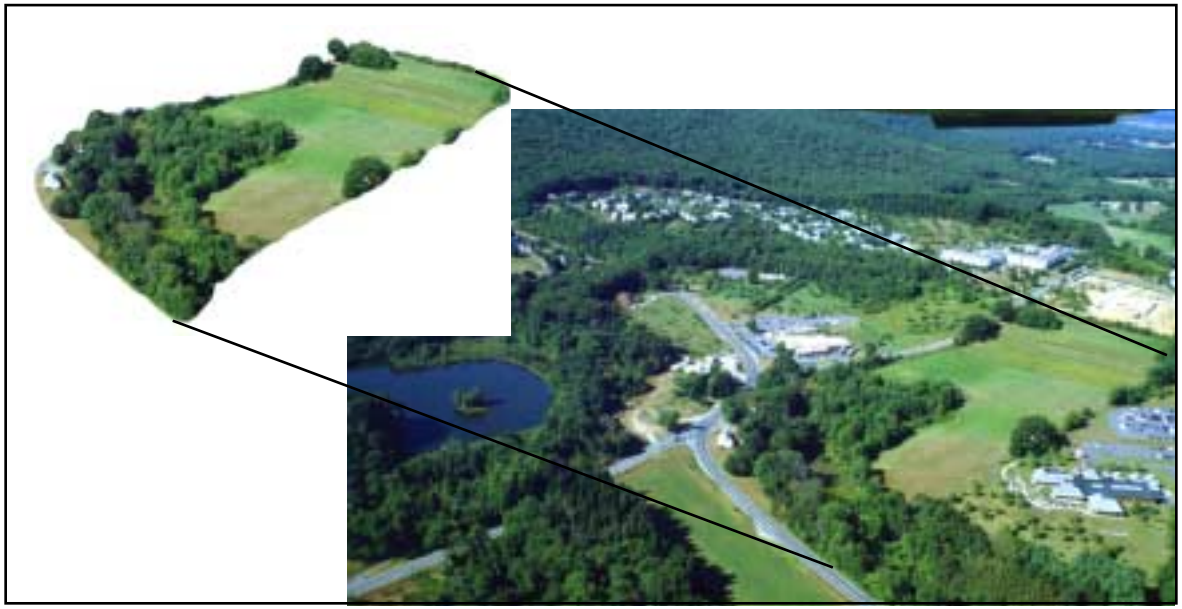
Unless specifically allowed by the local zoning ordinance, Rhode Island law allows no increase in the number of lots for Conservation Development over that which would be permitted under conventional development. Thus the maximum number of units that can be built under a conventional scheme becomes the maximum number allowed under Conservation Development. The method of determining this number is selected by each town that adopts Conservation Development, but generally follow either a numerical formula or a yield plan. In both cases, towns usually require that all or some of the land that is unbuildable be removed from consideration before other calculations begin.

Step 5. Locate Development Areas and Explore Conceptual Alternatives

Development of a conceptual neighborhood plan can provide a framework to tie the proposed community together as a whole, and to link it with the larger neighborhood of which it is a part. The purpose of this conceptual diagram or "sketch plan" is to identify a strong organizing principle, and select the most appropriate site planning approach and architectural style.

Step 6. Locate House Sites

With a preferred concept plan in place, attention turns to selecting house sites that provide high value to potential buyers, with opportunities for creative design, privacy, attractive views and yard space. Each lot must have suitable access, good drainage, provision for utilities, and, if necessary, be capable of supporting an individual well and septic system, or small community wastewater treatment system.



Too often, both Planning Boards and developers approach the site planning process as if a site were a blank slate with nothing around it. In reality, creating a successful design for any site requires understanding its context.

Step 7. Layout Streets, Trails, and Other Infrastructure

As house sites are being evaluated, alternative street alignments are measured against the goals of the overall development concept. The design of streets and pedestrian systems, curbs, utilities, and stormwater management all should reflect the larger goals and design concept of the project.

Step 8. Design and Program Open Space

Uses and design approaches for the open space created in the development should be carefully planned to take advantage of existing features and potential for active or passive recreation or other uses. Design guidelines for open space describe management principles for stormwater, sensitive resource areas, or active agriculture or recreation.

Step 9. Draw in the Lot Lines

The last step in physical planning is establishing lot lines on the plan to describe land ownership. Lot lines should reflect logical boundary locations in the field, such as streams, stone walls, and tree lines. Easements for utilities and trails are also set down to preserve access to important corridors.

Step 10. Establish Ownership and Management of Open Space and Other Shared Amenities

The final step establishes future ownership of open space created by the project, which can be held by a homeowner's association or deeded over to the town or a private conservation group. The best option may emerge from a study of potential uses for the open space, and the relative ability of different groups to provide ongoing management and maintenance.

Conservation Development is neither a formula nor a style of development, but a 'process' to fit new development into each unique site in a way that preserves the best features while creating vibrant new communities. Most conventional subdivisions follow a predictable pattern that varies only slightly from state to state in the northeast, and indeed across the country. Conservation Developments are specifically designed to fit into the specific physical and visual character of the community. No two will be exactly alike. What unites them is a shared system of values, a focus on more sustainable forms of development, and a design process that respects the site and its context.

Advantages of Conservation Development

Economic:

There are many ways to make any subdivision cheaper to build and maintain, but in general, a well-planned conservation development will have:

• Lower costs for lot clearing and home construction

• Lower construction and maintenance costs for roads.

• Lower costs for installation and maintenance of utilities.

• Lower costs for public services requiring travel, such as police, fire, ambulance, school transportation, mail delivery, etc.

• Lower costs for heating and cooling based on time-tested house siting and landscaping techniques.

Environmental

Conservation Development has direct and indirect environmental benefits. The most immediate improvement over conventional development is that sensitive areas on the site are avoided when laying out roads and house lots. The secondary benefit is that the larger systems that cross the site are preserved so that movement of water, plants and animals are not altered to the point where populations can no longer survive. This results in:

• Reduced impacts on groundwater supplies and surface watersheds.

• Preservation of wildlife habitat.

• Protection of riparian corridors and other connective systems.

• Reduction in fragmentation of forest blocks.

• Preserving meaningful open space without any cost to the community.

Social and Quality of Life Issues

By itself, Conservation Development does not change the social structure of subdivisions in a particular part of town, but it does provide developers with the flexibility to vary lot sizes, preserve areas for recreation, and spend less money on roads and more on other shared amenities that promote neighborliness. All of these factors will attract a more diverse population and promote a more active community life within the neighborhood. The result is a series of amenities and a range of features that can add significantly to livability and social cohesion of the community:

• Quiet streets, sidewalks, front porches and other amenities that promote neighborliness

• Walking and biking trails connecting to parks, playgrounds, schools, sport fields, and other centers of activity.

• Community buildings, gazebos, etc. that provide space for neighborhood functions.

• A range of house styles and sizes that meet the needs of large and small households.

Support of Local Planning Goals

Local Comprehensive Plans generally list goals that include protection of sensitive environmental resources, special places, farmland, and rural character – all of which are nearly impossible to preserve as part of a conventional subdivision plan – leaving the town with the option of either buying the land for conservation or losing these special features. With Conservation Development, on the other hand, it is possible to develop each parcel in such a way that these sensitive resources are protected, even as the town continues to grow. Moreover, with some forethought preserved open space areas on adjoining development sites can be linked into open space corridors and greenway systems that eventually form a permanent green network throughout the entire town and region.

The Issue of Lot Size and Density

Much of the discussion about Conservation Development gets tangled up in questions about relative size of lots and/or the overall density of development on a parcel. Unlike conventional development, where lot size – say one acre – is identical to density – one unit per acre – in conservation development lot size can vary. But in every case, as required by state law, the overall density allowed by zoning must not be exceeded. Thus, if zoning allows ten units on ten acres of land, there can never be more than ten units on that parcel, even if the individual building lots are only one-quarter or one-half acre.

In theory, local zoning ordinances prescribe densities based on the physical capabilities of the landscape: commonly one or two acres per unit in unsewered areas, up to five acres in some

rural districts. In writing Conservation Development ordinances, each town determines how large or small the actual building lots should be, usually starting at about half the size required for conventional development. That way, even after roads are built, up to half of the property can be preserved as permanent open space. The size of building lots should also reflect the carrying capacity of the site – that is, the capability of the site to absorb stormwater runoff and wastewater flows, as well as to supply private wells.

In Conservation Development, houses may or may not be closer together, but overall density remains the same as in a conventional subdivision. In the example shown here, the houses are about where they would be in a standard plan, but using the flexibility of Conservation Development, the developer has created a large common open space. That shared space will benefit each resident much more than if the same area was spread out over each home's front yard.

Typical Questions and Concerns About Conservation Development

While people may not be satisfied with the results of the conventional subdivision process, they may also have concerns about what could go wrong if Conservation Development is adopted in their town. Experience with improperly designed wastewater and drainage systems as well as improper use of clustering may raise concerns. Yet, most of these problems result because of poor planning when these earlier projects were built, or an unexpected change in use. Take for example, Rhode Island's dense summer colonies, many of which are being converted to year-round homes. Or subdivisions built on poorly-drained soils back in the 1950's, before more stringent engineering requirements were enforced. The Conservation Development process is designed to bring potential problems to the surface early in the process. That way, for example, if a site cannot support smaller lots another creative approach will be found – long before construction begins. Still, many people will be worried about different parts of the process, whether they are neighbors, town board members, elected officials, land owners or developers. The following provides responses to some typical questions raised when considering Conservation Development:

Wastewater: *Is there enough room within the smaller building lots often used in Conservation Development for Individual Septic Systems? Doesn't concentrating these systems add to the possibility of contamination?*

As described above, the risk of contamination varies with specific conditions on the site. The extensive analysis and assessment that occurs early in the Conservation Development design process will help determine the appropriate final density, based on the allowable number of potential units, proposed land uses, and site conditions. Creative alignment of lots may allow for standard setbacks between well and septic systems to be maintained, even though the houses themselves may be closer together. Advanced treatment systems for individual systems are available that do a better job at removing potential contaminants from wastewater. Small community systems can also be used, taking advantage of the best soils on the site to treat wastewater from more than one residence.

Market Acceptance: *Will the lots created through Conservation Development be worth as much as larger conventional subdivision lots?*

Numerous studies of the market acceptance of Conservation Development have shown that lots in well-planned Conservation Development projects equal or exceed the value of larger lots in nearby conventional development. The key is to provide tangible and usable amenities to the residents that make up for having less personal yard space. Indeed, as family size shrinks and the population ages, the market for smaller homes with less outdoor maintenance will only continue to grow.

Regulatory Issues: *What kind of changes in local ordinances will be required to enact Conservation Development in our town?*

Under Rhode Island laws, Conservation Development is adopted separately in each town by

incorporation in three principal documents: the Comprehensive Plan, the Zoning Ordinance, and the Land Development and Subdivision Regulations. The process of adopting Conservation Development is fairly straightforward, and an experienced planner and land use attorney can provide assistance.

Town Management Issues: *Is the review of Conservation Development projects going to make more work for the Planning Board and staff than ordinary subdivisions?*

Yes and no. Most towns, through years of experience, have reduced the review and approval process for conventional subdivisions to a manageable series of steps which, if not quick, is at least well understood. As Conservation Development is adopted there will be a learning period as the Town Planner, Planning Board, Town Engineer, and other parties become familiar with the process. Since decisions at each point are made based on a variety of factors, some additional time and expertise may be required – but this will be balanced by time saved in pursuing dead ends. Rather than the developer spending a lot of time and money developing a plan which is unacceptable, only to have the Planning Board send it back to the drawing board, the developer and the town become partners in a planning process which, while more complex, always moves forward. As a result, approval times are faster and expenses are reduced in comparison to conventional subdivision review.

In addition, Rhode Island law allows towns to collect review fees from the developer with which the town can hire its own consultants to assist with the design process. A model fee ordinance, entitled "Regulation Governing Fees and Fee Schedules," is available from the Rhode Island DEM Sustainable Watersheds Office, at (401)222-3434. Such fees allow towns without planning staff to manage Conservation Development proposals without overburdening volunteer boards.

Public Access: *If I buy a lot adjacent to protected open space in a Conservation Development will I have a lot of strangers trooping past my house?*

Through the design process, use and public access to open space within the development should be balanced with issues of privacy and safety for future residents. In most cases, open space will not be heavily used by "outsiders" unless it contains an important town trail corridor or recreation area, both of which should be clearly marked and managed.

Speeding Up Development: *Will Conservation Development encourage more development than would otherwise occur?*

Many towns are concerned that Conservation Development will encourage more development in a town than might otherwise take place. In fact, since in most towns the area of unbuildable wetlands, steep slopes, and floodways is removed from the total acreage of the parcel before the allowable number of units is calculated, the developer can't build more lots than could otherwise fit on the parcel. While some savings on road costs and other infrastructure may be realized, depending on the design, these are usually balanced by increased investment in planning and design, and provision of community amenities. As a practical matter, Conservation Development is most often considered only when landowners or developers are already planning to subdivide a property.

Open Space Protection: *Will the open space set aside really remain open forever*?

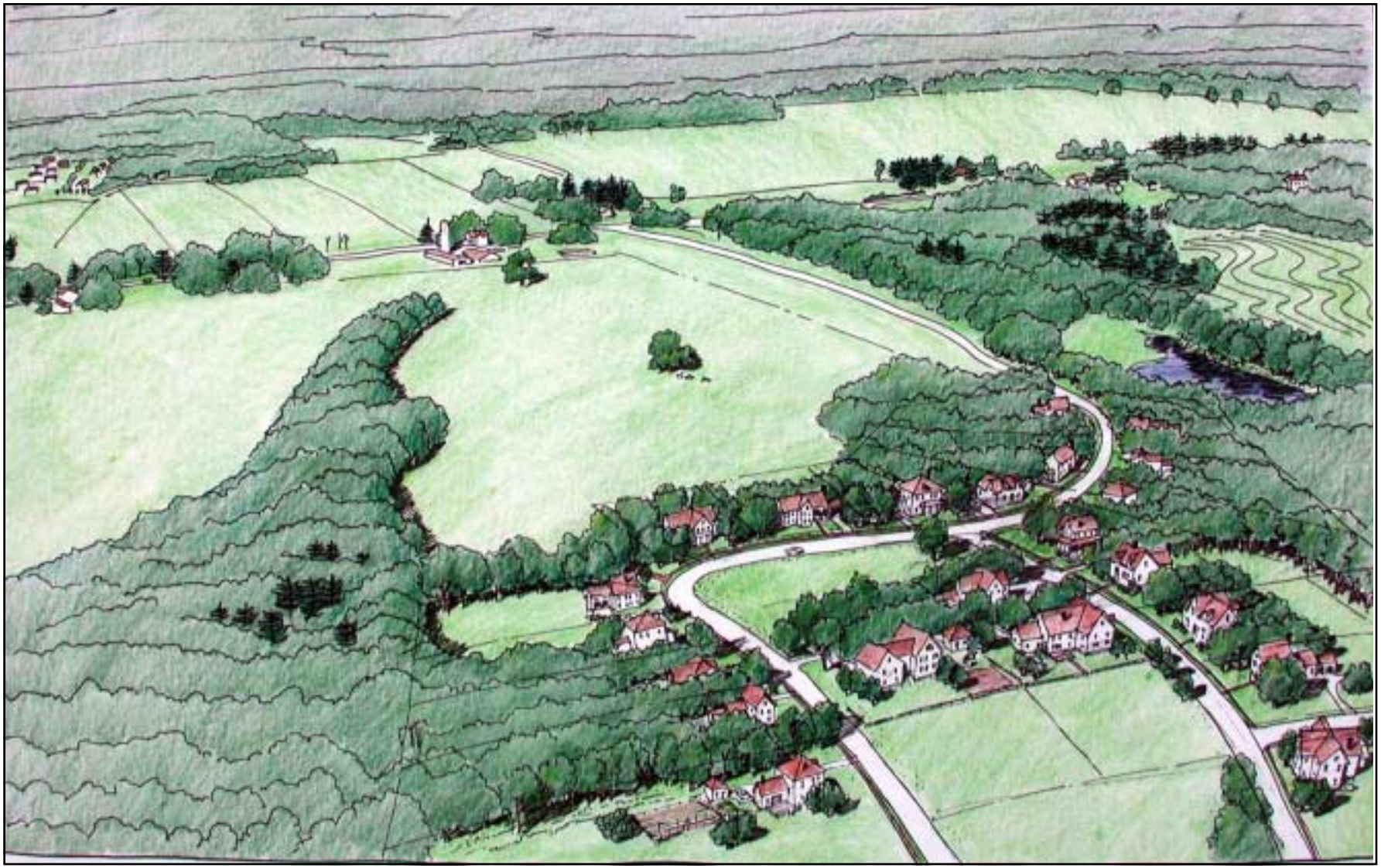
Under state law, any open space created through the Conservation Development process must be owned by a homeowner's association, a non-profit conservation group, deeded over to the town, or retained in private ownership restricted to farming, forestry or habitat use. If it remains in private ownership, permanent conservation restrictions must be placed on the open space that prevent further development in perpetuity. These restrictions are attached to the chain of title to the land and cannot be removed. There is no way that the open space could be developed now or in the future.

Existing Conditions

The site is made up of a varied landscape of farmland, forest, and wetlands, totaling about 175 acres. Each of these landscape types is connected to similar lands on neighboring parcels. Ecologically, the site is imbedded in a rich matrix of meadows, riparian forest, and upland forest. Economically, the active dairy farm on the site is central to one of the last remaining agricultural areas in Rhode Island -- a land use that gets harder to maintain as farms are isolated from each other by development. The visual character of the site reflects this remarkable variety of land uses: it includes historic farmsteads along the state highway, long views across cultivated land, and a series of small meadows and woodlots. Adding further variety to the mix are isolated large trees and hedgerows dividing the fields, as well as steams, ponds, and wetland corridors.

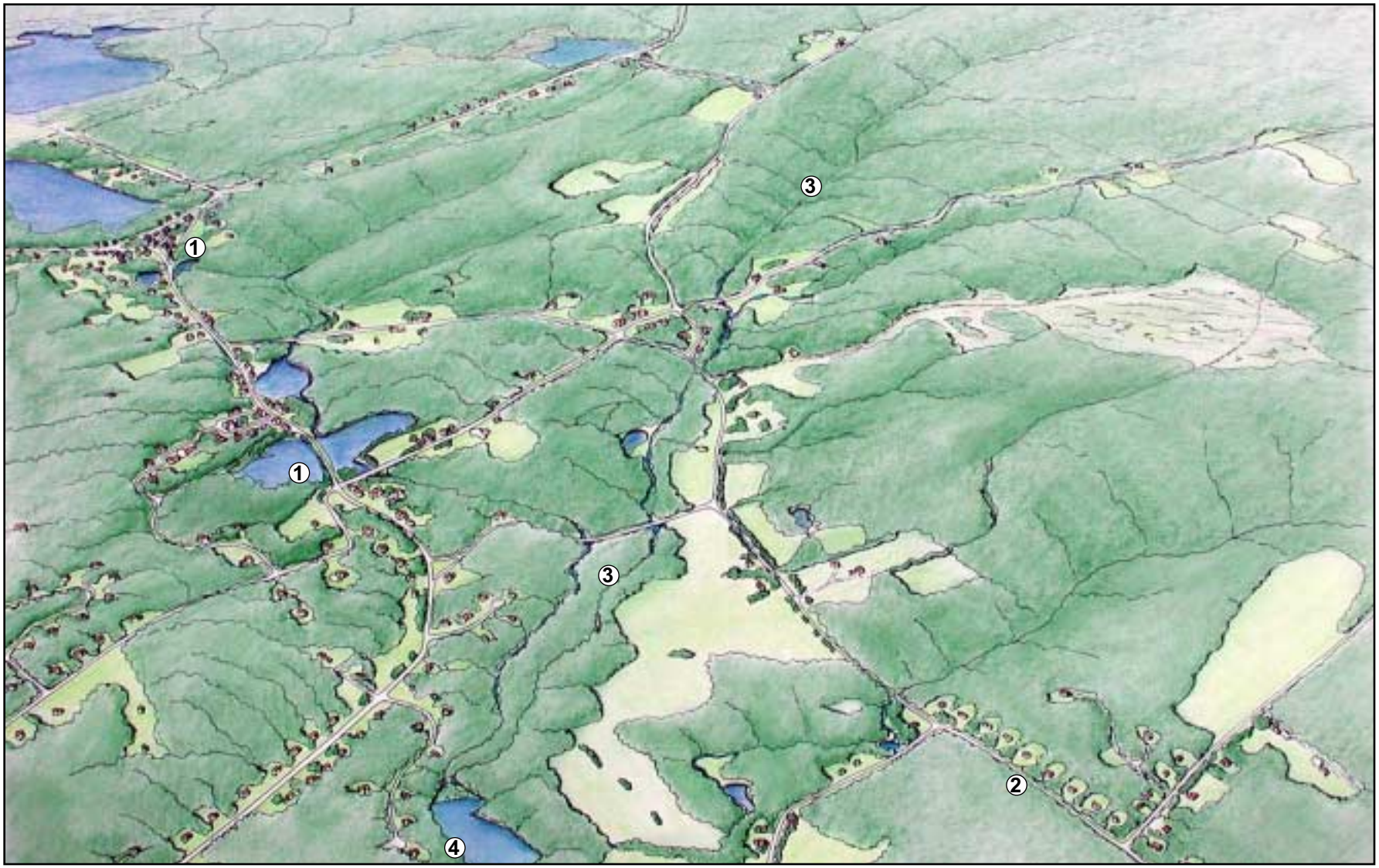
Conventional Development Scenario

Applying the 200,000 s.f. minimum lot size allowed in this district produces a subdivision of 34 lots (some out of sight below the frame of this illustration). Development of these lots and new roads to access them destroys the agricultural use of the land -- though homeowners would have enough room on individual lots to keep a few horses. The open character of the landscape, particularly on the more visible northern end (top of illustration), would make it difficult to hide the houses. At best, what results is a more spread out version of a typical suburban subdivision, with lots too large to be easily maintained, but too small for continued agricultural use.



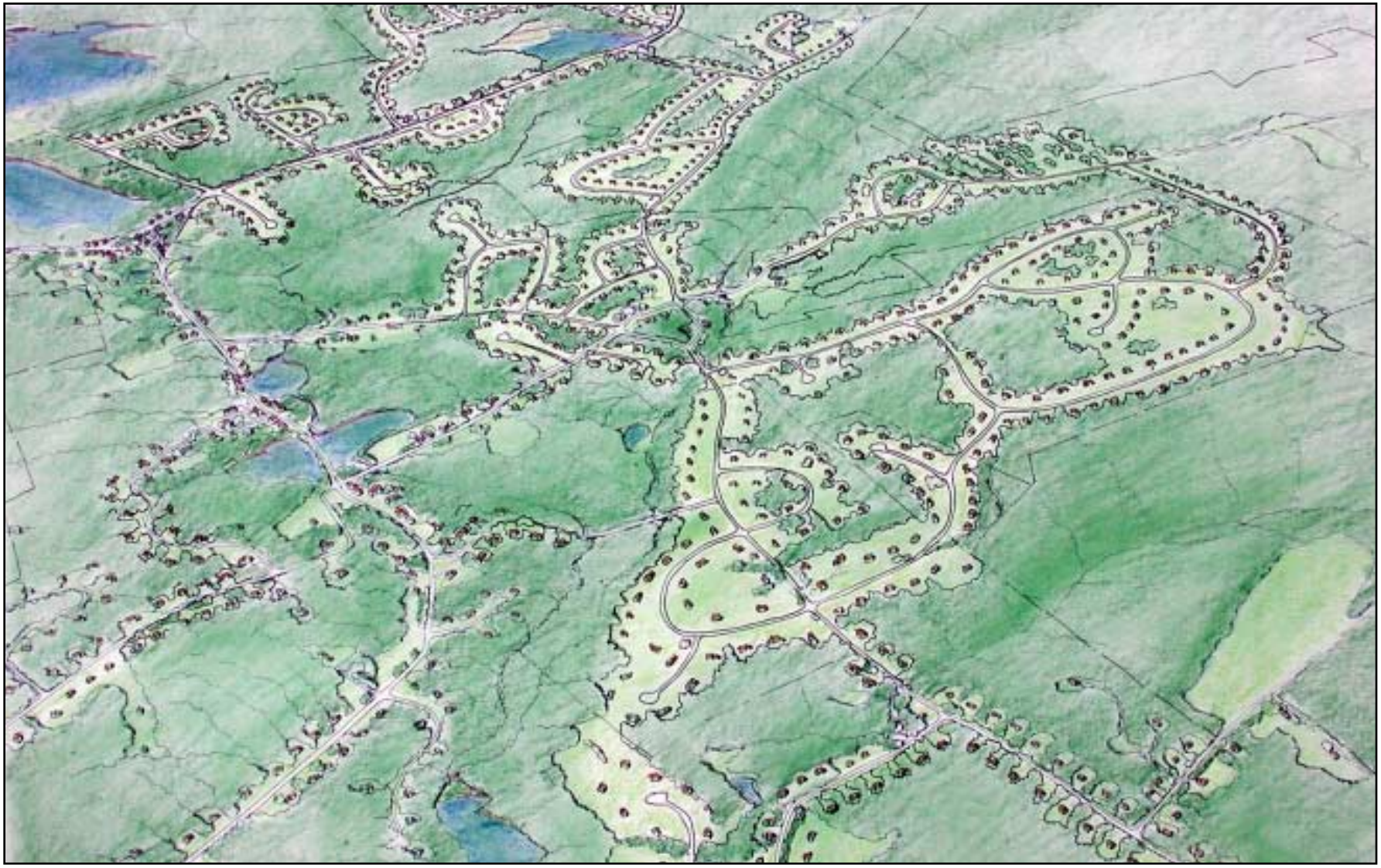
Conservation Development Scenario

The Conservation Development approach allows the farmer, the residents, and the public all to benefit. Most of the areas in active cultivation remain so, and are leased or resold to the same family now operating the farm. A new road follows the treeline along the edge of the fields to provide access to a new neighborhood tucked into the woods and meadows on the southern half of the site (bottom of illustration). The same 34 units allowed under current zoning for the site are constructed on lots averaging half an acre. The remaining open space is set aside for conservation of stream corridors and wetlands, while a network of pedestrian trails allows residents to enjoy this common land. Homes in the new neighborhood would each face out onto a small park, as well as having views and physical access to common open space in the rear of each property. The quality of life this affords keeps lot values high, even though the lots themselves are smaller.



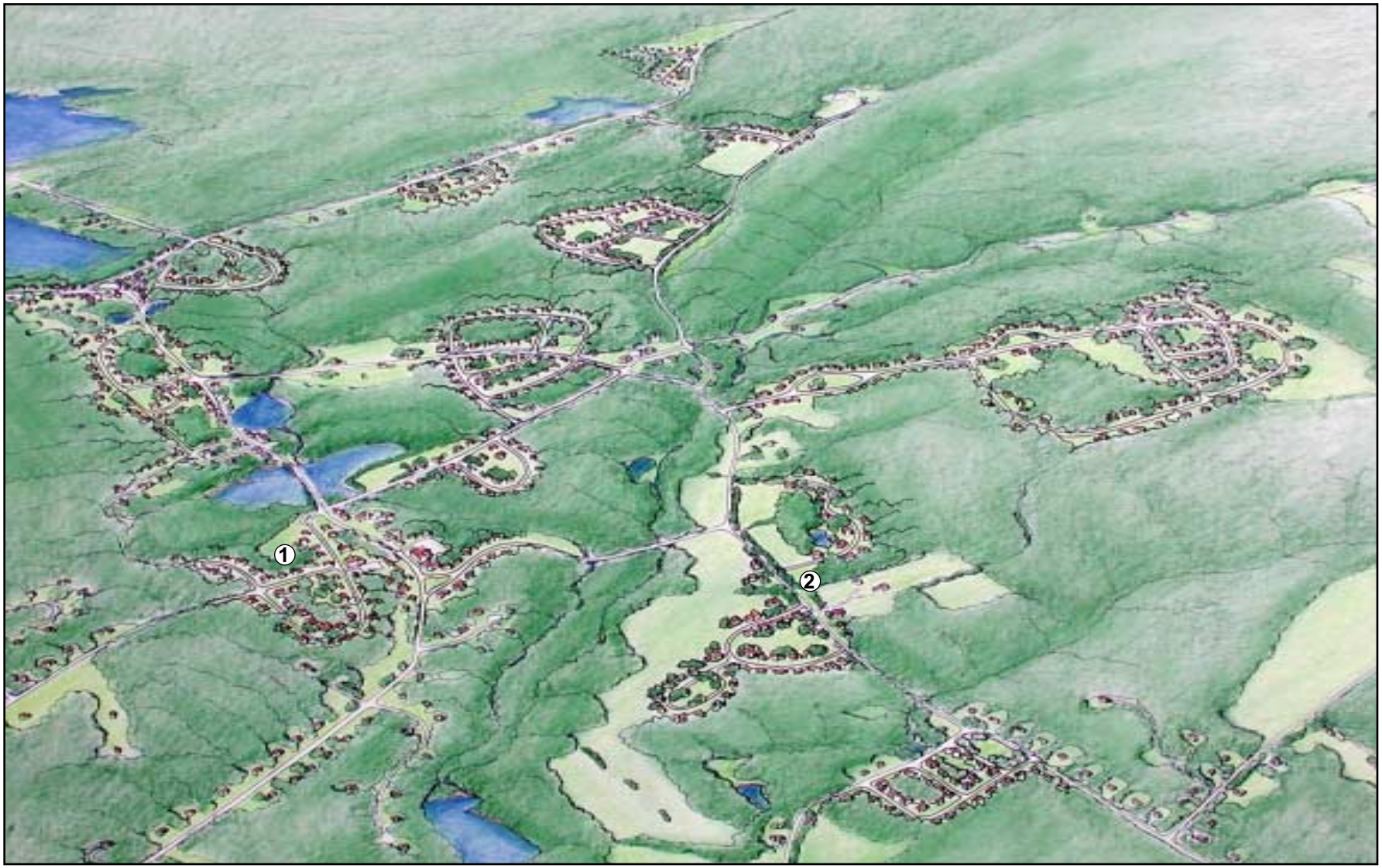
Existing Conditions

This drawing shows a typical rural area as it now exists. Like many areas in Rhode Island, it contains a mix of small farms and forested lands, interspersed with historic mill villages (1) and more recent frontage development (2). At the center of the image (3), a stream drains a narrow valley, collecting runoff from surrounding farms and woodlots and draining into the pond at the bottom of the picture (4). Each of the "undeveloped" parcels in this image is thus part of several larger ecological and cultural systems. For example, the rural highway at the left side of the image forms a continuous corridor of historic mill villages, while the rural road to the right connects a series of small farms into a continuous agricultural corridor. The stream valleys and wooded ridges that separate these cultural corridors form the backbone of an environmental system that supports native plants and animals and protects water supplies from contamination.



Conventional Development Scenario

This drawing shows the same rural area after development under conventional two-acre zoning. Most of the farmland -- often the easiest land to build on -- is developed first, along with existing road frontage. While large areas of wetlands and land already protected remain undeveloped, the new subdivisions and roadside frontage lots fragment wildlife habitat and replace rural vistas with suburban house lots. Meanwhile, the lack of two-acre lots in existing village centers brings growth to a halt in the places most suited to community life. The result is a landscape where existing natural and cultural resources are replaced by single-family house lots, with a resulting loss of rural character and quality of life.



Conservation Development Scenario

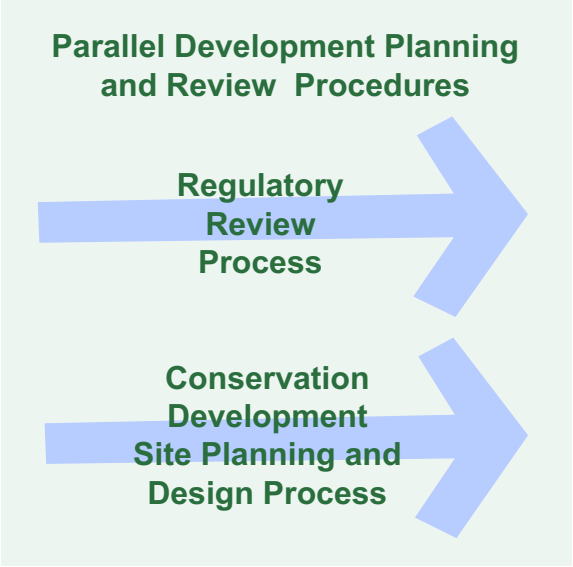
This drawing shows a creative approach to development of the area, using the Conservation Development process to build the same number of new homes allowed by current zoning in a pattern shaped by existing networks of natural and cultural resources. Development of parcels adjoining existing village centers (1) is laid out as an extension of the existing village: streets and sidewalks are connected, lot sizes and setbacks are based on the existing neighborhood, and open space is protected at the periphery to create a permanent greenbelt. In more rural areas (2), new homes are tucked into the edges of meadows or woods, or gathered into small hamlets designed according to local traditions of building walkable, livable communities. Open space is consolidated to buffer wetlands and sensitive stream corridors, and scenic roadside farmland is protected. Large tracts of protected forest are extended and connected to maintain movement corridors for wildlife and recreation.

Introduction

Why Ten Steps?

The difference between Conservation Development and other kinds of development regulations is that at its core is a *design process* that applicants are expected to undertake in order to gain subdivision approval. This process proceeds in conjunction with the regulatory procedure that towns currently use to guide applicants from Master Plan to Final Plan. Consideration of design is a *parallel* procedure that places equal emphasis on fitting the development into the property and the surrounding landscape. The first steps in this process focus on understanding the site and its context, with the goal of identifying the key resources on the site, and connections to natural and cultural resource systems in the rest of the town. With these potential conservation areas as a framework, house sites and streets are laid out to take advantage of, rather than erase, existing site features. Only at the end of this process are lot lines, setbacks, and other legal elements established to guide implementation of the plan.

As developed by Randall Arendt, the typical Conservation Development follows a four-step process: 1. Identify Conservation Areas; 2. Locate House Sites; 3. Align Streets; and 4. Draw in Lot Lines. This is simple enough to fit into local regulations, but within these steps there are actually a number of procedures that town boards and applicants need to go through in order to plan for Conservation Development, and to implement that plan once everything's down on paper. For example, the process of identifying conservation areas itself encompasses several distinct steps. The first is to analyze the site itself, making an objective inventory of resources within the boundaries of the parcel. The second step is to make a similarly objective inventory of the site's



context. Only after gathering and analyzing this information inside and outside the site can the applicant start drawing conclusions about what areas of the site should be preserved and where development should go.

Another critical part of the process is to determine the number of units that can be built under a conventional plan. Making this process simple, fair, and defensible is so important, especially for public acceptance of Conservation Development as a technique, that we have made it a distinct step in the procedure. Similarly, other steps have been added for the process of determining uses and physical designs for proposed open space, and for planning the legal structures for ownership and management of these public or semi-public areas.

The result is a process that has grown to ten steps -- designed to describe the process more completely and clearly, as a continuum of information gathering and design decisions involving applicants, town boards, and local citizens. One goal of this effort is to make the process less of a battle between landowners or developers and town boards, and more of a collaboration between parties whose aim is to use development as a positive force in towns, providing needed housing while at the same time preserving the elements that define the visual, environmental and social character of Rhode Island communities.

The Ten Step Process

1. Analyze the Site
2. Evaluate Site Context
3. Designate Potential Conservation Areas
4. Determine the Maximum Number of Units
5. Locate Development Areas and Explore Conceptual Alternatives
6. Locate the House Sites
7. Layout Streets, Trails, and Other Infrastructure
8. Design and Program Open Space
9. Draw in the Lot Lines
10. Establish Ownership and Management of Open Space and Other Community Elements.

In the following sections, each of these steps will be described in detail.

Description of the Ten Steps

Step 1. Analyze the Site

Introduction

The process of site analysis is the logical first step in any site planning and design process. The word analysis comes from the Greek meaning to "unloose" or "undo" (as in taking something apart to look at its component pieces), and it is through this breaking down into separate parts that we come to understand the site. Landscape Architects and Civil Engineers are trained to prepare this initial inventory of site conditions, emphasizing those elements likely to affect the proposed use for the property, but generally trying to get down on paper all the factors that might directly or indirectly impact the project.

To keep everything straight, these elements are typically divided into natural factors and cultural factors. Natural factors include the geologic structure of the land, the movement of water through and under the site, and the plants and animals that the land supports. Cultural generally include past or current human uses of the site, resources that people value, such as historic sites or rural vistas, and such practical matters as road capacity and utility connections. By analyzing each of these factors individually, the site planner can evaluate the capacity of the site to support development. This includes the ability of the environment to handle things like road run-off and wastewater, as well as the capacity of the landscape to absorb new development without ruining the visual character of the area.

Out of many possibilities, the following are factors most commonly explored in site analysis:

Natural Factors

- Landform and slopes.
- Geologic history; bedrock and surficial geologic structures, ledge outcrops.
- Soils; capability for various uses, prime farmland and forest productivity, etc.
- Hydrology: surface and subsurface water and floodplains.
- Climate: including rainfall, wind, solar access.
- Wetlands.
- Vegetation.
- Wildlife habitat.
- Ecology: biodiversity and natural heritage areas.
- Distinctive natural features: rock outcrops, glacial erratics; unusual landforms or trees.
- Required local, state or federal regulatory setbacks from wetlands, floodplains or other sensitive environmental features.

Cultural Factors

- Site history.
- Historic features.
- Archaeological features.
- Views and scenic resources.
- Distinctive cultural features: stone walls, cellar holes, interesting man-made elements.
- Public utilities: gas, electricity, water, sewer, cable, fiber optic.
- Stormwater drainage systems.
- Road capacity, traffic concerns, access points.
- Recreational trails: hiking, biking, horseback riding, boating, etc.
- Required local, state, or federal regulatory setbacks from historic features; deeded restrictions or easements, etc.

Site character is the sum total of many different factors interacting in the landscape, which together create something that is much more than the sum of its parts.

Understanding the Character of a Site

Many people, including trained professionals, prepare an excellent site analysis in terms of the basic inventory of factors, but never get around to thinking about what the site is as a whole. Any site is more than the sum of its parts: it's very useful before going further to try to draw some conclusions about what the site is, and what its many parts add up to. For example, a site that contains a mix of forest, meadows, fields and hedgerows, together with an historic farmhouse and out-buildings, is more than these separate pieces – it can be described, perhaps, as a traditional farm landscape. Other sites are defined less by man-made features than by natural systems, composed of interacting elements of landform, water, plants and animals.

There are many old words and phrases that describe these combinations of landscape elements: the wooded glen; the flowery forest glade, the wind-swept hilltop, the wooded knoll, the

flowery dell. Many sites contain a series of such distinct landscapes that could potentially be connected in a system of open space. The point is that by defining the essential character of a place you can begin to describe what it is that gives it its value, and begin to think about building *on* that value, rather than paving *over* it

Relationship to Later Steps

The usefulness of the site analysis, whether consisting of sketch overlays prepared for a pre-application meeting or carefully surveyed information submitted for Master Plan review, is that it provides an objective basis of facts from which discussions and decisions on both sides can flow. In this first step, the focus is on the site itself, its features and capabilities. In step two, attention shifts to what's around the site in the larger context of the neighborhood and town – again, from the standpoint of an objective inventory. Only in step three do these first two converge to help support decisions about which areas of the site should be protected – moving from objective facts to necessarily subjective decisions about the value of different resources and the developer's right to realize the development potential of the property.

Suggested Site Analysis Sources and Products

Data sources: At the pre-application stage, base maps can be constructed from existing materials. The best sources for site-level information are town planning or engineering departments, especially if there has been recent subdivision or road work on adjacent properties. RIGIS has good coverage for many types of data, some of which requires specialized software, but other parts available in standard "jpg" format, which can be viewed with an internet browser or word processor. If there is no recent boundary survey, or work is still in progress, local assessors maps

Landform is basic: the shape of the land determines a host of other factors; drainage and suitability for construction, flora and fauna, cultural patterns, and visual character.

are usually reasonably accurate. Topography can be based on USGS quadrangle maps or local photogrammetric surveys. Natural factors such as soils, wetlands, floodplains, and aquifers are available from RIGIS if no more detailed information exists in town. Many cultural factors such as field patterns, existing structures on and around the site, stone walls, etc., can be traced from aerial photography. RIGIS has photo coverage for the whole state at 1:5000 scale, in a series of tiles that have been rectified to fit all their other data layers. These layers include other cultural information including scenic areas, historic sites, and archaeological sites. This existing data is sufficiently accurate for pre-application review, at which time discussions with the Planning Board or other reviewing body will determine what further data collection and analysis will be necessary for the Master Plan submission. Typically, the Master Plan stage includes at least a preliminary field survey of soil conditions, wetlands, and boundary lines, all of which are critical factors in plan preparation. In any case, plans submitted for Master Plan review will be more detailed and accurate versions of those presented at pre-application.

A typical list of site analysis plans might include the following maps of natural and cultural factors:

1. Landform, including topographic contours at no more than 10 feet or 3 meter intervals; slopes, often grouped according to construction suitability, e.g., 0-3%, 3-8%, 8-15%, 15-25%, over 25%, and unusual geological features such as glacial eskers, kettle hole, or rock outcrops.
2. Water Resources and Hydrology, including drainage on and off the site and any existing drainage structures, pipes and culverts; watershed boundaries, wells, groundwater recharge areas and wellhead protection areas.
3. Soils, clearly showing suitability for development, onsite wastewater treatment, and stormwater management showing areas of high runoff, infiltration, and water table depth.
4. Floodplains and wetlands, with required regulatory buffers; vernal pools.
5. Wildlife habitat and natural heritage sites; vegetation, including single large trees and unfragmented forest.
6. Cultural features, including existing structures or their remains, roads, trails, stone walls, or other social or historical elements.
7. Visual character, views and scenic resources.
8. Utilities, including electricity, gas, telephone, cable, etc; sewer and water service, if available. Width and surfacing of adjacent roads, and likely access points.

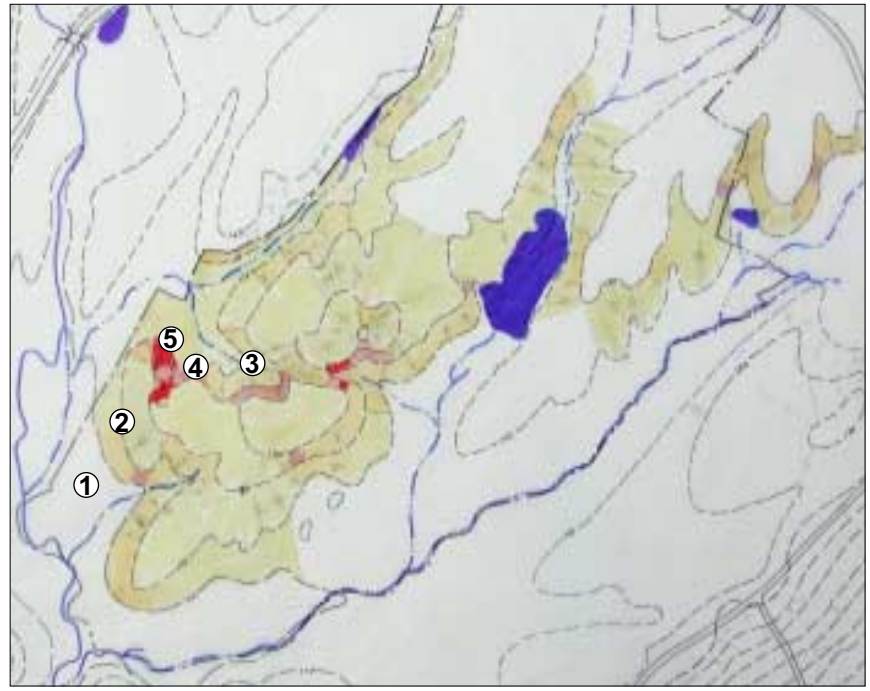
Many of these maps can be completed in a general way at the pre-application stage in order to help reviewers identify areas likely to need further study. This saves time and expense, not only by allowing the applicant to prepare what may be required in the way of field surveys early in the process, but by helping to prevent surprises that might derail promising design ideas.

Kenyon Farm Case Study:

To illustrate site analysis and subsequent steps, the Kenyon Farm in South Kingstown has been prepared as a case study in the Conservation Development Process. While the farm has been protected from development by its owners and the State of Rhode Island, it is a good example of a site with many different kinds of resources, including active farmland, sensitive wetlands and wildlife habitat, and historic cultural features. This and susequent steps show the level of information that is available from the state, and how the ten-step process can help organize that information in a way that allows good decisions about the form and location of development for any property.

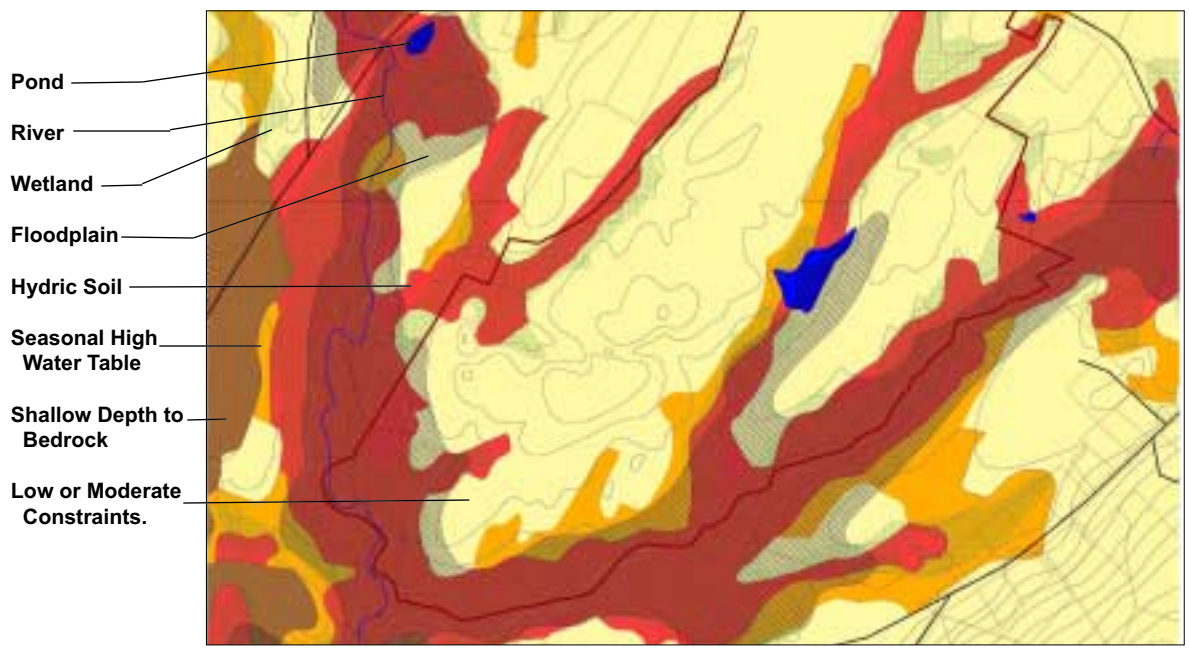
A simple base plan (right) was drawn on tracing paper using a printout of an aerial photograph from the Rhode Island Geographic Information System (RIGIS). The plan was colored within the borders of the property to show various features, including the existing farmstead and dairy barns (1), corn fields (2), pastures (3), and mixed hardwood forest (4). The site, which totals about 175 acres, is bounded to the north by a state highway, Rt. 138 (5), and to the south by the Usquepaug River (6).

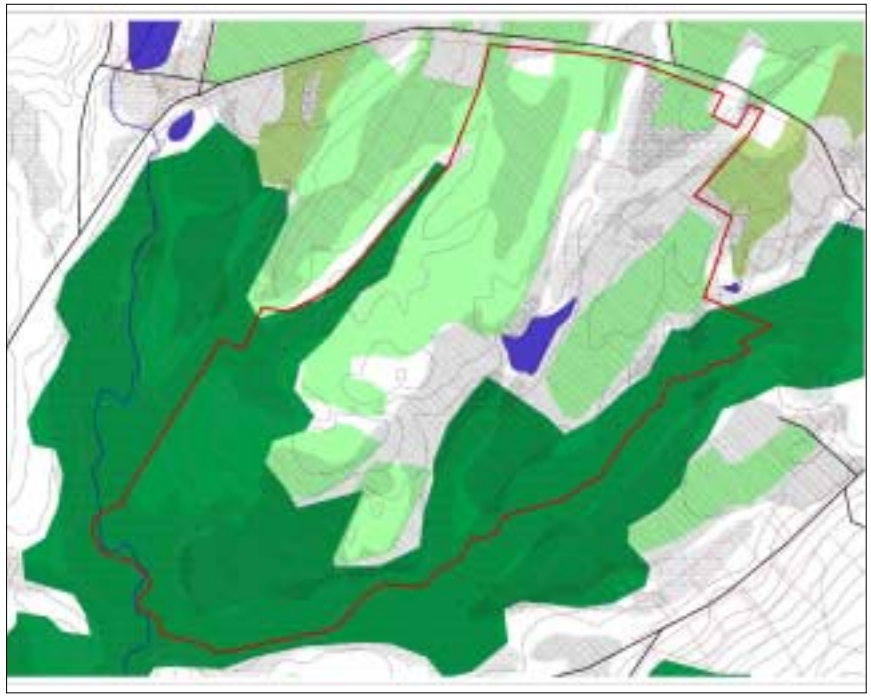
As suggested in the photograph at right, the site is a diverse mix of farmland and forest, the farmland itself part of a larger neighborhood of farms that is very important to the visual character of South Kingstown. The tall silo (far right) is a landmark for travellers on Rt 138. The existing site and two possible alternatives for the future are illustrated on pages 12-14.



In the absence of more detailed site surveys, the 10 foot contours from the USGS map can be used to gain a basic understanding of topography. These can be traced on the computer and overlaid with photographs (above). A slope map (above, right) uses the contour lines to generate slopes, grouped according to suitability for construction. 0-3% slopes, in white(1), and 3-8% slopes (2,light tan) are generally easy to build on. 8-15% slopes (3,dark tan) and 15-25% slopes (4,light red) represent higher costs for house construction and can limit road locations. Slopes over 25% (5, red) are generally unbuildable.

Additional constraints on development are mapped (right) to show the areas of the site may be unbuildable or difficult to develop. These include water bodies, streams, wetlands and floodplains, and soils constrained by wetness or bedrock outcroppings.





Separate overlays of natural, cultural, and recreational resources are mapped to gain an understanding of the most valuable open space areas on the site. Some, such as wetlands, may have some measure of protection, but all are potential amenities that could add value to the new community. Natural resources (above) include wetlands (cross hatching), continuous forest cover (dark green) and active agricultural land (light green). Cultural resources (above right) include historic structures and stone walls (yellow), state-listed historic districts (orange tone), state significant scenic areas (blue hatching) and special trees or tree groves (dark green). Recreational resources (bottom right) include statewide greenway corridors (light green), and regional hiking (green dashed line) and biking routes (orange line). An adjacent golf course (dark green) is also a potential recreational asset.

Introduction

Every site has a context: a specific set of adjacent land cover, land uses, and activities that surround it and influence its character as much or more than what is going on in the site itself. While the first step focuses on the area within the boundaries of the site, this step focuses on the area surrounding the site in the larger context of the town and region. The following describes in detail some of the contextual factors and issues developers and reviewers need to be aware of, and how context can influence design decisions on a particular parcel. The last section describes specific products and information sources for documenting and evaluating the context of the site.

As larger potential development parcels become more scarce, conflicts with natural resources, water supplies, and wildlife habitat become more frequent. In this view the pond and river valley is part of an important open space corridor for the town; adjacent forested lands protect these resources, filtering runoff from farmland and providing wildlife habitat.

A. Environmental Context

The environmental context includes the ecological systems upon which all life depends. Since rivers and streams and the animals and plants they support recognize no political boundaries, the environmental context is often contiguous with features on the site itself. In most towns, forests, wetlands, waterbodies and the networks of rivers and streams that connect them, form the most critical environmental resources. Not only do they provide food and shelter to many species of plants and animals, but they serve a critical function in slowing and absorbing flood flows and filtering runoff as it enters subsurface water supplies. While water bodies and wetlands are protected by state and federal laws, they are still affected by nearby construction that changes the amount of runoff, adds sediment and pollutants, or disturbs the upland habitats of plants and animals that depend on wetlands for food.

Since surface drainage links every development parcel to a larger watershed, no site is truly isolated; potential on-site wells will be affected by potential pollutants entering groundwater from the surrounding neighborhood, while the development will be scrutinized for its potential impact on nearby public water supplies. Watersheds of public reservoirs are watched carefully, for instance, as are areas directly abutting public wells, known as wellhead protection areas. Likewise the subsurface aquifers from which public and private wells draw serve as the sole source of water for much of Rhode Island, and are sometimes protected by local regulations. Aquifers are subsurface deposits of sand or gravel that are saturated with water in the pore spaces between soil particles; the water seeps into the aquifer from the surface, carrying with it any pollutants that are not filtered out by soils or vegetation. Areas whose runoff feeds the aquifer are known as aquifer recharge areas, and can include a surprisingly large area of a typical town.

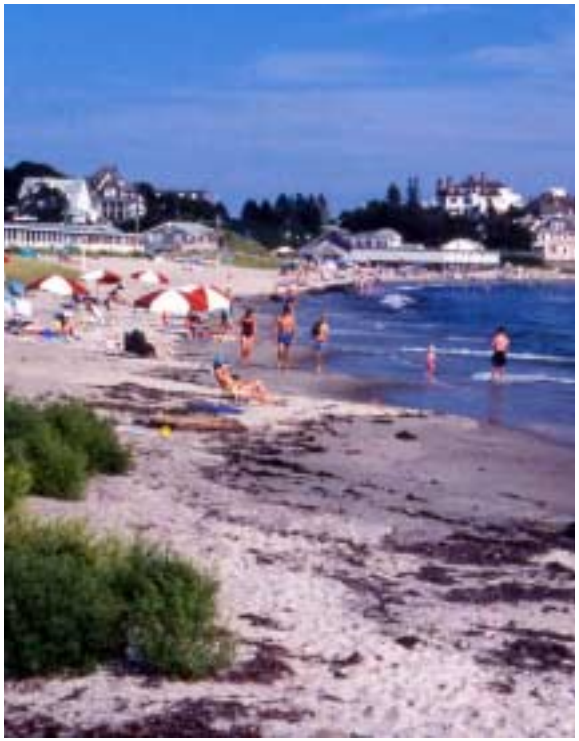
While the riparian corridors, wetlands, waterbodies, streams and river networks contain the most productive ecosystems, upland meadows and woodlands also contain important environmental resources. Many species of plants and animals have adapted to farmland, and often coexist quite well with agricultural activities. Hedgerows and copses of trees offer important cover and breeding habitat to many kinds of birds, while open grasslands are valuable to specific species

like bobolinks. Many farmers time their hay cutting, for example, to avoid destruction of grass-breeding bird nests before the young have left. Developers who work to preserve open space within their projects can use these same management practices to protect wildlife.

Forested lands play a critical role in protecting water supplies, providing food and shelter to wildlife, and buffering wetland and stream systems from pollution and disturbance. These wooded areas offer a special challenge for environmental protection, because their value to wildlife is often a function of how big they are; a few houses and driveways in an area of woods can totally alter the kind of animals that will live there, even though the landscape has not changed very much. While many species thrive in "edge" communities, where forest meets field (or house site), others can only live and reproduce in large areas of unbroken forest. Even if there is enough room for a couple of breeding animals, moreover, if there is not an adjacent population with which to interact, the population will not be viable. The fragmentation created by development can thus eliminate much of the diversity found in the forest, even if most of the trees are saved. Large areas of forest can be identified in orthophotos available from RIGIS, and have been mapped as part of the South County Greenspace Project.

B. Economic Context

Another kind of context that is frequently overlooked in the planning of new subdivisions is the economic context, meaning the way the existing site fits into the ongoing economic life of the town. For some uses, such as forest management or agriculture, this relationship is clear; for others, like tourism, it can be somewhat oblique. Changes proposed for a given site may take away the economic value of properties surrounding it, or add to it — but either way the development will be more successful if these aspects are investigated as part of the planning and design process. In the final analysis, there is usually a conflict between the "highest and best use" of an individual site — meaning the most intensive development allowed — and the value of the properties around it. Typically, development of a conventional subdivision creates visual impacts that will lower the value of surrounding properties. Yet, it doesn't have to be that way. There is a long tradition in the region of the "common wealth" — the notion that while individuals own their own property, they each have a responsibility to the others to sustain the health and vigor of the entire area, whether it be a neighborhood, a town, or an entire state. This idea is starting to come back into planning circles, especially as people observe the economic decline of areas that have been overdeveloped — where traffic, pollution and suburban sprawl so erode the quality of life that people no longer want to be there. In practice, this means recognizing that development of any site affects all the others for good or bad.



The Ocean State's harbors and beaches generate a tourist economy worth hundreds of millions annually; though this is a service based economy, it relies on healthy ecosystems and intact cultural landscapes for its long-term success.

Impacts of residential development are especially noticeable where there is a strong break with ongoing land uses on the site or neighboring properties. Some of these other uses include:

1. Agriculture and Forestry

Agriculture and forestry are important to the local economy of rural communities. These traditional rural land uses also maintain the visual character of the area, which in turn supports the housing and tourist industries. Agriculture and forestry also add a healthy diversity to the economic base, providing jobs and supplying locally grown food and materials. Perhaps most importantly, farming and forestry keep land out of residential use, which almost always requires more in services per household than is collected in taxes. It should also be remembered that in the future, having local farms may be much more important than today, when low shipping costs and government subsidies make it cheaper to import produce from California than to grow it locally. Farmlands and forests represent strategic resources that deserve to be protected for future generations.

2. Tourism

Tourist-related activities are an important economic generator in rural areas. Should that rural character be lost there will clearly be less of a reason for people to visit. The rural landscape helps to broaden recreational opportuni-

ties for visitors and residents alike, and spreads the season out by providing activities (such as local grist mills and pumpkin farms) that interest visitors when the warm weather comes to an end.

3. Drinking Water Supply:

Rhode Islanders are blessed with high quality drinking water. We use over 43 billion gallons each year from public water supplies. Over 765,000 Rhode Islanders get their water from reservoirs, while the rest use wells to pump groundwater. Open spaces play a vital role in protecting and cleansing our water supplies, providing what amounts to free water treatment service. In those cases where water quality has been impaired, it is usually the result of increased urbanization and development in our watersheds. As towns plan for growth, and seek perhaps to encourage growth of non-residential uses to support their tax base, ample water supplies will become a critical economic asset. In areas of Southeastern Massachusetts, Aquidneck Island, and Jamestown, for example, water supply is already limiting potential growth, and water restrictions are becoming more frequent in other Rhode Island towns.

Recent polls of town officials in South County identified water supply as the number one concern in most towns.

The design of Wickford Point in North Kingstown alternates village streetscapes (top left) with larger homes on large lots (bottom left). The neighborhood is tied together with brick sidewalks and paths through protected open space (right), which converge on shared parks and boat landings. Even though individual house lots are smaller than in a conventional plan, these shared amenities make for a sense of community and a high quality of life that is reflected in sale prices.

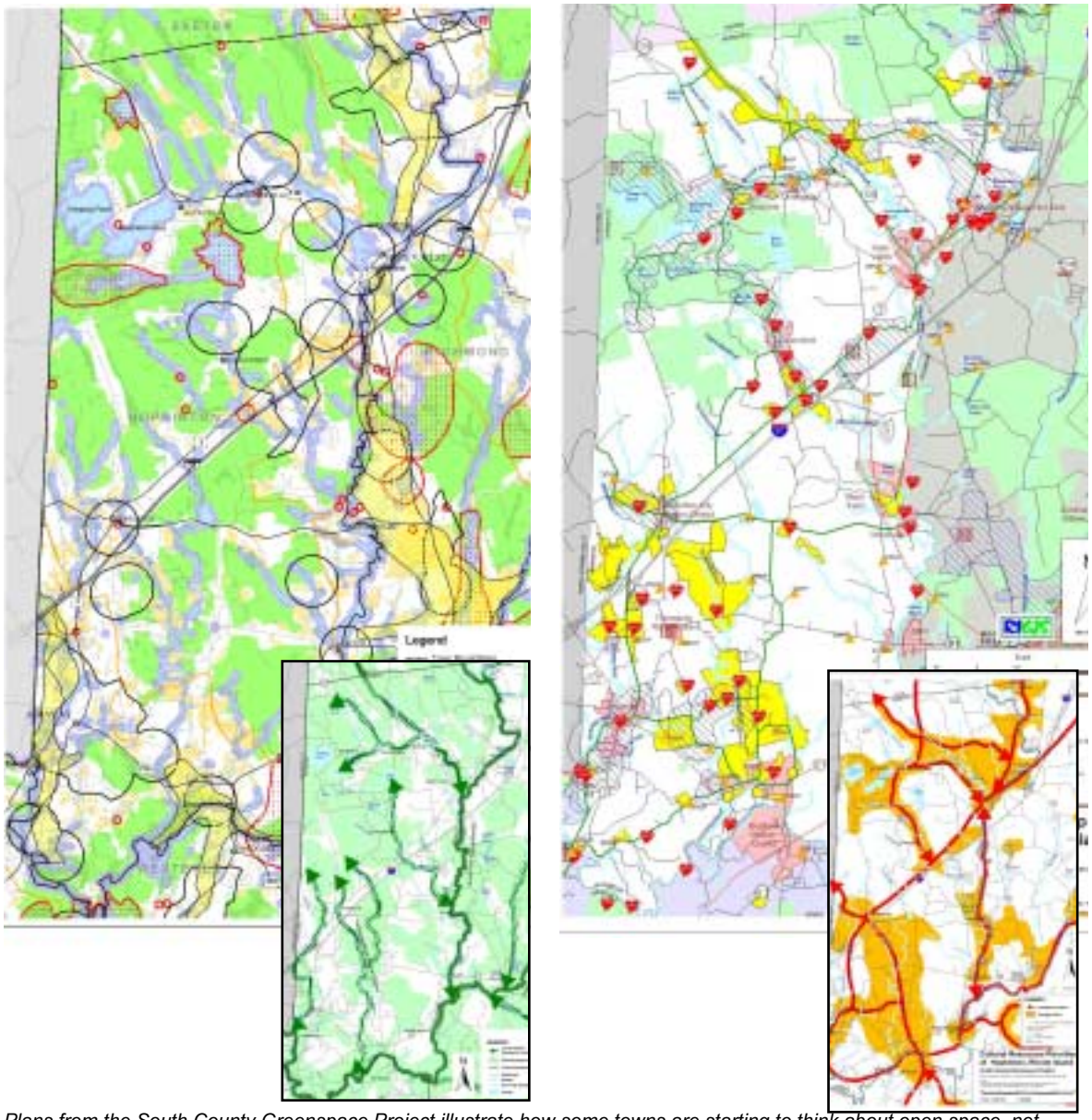
C. Community Context

Developers typically build the development that meets the minimum requirements of local zoning and subdivision regulations. Increasingly, however, builders are seeing the value of going beyond the minimum requirements to add public amenities that support the civic life of the community and enhance the quality of life for future residents. Typically, suburban areas are so devoid of this kind of civic amenity that new developments that provide them become the focus of the neighborhood - including surrounding subdivisions - and thereby command higher values. This doesn't require a major investment, either; sometimes a small park or town green, a playground or ball field, can become the focus of the entire community. Other developers will provide community halls, recreation centers, or set aside lots for civic buildings such as libraries, schools, government buildings, or churches. In any case, the first step is to determine the potential of the development site in connecting to and enhancing the life of the surrounding community — especially that part of the neighborhood that is within walking distance, about 1/4 of a mile. For sites near existing town and village centers this may mean simply providing pedestrian connections; for more remote sites there is an opportunity to create a real community where none existed previously.

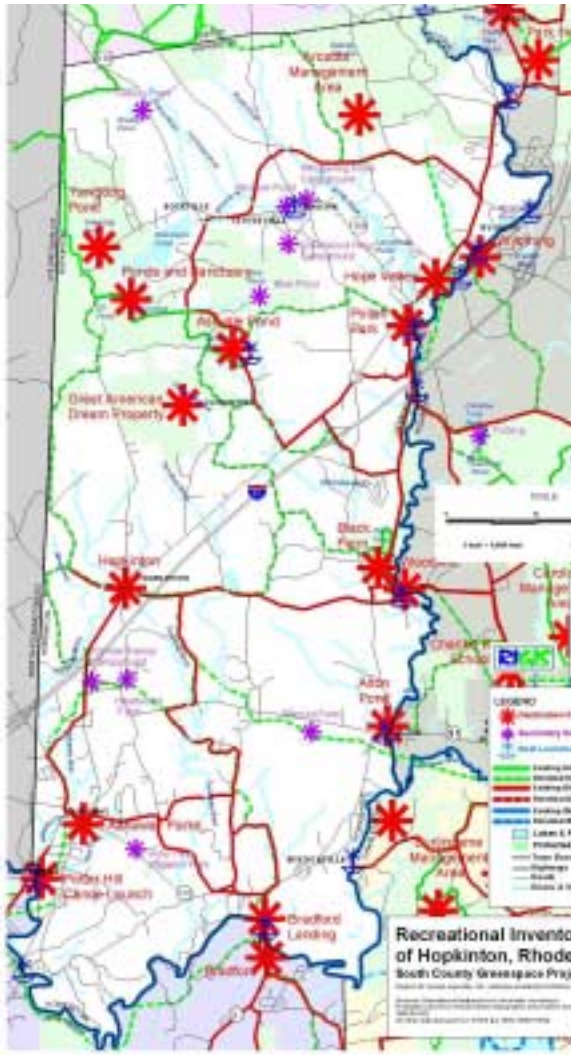
D. Greenways & Greenspace Systems

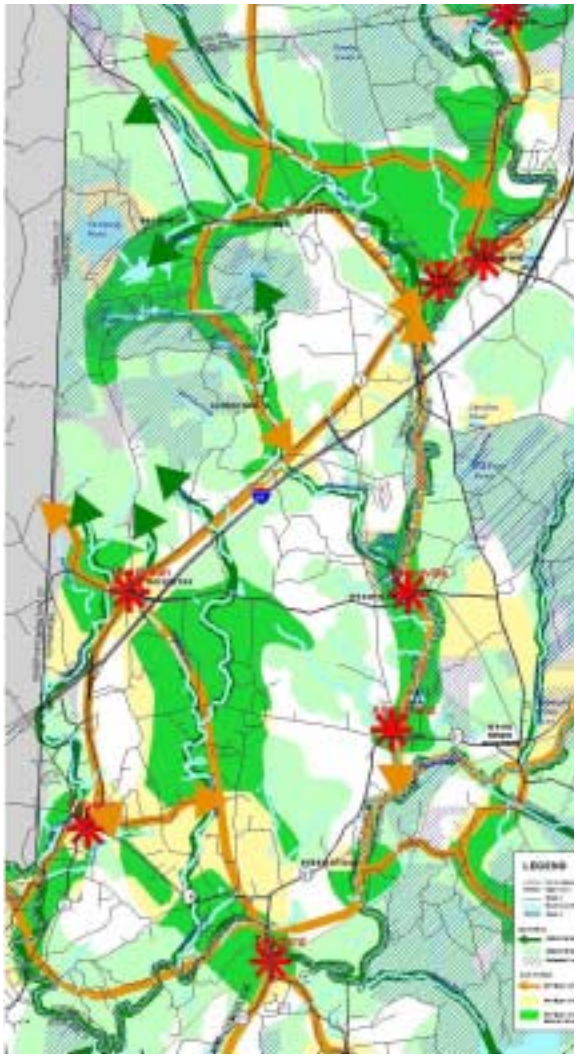
Greenways and greenspaces - areas and continuous corridors of protected open space - protect critical natural and cultural resources while at the same time creating a potential recreation network connecting all parts of the town. The foundation of this greenway network is provided by regulations protecting wetlands and water bodies, and significant areas that have been permanently protected as wildlife refuges. In many towns, ongoing efforts are being made to make this network usable for recreation by building trails on public land and seeking necessary easements to extend them across private property. In this context, carefully planned residential development provides the opportunity to link every new home to a permanently protected, townwide open space network. Information about existing and proposed greenway networks can be obtained from the Rhode Island Greenways Council. Projects to map natural, cultural, and recreational greenspaces in South County and the Woonasquatucket Watershed have been developed. Individual towns are also starting to use this "green network" approach in their open space and comprehensive plans.

Recreation is the glue that ties these networks together. Most towns in Rhode Island are blessed with a wealth of recreational opportunities: hunting and fishing on state management land; informal hiking trails on private land; biking on quiet country roads; and horseback riding, boating and beaching, etc. It would be difficult to find a site that is not within walking distance of one or more of these recreational resources – yet they are often ignored in the design of new subdivisions. Development of each individual site should be planned in relationship to nearby parks, playgrounds, and sport facilities, and every effort should be made to link up with townwide networks of bike trails and walking paths.



Plans from the South County Greenspace Project illustrate how some towns are starting to think about open space, not as isolated parcels of land, but as connected systems of natural, cultural, and recreational resources. For the town of Hopkinton, an inventory of natural resources (left) identifies areas with high value for ecological functions and water supply. A simplified diagram (inset), shows areas and corridors with greatest natural resource value. A similar cultural resource inventory (right) and priorities map (inset, right) illustrates townwide patterns of historic sites, traditional working landscapes, scenic areas, and special places.





Hopkinton's Greenspace project also produced an inventory of recreational resources (left) that identified existing and potential hiking trails, bike routes, and water trails, along with key destination points like parks, schools, and village centers. Bringing the maps together in different ways can identify areas with multiple resource values (right), such as where natural and cultural resources overlap, shown in deep green. These areas, not surprisingly, contain the diverse scenery and combination of wildness and human history that makes rural Rhode Island so interesting and beautiful.

Using the Greenspace maps, developers can design their projects to simultaneously support town goals while adding to the quality of life for future residents. By preserving a key stream corridor, viewshed, or trail connection that crosses the property, for example, a project can meet the town's needs while adding to the value of each house lot. The Greenspace maps thus become another way of looking at the landscape, helping everyone understand how a proposed building site(above right) fits into a larger pattern of land use (below).

E. Town Character Context

The unique visual character and sense of place of small-town Rhode Island are generated by the complex relationships between the varied landscapes of the town and the various human activities that occur within them. Every site expresses to some extent the character of its surroundings, and whether open, wooded, or part of an existing village, a site is part of a larger pattern in the landscape. It is up to the developer to propose how the site fits into that pattern, and how changes to the site will affect that existing character.

Theorists have often talked about rural character in terms of the "cultural landscape." This refers to the kind of areas that have never been "designed," but which look the way they do because of the how the land was used. The thing about cultural landscapes is that the patterns that exist are all expressions of functional relationships — few things are purely ornamental, but rather everything that one sees is there for a purpose. A historic farmstead, for example, is typically located close to the road for the sake of efficiency. Barns and outbuildings are located to block winter winds and create a sheltered, sunny farmyard that is comfortable for more months of the year. Shade trees and porches serve to provide for shelter from sun and rain during the summer. Dwellings are tall and narrow to provide for efficient heating, cooling and natural light to the interior, etc. The charming character that we find so attractive is thus merely the expression of a series of practical approaches to site planning and architecture, each with functional purposes.

Working harbors, mill villages, and agricultural landscapes all have a recognizable character that reflects the requirements of particular activities rather than design principles.

Developments that are designed with an understanding of the forces that produced the cultural landscape that surrounds them tend to follow the same common sense approach, and in that way harmonize visually with the things that came before. By contrast, if you ignore the patterns present in the cultural landscape, no amount of investment in architectural frills will make a new development feel like it belongs.

Developers can respond to the historic patterns and rural character surrounding their site in several ways:

1. Preserving Special Features, Views and Scenic Vistas

The easiest way to preserve town character is not to destroy it in the first place. This might mean preserving a meadow or stand of trees along the roadside or keeping development off a ridgeline or hilltop. Conservation Development offers the flexibility to protect these kinds of features while still developing a site. Sometimes it's as simple as preserving existing trees, and using dark colors on walls and roofs to help houses blend in.

While Conservation Development may not be able to preserve public vistas like this one entirely, in most cases the essence of such views can be protected by tucking new homes around the edges and leaving visual access from the public way.

2. Using Traditional Site Planning and Architecture

Along with protecting key features, the character of what is built can be designed to express the character of its context. This usually means developing subdivisions that follow traditional patterns -- with buildings either relatively close together, as in a traditional village or hamlet, or tucked into the landscape in accordance with the traditional farmstead or estate. The architecture itself need not be a slavish copy of an historical model, but rather a reinterpretation that maintains similar massing, proportions, and materials. Investigating the ways that nearby homes and communities were laid out can often provide a rich source of design ideas — particularly if the designer looks beyond the surface and attempts to figure out the underlying visual and functional relationships between various elements.

3. Maintaining traditional activities

All too often residential developments that are modeled on historic examples end up being rather sterile and lifeless (especially if all the residents are driving elsewhere to work, shop, and play). As important as appearance of a development is to fitting into the character of a neighborhood, it is just as important to maintain traditional activities. Open space within developments should be laid out to allow continued farming and forestry activities, and new residents should be made aware of the potential sights and smells that can arrive as by-products of the rural character they were looking for. The potential for conflicts in developing rural towns helped engender a statewide right-to-farm act that protects existing farm activities and farmer's rights.

Over centuries of use, agriculture has left a rich imprint on the Rhode Island landscape. The best way to maintain that imprint is with active farming activity. As towns continue to grow, new residents need to learn that views of fields and pastures come at the price of a certain amount of dust, noise, and smells.

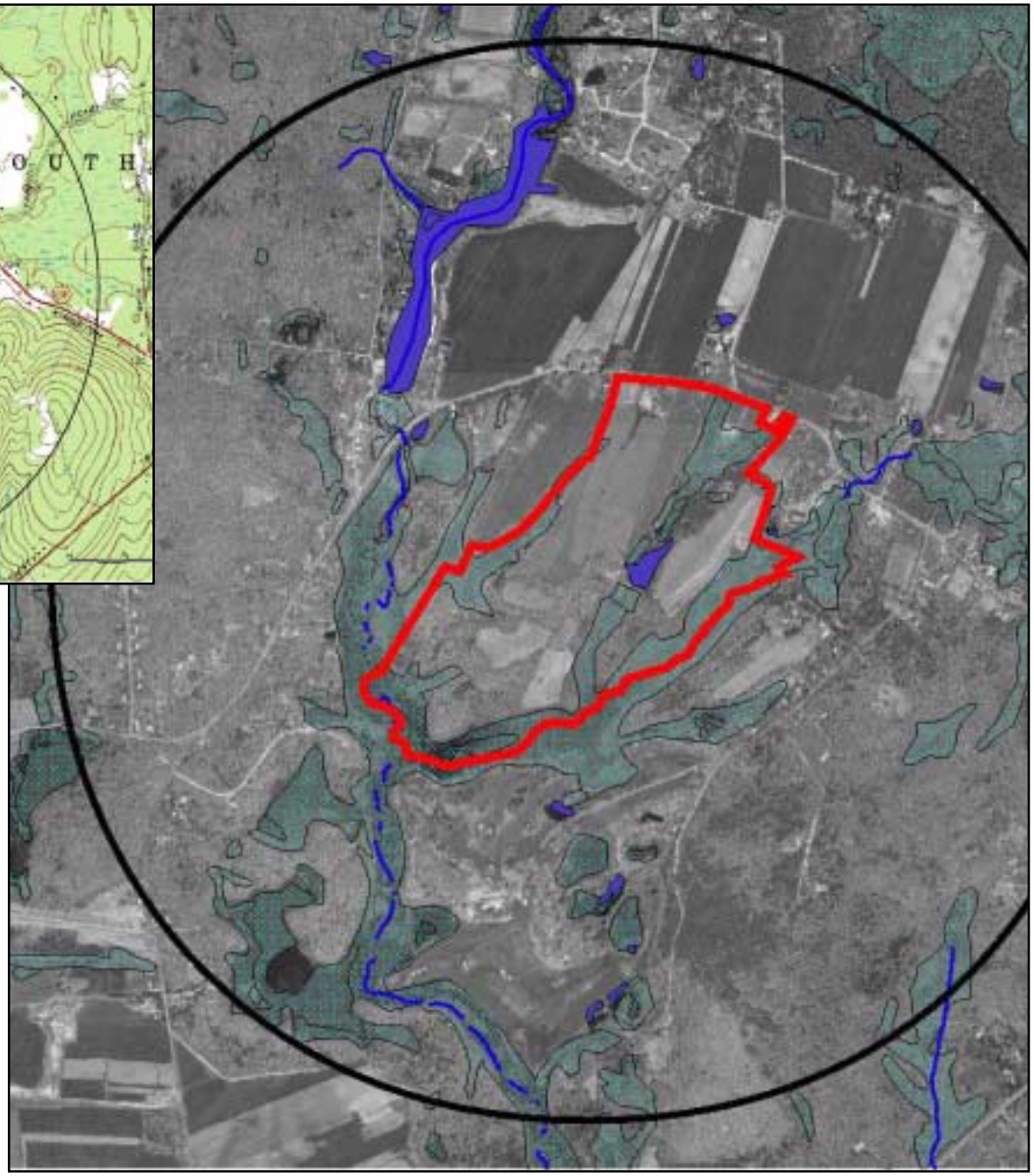
Local farmstands bring the varied produce of the seasons towns across the state, and serve a vital role in maintaining the viability of small farms, which otherwise struggle to compete with the agribusinesses that provide most of our food.

Suggested Contextual Analysis Sources and Products

One of the best sources for contextual information is the town's comprehensive plan, which usually contains an extensive discussion about natural and cultural patterns, local history, economic concerns, and upcoming plans for development of town facilities and services. Comprehensive plans often identify critical needs that could be reflected in proposed uses on the project site, which might include affordable or age-restricted housing, market rate housing for a particular market segment, or other uses such as neighborhood playgrounds or ball fields.

Plans for existing or proposed neighborhood or town-wide open space networks are sometimes included as an element of the Comprehensive Plan, and sometimes the subject of a separate Open Space Plan. The Planning Board, Conservation Commission and Recreation Commission can be consulted for information about important resources, trail connections, or special features, as can local land trusts. In some cases towns have prepared special area plans for key village centers or road corridors that include development and conservation recommendations for multiple parcels within a district.

For the purpose of site planning and development submissions, contextual maps can start with locating the site on the USGS quadrangle maps. Aerial photographs showing the site in its context are very useful in showing patterns of development in the neighborhood. Depending on the size of the site, a plan at a scale of 1" = 200' of the immediate neighborhood, plus a plan at 1" = 500' showing a one or two mile radius are very helpful. Both the USGS and aerial photographs make excellent base maps to show other elements that may be of interest, including stream corridors and large blocks of forest land important to wildlife; historic resources such as nearby village centers and historic sites; and features important to town character, such as scenic rural road corridors, agricultural landscapes and other beautiful areas.



Kenyon Farm Case Study:

Contextual analysis is one of the easiest things to do with Rhode Island GIS information. Standard USGS quadrangles (above) and 1997 black & white aerial photography is available electronically over the Internet for the entire state (www.edc.uri.edu/rigis). Adding the boundary of the property in red, and a circle with a radius of one mile, helps to show relative distances from the property to surrounding landmarks. All the other data layers in the Rhode Island GIS system can be overlaid with this base, starting with streams, ponds and wetlands (right).

Introduction

This is the first step in making design decisions; going from an understanding of the site and its context to conclusions about what areas are most important to preserve, and how these connect to each other and related features outside of the parcel. It needs to happen first, because it is where the interests of the applicant and the town overlap, and thus holds potential for greatest conflict as well as greatest mutual benefit. It is at this step where the town should determine the minimum amount of the site which must be preserved to protect shared resources. By doing so early in the process, it allows the town to work cooperatively with the applicant, rather than receiving a plan submission and only afterwards finding out that resources on the site are part of larger systems important to the town.

Designing the development to fit around the best conservation land on a site can add value to houselots at no extra cost to the developer. In the Case Farm subdivision in South Kingstown (above), the houses were place in the rear of the property to protect the open meadow along the roadside. The shared driveway follows a stone wall along one side of the property, and other walls were preserved to help demarcate individual house lots (inset).

This process has value to the developer, as well, saving time and money that might otherwise be spent going down dead ends. And, it can have significant financial benefits, including savings in construction costs, and higher sale prices. While this won't convince some developers, many others have found that preservation of trees, views, and historic landscapes enhances the beauty and livability of the development, and gives it a sense of place and identity that has measurable value at point of sale. The same features are important to everyone in the town: trail connections, vistas of forests and farmland, wildlife habitat, are all part of larger landscape systems that are easily fragmented by poorly-coordinated development.

Identification of sensitive resource areas at the beginning of the design process saves time and conflict for parties on both sides of the table during later town review of proposals.

During site analysis, the designer gathers information and develops an objective inventory of natural and cultural factors. In order to identify potential conservation areas, we must start placing these resource areas into categories that assess their capability for the proposed use. In site planning, this process is sometimes called "site assessment," and includes listing development "opportunities" and "constraints." For the purpose of Conservation Development, we focus this assessment process on identifying two types of possible conservation land. Some areas are so constrained by physical and/or regulatory conditions that construction is virtually impossible – these are labeled "Areas with Constraints to Development" (see box, Step 3A). Other parts of the site are not so *constrained* as to prevent construction, but contain natural, cultural, or recreational resources which would be lost or degraded by development (see box, Step 3B) These "Potential Conservation Areas," can be built on, but not without disturbing a variety of natural, cultural, and recreational resources. They therefore offer an *opportunity* to preserve existing resources on the site to immediately enhance the value of the house lots and provide an ongoing amenity for future residents.

Step 3A. Identify Areas with Constraints to Development

1. Non Buildable Sites

- Wetlands, waterbodies and vernal pools.
- Regulated setbacks from wetlands.
- Hydric soils (less than 2' depth to seasonal high water table).
- Ledge/outcrops.
- Slopes greater than 25%.

2. Partial Physical Constraints to Development

- Slopes between 15-25%.
- Floodplains.
- Poor Soils (less than 3.5' depth to seasonal high water table).

Water bodies, steep slopes and ledge outcroppings are protected by the laws of construction and practical economics as well as varying degrees of regulation.

Step 3B. Identify Important Natural, Cultural, and Recreational Resource Areas

1. Natural Resources

- Watersheds of drinking water supplies and other critical resources.
- Wellhead protection areas and groundwater aquifers.
- Stormwater management areas – well-drained with deep water table, suitable for stormwater infiltration.
- Biodiversity resources.
- Natural heritage sites.
- Large unfragmented forest tracts.
- Naturally vegetated riparian buffers.
- Prime farmland and productive forest soils.
- Land in active agricultural use.
- Special trees or shrub thickets.

2. Cultural Resources

- Historic sites and districts.
- Archaeological sites.
- Scenic areas, views/vistas, and scenic roads.
- Working landscapes.
- Special places.
- Stone walls, cellar holes, and other artifacts.

3. Recreational Resources

- Existing and potential hiking, biking, and bridle trails within the site.
- Existing or potential trails linking to town trail network.
- Boat launches and water trails.
- Existing or potential sport fields.
- Hunting and fishing areas.

Informal neighborhood trails are often lost to new subdivisions; potential conflicts and liability issues can be overcome with careful planning, preserving an amenity for residents.

Each town will develop a method for integrating this step into the development review process, as well as for determining the level of detail necessary on the maps and other information (see the checklists in Part 5 of this manual for guidance). This is an ideal time for a site visit with representatives of the town to review the site analysis maps developed in steps one and two, both to field-check the accuracy of the information and to see where more detailed surveys may be needed.

While much of the initial analysis of the site and its context will have been developed from existing RIGIS data and the local Comprehensive Plan, at some point additional surveys will be needed, particularly in the area of wetlands, vernal pools, rare species habitat, and cultural or archaeological resources. One objective now is to identify and agree on those areas of the site that will most likely be designated as conservation land; expensive field surveys can then focus only on areas where development is likely to occur.

One tool that can help is GPS (Global Positioning System) technology, which uses satellite signals to locate the position of a ground receiver.

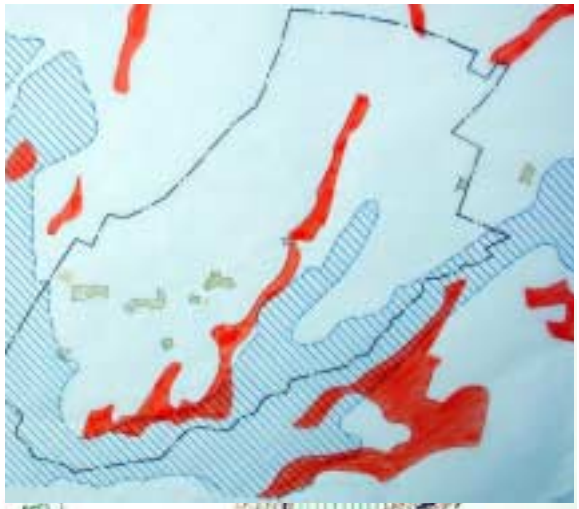
Step 3. Designate Potential Conservation Areas

Using a relatively inexpensive receiver hooked up to a laptop computer, many towns and private consultants are using GPS to quickly locate important resources early in the planning process. Cellar holes, stone walls, special trees and other features can thus be accurately located without sending an expensive team into the field with traditional surveying instruments.

Especially on sensitive environmental or historic sites, there will often be some disagreement over the accuracy or completeness of information. Towns can help in the process in several ways: by hiring consultants, at the developer's expense, to provide an objective survey of resources on the site; by sponsoring neighborhood meetings so that local residents can comment on conservation priorities and point out gaps in data; and by connecting developers with different boards and commissions that might have relevant information.

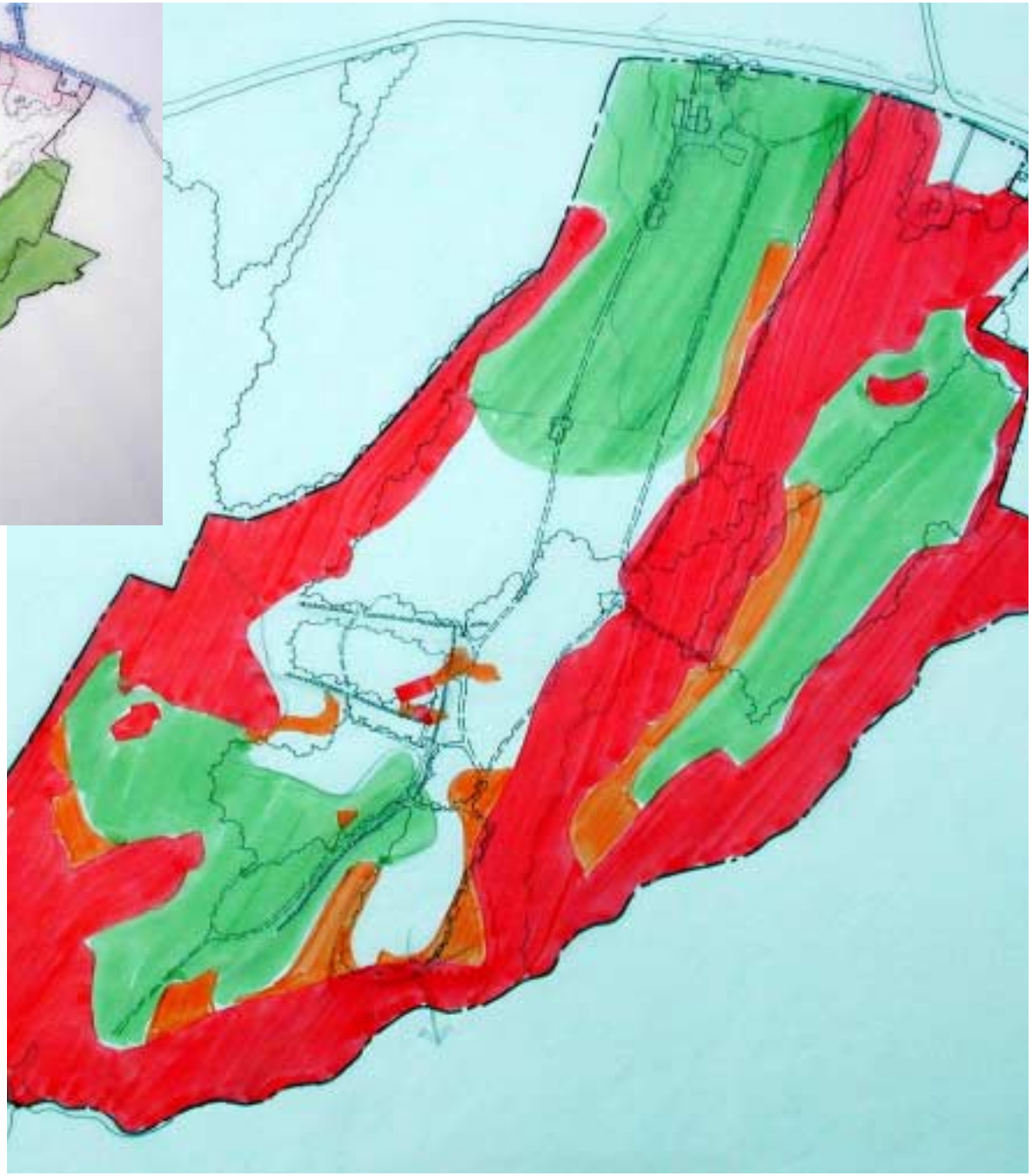
Once the applicant has a preliminary map of potential conservation areas - ideally at the Master Plan stage - the Planning Board and/or staff should review the plan at a more formal site visit to affirm the applicant's conclusions.

Kenyon Farm Case Study:
Designating the potential conservation areas begins with a series of tracing paper overlays on which information from the site analysis is redrawn based on levels of constraint and resource value. First, non-buildable areas are mapped out (below), including wetlands and waterbodies (green hatching), hydric soils (red hatching), regulated wetland setbacks (green dashed line), and slopes over 25% (red areas). Then the partially-constrained areas are drawn on a separate overlay (right), including slopes between 15-25% (tan areas), floodplains (blue hatching) and soils with seasonal high water table (orange).



Shown above is a composite plan of the important resources on the site which are not protected either by law or practical constraints on construction. The green areas represent natural resources, including prime farmland in active use and large forest blocks. The red cross hatching represents cultural resources, including old stone walls, areas of statewide scenic importance, and the historic dairy farm. The blue arrows represent the principal recreational opportunities, including regional biking and hiking routes that parallel Rt. 138, and potential trail connections to the golf course to the south and continuing along the Usquepaug River.

The plan at right shows these important resources in green, overlaid with unbuildable areas in red and partially-constrained areas in orange. Together these form the potential conservation lands, while the white area in the center of the site, conversely, represents the best area for development.



Introduction

Unless specifically allowed by the local zoning ordinance, Rhode Island law allows no increase in the number of lots for Conservation Development over that which would be permitted under conventional development. (Rhode Island Zoning Enabling Act of 1991, Section 45-24-31.13). A key step in the process, therefore, is to determine the maximum number of units that can be built under a conventional scheme. Making a fair and accurate determination of this maximum number of units is fundamental to a successful conservation development process. If too many units are allowed than can be accommodated under the site's conditions, or in the context of the surrounding area, then no amount of creative design will mitigate their negative impacts; if too few units are allowed, the landowner is denied his or her rightful value. Either way, perceptions of bias to one extreme or the other invite time-consuming debate, endless rounds of discussion based on too little data, and ultimately, lawsuits. Fear of these complications makes too many developers, as well as some Planning Boards, look to the conventional plan approach as the easiest way to plan and review development projects.

The solution is for each town to adopt a clear and defensible procedure for determining the maximum number of allowable lots, and to base this procedure in the objective site analysis and assessment process described in steps 1-3. This procedure, moreover, should be used just as strictly for review of conventional subdivision proposals as for Conservation Development.

Since the widespread adoption of cluster zoning in the 1960's and '70's towns have used varied methods for calculating the "basic maximum number" or "lot yield," but there are two principal approaches. The first uses a simple formula that divides the buildable acreage of the site by the minimum lot size. This was the most common approach through the 1980's, when presumably more towns started to see cluster proposals for sites constrained by wetlands or poor soils. As developers turn to these more marginal lands, questions naturally arise as to the accuracy of formulas in determining the true development potential of a site. This led many towns to adopt a "yield plan" approach, where a schematic site plan is drawn up that follows the zoning requirements and subdivision regulations to demonstrate where houses, roads and lot boundaries would be placed on the site. Whether using the formula method or yield plan approach, towns usually require that all or some of the land that is unbuildable due to physical or regulatory constraints be removed from consideration <u>before</u> other calculations begin. This helps to ensure that, as required by state law, the number of units that are approved under the Conservation Development does not exceed that which could be constructed under a conventional scheme. (The only exception being where such an increase in units is specifically allowed by the local zoning ordinance for some pre-determined public good.)

Local zoning sets requirements for minimum lot size, setbacks, and frontage for every parcel in a town, such as this 110 acre site (above). As a practical matter, the area of roads and unbuildable wetlands (above, right) will reduce the area available for building lots. Many towns that use a formula to calculate the maximum number of units thus subtract unbuildable areas and another 10-15% for roads. In this case, of this 110 acre parcel, about 33 acres is wetlands. The formula would thus read: (110 acres) - (33 acres wetlands) = 77 acres - (15% for roads) = 65.5 acres / 1 unit per acre = 65 units. A yield plan uses the same information, and follows the requirements of the Subdivision Regulations to locate a suitable road and the maximum number of lots that could be laid out on the site. The yield plan results in 60 building lots, due to difficult access to part of the site surrounded by wetlands.

The following describes both methods in detail, with examples from Rhode Island and elsewhere. As described in the conclusion of this section, neither method is best for all situations, even within a single town. Each community needs to adopt a method that best meets local circumstances. Perhaps the best approach is to have more than one method possible, to be selected by the town in consultation with the applicant after the first three steps are completed, when everyone has a better understanding of the site's development constraints.

The Formula Approach

Simple formulas for generating the maximum number of units were the rule, rather than the exception, in the early days of cluster development. It seems to have been assumed that simply stating that the number of units should not exceed that allowed under the conventional plan would suffice, with the burden on the applicant to show proof that this was so. In St. Louis County, Missouri for example, the maximum number of lots is computed by subtracting from the total acreage of the site 15-25% for street right-of-ways, land used for public utility easements, and floodplains. In Hopkinton, Massachusetts, the Basic Maximum Number is derived from a formula which states:

Total Number of Lots =

$$\frac{TA - .5XWA - .1XTA}{\text{District minimum lot area}}$$

TA = Total Area of the Tract
WA = Wetlands Area of the Tract

Thus half the wetlands are deducted from the gross acreage of the tract, along with an additional one tenth of the total for roadways. Other towns deduct all or portions of constrained land, including wetlands, floodplains, steep slopes, etc. Closer to home, The Town of Richmond uses a formula in which "land unsuitable for development…shall be subtracted from the total acreage of the parcel. In addition, the area of any street rights-of-way actually designed for the proposed [development] shall be subtracted from the total acreage, or 10% of the parcel being subdivided, whichever is greater." (Richmond Land Development & Subdivision Regulations, Article IV-A.3) Land unsuitable for development is defined as:

"Fresh water wetlands, except that area of perimeter wetland within fifty (50) feet of the edge of any bog, marsh, swamp or pond or any applicable 100-foot or 200-foot riverbank wetlands, as defined by Rhode Island General Laws Section 2-1-20 (1987), as amended.

Areas within a High Flood Danger Zone, as defined by Section 18.44 of the Richmond Zoning Ordinance, as amended.

Land within any publicly or privately held easement on which above-ground utilities, including but not limited to electrical transmission lines, are constructed." (Article III –C.1)




The key question in the use of a formula is whether and to what extent to remove unbuildable or constrained land from the equation before calculating the maximum number of units. Many towns eliminate wetlands and floodplains; others also subtract poor soils, steep slopes, ledge outcrops, and utility corridors from the total site area before dividing.

Similarly, Charlestown's Residential Cluster ordinance specifies the following formula for the maximum number of developable lots (Article XI, sec 218-60-E):

$$\frac{TA - CD}{LS} = DL$$

Where TA = Total area of proposed parcel to be developed.
CD = Constraints to development as defined by this ordinance.
LS = Minimum zoning district lot size.
DL = Maximum number of lots, with fractions rounded down to the next lower whole number.

Constraints to development are defined as:

"Resource areas subject to protective setback distance such as but not limited to, wetlands (freshwater or coastal) as defined by R.I. General Law, areas subject to storm flow, areas subject to flooding, hydric soils, and inter-tidal marshes.

Land located in any V zones or floodways as shown on the Flood Insurance Rate Maps or floodway maps of the Town of Charlestown…

Any area of the tract proposed to be developed equal to the area of any street and/or utility rights of way.

Any unique sites having historical, archeological values or protected species of flora or fauna as defined by state or federal agencies.

Any other lands which if developed would cause a threat to public health, or result in irreparable public harm, or loss of irreplaceable resources.

Any area of ledge and/or rock outcrops at/or within four feet of the land surface as may be identified in the Soil Survey of Rhode Island from the United States Department of Agriculture.

Any area where slopes exceed fifteen percent as

Wetlands are usually recognized as unbuildable: protected by state and federal laws and the practical economics of residential construction for all but the most expensive homes.

may be identified in the Soil Survey of Rhode Island from the United States Department of Agriculture or by topological survey" (Article I, Sec. 218-5).

Charlestown's Zoning Ordinance requires all of these constrained areas to be subtracted from the total acreage of the site before calculating the number of units. This represents a conservative, or protective approach, that could discourage developers from using the cluster provision, especially on constrained sites.

On sites without these constraints, the straightforward formula approach could be an incentive to developers, in that it allows them to proceed with planning for a cluster subdivision without having to spend time drawing up a conventional plan.

As in the Hopkinton, Mass. example, it seems fairer to landowners and developers if towns modify their formulas to account for the way in which constrained land types actually affect the number of buildable lots in a conventional plan. This recognizes that for large-lot (2 acres or more) conventional development, buildable lots often contain a significant proportion of unbuildable wetlands, steep slopes, etc. For a model ordinance created as part of Pennsylvania's "Growing Greener" program, for example, Randall Arendt, Michael Clarke and Ann Hutchinson developed a very detailed system of calculating "adjusted tract acreage" from which the number of permitted dwelling units would be derived. This method multiplies the area of each type of constrained land by a "density factor" which represents the limitations imposed by that constraint on a conventional development plan.

The areas to be deducted from the total tract area include:

- All land within the rights-of-way of existing public streets or highways, or within the rights-of-way for existing or proposed overhead rights-of-way of utility lines; and
- All land under existing private streets.
- Wetlands: multiply the acreage of designated wetlands by 0.95
- Floodway: multiply the acreage with in the floodway by 1.0
- Floodplains: multiply the non-wetland portion of the 100-year floodplain by 0.50.
- Steep Slopes: multiply the acreage of land with natural ground slopes exceeding 25 percent by 0.75.
- Extensive Rock Outcroppings: multiply the total area of rock outcrops and boulder field more than 1,000 square feet by 0.90.
- Moderately Steep Slopes: multiply the acreage of land with natural ground slopes of between 15 and 25 percent by 0.25. (Growing Greener, p.157.)

Thus the key decisions towns need to make in setting up a formula-based system for calculating density include identifying a list of constraints to development and, within that list, the percentage of each constraint type that should be subtracted from the gross area of the site. The list of non-buildable and partially-constrained lands developed in step 3A is a good starting place. Using this method, towns would develop multipliers or density factors for each type based on local experience and community priorities, starting with:

1. Non Buildable Sites: Range of 50-75%.
   - Wetlands and waterbodies.
   - Hydric soils, with water table at 0-1.5' depth.
   - Regulated setbacks from resource areas.
   - Ledge/outcrops.
   - Slopes greater than 25%.

2. Areas with Partial Physical Constraints to Development: Range of 25-50%.
   - Slopes between 15-25%.
   - Floodplains.
   - Soils with slow permeability or seasonal high water table 1.5-3.5 feet below the surface.

The Yield Plan Method

The formula approach, especially when modified with multipliers that recognize local conditions, is a simple, fair and straightforward way to calculate the maximum number of units. But no matter how carefully structured, it relies on good information about site conditions and results in a series of mathematical calculations that can subject the decisions of reviewing officials to public criticism and controversy. The Yield Plan Method is designed to avoid these arguments through the development of a schematic conventional development plan. This plan shows clearly the areas of the site subject to various development constraints and demonstrates how streets and lots meeting the requirements of local zoning and development regulations can be laid out. The idea is to draw up a quick, yet defensible conventional plan while closely following the regulations.

As in any site planning process, there are two basic factors that determine the conventional layout: physical constraints such as soils, slopes, wetlands, and road access; and regulatory constraints such as minimum lot size, frontage and setback requirements, maximum allowable grades on roads, and other standards found in town regulations. Un-buildable and partially constrained areas will have been identified in steps 1-3, based on various maps, reports, and other data sources and site investigations. Regulatory constraints are laid out by local Zoning Ordinances and Land Development & Subdivision Regulations. Zoning Ordinances spell out the base density, as lot size or units per acre, allowable land uses, and dimensional requirements for setbacks and frontage. Subdivision Regulations typically contain more detailed standards for construction of roads, sidewalks, stormwater drainage systems, and other infrastructure.

Proving the suitability of proposed development areas for construction of roads, house foundations and septic systems is critical to obtaining an accurate number of building lots, but requiring too much proof -- especially expensive on-site investigation -- may make it that much more likely that developers will proceed with a conventional subdivision. The key is to use existing data to narrow down the scope of on-site testing, then use field samples from limited number of sites for verification.

Unless a property is to be subdivided using only existing road frontage, the most critical element is the alignment and grading of new roads that provide frontage to lots within the development. Safe, durable roads require a firm substrate, good drainage, and cannot be too steep or tightly curved; in the Yield Plan, therefore, they deserve the most careful scrutiny. House lots, however, especially lots over one acre, can reasonably include a certain amount of land constrained by natural or regulatory factors, as long as there is enough room for the house, well, and septic system. Slopes between 10 and 25 percent, for example, are rarely a serious constraint to development as long as suitable access to the house is available from the road frontage; builders often take advantage of moderate grade changes to provide walk-out basements.

A key question with the Yield Plan approach is how to determine the suitability of the site for septic systems. Requiring extensive field testing forces the developer to spend time and money proving the conventional plan is buildable, which only encourages the conventional approach. But if no field testing is done, decisions must be based on soil maps with a fairly large margin of error. In a conventional plan it is never a question of how much soils testing is required to plan foundations and septic systems, only a matter of when such testing will occur, which is usually not until after a master plan is approved. Yet in the case of a Conservation Development, half the site might never be developed. Does it make sense to spend so much time and effort proving that half is in fact developable, especially when the testing itself can cause lasting damage?

Recent changes in septic system technology and regulations provide for construction in areas that may have previously been unbuildable. Mounded drain fields (above) are a low-tech way to achieve the required separation between the drain field and growndwater. Higher-tech alternative systems are also becoming more common, especially where lot values are high.

The solution is a common sense approach where testing requirements are established on the basis of the site analysis developed in steps 1-3. Based on maps of likely marginal soils, the town selects 5-10% of the building sites identified in the yield plan and tests are performed according to state and local septic system regulations. If the most difficult sites pass, it can be assumed that the rest will as well. If they don't pass, they are eliminated as buildable sites and others are selected until all the sites in a sample pass. This reduces the incentive of proposing development of marginal lots. In any case, the developer should report all water table and soil evaluations, not only those that pass, with the goal of understanding the patterns of soils and drainage on the site as fully as possible. A site-specific soil survey by a qualified soil scientist may be the most efficient way to gain a full understanding of septic capabilities, as well as more general suitability for construction of roads and buildings, and is highly recommended.

The capability of a site to support septic systems is less of a constraint on development than it used to be; improvements in wastewater treatment technology, and alternative systems now gaining approval from state regulators, mean that building septic systems on marginal sites is more of a financial constraint than an absolute physical constraint. (Though rarely will DEM permit a variance for a new septic system where the water table is less than two feet below the surface.) In general, however, where building sites and home values are high, land once considered too wet or rocky to support septic systems may now be developable.

Conclusions

Both the Formula and Yield Plan methods of calculating the maximum number of units can provide fair and accurate results, but reliable conclusions in both cases are based on the quality of the information that is available. Each town must determine ahead of time what level of comfort they are willing to achieve, for every additional hoop that landowners and developers must jump through to prove the accuracy of their calculations brings them closer to giving up on Conservation Development and going after the tried and true conventional plan. One antidote to this syndrome is to require the same level of site analysis information for conventional plans as for Conservation Development -- at least leveling the playing field.

In some towns, particular constraints can throw a curve into the process, especially when landowners were previously unaware that a parcel has a high water table, an abundance of bedrock outcroppings (ledge), wetlands, or seasonal streams. The applicant may want to do a Conservation Development, but can't understand why the town won't allow the number of units suggested by the parcel's zoning density. In such cases, review of all kinds of development is enhanced if areas with difficult site conditions are carefully documented. Local engineering departments, building inspectors, planners, and state agencies can work together to identify wetlands, floodplains, shallow bedrock and other constraints, using documented borings, soil tests and site surveys done over time for various projects. This process takes the common knowledge built up by town officials, local builders and citizens over many years and makes it available at an early stage to landowners and developers. When documented systematically, this information will also start to show patterns of development constraint across the town. The next step for communities is to reflect these constraints within their Conservation Development ordinance by specifying the percentage of a lot that can contain non-buildable land – in each case reflecting the specific character of such land in each town. Lands which are constrained because they are steep or rocky, for example, may still be usable by residents. Wetlands and floodplains, on the other hand, may be both unusable and vulnerable to disturbance and pollution if they make up too high a percentage of a lot.

Kenyon Farm Case Study:

This yield plan for the property was prepared by applying the requirements of South Kingstown's zoning ordinance and other development regulations to the site. Roads and houses have not been placed in the areas which were shown in step three to be unbuildable or partially constrained. These areas are incorporated into individual house lots, however, though each house site has a minimum of about an acre of buildable upland. The 34 houselots shown would represent the maximum number of units allowable on the site under the yield plan approach, subject to approval of suitablity for construction of roads, houses, and septic systems.

The formula approach, assuming 10% of the base area was subtracted for road construction, reaches the same conclusion:

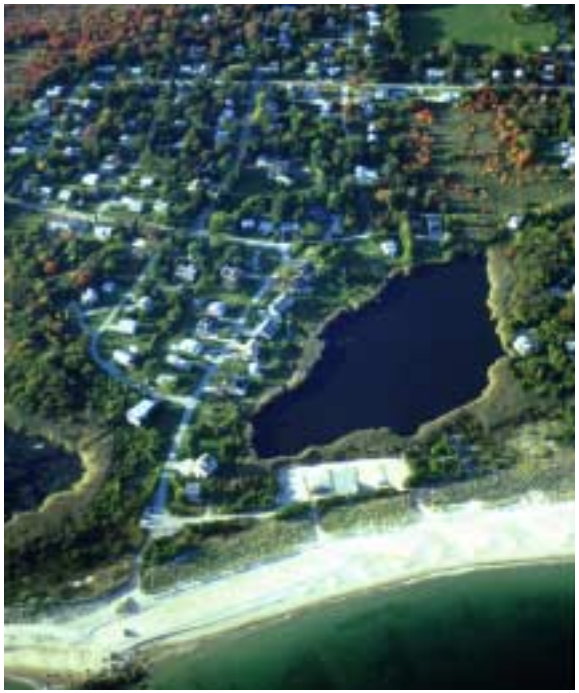
175 acres - 10% = 157.5 acres

157.5 acres = 6,860,700 s.f.

$$\frac{6{,}860{,}700 \text{ s.f.}}{200{,}000 \text{ s.f. minimum lot size}} = 34.3 \text{ lots.}$$

Introduction

Before locating house sites, roads, or lots lines, it is useful to start with an overall concept to guide the plan as it develops. This conceptual "sketch plan" can provide a framework to link each part to the whole, and to connect the new neighborhood to the larger community of which it is a part. In step four we determined the basic number of units, and in this step we identify the areas most suitable for developing those units. This would be fairly straightforward, if we were to consider the site as an island whose only connection to the outside world was its road frontage. But despite the common practice of developers, and even planning boards, no site is an island – which is where the analysis of context conducted in step 2 comes into play. A site on the edge of an existing village or town, for example, suggests a development concept that forges physical links to adjoining neighborhoods, and which perhaps reflects the density, development patterns, and style of those neighborhoods. A site in the woods on the edge of a pond might be planned with houses pulled back into the trees, while in a tract where the forest is most valuable homes are gathered near the road to create a new hamlet. In so many suburban and rural towns, haphazard development over the years has resulted in a scattered growth pattern that neither works well nor looks very good. Well-planned Conservation Development can not only "do no harm" in such a situation, but can really begin to tie these different pieces together into a coherent neighborhood, at whatever scale: completing street networks to improve vehicular circulation; connecting pedestrian trails; filling in gaps in the "townscape" of pedestrian-friendly streets and architecture; and firming up boundaries between village and countryside.



New development at the edge of an existing village like this one works better, and looks better, if it follows the same principles for design of roads, lots, location of houses, etc.

Near existing village centers like Wickford (right), designing new development based on the site planning and architectural traditions of the old center helps create an attractive development that feels like it belongs (Wickford Point, above).

Of all steps in the process, conceptual planning is perhaps the least linear, in that you cannot gather data, make decisions, and come to a single conclusion. It is really more of a cyclical process, where ideas and organizing principles are generated, then each scenario is run through the filters of how well it fits the site, relationship to the context, potential costs vs. market value for the homes or houselots, etc., after which you refine the original concept and experiment with new ones. Eventually, one scheme will stand out as that which best balances each of these factors. The activities described below are part of this process of conceptualizing, testing, and revising concepts.

Selecting the best development areas

One might think that the process of designating potential conservation areas would reveal those areas of the site that are ideal for development – but things are rarely so clear-cut. There are often gray areas, where impacts on fields and forests, public views and other valuable elements must be balanced with the need for the developer to get a good price for the lots. Simply relegating the development to the least valuable land may protect important resources, but produce a completely forgettable development. At the same time, if the houses are placed so that each one has the best possible individual setting, with a view of open space equal to all the others, you end up ringing the open space with houses, producing a better, but likewise mundane result. The best location for development is often one which neither hides nor focuses on the new homes, but rather creates a unified composition where the community and the site merge into something greater than both. This is something designers of all kinds struggle with all the time, and there's no easy way to do it. One way to start is to quickly sketch up many alternatives, and then evaluate each of them on the basis of quality of individual house sites, the visual character of the open space, and the experience of visiting or living in the community. This process usually leads to further ideas that can be explored in more detail.

Relating Development Areas to Open Space

The heart of the problem is the way the developed areas relate to the open space, for only by merging the two into something better than either alone can the Conservation Development designer truly succeed. Clues and starting points can often be found in existing communities, especially historic farmsteads and villages in the area. Should there be a sharp line between the neighborhood and surrounding open space? Or does the development gradually blend into the surrounding forest or farmland with a transition area of parks and gardens? Does the community focus inward, or outward, or both? Do you drive through the open space areas and arrive at the new community, or is the project an extension of an existing neighborhood, through which you travel to a new countryside edge? Central to all these questions is the experience of living in and moving through the proposed neighborhood, which is (unless you never leave the site) an extension of the rest of peoples' lives and all the places they work, shop, go to school, etc. What we are after is a layout that takes advantage of the unique qualities of the site and its context in order to make for a more interesting experience for everyone. Developers and planning boards can get help with these issues from a Landscape Architect, who is trained to help new development fit into the existing landscape.

In the countryside, new development often fits in best when tucked in around the edges of existing fields and meadows. In this case, the organizing principle is the pattern of open space, rather than a new street or town green.

Developing an organizing principle

Somewhere in the process of thinking about the general areas of conservation and development on the site, and the way development relates to open space and the surrounding context, it is useful to think about what principle or principles tie these elements together. Most communities that people say they like have such an organizing principle; New England towns and villages, for example are usually organized either by a linear Main Street spine, or as a campus of buildings around a town common or village green. As these communities grew, they often incorporated elements of both, punctuated by other functional elements such as harbors and railroad depots. As time goes on, new streets extend from the Main Street in a rough grid, which helps to tie the growing community together. In more rural situations, the landscape plays a more important role in organizing the composition. Houses can follow the edge of a meadow, stream, or other

feature; they can have a functional relationship to a working landscape, and take the form of a traditional farmstead grouping with its houses, barns and outbuildings; or, like many of Rhode Island's historic seaside communities, they can relate to the waters edge and an ocean view. In all these cases, the organizing principle is some feature of the landscape, which ties all the elements of the composition together, while at the same time linking them to the specific location.

Selecting House Types and Architectural Themes

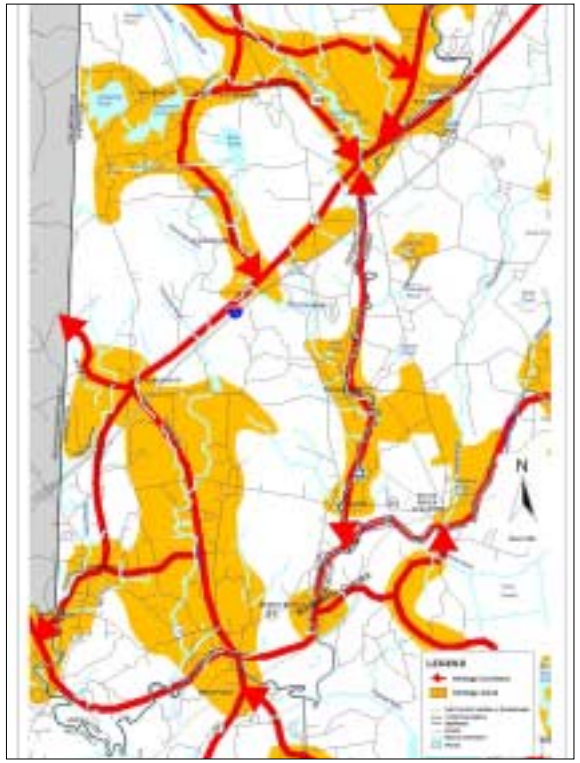
Just as a spatial organizing principle helps to unite separate elements into a single composition, an architectural theme brings the new development together into a whole that is greater than the sum of its parts. Again using traditional neighborhoods as an example, one of the reasons they are so attractive is that every structure tends to be a variation on a few simple themes. There is a consistent approach to the size and shape of buildings, to the shape of the building masses and roofline, and to details of windows and doors and cladding materials. Historically this resulted from limitations in available materials, as well as a common approach to designing buildings in an age where most houses were designed by carpenters rather than architects. Today's builders can and do use shapes, materials, and architectural plans of almost infinite variety – sometimes resulting in jarring juxtapositions of styles and colors. By establishing an architectural theme ahead of time, a developer can allow for variations within a reasonably consistent vocabulary. This can, but need not be limited to historic styles found in the area; it is often enough to establish some basic rules for consistency while allowing individual designers and builders to play with the details. Thus materials might be limited to wood shingles and white trim, with traditional doors and windows, while design is allowed to vary to include contemporary styles. Or conversely, building massing and roofline shapes are kept to a few simple, traditional forms, but builders are allowed to vary colors and materials in interesting ways. The point is that by establishing a unifying theme, then allowing some variation on that theme, the architectural composition has some consistency but also some liveliness. This is the essence of good design.

A consistent architectural theme can pull a project together visually, which is especially important when houses are arranged according to a village theme, as shown in this example from Norwell, Massachusetts.

In practice, it is hard for developers, let alone towns, to dictate house styles and materials. It's easy, of course, if the developer is also the builder – but the developer must be willing to restrict the available building styles and floor plans to a limited range. Where the developer is selling individual building lots to builders or individuals, the best approach is a strong "sales job," with beautiful drawings of the development using the proposed architectural theme, along with ample encouragement. With leadership by the developer, and support from the town, most builders and potential homeowners will see the potential of a consistent approach, and will be inclined to go along with it to enhance the value of their own property. Free copies of architectural plans, or subsidized design services, can serve as an additional inducement.

Using a Town's Comprehensive Plan and Open Space Plan to Understand Local Goals for New Neighborhoods

Local planning studies can often provide valuable clues to understanding both historic development patterns and a town's long-term goals for the development of the community. Just as open space on the site will make a lot more sense if it is coordinated with town-wide open space networks, selection of development areas and conceptual development schemes should reflect an understanding of existing and future patterns of development in the surrounding area. Comprehensive plans generally include a description of the history of the community, along with detailed information about demographic and social patterns, schools and other town facilities, tax structure, local services, and other factors that help in understanding the character of the community.



Local open space plans, such as this map of cultural resource areas and historic corridors prepared as part of a Greenspace Plan for Hopkinton, illustrate the community's priorities for protection of sensitive resources.

Of particular interest is the "proposed future land use plan," which indicates – in a way the zoning map may not – the town's vision for the character of different districts. Is the site in an area that the town sees as an extension of an existing town or village center? Is it within a district where the community hopes to preserve rural character, views of farms and traditional activities? Or do they see themselves, or the particular area, as a conventional suburb, where most of the land will eventually be developed, except for a network of schoolyards, parks and playgrounds? While in each case the existing features of the site may be identical, in each the design of the developed areas of the site could be very different.

Similarly, communities' open space plans can help the designer lay out development areas along with indicating the best way to link open space on the site to town-wide networks. Typically such plans will describe the features or resource elements that are important to the town, and why, and offer clues as to an appropriate response on the site level. For example, in a town where natural functions and watershed protection are paramount, the design of new neighborhoods might respond with a heavy emphasis on stormwater management, buffering wildlife habitat and other functional concerns, while the design of homes and the pattern of development is not as important. In another town, studies may indicate that it is views and rural character along a scenic road or river valley that needs to be protected, in which can the design might emphasize careful screening and visual buffers, or a traditional village development pattern designed to complement a rural district. The point is that a close reading of town plans can often provide the key to fitting new development into the existing and proposed future patterns of development in the larger community.

Sustainability and the Conceptual Development Plan

Towns and other reviewing agencies are increasingly looking for developers to employ more sustainable site planning and construction techniques in the design of new neighborhoods. Sustainable design at a minimum means looking for ways to reduce impacts, not only on the site, but on the surrounding area. It is based on the larger ethic of leaving the world a better place than you found it, and of passing resources on to future generations, rather than saddling them with our problems. On the level of the conceptual development plan, a more sustainable approach looks for areas that will require the least amount of site preparation, grading and drainage work, locations which are protected from winter winds, open to the sun for natural light and warmth, and requiring the least amount of impermeable paving. A sustainable plan will avoid impacts on wildlife habitats, and be compatible with rural agriculture and rural services. Developers also benefit by considering these factors, which make the development cheaper to build and maintain, thus providing an immediate and future financial reward.

Sustainable management of stormwater is particularly important, since increases in the amount of runoff as well as the potential for siltation and pollution of nearby streams and water bodies present the greatest potential detriment to the health of the larger community. Ironically, we are starting to realize that even the best efforts to drain a site and manage stormwater can have the unintended effect of reducing the amount of water that gets back into the ground beneath the site itself, lowering water tables and drying out wells. As a result, the next generation of stormwater management, termed Low Impact Development, or LID, emphasizes reduction in runoff at the source, with immediate dispersal and recharge into on-site soils rather than merely conducting the water into off-site stream systems (an excellent summary of the approach can be found at the Natural Resource Defense Council website: www.nrdc.org/water/pollution/storm/chapter12.asp). The LID approach takes the old idea of on-site stormwater detention to the micro level, using rooftops, sidewalks, yards and parking areas as rain gardens, infiltration zones, and temporary storage sites – eliminating the need for expensive structured systems. By minimizing disturbance and using every opportunity to limit volume of runoff at the source, much of what does run off can be drained back into the ground before it leaves the development site. These techniques make a great fit with Conservation

Development, where paving is already reduced and shared open space provides many opportunities for on-site bioretention, which can be easily incorporated into landscaped garden areas.

Finally, many communities in Rhode Island are now required to address stormwater management issues pursuant to new "phase 2" stormwater regulations recently promulgated by the U.S. Environmental Protection Agency. So sustainable design is not just a good idea – it's the law.

Testing the Fit Between the Design Concept and the Market

No matter how well the Conservation Subdivision is designed, if the developer goes broke because people don't want to buy the houses it may be the last time the town sees the technique used. There are several ways to test the fit between the homebuyer market and various planning and design concepts identified at this stage. One way is to look at comparable projects in similar areas of the region. Which are the most successful projects, and what are people looking for? Are people buying the location, the building style, the local school system, open space amenities, or some combination of all of these? Of nearby conventional development, what elements seem to have the highest value in the market? Within existing historic centers (which often have very high values despite small lots and tiny houses) what factors seem to make it worth people's while to live close together? Is it the ability to walk to school, shops, and other services? Affordable prices? Or do people just like to live in a real neighborhood? Another way to test design concepts in the market is to show them to real estate agents and other professionals. Condominium developers often test house styles and amenity packages with focus groups made up of the type of people they're trying to attract. These studies can help evaluate various proposals, and are a useful way to generate additional ideas.

The Center for Watershed Protection recently prepared a set of **22 Model Development Principles** (listed below, with emphasis added) created over a two-year period by a roundtable of experts in planning, landscape architecture, engineering, construction and environmental protection. The principles are meant to provide guidance to towns in identifying areas where existing codes and standards can be changed to better protect streams, lakes and wetlands. An extensive report describes the principles in detail: *Better Site Design: A Handbook for Changing Development Rules in Your Community*, available from the Center for Watershed Protection - 8391 Main Street, Ellicott City, MD 21043 (410) 461-8323. For more information see www.cwp.org.

Residential Streets and Parking Lots

These principles focus on those codes, ordinances, and standards that determine the size, shape, and construction of parking lots, roadways, and driveways in the suburban landscape.

1. **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.
2. **Reduce the total length of residential streets** by examining alternative street layouts to determine the best option for increasing the number of homes per unit length.
3. Wherever possible, **residential street right-of-way widths should reflect the minimum required** to accommodate the travel-way, the sidewalk, and vegetated open channels. Utilities and storm drains should be located within the pavement section of the right-of-way wherever feasible.
4. **Minimize the number of residential street cul-de-sacs** and incorporate landscaped areas to reduce their impervious cover. The radius of cul-de-sacs should be the minimum required to accommodate emergency and maintenance vehicles. Alternative turnarounds should be considered.
5. 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.**

6. **The required parking ratio governing a particular land use or activity should be enforced as both a maximum and a minimum** in order to reduce 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.

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

8. **Reduce the overall imperviousness associated with parking lots** by providing compact car spaces, minimizing stall dimensions, incorporating efficient parking lanes, and using pervious materials in spillover parking areas where possible.

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

10. **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.

Lot Development

Principles 11 through 16 focus on the regulations which determine lot size, lot shape, housing density, and the overall design and appearance of our neighborhoods.

11. **Advocate open space design development** incorporating smaller lot sizes to minimize total impervious area, reduce total construction costs, conserve natural areas, provide community recreational space, and promote watershed protection.

12. **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.

13. **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.

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

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

16. **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.

Conservation of Natural Areas

The remaining principles address codes and ordinances that promote (or impede) protection of existing natural areas and incorporation of open spaces into new development.

17. **Create a variable width, naturally vegetated buffer system along all perennial streams** that also encompasses critical environmental features such as the 100-year floodplain, steep slopes and freshwater wetlands.

18. **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.

19. **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.

20. **Conserve trees and other vegetation at each site** by planting additional vegetation, clustering tree areas, and promoting the use of native plants. Wherever practical, manage community open space, street rights-of-way, parking lot islands, and other landscaped areas.

21. **Incentives and flexibility** in the form of density compensation, buffer averaging, 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.

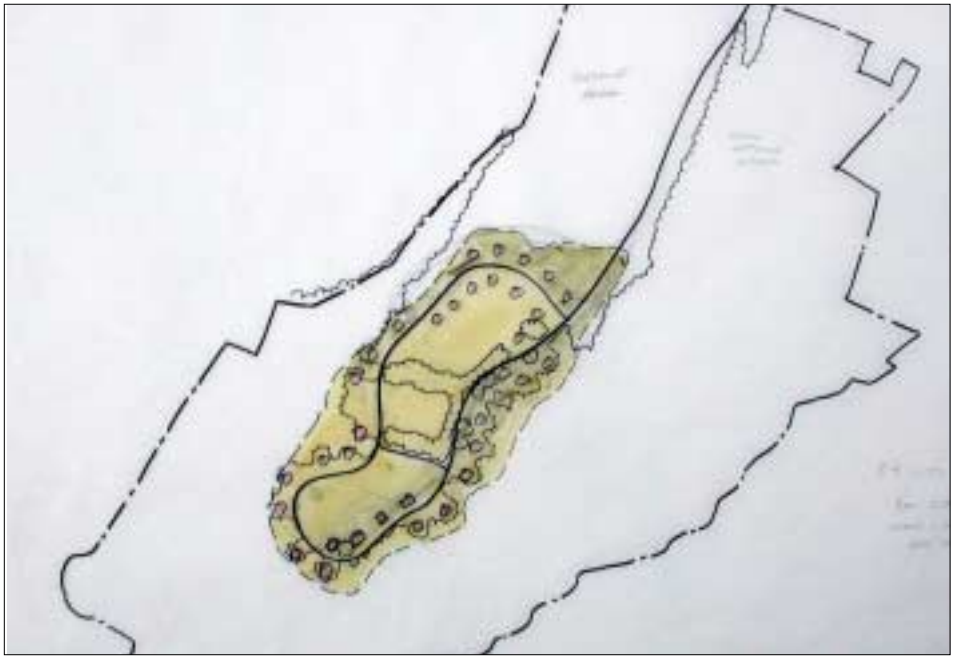
22. **New stormwater outfalls should not discharge unmanaged stormwater** into jurisdictional wetlands, sole-source aquifers, or sensitive areas.

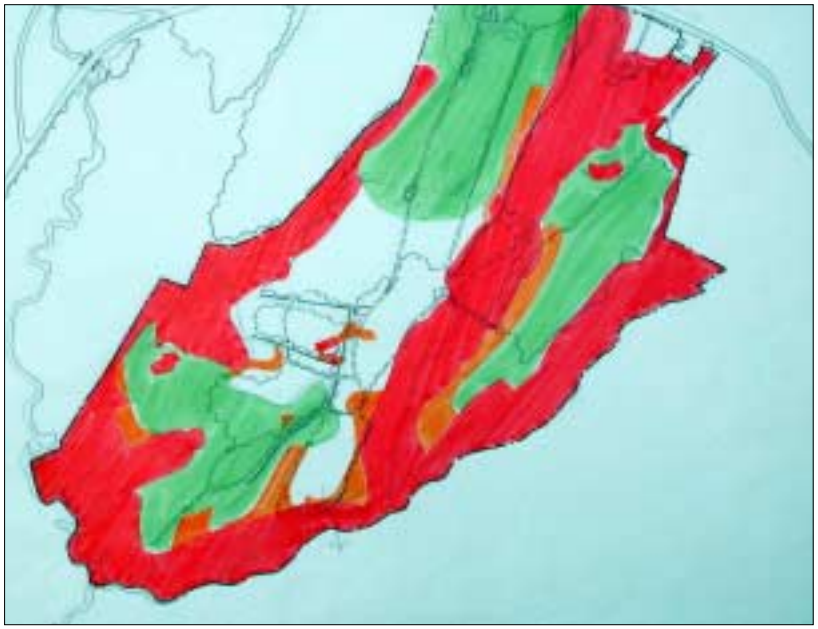
Kenyon Farm Case Study:

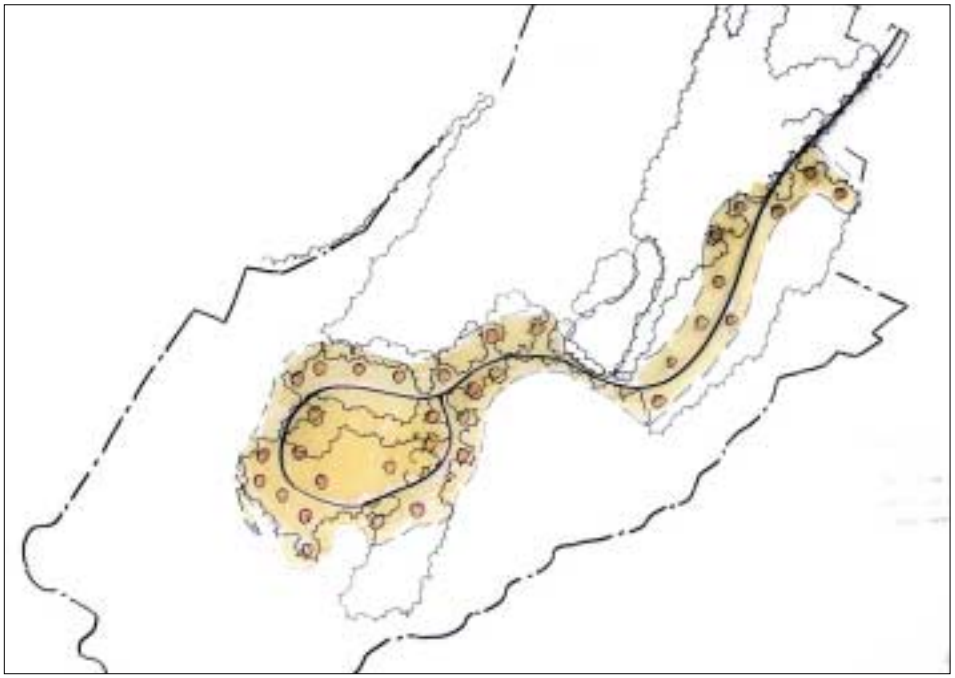
Using the summary map of development constraints and important resources (below) as a guide, several sketch plan alteranatives explore development of 34 homes within the area containing the fewest important features. In each case, a long entry road will be required to provide access from Rt. 138 to the site of the development. Each plan leaves the farmland along the road intact, and avoids impacts on natural and cultural resources.

Scheme A (top right) locates house sites around a long loop. The road itself serves as the organizing element of the scheme, with alternating views of homes and open space as you drive around the development. Average lot size within the development area would be about 1 acre per unit.

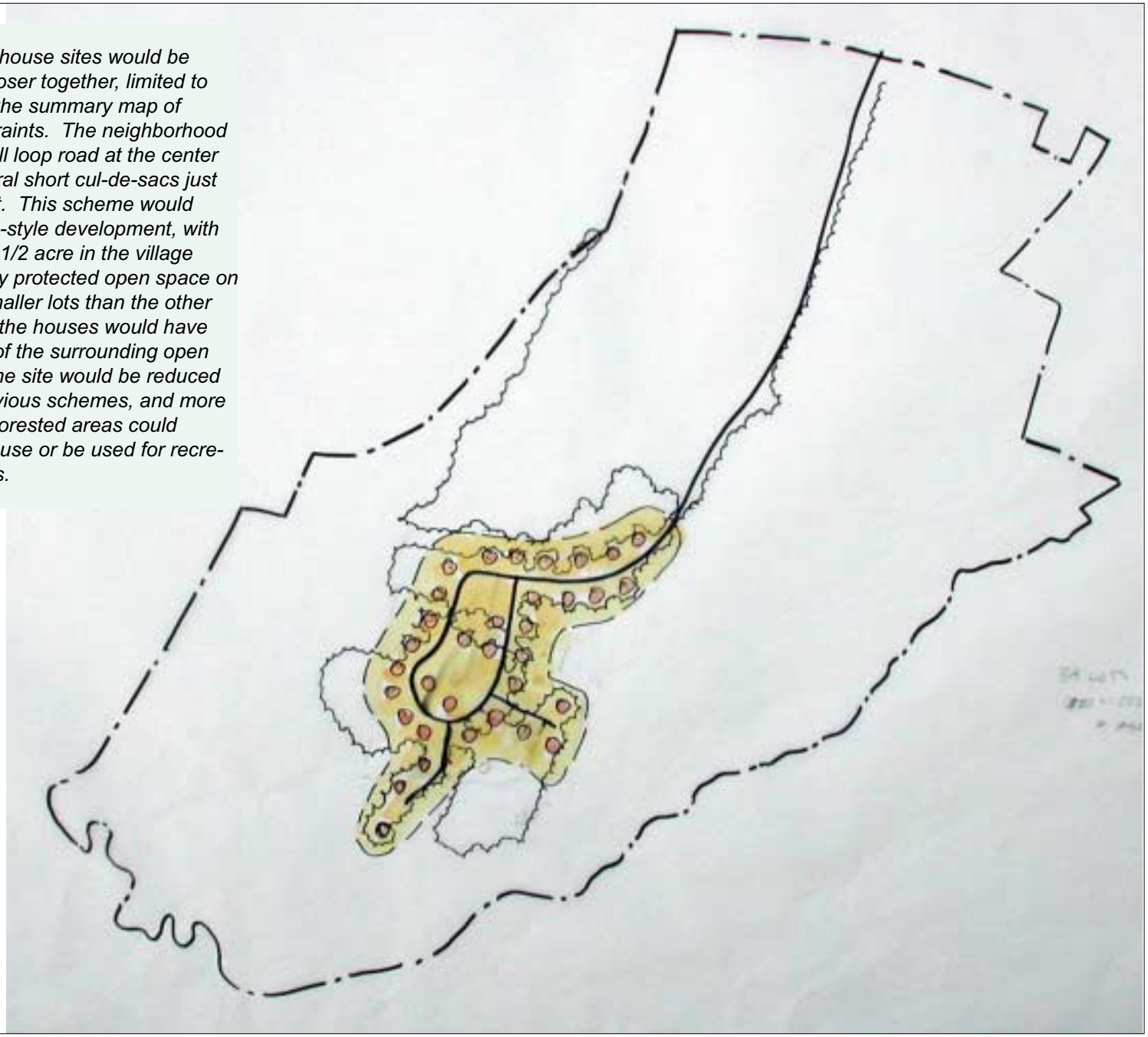
In Scheme B (below right), the road enters at a point further to the east, and houses are built along the entry road where it crosses a cornfield. A smaller loop at the center of the site provides a focus for the remaining homes. Lot sizes would be about 1 acre per unit.







In Scheme C (right), house sites would be located somewhat closer together, limited to the area in white on the summary map of resources and constraints. The neighborhood is built around a small loop road at the center of the site, with several short cul-de-sacs just to the south and east. This scheme would lend itself to a village-style development, with lots averaging about 1/2 acre in the village center, surrounded by protected open space on all sides. Despite smaller lots than the other alternatives, most of the houses would have uninterrupted views of the surrounding open space. Impacts on the site would be reduced compared to the previous schemes, and more of the farmland and forested areas could remain in productive use or be used for recreation by the residents.



Introduction

Once one or several promising development concepts emerge, the process of locating house sites is fairly simple, and provides a useful focus on maximizing the potential value of each lot to a potential homeowner. Like the previous step, this should not be the final determinant in the design of the overall development -- but after all it's the "curb appeal" of an individual house that gets the buyers in the door – the other amenities they may not discover until after they move in. Certain factors weigh heavily in the location of house sites, as discussed below.

Locating the best house sites on a property is always a balancing act between maximizing value for each individual lot, measured against what development of that site takes away from the value of the other lots. Sales values, in turn, must be balanced with the cost of developing particular sites, or the larger cost to the community and the environment of inappropriate house locations.

Development Suitability

Unless there is a market for high-end homes, and even if there is, most builders are working under limited profit margins. Difficult sites where they have to apply expensive drainage and dewatering to foundations, blast bedrock to install utilities or basements, or build extensive retaining walls tend to be profitable only if the site cost is very low, or the return very high. One of the benefits of Conservation Development is that it avoids these headaches by allowing houses to be sited in the most suitable areas. But simply locating houses on the best soils, for example, can conflict with other factors – especially when the most suitable soils include farmland or other resources. The designer should map out the most suitable areas, certainly, but make decisions about the best house locations by balancing ease of construction with future benefits to homeowners or the public of developing sites which may require more work up front.

Water and Sewer Service

Perhaps no other element plays so important a role in limiting the possibilities of Conservation Design than these "hidden" services, which in practice often determine how close homes can be to each other. In the event that there is public water supply (municipal or privately owned system connected to 15 or more residences) and sewer service available, or even one of these utilities, there is a great deal of flexibility in the selection of house sites. With on-site water and septic system, soils and the ability to locate a well that provides sufficient household water (greater than five (5) gallons per minute is desirable) often determines how much land area each house needs.

The state's 'set-back' distance between a water well and a septic system may also influence the dimensions or configuration of a house site, and setbacks to neighboring homes. In most towns historically, base densities in each residential zoning district were established primarily on the basis of the ability of sites in each area to support on-site septic systems and residential wells. This is the basic reason for the common one or two acre minimum lot size across the Northeast. There is also scientific support for requiring a minimum of one (1) acre for each home (typically a four person household) using a conventional septic system. This density keeps the concentration of nitrate - nitrogen to less than 10 mg/l (milligrams per liter, or parts per million) in groundwater which is considered a threshold for unacceptable contamination under state and national drinking water standards. States and communities often use a standard of 5 mg/l nitrate so that actions can be taken before water quality is degraded to the 10 mg/l level.

In practice, these housing densities are usually either too high or too low for a given development area; in certain soil conditions, septic systems can be accommodated on relatively small lots, and today, there are more advanced systems that can eliminate 50% or more of the nitrogen loading close to the source.

In much of Rhode Island, the true limiting factor is wells, rather than septic systems. Especially in the bedrock aquifers from which many private wells draw, flows can be fairly low, and can be unacceptably so if wells are too close together and competing for the same flows. The limitations this will place on a particular project will vary, but need to be explored carefully early in the design process to prevent a lack of water supply from scuttling a good plan.

For plans based on a fairly compact grouping of homes, there are some alternatives to private septic and wells. However, even if a developer is willing to go through the extra steps in permitting a new public water supply for multiple homes, there is no guarantee that a single well will produce more water in the aggregate than multiple home wells. Small community public water supply wells (serving 15 or more residences) often tap into water-abundant shallow sand and gravel aquifers, in contrast to individual bedrock wells, which tap into water-carrying cracks or fissures. Small public water sources are therefore more vulnerable to contamination and must undergo state required water quality monitoring that may become costly.

Shared wastewater systems are probably easier to design and permit, and have a growing track record of successful installations in the region. Instead of many individual systems, which limit options to a few simple alternatives, a shared system can take advantage of new technologies which provide a much higher level of treatment. The disadvantage is higher maintenance and oversight costs, but these can be incorporated in homeowner's association fees – and it must be remembered that individual systems also require maintenance, and problems often go unnoticed for years before being fixed.

Scenic views can add thousands to the value of a building lot. Well-planned house sites can provide views from individual houses while preserving views from the public street that add to the value of the whole development.

Views and Visual Quality

Beyond the general location and character of the development, the visual quality and potential views from house sites have perhaps the highest value to a prospective owner. While the typical subdivision offers views of someone else's backyard, the key benefit of Conservation Development is preservation of significant open space so that on at least one side of every home it is possible to get a private view into an undeveloped area. Careful planning of multiple structures can extend these views over the neighbor's hedge to encompass a distant line of trees or hills. An important part of the visual character of the house site is the incorporation of existing trees, rock outcrops and other unique features within the plan. Houses can be lined up along existing stone walls, carefully "shoe-horned" in next to existing large trees, and otherwise tucked in around the edge of clearings to achieve a grown-in effect that otherwise would take years to achieve.

Potential Yard Spaces & Activity Areas

One of the ironies of community design is that putting the houses far apart does not necessarily create more useable space; and that equal side setbacks designed to enhance the setting for the house actually result in two largely useless side yards. By moving the houses toward one side of the lot or the other, a single larger and more useful side yard emerges. Some towns encourage this by allowing "zero lot line" houses, where the structure actually is on or near one of the side lot lines. Each house opens up to its side yard, and on the other side creates a wall for the neighbor's garden. With a limitation of window openings on the neighbor's side, this produces much more useable space for everyone. In towns that don't allow houses close to the lot line similar effects can be achieved by pushing opposite pairs of houses to the minimum setback line, or staggering house sites fore and aft so that each one has an uninterrupted view over the neighbor's yard.

Privacy vs. Neighborliness

Along with views and useful yard spaces, selection of house sites is tied directly to the general social theme of the development. Are these to be private house lots where contact with neighbors is reduced, if not avoided? Or is the idea to promote neighborly interaction "over the backyard fence" if not on the front porch swing? Some of the most successful communities provide opportunities for both types of house sites, which can help the developer market to a broader range of buyers. In fact, one of the secrets of the traditional neighborhood is that every house has a public side and a private side, and levels of privacy within each that make it comfortable to live even on a very small city lot. This requires planning not only for the location and alignment of the house, but for other elements such as front, side and rear setbacks, and the provision for fences, hedges, and privacy screens. Again, one of the reasons that cluster development has failed in the marketplace in the past is that houses were placed very close together without provision for the traditional elements that create privacy and enhance control of homeowner's private yard spaces.

Access, Service and Parking

The overall design concept will govern to a large extent the means of providing access to individual units. Traditional town and village planning incorporates many techniques to provide service and parking to individual units. Garages placed on or next to the lot line and set back from the front façade of the house minimize the visual intrusion of what is rarely an asset to the appearance of a house. Driveways that follow the lot line, or better yet, shared driveways that straddle the lot line minimize intrusion on useable yard spaces. Rear alleys providing hidden access to service and parking areas and garages are also making a comeback in community design. This allows a reduction or elimination of curb cuts and pedestrian-car conflicts and greatly enhances the beauty of the streetscape. Where houses are set back from each other or spread out in a more rural setting, access can be provided by a shared driveway configured as a farm lane or estate carriage road. Aligned along an existing stone wall or hedgerow this can create a beautiful arrival to the homes and double as a walking path through the neighborhood. To be avoided are individual driveways that snake across open spaces; even though they can create a dramatic arrival to a single home they tend to ruin the effect for everyone else.

Driveways shared by two homes, with garages in the rear of each unit minimize intrusion of automobiles on this village-style conservation development project.

Selecting Energy-Efficient House Sites

A more sustainable approach to house siting works with climate to reduce heating, cooling and maintenance costs. Selecting climate-friendly house locations begins with an understanding of the site's microclimate. Prevailing winds in the winter tend to come out of the Northwest. Hillsides, tree masses, and adjoining houses can provide shelter from these wintry blasts and lower heating bills. Desirable summer breezes, on the other hand, prevail from the Southwest and can be enhanced with south-facing porches and breeze-ways. Wooded hillsides generate cooling air flow in the summer as cool air settles beneath the trees and flows down hill.

Solar orientation is perhaps a more commonly-known factor in house design, where natural lighting and passive solar gain is enjoying a renaissance. Orientation of the longer walls and rooflines to the South maximizes passive solar gain through windows and provides for active rooftop systems for heating water or generating electricity with solar cells. South facing yard and parking areas are more comfortable in the winter and dry out faster in the spring. Most of these ideas were worked out by necessity long ago and can be observed in rural farms and hamlets, where homes tend to be strung out east-west to block the wind and pull in the sun. Doors most often opened to the south side, and outbuildings and hedges were strategically located to block the wind. Learning from these traditions allows us to build houses that are cheaper to operate, which in the aggregate is better for all of us; just as importantly, they help people to connect to the real world.

Kenyon Farm Case Study:

The map of ideal house locations (right) shows the building sites with the highest value as individual elements. While this individual value must be balanced against the value of shared amenities that can be created by a design that incorporates the roadway and open space elements, by looking at house sites individually we can identify the factors -- such as privacy, views, ease of construction, and microclimate -- that will enhance the value of individual lots.

The red line (1) represents the edge of the unbuildable area identified in step 3. The blue line (2) is the preferred boundary of the development area from step 5. Within this area, the yellow bubbles (3) are areas with the best solar exposure, protected from winter winds by masses of vegetation. Blue arrows (4) are the best views from these areas. Finally, the small orange circles (5) represent the 34 potential house sites.

Identifying ideal house sites as a separate step helps to establish criteria for developing the highest value for each house lot. However, this value must be balanced against the shared value that could be generated by a plan that emphasizes shared elements of the community. This is not just an argument about individual rights vs. community values: as described in step 7, house lots organized in a neighborhood with traditional streets, small park spaces, and a clear edge between "village center" and surrounding open space, also share in a measurable economic value that is not apparent if you look only at individual lots.

Introduction

Successful street design flows out of the concept for the entire development. Building on the conceptual alternatives explored in step 5, streets may be central to the design, or a supporting element that fades into the background. The first step is to establish the functional requirements, which determine the width of the right-of-way and pavement, and then to balance these requirements with the desired character of the new community. Historically, people by necessity made the most of the investment they made in improving and paving streets, which tended to be laid out as efficiently as possible to serve the most houses. Only recently has the heavy equipment and reasonable paving costs been available that allows towns to require thirty-foot wide subdivision roads to serve even the most remote hillside projects. In the last 10 or 15 years there has been a movement away from this kind of over-building and a return to streets designed to be safe and durable, but only as wide as they need to be for the proposed use. This improves visual quality, but more importantly reduces environmental impacts and stormwater flows, and cuts costs for construction and future maintenance.

Location and Alignment

Assuming the town allows some flexibility in the width and grade of streets, the next step is to locate these streets on the site. Creative alignment can itself justify smaller road widths by making narrower roads work better. For example, towns often require wide roads because of the popularity of the conventional suburban cul-de-sac in subdivision design. Emergency services often are concerned about such dead ends being cut off by fallen trees or stalled cars, and look to greater widths to ensure access. One alternative is to use fewer cul-de-sacs and instead make sure streets connect to each other on both ends. Looping roads or a simple grid allow multiple access points to a given location, easing traffic congestion at any given point and allowing narrower streets to provide reliable access for emergency services.

A streetscape design includes street, sidewalk, plantings, fences and other features as part of a unified design for an inviting public pedestrian space, like this walk in Kingston.

Both cul-de-sacs and grids have a long history in city planning; where either approach fails it is usually because it is simply laid over the site without much thought for the integration of the street with the landscape. The wiggly suburban subdivision road, for example, is the descendant of roads designed for subdivisions by the great landscape architects of the 19th century. These roads were consciously laid out as an antidote to the sterile grid of city streets, designed to fit into the landscape and turn the entire neighborhood into a park through which pedestrians and carriages move with comfort and grace. This worked well for horse-drawn society, but as it evolved through the age of the automobile, the street became divorced from the landscape and dominated the scene. While many people are comfortable with the effect this creates, rural towns in particular have seen how this suburban model tends to replace the existing character of the area with something that just doesn't seem to fit.

Designing Streetscapes, Not Just Streets

In conventional subdivision planning the focus is often on the functional design of the street, and revolves around the requirements for pavement width, grading and drainage established by a town's development regulations. The streetscape approach focuses more on the integration of the street design into the function and appearance of the entire project. In a rural setting, the street provides access to the homes, but also establishes the route that people follow through a rural landscape. In village settings, the street itself can become a special kind of shared public space, enclosed by structures lining both sides of a road. In both cases, the goal of streetscape design is to create out of the many parts a cohesive whole that is a public space distinct from the private yards and homes that surround it. A strong, coherent streetscape creates a unifying structure within which many individual variations can continue, and often serves as that "organizing principle" that holds the design together. With the street as a unifying element, variations in the design of houses and other features can occur within, and indeed add a pleasing variety to, a consistent theme. This is a key step in creating memorable, livable communities. (For more about streetscape design, see RIDEM's South County Design Manual).

Width of Pavement and Right-of-Way

From the standpoint of cost, impacts on the site, minimizing runoff, and improving the visual character of development, paved roadway width should be kept to the minimum necessary to provide safe and convenient access to each home. Since parking will most likely be provided off street, within or next to structures, there will probably not be a need to provide room for on-street parking. This allows the road to serve primarily for vehicular lanes, for which the American Association of State Highway and Transportation Officials (AASHTO) standards for local residential streets specify a width of 9-12 feet for each lane. Parking requires a 7 foot lane, and addition of curbs generally requires an additional 1 foot setback. The result is a roadway cross section that can be as narrow as 18 feet while still meeting AASHTO standards, and this is generally a good width to start with as the "default option," adding extra pavement only for specific reasons. Another way to reduce the need for a lot of roadway is to provide access for smaller clusters of houses, or at least two houses at a time, with shared driveways. Thus the road only goes a certain amount of the distance into the site, while the last part is treated as a country lane. This has many benefits in the aesthetics of the design, as well as reducing costs and environmental impacts.

Like paved widths, the width of the right-of-way required in most towns is based on a need to provide for future contingencies rather than immediate needs. Usually 50 or 60 feet, ROWs provide for town maintenance of roadways, sidewalks, tree plantings, and utilities, but can force buildings back away from the roadway. Many towns are allowing narrower right-of-ways, which is a useful way to shift more of the public space to larger activity areas, rather than spreading it out around the edges where it has little impact

In his recent book **Residential Streets** *(Urban Land Institute, 2001), Walter Kulash recommends pavement widths based on the minimum necessary to "reasonably satisfy all realistic needs, thereby minimizing construction and annual maintenance costs, while at the same time maximizing the livability of the community." These are summarized in the following table:*

Recommended Pavement Widths

	Pavement Width
Local Streets	
-No Parking Expected	*18 feet*
-Low or Restricted Parking	*22-24 feet*
-Normal Residential Parking	*24-26 feet*
Residential Collector	*32-36 feet*

Curbs

Even in relatively low-density subdivisions, curbs can play a useful role in controlling traffic, channeling water flows, and keeping dirt off the roadway. Traditional granite or concrete village curbs provide a measure of protection for pedestrians on adjacent sidewalks. An unfortunate side effect of the universal use and low cost of bituminous paving is the extruded bituminous curb or "cape cod berm," which while cheap and functional, tends to get gouged and torn by plows, dented by truck tires and otherwise has a character synonymous with the suburban strip commercial center. That being said, the bituminous curb does make a clean edge to the roadway, at least in the short term. Many developers compromise by using granite around the more exposed curved sections and roadway turnaround, with asphalt curbs elsewhere. As with other elements of the plan, the best approach is to lay out the development so that roadways, especially those that adjoin open space areas, drain freely into swales or lawns without curbs, with curbs only in those areas with more of a village character. This helps with distribution of stormwater, as recommended by advocates of low-impact development, and rather than spreading the investment out across the entire site, this concentrates the available funds so that it is possible to use a more durable material where curbs are necessary.

Sidewalks and Path Systems

Sidewalks are often treated as an afterthought, or merely part of a town checklist, rather than a key element in creating livable neighborhoods. In rural settings, it is often more appropriate to provide internal paths that leave the roadside to connect each house into a network, rather than building sidewalks along the street that few will use. A common goal in either case is to allow all the residents to get everywhere on a continuous path system. In village settings this most often builds off of sidewalks on a least one side of the street. Each house is connected to the sidewalk with a paved path (or at least the driveway). A parallel system of paths runs through the protected open space, with lateral connections between the sidewalks and open space paths tying the whole network together. Ideally, the system within the site is connected to a larger network of trails that goes through the whole town.

Materials vary widely, but all are based, literally, on a good foundation of 6-12 inches of gravel, depending on subbase conditions. Surface materials can vary depending on use; asphalt is inexpensive but not as long-lasting as concrete, brick, or stone. In rural areas compacted stone dust or shells can make a durable surface that is firm enough to meet the requirements of the Americans With Disabilities Act (ADA) for accessibility. A well-constructed path is designed and built

much like a smaller scale version of the roadway, with a crown to shed water to each side, firm edges, and drainage to prevent erosion or undermining. 4-5 feet is a good minimum width; "collector" trails that connect to town networks should be at least 8 feet wide. The ADA also sets maximum grades for accessible paths and sidewalks: 5% (1 foot rise in 20 feet distance) is the maximum for paths without handrails; otherwise you must build an accessible ramp with a maximum 1:12 slope, railings, and flat landings every 30 feet.

Sustainable Stormwater Management

Roads and driveways represent the largest source of stormwater runoff in a development, and that runoff contains all the oil, grease, and other contaminants that washes off the road in each storm. Management of stormwater traditionally follows a few simple models: in more urban situations, curbs direct the water to catch basins, from which it flows into a detention basin where it is gradually released from the site – a system primarily designed to slow the runoff down and reduce flooding. Likewise, in rural areas road runoff is directed into grass swales and culverts before it reaches a detention area. In both cases, detention basins can silt up, and their use reduces recharge of stormwater into ground water aquifers.

As described under Sustainable Site Planning in Step 5, the next generation of stormwater design, known as Low Impact Design, or LID, takes this minimal approach to a new level: reducing runoff at the source, and taking every opportunity to send it right back into the ground rather than off the site. A whole suite of techniques have been developed as part of the typical LID installation, many of which involve street design: instead of curbs and gutters, grass swales and "bioretention areas" provide for infiltration as the water flows across the site; pavement is reduced and pervious pavement that allows water to drain through is used whenever possible; constructed wetland systems are used that help to sponge up excess water and remove pollutants. LID is designed to treat the problem with many small interventions at every point in the system, rather than conducting all the water to a single point requiring a big engineering solution. As such, these techniques are ideal for Conservation Development, for protected open space can often double as infiltration areas, road length and width can be reduced, and the market is more likely to support "green" technology. (For more about LID see Natural Resource Defense Council: www.nrdc.org/water/pollution/storm/chapter12.asp and The Center for Watershed Protection at www.cwp.org.)

Streetlights, Electrical and Cable Television Services

All utilities should be buried whenever possible. When we only had to look at telephone and electrical wires strung along our streets it was possible to look past the visual intrusion, but the explosion in the number and size of cables in our increasingly wired world makes it impossible to ignore them. You can see the difference when you drive through a rural area and see how the high, thin electrical wires largely disappear into the background. Compare this to a typical suburban street, where the utility poles are often groaning under the weight of electrical, telephone and cable service, often doubled up by competing providers. Not only are these cables much thicker than the old electrical service, they are attached lower on the poles where you can't avoid seeing them. In placing these utilities underground, utility companies inevitably place pads and telephone switching boxes in the worst possible place. The designer should work with the provider of these services to locate these surface components during planning and construction of the project. In rural areas, the greater distances between homes can make it very expensive to bury utilities: while this is another reason to group houses together, a compromise is to string wires on poles across less visible portions of the site, and bury only that part passing through the active use areas. Streetlights should be carefully designed to blend with the character of the street. For a residential area this usually means fairly low light poles, cut-off luminaries to limit glare, color-corrected lamps, and reduced wattage. Bright lights on tall poles provide the most light for the money, but this is a false economy in the long run – blinding residents with glare and polluting the night sky with misdirected lights. Human-scaled streetlighting and indirect illumination of structures and landscape elements can enhance both security and beauty. In general, a greater number of low-intensity streetlights are better than a few bright ones.

Traffic Calming

A recent concept in traffic engineering, "traffic calming" refers to a series of design elements that can be incorporated into existing or new streets to slow down traffic and ease conflicts with pedestrians. These techniques include elements that force drivers to slow down, such as speed bumps, small traffic circles, and lateral shifts in road alignment. They also include safety features for pedestrians, such as narrowing of road widths at crossing points, raised crosswalks, islands in the middle of the street, and better signage. A large part of this approach involves the design of the whole community: narrow streets with buildings closer to them tend to slow traffic; pedestrian/vehicle conflicts can be reduced by designing an integrated pedestrian network that consolidates crossing points to a few places where they can be made safer with the use of some of these specific design techniques.

Kenyon Farm Case Study: **Street Layout Option A**

This schematic plan shows a road system and driveway access designed to keep as may homes as possible in the ideal locations identified in step 6. A variety of streetscapes divide the development into three neighborhoods. Entering from the North you arrive at a street with houses on both sides. Continuing, there is a loop road providing access to 9 homes, and farther on a second loop with the remaining 15 homes. Each loop provides a focus for a group of houses, and could be laid out as a narrow "country lane" with one-way access. Shared driveways for pairs of homes keep more yard areas open for active use. Sidewalks and pedestrian paths (dashed line) provide access from each home to the surrounding open space.

Street Layout Option B

Option B organizes the homes around a single loop with a small additional cul-de-sac. The houses are still gathered into several distinct areas, each with a central open space -- but in this scheme the single loop road unites the whole development into one community. Houses are also kept closer to the street throughout the plan, which as a result would have more of a village character. While fewer of the homes are in the "ideal locations" identified in step 6, all would share in more attractive streets, views of open space, and shared recreation, such as the horse barn and corral shown at the bottom of the plan. In both options, existing stone walls have been retained and used to help shape the location of houses, streets and pedestrian paths.

Introduction

Many cluster development projects have failed to take advantage of the open space that was created, either because the basic design was faulty, or the open space is not effectively managed. When you design buildings, you establish a program, or list of uses and users, that determines size, shape, layout and detailing, etc. The same kind of programming exercise can help in the design of open space areas. Some programming elements will flow from the existing character and unique features of the site: wetlands and wildlife habitat suggest conservation activities, nature trails, and so on; other program elements like sport facilities, garden space, agriculture, forestry, and trails, all flow from an understanding of the site, the potential homeowners, and the surrounding context.

Forested stream corridors contain some of Rhode Islands most important natural resources -- combining wildlife habitat, flood mitigation, and protection of surface water quality with recharge of subsurface water supply aquifers.

Uses and programming therefore will emerge naturally from the previous steps of analysis and community design, and discussions held along the way with town planners and Planning Boards. The final step is to identify specific uses for each open space area, together with a general design approach that accommodates the proposed use while respecting the overall design of the project. For example, the masterplan may provide for a large central open space, and there is a need in the neighborhood for a ball field. Yet a traditional little league field with its fences and backstop might actually ruin views of this open space. A compromise is a low-impact ball field with grass infield and low backstop, suitable for softball perhaps, but not league baseball games. The point is that selection of uses and detailed design approaches have to go hand in hand with the overall design concept for the proposed neighborhood.

Potential Open Space Uses and Programming Approaches

Preservation of Biodiversity

Areas with highest value for nature tend to follow the edges of water bodies like lakes and ponds, stream and river corridors, and their associated wetlands. All these will have been identified through earlier site investigations in steps one and two. Less well documented are vernal pools: areas that flood only for a few months out of the year, and as a result support a unique diversity of plants and animals. These have received a lot of attention recently, particularly as scientists studying the life cycle of a number of rare amphibians have begun to realize that many of these animals rely on vernal pools to reproduce. Drier, upland areas can also be important for natural protection, particularly for food supply, protection from predators, and nesting areas. Two factors seem to be key for defining the value of upland areas for nature: first, the age of the forest, since many species depend on mature trees for food and shelter, and nest in the kind of hollow snags that are found only in older forests; and second, the size of the forest, which is critical to the ability of multiple pairs of a given animal to live in one area, interbreed, and sustain a healthy population. Forest size is also important to a number of animals that won't live in an area if there is any outside disturbance.

The suitability of a given site for nature-related uses can be inferred from the presence of wetlands and waterbodies, and potential connections to larger ecological systems. Simply preserving the core habitat may not be enough to continue the viability of whatever interesting things are living there. In Massachusetts, which began protecting vernal pools several years ago under state wetlands regulations, there have been several instances where the pool itself was protected, but it turned out that the salamanders which bred in the pool lived in the unprotected surrounding forest. In other cases, development of the area surrounding a vernal pool either drained all the water away or made it into a permanent pond – in either case rendered uninhabitable for the target species.

The lesson for planners and developers interested in maintaining natural areas is to look carefully at the needs of the animals or plants that have been identified for protection to see if they will actually benefit from the proposed open space. A visit by a trained ecologist can help determine the potential value of open space to nature, and what the minimal size and management of that area should be.

Recreational Trails and Sidewalk Connections Within and Outside of the Site.

Many towns require sidewalks on one or both sides of the street – even if they don't go anywhere – on the theory that as the neighborhood fills in, sidewalks would be built along all the existing streets connecting new developments. In many rural towns, of course, this doesn't make sense. Stone walls and trees along the streets don't leave enough space for sidewalks along the roadside, and property owners can be leery of maintenance and liability issues. It may make more sense to provide for pedestrian connections through a network of trails leading to the local greenway than to force pedestrians to follow what may be a haphazard and indirect street system. Likewise, within individual development projects, towns are beginning to allow trails through the open space to replace sidewalks. The key is to establish the goal of connecting each house to the pedestrian system, and then to allow the applicant to figure out what combination of trails and sidewalks best achieves that goal. The selected method should reinforce the design intent of the development: for example, brick sidewalks with benches and post lamps lining the street in a traditional village layout, or curving paths looping through a natural area at the center of a more informal development.

Facilities for Active Sports

Active sport facilities can make a new neighborhood much more attractive, particularly to families with children. Swimming pools and tennis courts, combined with low maintenance dwellings, were the traditional selling points for condominium developments. The typical Conservation Development likewise offers smaller yards, and will sell better with shared amenities. With lower overall densities than the "traditional condo," Conservation Development provides opportunities to go beyond the small pool/tennis center to include playing fields, playgrounds, exercise circuits, etc. Soccer and softball fields can take up anywhere from 1 to 3 acres at a minimum, but have the advantage of providing open turf areas that accommodate many different uses other than organized ball games. The best approach is to think of the open space as a continuous park, into which the smaller elements like playgrounds, ball courts, and the like are set like jewels. "Hard elements" such as backstops and pavement should be kept to the edge of the larger park spaces, so that views can flow uninterrupted across the greatest possible distance.

This path and bridge at The Village at Indian Lake in South Kingstown provide access to common waterfront areas.

There is a reason that few developments of any kind feature these sorts of public amenities – it simply is very expensive to build them. This makes the initial steps of analysis and site planning all the more important. For example, in areas with fertile, well-drained soil, with minimal clearing and re-grading needed, it is a simple matter to build a soccer field. Opportunities for such low-cost amenities leverage the flexibility inherent in Conservation Development to create valuable amenities that otherwise would be swallowed up by private house lots.

Agricultural Uses

Even more than sport fields, agricultural uses are tied to the existing capability of land and its suitability for crops, pasturage or hay fields. Few farms can make a profit on land requiring major site preparation or soil amendments; where these uses are made part of Conservation Development, it will most likely be as a continuation of existing agricultural uses whose location and functioning can easily be surveyed onto the existing conditions plans. Less predictable are opportunities for small-scale agriculture, community gardens and the like that could be built from scratch, even on a wooded site. Even with this kind of "pocket agriculture," little success is likely unless basic soil fertility and moisture content are favorable. Soil surveys are available from USDA Natural Resource Conservation Service, and also available on Rhode Island Geographic Information System. Further site investigation and soil testing of potential agricultural areas should all be undertaken as possibilities for agricultural use are considered.

Forestry Use

Like habitat preservation, maintaining lands in active forestry use is highly dependent on the size of the parcel and adjacency of other forested areas. Areas less than ten acres are usually too small to be economically managed for timber products, but could possibly succeed if there are similar areas nearby under the same

management. Alternative forest products, including edible, medicinal and floral greens, can be a profitable and sustainable addition to timber harvesting on small parcels. Likewise, if the potential open space within the development is contiguous with managed forest land, active forestry uses could be feasible.

Small-scale forestry can be an ideal long-term use for open space areas. In much of Rhode Island, forests are still maturing, and valuable trees are competing with less useful varieties for space. The usual practice is to have a trained forester evaluate the stand, selecting some trees for harvest as lumber, if any, and others for thinning as cordwood, allowing the rest more room to grow. This initial step of harvesting and thinning can be accomplished during the early phases of construction. Afterwards, the forest serves multiple uses as wildlife habitat and passive recreation area for the residents. While residents of the development may object to the harvesting of trees ten or fifteen years hence, long-term forest management can include alternative forest businesses that leave the trees standing and concentrate on other forest products. In any case, it is very important to acquaint buyers with the forest manager and management plan, and to share profits from forest products for mutual benefit. In the meantime, the forest is providing valuable public benefits in protecting and improving the quality of our water and air.

Formal Parks and Squares

Parks and squares are traditional urban design elements that were built into city and town plans through the 18th and 19th centuries. More recently, planning for neighborhood parks has been left to public agencies, and individual developers were rarely asked to incorporate them, except in the largest projects. Increasingly, however, designers are rediscovering the potential of

A formal park space can provide a visual focus and sense of shared identity for a community, but more importantly can serve as the focal point of daily life in the neighborhood.

parks to enhance the visual and social vitality of our communities. Typically small enough to be easily maintained, such parks are designed for walking, sitting, and informal play, and can be as simple as a small corner parcel or empty lot at the center of a neighborhood, or a more extensive linear park along an entrance road. The thing which separates a park or square from a simple open space is a more formal relationship to other elements in the design, like roads and buildings. Typically, homes will be laid out along a consistent setback line surrounding the proposed park. This creates a sense of enclosure and formality that sets the space aside as a shared public area. The square combines this shared open space with roads fronting the structures, which can serve as a shared access or common driveway to the houses surrounding the space. The traditional New England town common or village green incorporates these elements, though the level of formality varies widely from a simple open meadow to a formal park with paved paths, lights, benches, and bandstand. On both ends of the spectrum, a space that is recognizable as a public park serves an important visual and symbolic function, providing a visual and social focus for the life of the community.

Historic Preservation

Historic structures, landscape features, or archaeological sites are likely to be the most unique features on a property; their incorporation into new development can create an instant "sense of place" for the project – a feeling of connection to the past and palpable rootedness to a particular landscape. Historic elements most commonly remaining include old houses, stone walls, barns and other outbuildings, cellar holes, and "town pounds." Historic cemeteries are also sometimes found on land slated for development. State law requires a 25' construction setback and permanent public access to cemeteries. Making these historic elements part of the open space plan involves decisions about balancing public safety and maintenance requirements with possibilities for ongoing use, often in conjunction with trails and park planning.

The ideal approach is to incorporate historic site features directly into the proposed design: historic stone walls, tree plantings and hedgerows can be used to border proposed entrance roads or house lots, for example. The historic "home lot" spaces around a historic farmstead can be preserved in the organization of homes and yards in the proposed development. Preservation of historic elements within the plan is the first step,

and if carefully done can establish a theme for the development. Another possibility is for interpretation of historic elements as part of a park system. This could involve a trail leading to an historic site, an old barn foundation incorporated in a garden, and so on.

Buffers

The use of open space as a buffer between the proposed development and neighboring properties is common in older cluster subdivisions, and often the reason they fail as improvements to conventional development. The problem is that by incorporating much of the open space created by clustering the development in a buffer zone at the periphery of the project, you lose much of the opportunity to leverage the value of that open space to the benefit of the residents. While neighbors may have a screened view of the new homes, only the homes at the edge of the development can benefit from views of the open space. Meanwhile the density at the center of the development is higher, and looks higher, without the immediate amenity of shared open space.

When much of the open space in a Cluster Subdivision is used to create buffers between new homes and neighboring parcels, there is less opportunity to preserve significant resources or provide recreational amenities.

The solution is to eliminate the need for buffers by designing a project which fits in better with the surrounding neighborhood. Where buffers are absolutely necessary, preservation of existing site features like walls and hedgerows should be the first option, rather than mere open space set backs that look good on paper, but provide little real privacy.

Design Guidelines for Open Space

Treatment of Streams and Water Bodies

State law provides for DEM oversight of construction within 50-200 feet of wetlands and waterbodies, depending on wetland type. This limits direct impact on wetlands from construction of roads and structures, but this protection is often irrelevant in open space areas, where alterations to grades and vegetative cover can still occur, and sometimes happen long after construction ends. State setbacks should be considered minimums; since each site is unique, setbacks should be established based on the sensitivity of the resource and potential impacts. For example, a vernal pool may need to be surrounded by several hundred feet of undisturbed forest to ensure the survival of all the species using that habitat. Where uses of the open space such as mountain bike trails or agriculture raise the possibility of increased stormwater runoff and sedimentation, management techniques such as interceptor swales or settling pools may be more valuable in preventing pollution than setbacks alone. Again, the critical need may not be protection of acres of land per se, but rather prevention of erosions and sedimentation, or simply the ability of animals to move through the area. Amherst, Massachusetts, for example, is famous for the "salamander tunnels" the town installed to allow some rare amphibians to move safely from their breeding grounds to their winter home on the other side of a busy street. A wetland biologist who is a member of the Rhode Island Wetland Association has the training and expertise to provide consultation on potential impacts to wetland functions and values.

On the scale of the site, arbitrary setbacks are less useful than an understanding of soils, vegetation, and wetland ecology.

Integration of Stormwater Management Systems

Stormwater systems typically are designed only on the basis of function and cost, with little concern for aesthetics or provision for natural habitat. As with other aspects of conservation development, these necessary "plumbing fixtures" provide an opportunity to leverage additional benefits from an investment you have to make

anyway. The typical approach catches stormwater from roads and rooftops, and directs it through pipes or surface swales to a stormwater detention basin surrounded by chainlink fence, where the water is kept and slowly released. The creative alternative is to design a system that looks and functions more like a natural system of streams, ponds, and wetlands – dealing with the stormwater flows, but also providing wildlife habitat and a visual amenity that adds to the value of the development. These systems can be designed as a "treatment train," which mimics the functioning of a natural stream system: runoff is channeled into a small pond, where sediments begin to settle out, before passing into a constructed wetland, where plants absorb nutrients and other pollutants; further stream flow mixes oxygen into the water, and larger ponds provide natural decontamination by sunlight on open water. After initial construction the system is largely self-maintaining, and the living plant systems can grow or shrink in response to the level of water and nutrient loads. Such systems can also serve as ideal extensions and buffers of existing streams and naturally-occurring wetlands, extending wildlife habitat and areas for human use and enjoyment (see Sustainable Stormwater Management, p.58).

Treatment of Steep Slopes and Erodible Soils

Steep slopes and soils subject to erosion and sedimentation will have been identified as unbuildable or constrained in earlier steps, but that doesn't solve the problem of how to deal with them as part of protected open space areas, where they can be ruined by inappropriate use, or create a risk to life and limb. Physical stability can be created through a variety of techniques, from reinforced concrete retaining walls to bio-engineered slope treatments, but the best approach is to leave natural vegetation in place, if possible, while looking for ways to reduce possible erosive activities such as hiking, mountain bikes, and horseback riding. Education of homeowners and other likely users of these areas is a good way to reduce impacts; in the case of steep slopes some signage or fencing may be required to keep kids from being injured. In special cases, the bylaws of the homeowner's association or other management plans should provide diagrams and written guidelines for protection of sensitive areas.

Mature forests develop a complex layered ecosystem with canopy trees, shrubs and ground-cover vegetation that is hard to recreate once it has been disturbed.

Treatment of Forested Areas

Design of woodlands will most likely involve management rather than construction, with an eye to retaining and encouraging native vegetation. In areas where the Conservation Development is carved out of the existing forest, the remaining woodland edge often has a scalped appearance at the clearing line, where trees lack the lower branches they would logically have if they were always at the edge of an open space. It is important to ensure that, along with the usual clearing and grubbing operations, the developer gets an arborist to prune the remaining trees to remove dead limbs and encourage growth. The clearing line itself too often is too straight to look natural; careful planning and marking of trees in the field before clearing begins can establish a more varied, irregular clearing line that weaves in and out to take advantage of the best trees. The interior of wooded areas, meanwhile, should be left alone in most cases; if invasive vines and other plants have taken root, a concerted effort to weed them out at the start of construction pays big dividends later on. Even if active forestry or timber harvesting is not contemplated, it's worth consulting a forester for advice on management options to promote more healthy growth of desirable trees. A wildlife scientist can provide information on enhancing wildlife habitat.

Hedgerows are another rural design element that most people take for granted, but which can benefit greatly from some proactive maintenance. Thinning of undesirable species such as Norway Maple, Bittersweet, grape vines, etc., can leave room for long-lived native species to flourish. Hedgerows can be kept rather formal through regular clipping and lopping, or left to grow more naturally, in either case reflecting the design of the overall development.

Individual trees can be extremely valuable to the

character of a new development, but are vulnerable to changes in groundwater, soil compaction, or sunlight caused by nearby clearing or construction. These impacts can be mitigated by pruning and fertilizing trees early in the construction process, watering during dry periods, and protection with fencing to prevent soil compaction and mechanical damage by vehicles or equipment.

Design of Agricultural Areas, Pastures and Croplands

One of the charms of the rural landscape is the orderly pattern of row crops, trees in an orchard, or furrows in a plowed field. The pastoral simplicity of a rolling meadow set about with clumps of trees is such a successful design statement that it long ago was borrowed as the theme for parks and estates across Europe and America. The fact that in much of Rhode Island these beautiful landscapes are still tied directly to actual food production only adds to their potential richness as part of a Conservation Development project. If agricultural uses are preserved as part of the plan, they will not need to be "designed" in the artistic sense. Often changes in access, the need to prevent conflicts with residents and other concerns will require changes in fencing and farm roads, but otherwise the form of agricultural areas should follow their intended function. Hay fields and pasturage can be more actively shaped to enhance views and overall composition, with an eye to creating long vistas that unfold gradually as you move through the space.

In areas with sensitivity for water quality, such as water supply watersheds or aquifer recharge areas, the local conservation district should be consulted to ensure selection of low-impact crops and farming techniques. Well-defined best management practices have been established for many types of farming that help limit run-off and groundwater pollution. The farmer should be involved early in the process to make sure that any limits or management guidelines are practical and achievable in day-to-day operations.

Agricultural or forestry uses of open space, including Christmas tree farming, can produce a landscape with both visual interest and profit-making potential.

Treatment of Historic Structures & Sites

Occasionally historic structures like barns and stone walls will be part of open space areas. These can be worked into an overall design scheme that builds on the original geometry of fields and fence lines, if not preserving these features in their entirety at least not directly conflicting with them. The best way to ensure protection of historic features is to put them to use: stone walls that mark the boundaries of lots will be maintained by the owners; barns and other outbuildings can be put to active use for storage of maintenance or sports equipment, or converted for use as community centers. They can also disguise equipment needed for water pumping and storage, or for shared wastewater treatment systems.

In some cases, historic features may be unique enough to warrant special efforts to preserve and interpret artifacts. Dams and associated mill equipment, for example, are particularly evocative of local history and lend themselves to incorporation into short historic trails. Such features can provide a visual focus to public space and help to create a sense of place for the development. The local historic commission or state historic preservation office should be consulted in planning for protection and interpretation of historic features.

Protection of Scenic Views & Viewsheds

There is a natural tension between the provision of views for the residents of a development and the protection of views from surrounding streets, since it is difficult to do a good job for both. The first step is to identify the prominent views of the site from neighboring streets and other public areas, especially open meadows along the roadside and visually-prominent topographic features such as knolls, hilltops and ridges. Selective clearing can enhance view of these areas from both inside and outside of the property. More important than any single view is an understanding of the place of the site in the visual experience of the neighborhood. Is it part of a long sweep of farmland along the roadside, or a single break of open space in an area of forest? Is it the only place to get a clear view of the distant hills, or more important as an enclosed landscape of forest? By understanding the part the site plays in its larger landscape, for example, the designer can put some houses in the view while still maintaining the larger overall pattern.

Kenyon Farm Case Study:

With option B selected as the preferred plan, the next step refines the use and design of each of the open space areas. Areas in active agriculture (1) are to remain under the control of the farm family. As plans progress, the current and future plans for the farm operation will be critical, including access for equipment and animals, fence locations, and possible limits on access for residents.

Areas to remain in forest (2) will stay in a natural state, subject to a management plan that should explore enhancement of timber value and wildlife habitat. Trails (3) are shown as a series of loops through the forest and around the cornfield and pond, with a possible connection over a bridge to the golf course that lies beyond the south boundary of the site. Final trail locations should be laid out in the field, and final plan submissions should include cross sections and specifications for trail construction.

A small equestrian center (4) provides one possible user of the trail system. An existing pasture is retained for the horses, and access to the stable comes off the cul-de-sac at the southeast side of the development.

As the scheme with the smallest individual lots, providing active use and enhancement of the surrounding open space is an important part of maintaining the value of the house lots compared to a conventional large-lot scheme. With such enhancement and forethought, the visual character and recreational opportunities of this plan far outweigh the other plan alternatives.

Step 9. Draw in the Lot Lines

Introduction

While lot lines and the geometry of metes and bounds are often the focus of subdivision design, the whole point of Conservation Development is to encourage applicants to design a well-planned, livable community first, and worry about lot sizes and dimensions afterwards. Yet as a practical matter these legal descriptions carry enormous importance to future homeowners. A poorly conceived lot layout can set neighbor against neighbor, and residents against the town. A well-planned layout is closely tied to the logic of actual land use; when done properly, the system is invisible and rarely becomes an issue, simply reinforcing in deed descriptions boundaries that make sense on the ground. Some issues to consider include:

Respecting Natural Boundaries

Surveyors and engineers are often trained to simplify lot layouts, describing with the minimum number of points and boundary lines all the lots in a development. This saves drawing time in the studio, but more importantly reduces costs in the field, where each property boundary marker adds to the total cost of development. This makes a lot of sense, but can result in boundaries that ignore natural features like streams and water bodies, or cultural features like stone walls -- emphasizing efficiency over actual physical features. The best approach is a balance of simplicity with logical placement within the site. Streams, ponds, obvious changes in landform, stone walls, hedgerows, or trail corridors provide sensible places to set lot lines, and make future boundary questions clearer. Variable lot sizes should be encouraged where these allow the applicant to better fit the plan to the site. A little variation has the added benefit of promoting visual variety, helping to avoid the cookie-cutter subdivision effect.

Lot lines work much better when they are drawn to correspond to the most logical existing or created enclosing elements, such as stone walls, hedgerows, and forest edges.

Condominium vs. Individual Lots

When people hear the word condominium, they usually think of the typical “condo development,” with its attached townhouses, lack of private space outside the homes, and restrictive rules and regulations. “Condominium” has become associated with a style of development, rather than what it really is, which is merely a form of ownership in which units are individually owned, but all the land is in common ownership. When described in these broader terms, condominium ownership provides some interesting possibilities for Conservation Development. For one thing, there are more flexible setback requirements between houses or yards, so the layout can take advantage of unique site features. Houses and garages don’t need to be lined up in rows, but rather can be staggered or even braided in different ways to create a variety of private and public spaces that use the site more efficiently with better results. And, for good or bad, depending on your point of view, the homeowner’s association can be structured to have common responsibility for maintenance of building facades, landscaping, etc., and can ensure consistent treatment of areas visible from public streets.

Having individual lots, even very small lots, does provide some advantages. Buyers used to having their own yard move into something much like they had before. Individual approaches to landscaping, holiday lighting and other personal statements occur with the freedom of ordinary neighborhoods. Perhaps most importantly, private front and back yards coincide with lot lines, providing the kind of semi-secluded transitional space between the public space of the street and the private space within the home. All these things are possible with condominium ownership, but always with the possibility, however faint, that association boards establish overly restrictive aesthetic standards.

Street Right-of-Way (R.O.W.)

Local Land Development and Subdivision Regulations will typically establish the required width of the right-of-way -- that area, usually conveyed to town ownership, containing the paved street, sidewalks, utilities, street tree plantings, etc. In most towns rights-of-way vary from 40 feet to 60 feet, with 50 feet most common. Some interesting variations that emphasize the public use of the street and adjoining areas allow for wider than usual R.O.W. widths, and incorporate open space elements directly into the public street cross section. This can include the boulevard approach, with two opposite travel lanes separated by a green strip – which itself can vary from a few feet to the width of a town common or park on the order of Commonwealth Avenue in Boston. Another variation, using smaller R.O.W. widths involves the alley or lane. These traditional kinds of minor streets were often only one rod – 161/2 feet – wide, providing public access to a few houses off a country road or to the rear of properties in a town or village center. Both are increasing in popularity along with the rediscovery of traditional village planning principles.

Reduced road width can raise concerns with police, fire and other services concerned with emergency access. Where access is an issue, one answer is to maintain the standard 50 or 60 foot right of way but reduce the paved portion to 24 feet or less. Replace curbs with grass swales but design the sub-base of the road to extend to the swale. If designed properly with a good base, the swale can serve as a runoff filter and safe pull off or parking area. Geotextiles can be used to enhance vehicle support where necessary.

(For more on road width, see reference to Walter Kulash's Residential Streets, p.57).

Utility and Trail Easements

Utility corridors often need to follow the shortest route to save money, or follow the contours of the land in the case of sewer or stormwater systems. Trails likewise respond specifically to the "desire line" between destinations, linking up as directly as possible both ends of the journey. In all these cases, these shared public elements can thus lie across parts of the parcel that otherwise are best made part of a private house lot.

The use of easements is well established to deal with these contingencies. An easement is essentially a surveyed corridor shown on the deed and recorded plans for the affected parcel, indicating public rights and responsibilities for an agreed upon use. Thus, a utility easement provides for water, sewer, gas, or electric lines to cross above or below private property, and give town agencies or utility companies the right to maintain access, clear brush etc. Likewise, trail easements provide for permanent access to private lands for the purpose of using the trail.

Minimum Area for Individual Septic System and Water Supply

As described in Part 2, a fundamental question with Conservation Development is the size of a house lot necessary to accommodate private sewage disposal and water supply well while avoiding contamination of water supplies and the environment. There is no absolute answer, since the potential for contamination varies with the capability of soils, hydrology and other site features, and homeowner practices. Most towns justify one, two or even five-acre minimum lots sizes based on the typical lot size that prevents problems in different parts of the town. In any case, in a Conservation Development the aggregate amount of nitrogen loading into the surrounding environment will likely remain the same as for conventional development. The greater concern is for ensuring that wells are not so close to each other that there is competition for water in dry seasons, and that septic systems are not so close to each other or to wells as to contaminate drinking water. Thus, under good conditions you may be able to start with 2 acres per unit and cluster down to ½ acre, have plenty of room for septic system and well, and save 75% of the parcel as open space. But, the only way to predict for sure is through careful analysis of soils, hydrology, and potential water sources.

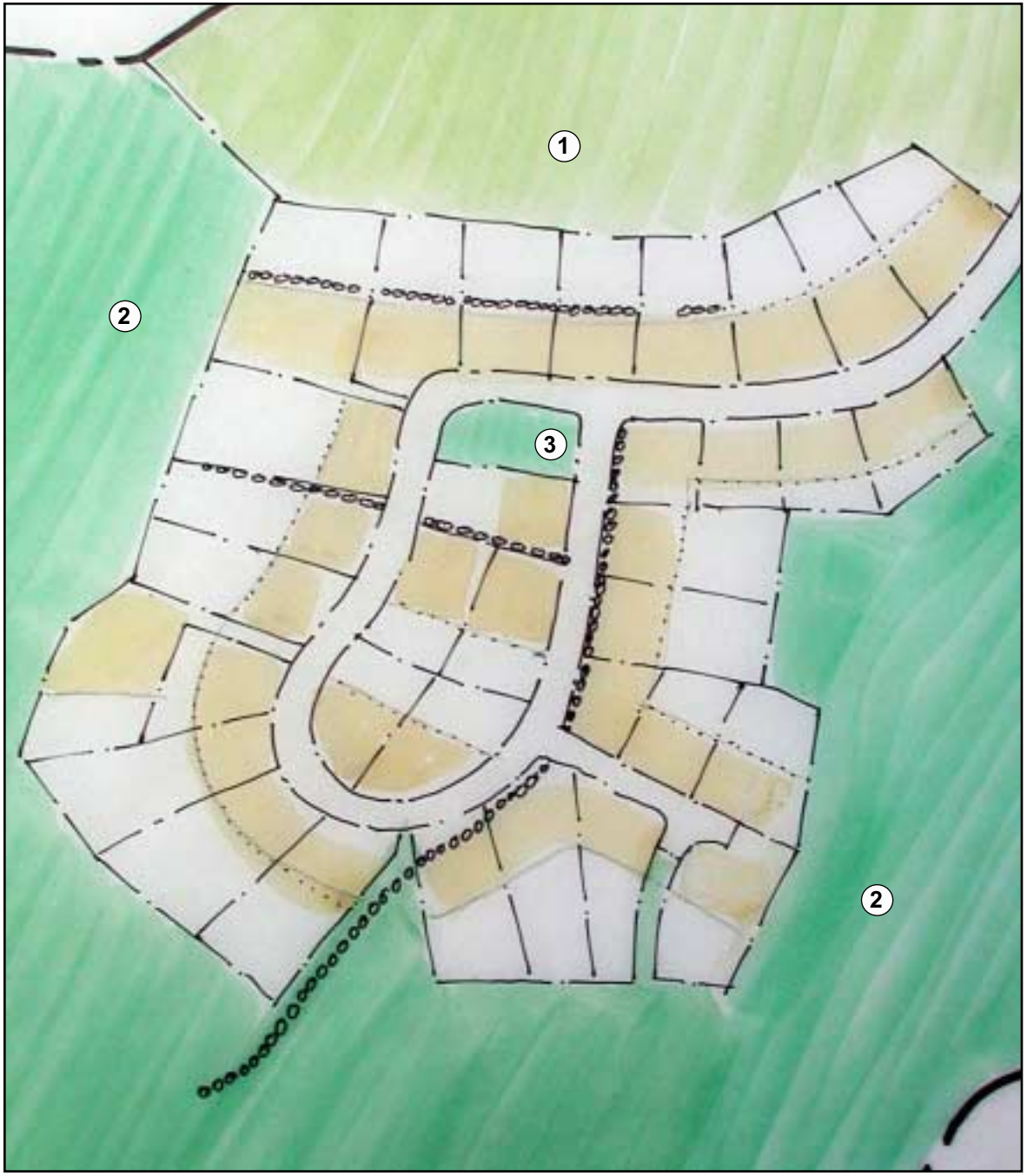
There is no magic formula; the place to start is in the physical capabilities of the landscape, which will be well documented by the time the yield plan calculations are completed. Under constrained circumstances, it may be worth taking another look at condominium ownership or shared water and or septic systems separate from the building lots. If there is a need for larger setbacks between septic systems and wells, it may be possible to draw lot lines further back from the buildings to enclose a well site, or septic system location, that is at a greater distance from the structure. In this case, the "backyard" of each unit extends as a long rectangle into what may be designated as "shared open space" in the conceptual development plan. This maintains individual ownership of the well or septic system, but may require visual or trail easements across the rear of individual house lots to ensure that the community retains the physical or visual access to the area which was envisioned by the master plan.

Kenyon Farm Case Study:

Individual house lots, averaging about 1/2 acre, are drawn in locations that make use of existing walls and tree lines as natural boundaries that will make sense to future residents. A fifty foot right-of-way would be taken over by the town or remain as a private road managed by the homeowner's association.

The area of each lot shown in tan represents a building envelope, which is the area where the structures must be built. Based on the overall concept for the streetscape, this is designed to ensure that each house is built fairly close to the road, with the exception of two houses on rear lots on the west side of the development. The building envelopes are also laid out, where possible, in reference to existing stone walls and tree lines, to make it easier to identify these locations in the field. For Preliminary and Final Plan submissions, the building envelopes would be more carefully delineated to reflect detailed site surveys and finalized town objectives for protection of sensitive resources, visual buffers, etc. The Final Plan should indicate locations for protective fencing to limit disturbance during construction.

Separate lots for open space are also shown, including the area to be leased or owned by the farmer (1), areas to remain in forest (2) and a small park area within the neighborhood (3).



Introduction

Conventional development emphasizes only two kinds of ownership; private house lots and publicly-owned streets. One of the potential benefits of Conservation Development is that it encourages the creation of a third kind of neighborhood space – neither entirely public or private – shared by residents of the development and in some cases open to the residents of the surrounding town. As with other aspects of Conservation Development, this shared open space creates great opportunities for community design, but carries with it the potential for confusion and controversy if ownership and management responsibilities are not crystal clear.

State statutes (Section 45-24-47(D)) provide for four options for ownership of the open space:

> "A zoning ordinance provides that open land provided by a cluster development or other land development project for public or common use, shall either: (i) be conveyed to the city or town and accepted by it for park, open space, agricultural, or other specified use or uses, or (ii) be conveyed to a nonprofit organization, the principal purpose of which is the conservation of open space or resource protection, or (iii) be conveyed to a corporation or trust owned or to be owned by the owners of lots or units within the development, or owners of shares within a cooperative development. If such a corporation or trust is used, ownership shall pass with conveyances of the lots or units, or (iv) remain in private ownership if the use is limited to agriculture, habitat or forestry, and the city or town has set forth in its community comprehensive plan and zoning ordinance that private ownership is necessary for the preservation and management of the agricultural, habitat or forest resources.
>
> (2) In any case where the land is not conveyed to the city or town: (i) a restriction, in perpetuity, enforceable by the city or town or by any owner of property in the cluster or other land development project in which the land is located shall be recorded providing that the lands shall be kept in the authorized conditions(s) and not be built upon or developed for accessory uses such as parking or roadway; and (ii) The developmental rights and other conservation easements on the land may be held, in perpetuity, by a nonprofit organization, the principal purpose of which is the conservation of open space or resource protection.
>
> (3) All open space land provided by a cluster development or other land development project shall be subject to a community approved management plan that will specify the permitted uses for the open space."

While this statute, revised in 2002, thus requires a town-approved management plan for protected open space, responsibility for other shared elements, such as streets and sidewalks, walking paths, recreation facilities and so on, can fall through the cracks if they are not part of the initial management plan. The management plan should therefore include both open space areas and other parts of the development that are accessible to or viewed by the residents.

The bylaws of a typical condominium association, for example, often describe in detail exactly what is allowed, down to planting of flowers, display of flags, mail box styles, etc. This is not to suggest that such stringent rules are desirable in the typical Conservation Development, but rather that clear, up-front agreement on the management of open space and other community elements can enhance the visual character and quality of life, not to mention property values, of all future residents. The danger of this approach, as too many condominium residents have found, is that such a rigid system is set up that all personal expression and natural growth and maturing of the community is choked off.

Choosing the Best Owner for the Open Space

The choice of the future owner of the open space should be based on careful analysis of its use, character, and resource sensitivity. Each of the four options is well-tested and reliable – given the right fit between the ownership scheme, the proposed use, and the site itself:

Ownership by city or town

- Most accessible to local residents
- No cost acquisition of public open space
- Town assumes ongoing maintenance responsibilities
- Most suitable in the case of lands set aside for public parks and recreation areas

Ownership by a Non-profit Group

- Predictable track record of management abilities
- Clear goals for use and stewardship
- Staff responsibility
- Ideal for significant natural resources & habitat.
- Strong leadership in habitat and historic preservation

Ownership by Homeowner's Association

- Homeowners "buy in" to management responsibilities
- Developer structures association and subsidizes it prior to sale of lots
- Membership required and automatic for purchasers and their successors
- Association maintains insurance and taxes on open space
- Members share costs of maintenance
- Most suitable for semi-private recreation, buffers, neighborhood playgrounds, etc.
- Should be automatic with purchase of property

Private Ownership for Farm, Forest or Habitat use

- Keeps land on local tax rolls.
- Streamlines management and maintenance.
- Gives managers more control over land use decisions.
- Allows farmers to keep farming just as they have before, while allowing development on a portion of their land.

Allowing farmers to keep farming is a no-cost solution to ongoing maintenance of open space, but residents must be willing to cope with the sights and smells of agriculture.

Tax issues can sometimes play a part in the open space ownership decision. Some towns are reluctant to take on more conservation land if it removes land from the tax rolls – however, it must be recognized that land restricted to open space use, even by a private owner, should have a low assessment, particularly if the land was enrolled in the Farm, Forest and Open Space Act, which assesses land for current use rather than development value. It can also be argued that the private house lots surrounding the protected open space increase in value as a result of that protection. Homeowners end up paying increased taxes which balance the revenue lost to the town, if any, resulting from lower assessments on the open space.

Ensuring Ongoing Management of Conservation Lands

A suitable open space management plan can be as brief as a couple of pages or make up an entire volume, depending on ownership structure and the proposed uses and programming of the open space. In either case, trying to think up a rule or restriction to cover every contingency will probably be less successful than stating overall goals and objectives -- establishing in plain English what the desired outcomes are -- while leaving some room for interpretation by a committee of future owners and users. In addition to written description, a diagrammatic plan based on the Final Plan for the development will help to clearly demarcate areas described in the text. The process should provide for update of the plan at five or ten year intervals, with town review and approval.

Promoting Private Management of Agricultural and Forest Lands

Any one of these ownership options provides the opportunity for sub-leasing open space areas to a farmer or other entity that would continue productive use of the land. This reduces maintenance costs and preserves rural character. The farmer gets low-cost land, while the owner gets some oversight over how the land is used. Just what uses and how much oversight needs to be thought through ahead of time and carefully written up in a management plan that protects the rights of the farmer as well as future residents. Rhode Island Conservation Districts can be consulted to assist in developing appropriate management objectives and a corresponding management plan for open space to be used as a working landscape.

Suggested Requirements For Open Space Plans

As part of the process of creating the open space management plan, a separate plan based on the Final Plan for the development should be drawn up. All the necessary information can be assembled from the other parts of the Final Plan set, and should include these elements:

- General location, area and proposed uses
- Existing topography, vegetation, wetlands and waterbodies
- Location of existing and proposed structures, walls and other unique natural or cultural features
- Proposed clearing, excavation and regrading
- Location and amount of paving and other impervious surfaces
- Proposed protection of sensitive areas and important trees and other vegetation during and after construction

After construction is completed, an “as built” plan should be recorded with the written management plan to show any changes from the Final Plan as approved by the town, which always evolves somewhat during construction in response to site conditions. This often involves changes to lines of clearing, improvements to the grading or drainage scheme, removal of trees that die during construction or which turn out to be hazardous, etc. In addition to ensuring compliance with the Final Plan, the as-built can be used by the entity which ends up owning the open space as part of their legal documentation.

Paying for Ongoing Maintenance

Where a homeowner's association or the town will own the open space, funding sources are fairly straightforward. The annual fees for the homeowner's association provide revenue for maintenance of open space, in addition to any other shared facilities. Especially in rural areas, it will be important to keep maintenance cost low, which can be accomplished by keeping open space areas in a natural, "self-maintaining" state, using local farmers to mow meadows, and otherwise avoiding a lot of fussy landscaping. Where the town owns the open space, it will be likely be brought into the larger system of town parks and conservation areas and maintained at a similar level by the DPW or parks department. Recognizing the limitations of local budgets, town-owned conservation areas are often adopted by neighborhood groups which provide volunteers to do annual maintenance of parking areas, trails, etc.

Where a non-profit group will own the open space, it is becoming more common to establish a permanent endowment at the beginning of the project to pay for maintenance. This typically requires annual interest income sufficient to hire a private contractor to maintain the property – which means establishing an account on the order of twenty times the annual expenditure. In the absence of a generous donor, coming up with this amount can be difficult. One source is the dedication of revenue from the sale of one or several additional lots beyond what is needed to make the project profitable. This reduces the immediate profit for the developer, but by adding value to the remaining lots (by eliminating future homeowner fees), can allow him to charge more for the remaining lots.

Dedicated endowments are increasingly used as a tool to fund maintenance of publicly-owned parks. Perhaps the best example is the Central Park Conservancy in New York City, which receives some public funding, but also raises money from private donations and event fees which pays for maintenance. Especially where the open space is a public park, this provides for appropriate town oversight and control, while reducing the drain on the annual budget – which can be the key to getting town support for one-time capital outlays.

Establishing Conservation Easements or Restrictions

Regardless of who owns the open space, permanent protection can be enhanced with a conservation easement recorded with the property deed. This is required by Rhode Island statute for open space that is not given to the town; it may be just as important to establish such easements on town-owned land to avoid future urges to use the open space for new schools or other projects. Adding multiple parties to the easement ensures a further measure of protection. For example, the town may be responsible for enforcing the terms of an easement, but lack the money or staff time to provide regular inspections; if a non-profit group is also named as a holder of the easement, they can send someone out to keep an eye of things, and manage the hiring of contractors to do critical maintenance in a timely way if the owner has failed to do so. The easement should provide for the enforcing agency to be able to recoup the cost of such expenses from the owner, and to place a lien on the property if the bill is not paid.

Liability and Insurance Issues

Both public and private landowners are shielded by state law from most liability for injuries to those using their lands for recreation. Chapter 32-6-3 of Rhode Island General Laws establishes that

> "…an owner of land who either directly or indirectly invites or permits without charge any person to use that property for recreational purposes does not thereby:
>
> Extend any assurance that the premises are safe for any purpose;
> Confer upon that person the legal status of an invitee or licensee to who a duty of care is owed; nor
> Assume responsibility for or incur liability to any person or property caused by an act of omission of that person."

This limitation of liability can only be challenged if the owner charges a fee for the recreational use of the land or exhibits "…the willful or malicious failure to guard or warn against a dangerous condition, use, structure, or activity after discovering the user's peril…" (Sec.32-6-5). What this means is that there can be public access to open space, and that the owner can even provide trails and other amenities, without being open to liability for damages unless there is gross negligence involved – such as excavating an open trench across a trail – simply tripping over a log doesn't make the landowner liable.

The best defense is a carefully thought through and implemented plan that provides reasonable protection from injury – which is important in any subdivision project, not just Conservation Development. Cellar holes and old wells should be stabilized or filled in, collapsing outbuildings and old barbed wire carted away, and dead branches and trees removed where they overhang trails and gathering places. That being said, many towns and homeowner's associations maintain some liability insurance to cover contingencies. If there is likely to be heavy public use and the site has cliffs or swimming holes and the like, town ownership may make the most sense.

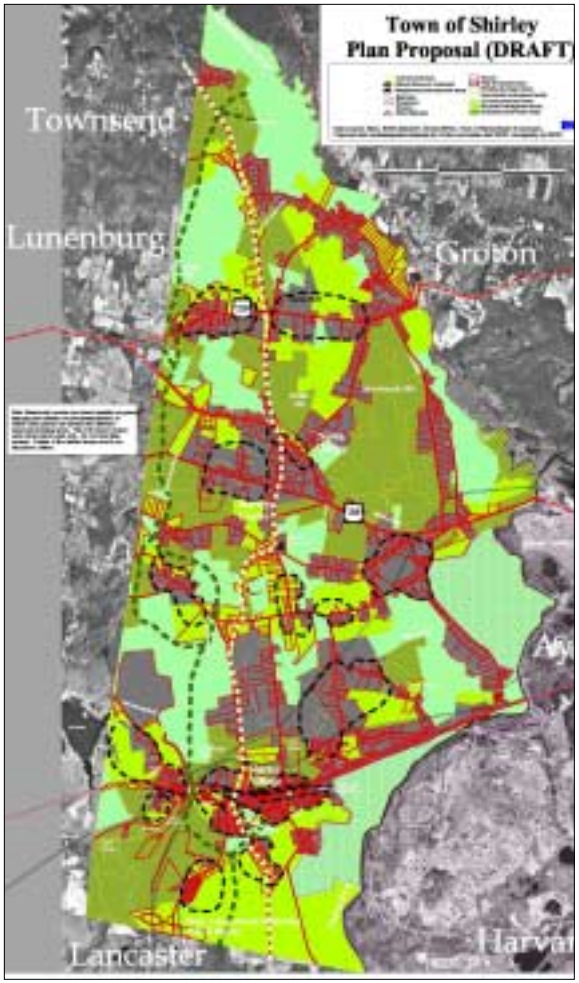
Introduction

If you have read this far, you will understand that Conservation Development is not just a new form of regulatory control to be administered by zoning officials; rather, it is a collaborative process that may involve many different groups. For example, developers or individual landowners can agree to shift road, driveway and house locations, or even to limit the number of house lots, in order to preserve sensitive resources. Towns can work with residents to prepare neighborhood masterplans that lay out, at least conceptually, desired areas of conservation and development. Land trusts can buy land and develop a part of the property to recoup costs, while putting the rest into permanent conservation. Along the way, both public and private planners can apply the principles of contextual design and resource-based site planning to make all development projects better.

One of the reasons that conventional subdivisions are so common is that the process is relatively simple and straightforward. Conservation Development, on the other hand, can seem like a relatively complex process, with more options and decisions at each stage of the review. Therefore, in order to successfully implement Conservation Development in your community, it is may be necessary to look at local plans, ordinances, and review procedures so that Conservation Development is as easy as conventional development.

Conservation Development and the Local Comprehensive Plan

Besides recommending land uses and densities, a town's Comprehensive Plan and Open Space Plan should identify specific physical goals for protection of key landscapes and establishment of open space corridors and trail networks. At the same time, the plans should identify growth centers where Conservation Development projects could infill suitable parcels within town or village centers, establish stronger edges on the outskirts of developed areas, or create stronger neighborhoods in rural districts.



Progressive Comprehensive Plans go beyond policy statements to establish clear physical boundaries for future conservation areas and growth centers, as shown in this proposed land use plan for Shirley, Massachusetts.

While a *good* Comprehensive Plan will make clear recommendations for areas suitable for future conservation and development, a *great* Comprehensive Planning process builds the *political will* to support the changes in zoning and development regulations that may be necessary to adopt a Conservation Development ordinance. With such public support in place, Rhode Island land use enabling legislation provides an efficient procedural framework on which to build Conservation Development into local zoning and development regulations. The administration of these new or altered elements may create some initial administrative complications, especially in towns where clustering of any kind has not previously been allowed. Fear of these complications, in fact, as well as the time and expense involved in adopting them, may be the primary source of local reluctance to adopt Conservation Development. But, as described below, a relatively simple series of administrative procedures can make the process relatively painless – especially when compared to the experience of Planning Board members who may have spent many unhappy years "rubber stamping" conventional development plans.

Finally, implementation of Conservation Development can be promoted through specific actions by both the public and private sectors. These can include town efforts to preserve open space and trail corridors either through outright purchase or as easements, along with the work of land trusts and private conservation groups to do the same. Increasingly common, however, are conservation projects that actually develop a portion of a site in order to pay for the protection of a particular resource area. While this proactive approach has been used frequently by land trusts throughout the Northeast, it is becoming a more common tool for traditional conservation groups, and even town government.

Section 45-24-34 of the Rhode Island Enabling Act of 1991 requires consistency of zoning ordinances with the Comprehensive Plan. This helps to make a direct link between policy decisions in the plan and implementation actions on the ground. That's good news for advocates of Conservation Development, which is a terrific tool for protecting rural character and promoting sustainable development – policies which most comprehensive plans support. Yet the Comprehensive Plan can also be a stumbling block to Conservation Development. Developed by committees over the course of several years, the Comprehensive Plan usually represents a consensus about such things as recommended land uses and densities – the trouble is that in order to achieve that consensus there are often compromises on such issues as lot size, frontage requirements, and so on.

Towns can have good Comprehensive Plans, Open Space Plans and Conservation Development ordinances that allow clustering to protect open space -- but if they are not coordinated, the result can be disappointing, as in this Massachusetts example, where even though open space was protected, the new neighborhood is still a hodgepodge of suburban houselots.

These compromises tend to even out differences between existing development centers and potential development areas. Often, minimum required lot sizes for new construction in town or village centers end up being larger than the average size of surrounding older structures. Meanwhile, in rural areas which historically may have had very large parcels in the tens or hundreds of acres, zoning densities are often set as high as one or two acres per unit. As a result, Comprehensive Plans often say on one page that the town should protect its rural character and encourage growth in or near existing centers, while on another page recommended densities in all areas that are set at nearly the same level, making growth of the centers difficult and replacing rural character with suburban sprawl.

The answer starts with making more than a token connection between the Comprehensive Plan and the zoning ordinance: if the aim is truly to protect rural character, cookie cutter two-acre subdivisions won't work. Base densities may need to be reduced, and at the same time minimum lot sizes made more flexible. This is exactly what Conservation Development is designed to promote: by thus separating the overall density on a parcel from lot size, project planners can take advantage of opportunities to put houses closer together where it makes sense. Having the support of the Comprehensive Plan in this endeavor makes it much easier to bring such creative plans before town boards and commissions.

Another area where Comprehensive Plans often fail is in making clear recommendations for the conservation of key parcels and connecting corridors designed to create a town-wide network of open space. A statewide greenways plan was developed a few years ago by the Rhode Island Greenways Council, and is part of the State Guide Plan; recently, nine towns in South County participated in a regional Greenspace Planning process that identified the most important natural, cultural, and recreational corridors in each town. These efforts demonstrate what individual towns could do through their Comprehensive Plans to set down specific goals for protection of special areas and linking corridors. Ultimately, this could provide planning boards and developers with guidance for what part of a parcel should be preserved as open space. If each new subdivision is planned with this town-wide greenspace network in mind, the development process itself could be the engine that implements the town's Open Space Plan. This is the real promise and potential of Conservation Development.

Legal Steps to Adopting Conservation Development*

Three Rhode Island enabling acts, the Comprehensive Planning and Land Use Regulation Act of 1988, the Zoning Enabling Act of 1991 and the Land Development and Subdivision Review Enabling Act of 1992 (the Development Review Act) form a triumvirate of authority that must be read together and applied as one body of law. They all require consistency between a local community's Comprehensive Plan, Zoning Ordinance, and Land Development and Subdivision Regulations. As a result, it will be necessary for any local municipality that desires to implement Conservation Development to examine all three of these documents, and possibly to amend all three.

It is in a town's Zoning Ordinance that the basic authority for Conservation Development must be inserted. Such an ordinance explicitly gives the Planning Board the authority to approve developments that differ in carefully measured ways from the rigid formulas of more conventional development.

The Land Development and Subdivision Regulations are where the "meat" of the new rules will be placed. It is neither necessary nor legally permissible to add a whole new set of procedures just for Conservation Development. They can fit into the general procedural framework for all major subdivisions and major land development projects, using the same meeting classifications and timeline.

*This section prepared by Andrew Teitz of Ursillo, Teitz & Ritch, Ltd.

Details of the Subdivision Process and Related Legal Issues

Linkage

All subdivisions, including Conservation Development, need to be explicitly linked to both the community's Zoning Ordinance and Comprehensive Plan. Land Development Projects (formerly known as Planned Unit Developments or PUDs) and Development Plan Review (formerly known as Site Plan Review) are now expressly controlled by the procedures of the Development Review Act. One option is to leave conventional subdivision rules intact (at least for a transition period), and make Conservation Development subdivisions into Land Development Projects which are also in the hands of the Planning Board. The overall scheme is that the planning board "plans" and "reviews" projects, the zoning board grants relief, variances and special permits, and hears appeals, and the town or city council only legislates the broad outline by adopting the comprehensive plan and the zoning ordinance.

Uniform Procedure, Not Substance

A goal of the Development Review Act was to provide a uniform procedure for subdivisions and land development projects throughout the state of Rhode Island. The aim was to allow an applicant to go before the planning board in any one of the 39 cities and towns and find the same terminology in use and the same process. However, the substance of land division regulations has been left almost entirely to the judgment of the municipal governments. Everything else, from the basic lot size set forth in the Zoning Ordinance, to mandatory cluster or conservation requirements, to road construction details, has been left to local discretion. Thus Conservation Development already fits into the legislative and regulatory scheme.

Classification of Development Type

The Development Review Act sets forth three different types of subdivisions which are strictly defined. There are also provisions for two types of land development projects, and development plan review:

Administrative Subdivision. An administrative subdivision is any moving of a lot line, whatsoever, which yields no additional lots for development and involves no creation or extension of streets. This type of subdivision is finalized by a written decision being filed and posted with the town or city clerk just as any other subdivision (R.I. Gen. Laws 45-23-37). Metes and bounds lot divisions are not allowed.

Minor Subdivision. A minor subdivision is five or fewer lots, whether or not residential. If no street is created or extended, then no public hearing is required. If a street is created or extended, than a public hearing must be held. Frontage lots are subject to this requirement.

Major Subdivision. A major subdivision is everything else.

Minor Land Development and Major Land Development. Minor and Major land development are determined by the Zoning Ordinance, and once so determined, are governed by the procedures set forth in the Development Review Act.

Development Plan Review. Development Plan Review must be handled by the Planning Board for applications needing a variance, special-use permit, or zoning ordinance text/map change. For uses that are as-of-right, the review may be handled by the Planning Board, but the Zoning Ordinance can designate another body to handle Development Plan Review.

Pre-application Meeting

Under R.I.G.L. 45-23-35, Pre-application meeting and concept review are now formalized. A pre-application meeting is mandatory for a major subdivision or land development, and optional

at the request of either the municipality or the developer, for everything else. This is the key step to get the developer to realistically consider Conservation Development (if not already mandatory in your regulations) before the developer has spent a great deal of money on engineering and site work on a conventional design. It is at this step that the existing features site analysis would begin. The different element with Conservation Development is that the Planning Board site visit would take place at this stage, as opposed to waiting for a Master Plan application. This way, the Planning Board and staff will also obtain an early familiarity with the existing features and constraints on the site

Master Plan Process

It is at this stage that an applicant would present both the yield plan and the Conservation Development plan. Based on the work already done at the Pre-application stage, the Planning Board would be able to realistically begin reviewing the plan and could settle on a yield plan lot number with the applicant.

Preliminary Plan Process

This is really a misnomer in review of all subdivisions, since it is the main stage of review, and many items have already become vested at Master Plan. However, it is a holdover term from before the Development Review Act of 1992, and is therefore still in use. At this point, the applicant would be expected to have all necessary Federal, State, and other municipal permits and approvals in hand. The expensive engineering would be done and assumptions made at Pre-application and Master Plan can now be verified or disproven. Any substantial changes from those assumptions that are revealed could lead to rejecting the application and/or changing the yield plan.

Final Approval Process

This is mostly an administrative process and would not change regardless of whether the development was conventional or conservation.

Administrative Officer

Under R.I.G.L. 45-23-55, an Administrative Officer must be selected to administer the local regulation and the review process. However, the selection and qualifications are left open to the municipality to decide. Note that under the definition, 45-23-32(l), the Administrative Officer may be a member of, or the chair of, the Planning Board, or an appointed official. If there is a Technical Review Committee, the chair MUST be the Administrative Officer. If a community is going to adopt Conservation Development regulations, it will put additional responsibilities on the Administrative Officer and such person must be capable of handling them.

Technical Review Committee

Under R.I.G.L. 45-23-56, a Technical Review Committee (TRC) may be created to handle some of the duties of the Planning Board. It is chaired by the Administrative Officer and must have at least three members. The rest is open to the municipality to decide. Its decisions are not binding on the Planning Board, but the TRC can receive the delegated power from the Planning Board to approve certain applications, e.g. Development Plan Review. If a community does not yet have a TRC, the adoption of Conservation Development regulations would be an excellent time to create one, which could then handle some of the extra work.

Precedence of Approvals

Under R.I.G.L. 45-23-61, approval of a special-use permit is a three-step process, with the Planning Board reviewing both first and last, and the Zoning Board or Council going in the middle. It is a cumbersome process, and thus it is recommended that Conservation Development NOT be made a special use permit.

Waivers

Under R.I.G.L. 45-23-62, waiver of local regulations, can now be granted by the Planning Board, under certain circumstances. In addition to undue hardship, a waiver can be granted for good planning practice or design which is evidenced by consistency with the Comprehensive Plan and the Zoning Ordinance. In the context of Conservation Development, a Planning Board may be given explicit authority to waive dimensional provisions of the zoning ordinance as an incentive, pursuant to R.I.G.L. 44-24-47(B) when reviewing a land development project. That section reads: "In reviewing, hearing, and deciding upon a land development project, the city or town planning board or commission may be empowered to allow zoning incentives within the project, provided standards for such adjustments are described in the zoning ordinance…" (Emphasis added). These incentives explicitly include open space.

Vested Rights – a vested right is: "The right to initiate or continue the development of an approved project for a specified period of time, under the regulations that were in effect at the time of approval, even if, after the approval, the regulations change prior to the completion of the project." Thus a vested right concerns the right to continue a project under prior regulations. It will be important to explain in the Zoning Ordinance and Subdivision Regulations just how previously-approved or partially-approved subdivisions are to be treated under the Conservation Development regulations.

Findings Necessary by Planning Board for Approval

Before a Planning Board can approve a subdivision there are certain findings which it must make. Planning Board members must be aware of those required findings just as much for Conservation Development as for conventional development. They are as follows:

"Section 45-23-60. Procedure – Required findings. – All local regulations shall require that for all administrative, minor, and major development applications the approving authorities responsible for land development and subdivision review and approval shall address each of the general purposes stated in R.I.G.L. 45-23-30 and shall make positive findings on the following standard provisions, as part of the proposed project's record prior to approval:

The proposed development is consistent with the comprehensive community plan and/or has satisfactorily addressed the issues where there may be inconsistencies;

The proposed development is in compliance with the standards and provisions of the municipality's zoning ordinance;

There will be no significant negative environmental impacts from the proposed development as shown on the final plan, with all required conditions for approval;

Subdivision, as proposed, will not result in the creation of individual lots with such physical constraints to development that building on those lots according to pertinent regulation and building standards would be impracticable. Lots with such physical constraints to development may be created only if identified as permanent open space or permanently reserved for a public purpose on the approved, recorded plans; and

All proposed land development and all subdivision lots shall have adequate and permanent physical access to a public street. Lot frontage on a public street without physical access shall not be considered compliance with this requirement."

Conservation Development and Rhode Island Land Development and Subdivision Regulations

The procedures outlined by the ten-step process are nothing new, but they are rarely applied systematically in preparation or review of development proposals. This is because local regulations, based on state enabling legislation for Land Development and Subdivision, focus more on administrative procedures than on planning and design. Rhode Island law (Section 45-23-39) establishes three stages of review for a major subdivision: master plan, preliminary plan, and final plan. In addition, Section 45-23-35 requires at least one pre-application meeting.

At the **Pre-Application** stage, the statute allows the applicant to request an "informal concept plan review" based on "general, conceptual materials." The aim of this review is "…to encourage information sharing and discussion of project concepts among the participants." The reviewing board or committee has 60 days to schedule the meeting after these conceptual materials are submitted, after which the applicant can file a Master Plan submission.

At the **Master Plan** stage, Section 45-23-40 requires submission of information including: "information on the natural and built features of the surrounding neighborhood, existing natural and man-made conditions of the development site, including topographic features, the freshwater wetland and coastal zone boundaries, the floodplains, as well as the proposed design concept, proposed public improvements and dedications, tentative construction phasing, and potential neighborhood impacts."

Preliminary Plan submissions require much of the same information at a greater level of detail: "engineering plans depicting the existing site conditions [and]…the proposed development project, a perimeter survey, all permits required by state of federal agencies prior to commencement of construction, including permits related to freshwater wetlands, the coastal zone, floodplains, preliminary suitability for individual septic disposal systems, public water systems, and connections to state roads."

Beyond this description of minimal elements to be included in proposal submissions, state statutes, as well as many local regulations, leave much to the imagination of the Planning Board and the developer. Depending on the experience of the parties involved, things can go smoothly and the plan can be a great success. More commonly, there is a series of misunderstandings on both sides, compromises no one is happy with, and unnecessary waste of time and effort. The ten step process provides guidance on the site planning and design procedures that go into producing the submissions required by state law and local subdivision regulations.

It must be understood at the outset that the ten step process cannot be divided neatly into these regulatory benchmarks, nor is it a straight line from one end to the other: rather, it becomes a looping, or cyclical process that is repeated at Pre-Application, Master Plan, and Preliminary Plan stages -- at each point becoming more detailed. Thus, at the Pre-Application stage the developer and the town work together to quickly run through the first five or six steps: identifying key site features and resources to be investigated in more detail; getting a general idea of which areas of the site are most suitable for development and developing a few conceptual design alternatives for the layout of the development. This process is repeated in more detail for the Master Plan submission, with site analysis focused on areas that are clearly best for development, and contextual analysis on elements of highest concern to the town. This saves time and money for both the developer and the town, and results in better design because concepts and analysis evolve together.

This circular, or iterative, design process might seem to create more hoops for developers to jump through, but in fact it allows a fair amount of effort to be avoided by identifying early in the process the best development locations, allowing detailed analysis and field surveys to be concentrated in limited areas, rather than over the whole property. Furthermore, advances in the availability of information about land, especially data for soils, topography, wetlands, land use and aerial photography, all available for free from Rhode Island Geographic Information System, make it possible – even at the Pre-Application stage – to reach the kind of sound judgments about site potentials that just a few years ago required thousands of dollars worth of field work and engineering. Many local planning and state agencies are using this information in planning and development review. One useful resource is URI Cooperative Extension's "rapid site assessment" approach, designed to further streamline the design/review process for towns and developers (see: www.uri.edu/ce/wq/mtp/rapid/rapid.html).

Fitting the 10-Step Conservation Development Process into the Procedures for Local Development Review

1. Analyze the Site

For Pre-Application submissions, the applicant puts together a quick review of natural and cultural factors based on existing data. State statutes allow towns to request "general, conceptual" materials at the pre-application stage. Everything needed, other than ground-level site photos, is available either on-line from Rhode Island Geographic Information System (RIGIS) or in the local Comprehensive Plan. Thus, if the applicant is going as far as to request pre-application meeting, he or she might as well take advantage of existing data – saving everyone involved a fair amount of time and effort down the road. At the Master Plan stage, the process is repeated in more detail for those areas identified in the Pre-Application review as requiring more detail or those aspects of particular concern to the surrounding neighborhood or the whole town.

Resources in Geographic Analysis

RIGIS: The Rhode Island Geographic Information System provides a central clearing house for geographic data for the entire state (www.edc.uri.edu/rigis).

RI Atlas: The Environmental Data Center at URI has prepared printer-friendly maps of critical environmental resources for each town and watershed in the state (www.edc.uri.edu/riatlas).

DEM Internet Map Server: Rhode Island Department of Environmental Management's Geo-Data Viewer allows you to make custom maps using any web browser (www.state.ri.us/dem/maps/index.htm).

2. Evaluate Site Context

While the first step focuses on the area within the boundaries of the site, this step pulls back to look at the area surrounding the site in the larger context of the neighborhood and town. Most local Comprehensive Plans and Open Space plans provide a ready source of material for quick context studies at the Pre-Application stage. RIGIS aerial photography and USGS map coverage for the entire state make it easy to show the site in relationship to the surrounding neighborhood. RIGIS natural resource coverages are ideally suited to providing a quick understanding of watersheds, wellhead protection areas and other regional resources. Aerial photographs are particularly effective in showing historic patterns of development surrounding the site that can jumpstart discussion of what sort of development might best fit into the area. At the Master Plan stage, these same photographs can support an applicant's decision to pursue a particular style or site planning approach.

3. Designate Potential Conservation Areas

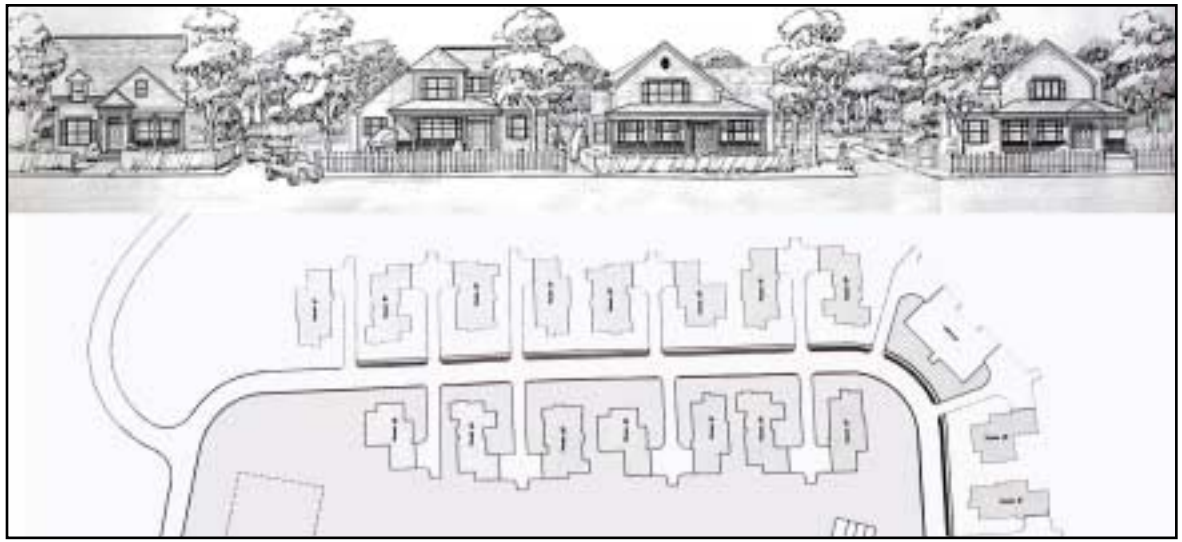
Even at the Pre-Application stage, it will be apparent for many sites that certain areas are simply too wet or rocky to support development. Other features, such as historic agricultural landscapes, regional trail connections, or upland forests, can be identified early-on for further study as potential conservation areas whose preservation contributes as much to the value of the development as it does to the quality of life for existing town residents. At the Master Plan stage, the applicant returns with more information about these features -- again, helping to support the proposed development layout.

4. Determine Maximum Number of Units

At the Pre-Application stage, applicant and reviewers agree on an acceptable approach to determining the number of units that can be built on the site under conventional subdivision. Towns vary in how this "basic maximum number" is calculated, but there are two principal approaches. The first uses a simple **formula** that divides the buildable acreage of the site by the minimum lot size. The second involves the creation of a **"yield plan,"** essentially a conventional site plan that follows the zoning requirements and subdivision regulations to demonstrate where houses, roads and lot boundaries could be placed on the site. In both cases, towns usually require that all or some of the land that is unbuildable be removed from consideration before other calculations begin. This helps to ensure that the number of units that are approved under the Conservation Development process does not exceed that which could be constructed under a conventional scheme.

5. Locate Development Areas and Explore Conceptual Alternatives

This will in most cases be the final step for the Pre-Application stage. Organized conceptually by the location of character-defining site features and sensitive resources, several proposed development locations should be explored as part of the Pre-Application submission. An honest discussion of how each alternative impacts the potential value of house lots, versus the benefits to the town of one or another approach, will go far to establishing that level of discussion and guidance promoted by the statute. This is also an appropriate time for the Planning Board or other designated review committee to conduct a site visit to review the preliminary site analysis and plan alternatives. At the Master Plan stage, the developer and the town both have the oppor-



In planning for conventional subdivisions, lot line geometry tends to drive design decisions. In Conservation Development, lot lines are drawn in only after a plan has been created that best fits the site. In this example, the developer came up with a plan that worked, and decided in the end not to have separate lots at all, but to sell the units as condominiums. In most other respects the project is a typical "single-family detached" development, with individual structures, and private front and rear yard spaces which are controlled by individual home owners.

tunity to settle on an approach that avoids unhappy compromises, and instead fulfills the promise of Conservation Development to create new communities that minimize impacts to the environment and fit in gracefully with the character of existing neighborhoods.

6. Locate the House Sites

During Pre-Application and early in Master Plan, potential house sites will be included as rough bubbles on sketch plans. As the potential development areas become more clearly defined, the best house sites within them are identified on the basis of suitability for construction, views, privacy, and microclimate. During Master Plan design and review, this information helps in understanding the potential value of house lots in different alternatives, and informs design decisions as planning moves from "conceptual bubbles" to detailed construction drawings.

7. Lay Out Streets, Trails, and Other Infrastructure

Depending on the preferred conceptual alternative, streets and other infrastructure may be secondary to the open space and house lots – intended primarily to provide access to the buildings – or they may take the form of more traditional village streets with curbs, sidewalks, and so on. The flexibility which Conservation Development provides tends to reduce the importance of streets, making trails, parks, commons and pedestrian systems a more important part of the Master Plan submission. Small community drinking water and wastewater treatment systems, where applicable, would also be located during this step.

8. Design and Program Open Space

As shown by too many poorly-planned cluster subdivisions, it's not enough to simply set aside open space: unless it has a clear use, design, and management plan, open space areas often revert to weed or vine-infested jungles or are annexed into individual house lots. A successful Master Plan review process will establish as clear an approach to the use and maintenance of open space as it does for development areas.

9. Draw in the Lot Lines

Lot lines (or a decision to eliminate lot lines in favor of common ownership), will be necessary for Master Plan approval, though it need not include metes & bounds until the Preliminary Plan stage. As with other steps in the Conservation Development process, alternative approaches to drawing of lots can be presented for discussion.

10. Establish Ownership and Management of Open Space and Other Community Elements.

Just as lot lines establish legal control and responsibility for private lots, Conservation Development requires careful assignment of responsibility for shared public space. While conventional development creates private lots and public streets, Conservation Development often results in a third kind of neighborhood space, not entirely public or private, and requiring clear guidelines for management. The state statute (Section 45-24-47(D)) requires that the open space either be conveyed to a city or town, be conveyed to a nonprofit organization, or be turned over to a homeowners association. An additional form of ownership was added to the statute in 2002, which was revised to allow the open space to remain in private ownership if it remains in agriculture, forestry or natural habitat. In any case this step would begin with suggested approaches at Master Plan, and be finalized at the Preliminary Plan stage.

The following checklist summarizes and organizes the ten-step conservation development design process according to each stage of land development and subdivision review process required under Rhode Island law. For each stage, the checklists describe the information to be provided by the applicant, and the decisions that the town should make based on that information. As described earlier in this manual, some of the same categories of information are requested at each subsequent stage of review, though at different levels of detail. The checklist describes existing sources of information that can be used for initial planning. If more detail is required, site surveys and other research can add to the depth of information in each category during later stages of review. For the Pre-Application Meeting, for example, most of the information listed in the checklist is available on the Rhode Island Geographic Information System (RIGIS) or in local planning documents. During the Master Plan stage, more detailed site analysis and field verification may be required, followed by additional field work to prepare the Preliminary and Final Plans.

This approach is designed to take advantage of the inherent efficiency of Conservation Development by eliminating expensive field investigation on that portion of the site that is clearly unbuildable, or which the applicant desires to preserve as an open space amenity. This allows detailed surveys and soil tests to be applied only to those areas where development will likely occur, or to those areas where resource values and/or development suitability are unclear.

The checklists also describe a recommended scheme for drawing and coloring existing and proposed site features on the plans. By adopting a common graphic scheme for all submittals, reviewing boards will find it is much easier to evaluate the sensitivity of various resources and compare design alternatives. It is strongly recommended that communitites incorporate the following checklist into their subdivision regulations. Each community, of course, should add or subtract items from the checklist based on local priorities.

A. Pre-Application Meeting

The submission materials for the Pre-Application Meeting consist of the following maps, at a minimum, which correspond to Steps 1-3 of the Conservation Development design process:

1. Site Base Map
2. Site Analysis Map
3. Site Context Map
4. Potential Site Conservation Areas Map

Base Map

The base map shows the principal existing features of the site, including parcel boundaries, roads, structures, water bodies and vegetation. It should be drawn at a scale sufficient to clearly show all of the information required - depending on the size and complexity of the property usually 1 inch = 100 feet or 1” = 50’. Much of this information could be shown based on the USGS maps and/or orthophotos available from RIGIS.

1.____Name of the proposed subdivision.
2.____Name and address of property owner and applicant.
3.____Date of plan preparation, with revision dates.
4.____Graphic scale and true north arrow.
5.____Plat and lot numbers(s) of the land being subdivided.
6.____Zoning district(s)of the land being subdivided.
7.____Approximate parcel boundaries and boundary monument locations.
8.____Approximate location of public rights-of-way and/or easements.
9.____Area in acres of the parcel.
10.____Location, width and names of existing streets.
11.____Location and approximate size of existing structures.
12.____Known surface waters including rivers, streams, lakes, ponds and wetlands. It is not necessary to field verify wetlands at this stage.

Kenyon Farm Case Study:
The following maps that illustrate the checklists show the kind of information that is readily available for any site in Rhode Island. More detailed information about the creation of the maps can be found in Part 3 of the Conservation Development Manual.

The simplest base map can be made by overlaying the parcel boundary on an enlargement of the USGS survey maps (above). These, as well as 1997 aerial orthophotos (below) are available from RIGIS for the entire state.

The usgs map and aerial photograph can be traced to create a simple base map. Using pens and colored markers on tracing paper, important features of the site can quickly be highlighted, such as forest, agricultural land, water bodies, roads, and buildings.

Step 1: Site Analysis Maps

During Site Analysis, information about natural and cultural factors is collected and mapped, creating an objective basis of facts to inform discussions and support fair decisions. In this first step, the focus is on the site itself, its features and capabilities. The Site Analysis process is described in detail in Part 3, Step 1 of this manual. The number of Site Analysis maps required will vary with the complexity of each site. The following maps should be prepared as separate overlays, which can be combined in different ways to better understand the interaction of the various site features and resource types.

Topography and Slopes

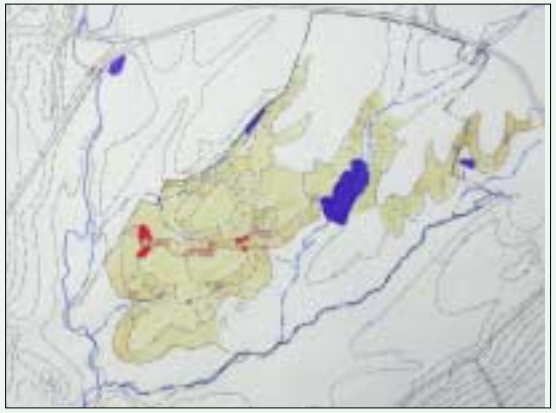
The form of the land is fundamental to understanding both natural systems and suitability for construction. USGS topographic maps provide 10' contours (elevation lines); these can be traced manually or digitized for use as an overlay. In addition, a slope map provides a general assessment of development suitability, or potential hazards, based on slope.

13.____Topography with 10' contour lines.

14.____Slope map, with slopes grouped according to five categories based on development suitability: 0-3%, 3-8%, 8-15%, 15-25%, and over 25%. Steeper slopes should be shown in progressively darker colors or shades of gray.

15.____Existing drainage and drainage structures, such as culverts and pipes, etc.

If more detailed site surveys are not available, the 10 foot contours from the USGS survey are suitable for basic slope analysis. These can be traced, by hand or using a CAD or GIS program, and overlaid with other information such as the orthophoto (above). Slopes can be calculated by measuring the distance between adjacent contour lines (below).



Natural Resource Inventory

Unique features and local priorities for natural resources can be found in the Comprehensive Plan. Smaller parcels in particular may contain only a portion of a resource area or buffer zone, which may be shown more clearly on a separate map showing the site within a larger district or watershed. Subsurface groundwater aquifers and surface water supplies should be indicated in a gradation of blue colors, tones or hatching where the surface water supply reservoir or aquifer is darkest and its watershed or recharge areas are progressively lighter. Farmland and forested land should be shown in light and dark green, respectively, with an indication of underlying soil types with hatching and/or labels. Natural Heritage areas can be shown with a red outline around the designated area.

16.____Name and location of surface watershed, water quality classification and existing condition of nearest surface water(s). See RI DEM Water Quality Regs.

17.____Groundwater aquifers, recharge areas and wellhead protection areas.

18.____State-designated Natural Heritage Sites

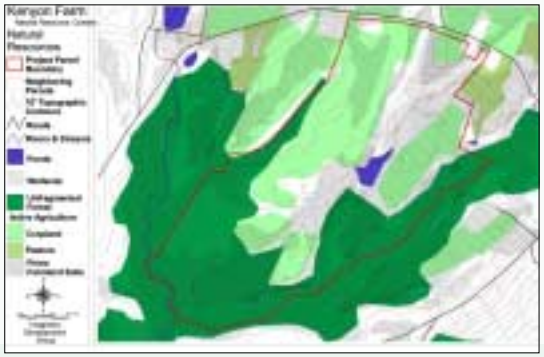
19.____Unfragmented forest tracts.

20.____Prime farmland soils.

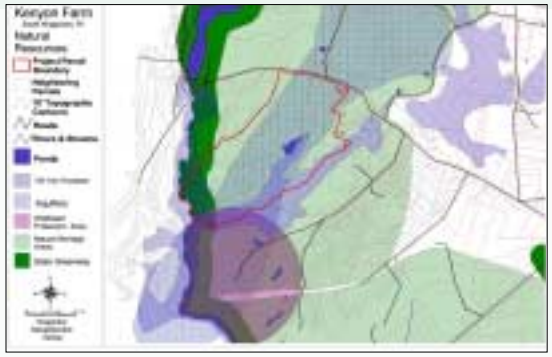
21.____Land in active agricultural use.

22.____State, regional, or community greenways and greenspace priorities.

23.____100-year floodplains as shown on federal flood protection maps.



Natural resources (above) that can be shown as an overlay include waterbodies and wetlands, forest, prime farmland soils and areas in active agriculture. A larger area may need to be shown (below) to be able to convey the location of regional resources such as watersheds, aquifers, floodplains and greenway corridors. Each of these data layers is available from RIGIS, with the exeption of agricultural land use and forested areas, which are best traced off of the aerial photograph.

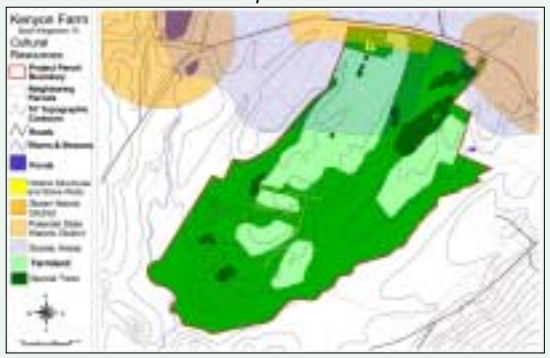


Cultural Resource Inventory

State and local records of historic features can be transferred to a base map by hand or as GIS layers. Site-level features such as stone walls, agricultural elements, historic houses and outbuildings, and other landscape features can be located on RIGIS orthophotos or transferred to an overlay map based on a site walk. Scenic roads and areas are identified in state and local plans, and specific views on the parcel can be identified with arrows and text description.

24.____State or locally-designated historic sites, districts, cemeteries or landscapes.
25.____Archaeological sites.
26.____Scenic road corridors and state-designated scenic areas.
27.____Approximate location of stone walls, structures, outbuildings, roads or trails, and other historic features on the parcel.

Cultural resources (below) that are available from RIGIS include historic and archaeological sites, and scenic areas. This should be supplemented by tracing features off aerial photographs or on the basis of field surveys. On this map, stone walls, historic structures, and special trees were added based on the aerial photo.



Recreational resouces (below) can be identified on RIGIS layers for trails, boat launches, greenways and recreational open space. Local Comprehensive Plans also often contain maps of town recreation areas and trails.

Recreational Resource Inventory

Trails and recreational areas can be identified based on site observation, USGS maps, and aerial photography. Regional trails, boat launches and recreational sites may be found on RIGIS, and local Comprehensive and Greenspace Plans indicate existing and potential trails and recreation areas within many towns. Trails should be graphically separated into existing (solid line) and potential (dashed line), and colored green for hiking, red for biking, blue for boating, etc.

28.____Existing hiking, biking, and bridle trails within and adjacent to site.
29.____Boat launches, lake and stream access points, beaches and water trails.
30.____Existing play fields and playgrounds adjacent to the site.

Utilities and Infrastructure (if available)

Utility information available on RIGIS is 14 years old, and therefore lacking more recent extensions. Local Comprehensive Plans contain more recent maps of utilities, and local engineering departments and public utility companies maintain the most up-to-date records. A quick field survey of manholes and utility poles can often provide a good approximation of available utilities.

31.____Size and approximate location of public water lines.
32.____Size and approximate location of public sewer lines.
33.____Gas service.
34.____Electrical service.
35.____Telephone, cable, and other communication services.
36.____Width and surfacing material of existing road(s) at access points.

Step 2: Site Context Map

In Step 2, attention shifts to what's around the site in the larger context of the neighborhood and town. Objective data is collected for natural, cultural and recreational resource systems that surround the site, as well as the social structure and visual character of the neighborhood. The Contextual Analysis process is described in detail in Part 3, Step 2 of this manual, and can include many of the same features and resources mapped for the site analysis, but this time with a focus on the area surrounding the site.

Using 1997 RIGIS orthophotos, or more recent aerial photography if available, show the area within 1 or 2 miles of the site at a scale of l"=400' or 1" = 500'. Outline the parcel boundary. Surrounding parcels, 10' contours, surface waters and wetlands from RIGIS may be overlaid with the photograph if available. Resources which extend over large areas, such as public drinking water supply watersheds, groundwater aquifers,

A USGS map, either in paper form or as a digital scan from RIGIS, shows most of the principal features surrounding the site, including forested and open lands, roads, structures, and waterbodies.

Information from RIGIS, such as wetlands and waterbodies as shown here, can be overlaid with the orthophoto to show the site within the context of larger environmental systems.

well head protection areas and agricultural districts, may also be shown more effectively at the context scale than on the site analysis maps in Step 1.

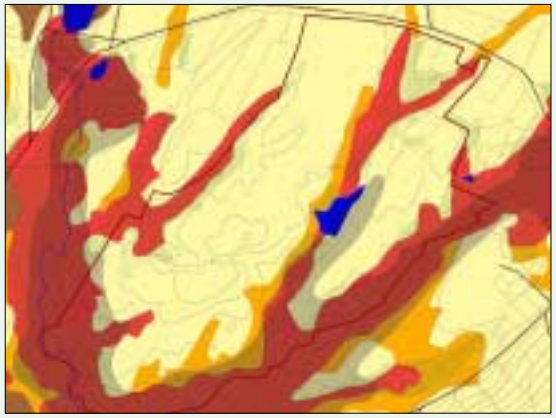
Step 3: Potential Conservation Areas

Based on the data mapped as part of the analysis of the site and its context in Steps 1 and 2, respectively, an assessment map of potential conservation areas shows that part of the site which must be protected by law, that which cannot be built on because of physical constraints, or which represents an important resource or neighborhood feature to be protected. Together, these represent the most logical potential conservation areas. While the first two steps consist of a straightforward inventory of resources, opportunities and constraints, for Step 3 planners must reach a consensus about which areas have high value for conservation. Designation of Potential Conservation Areas is described in detail in Part 3, Step 3 of this manual.

Graphic and coloring schemes, as suggested below, can help keep this information legible as the information is combined on the maps. Separate overlays may be required to illustrate more complicated situations, but where possible try to keep these coverages on the same map.

Non-Buildable Areas

1.____Wetlands,surface waters and vernal pools, including local and state regulated setbacks.
2.____Surface waters - can be mapped in blue, with wetlands in blue/green and setback lines in darker blue/green.
3.____Ledge/out crops - can be mapped in brown.
4.____Slopes greater than 25% - can be mapped in orange.
5.____Existing utility easements and power line right-of-ways.
6.____Hydric soils - can be mapped collectively in red cross-hatching rather than individual soil types.

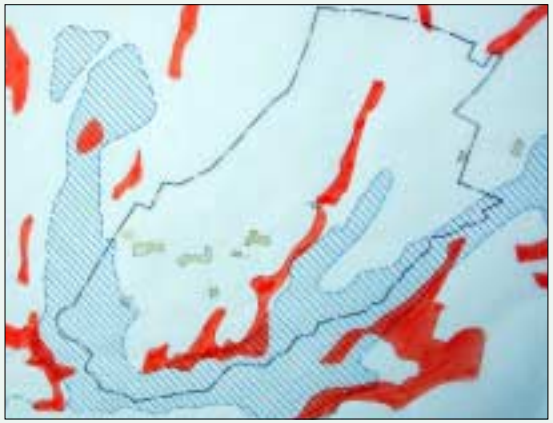


This map of non-buildable areas of the Kenyon Farm parcel shows hydric soils in red, soils with seasonally-high water table in orange, ledge outcrops in brown, and wetlands and floodplains in hatch patterns. The remaining area, shown in yellow, is only moderately constrained.

Since soil conditions are fundamental both to natural resources and construction suitability, the statewide soil survey available on RIGIS can yield an approximate idea of areas where construction will be difficult or impossible. The soils data also shows where development may be most appropriate, particularly for on-site wastewater treatment systems. Several ways of grouping and assessing soils have been prepared by state agencies to aid in this assessment. RIGIS provides a grouping scheme based on water table, slope, bedrock, and miscellaneous severe constraints. Cooperative Extension at URI has developed a grouping scheme based on hydrological characteristics, from well-drained soils with a deep water table to hydric soils that are essentially wetlands. (A comparison of these methods may be found at the Rhode Island Cooperative Extension's web site: www.uri.edu/ce/wq/mtp/rapid/sscomp.html.) The extent of hazard or constraint will depend to some degree on local conditions and availability of public sewer and water, etc. Items to be identified as potential conservation areas will therefore need to be identified in consultation with town staff or the reviewing board.

Partially Constrained Areas
(Physical Constraints to Development)

7.____Slopes between 15-25% - can be mapped in yellow.
8.____100-year flood plains - can be indicated with blue cross-hatching.
9.____Soils with seasonal high water table less than 3.5 feet or slowly-permeable "hardpan" soils - can be shown with orange cross-hatching (primarily a constraint on the construction of septic systems).



A map of partially constrained areas on the Kenyon Parcel shows flood plains in blue hatching, and a few small areas of moderately steep slope in yellow. The orange areas are those where the water table during wet seasons may be found closer than 3.5 feet below the surface.

Important Natural, Cultural, and Recreational Resource Areas

Identify the resources in each category which are the most important to protect, based on an assessment of the natural, cultural and recreational resources mapped for Step 1; these can be indicated with transparent tones and/or written annotations on the map.

10.____Natural resource areas - can be shown in green transparent tones.
11.____Cultural resource areas - can be shown in red transparent tones.
12.____Recreational resources - can be shown with solid and dashed lines, hatching for areas, and annotations, as appropriate.

By grouping natural resources (green), cultural resources (red hatch) and recreational resources (arrows), overall patterns emerge showing areas with high resource value.

Conclusions/outcomes from Pre-Application Review

____Agreement on areas for further investigation, necessary detail of field surveys, etc.
____Approximate location of natural, cultural and recreational resources and agreement on town's priorities for resource protection in the areas of the site.
____Understanding of resource systems within the site's larger context.
____Preliminary location of potential conservation and development areas.
____Agreement on approach to determining maximum number of units.
____Schedule for the site visit(s).
____Agreement regarding the consultants, if any, the community will use to assist in the review process. Important Note: It is recommended that communities engage expertise in landscape architecture, biology, hydrology, etc., to assist in the planning and review process. Ordinances or regulations should make it clear that the applicant must pay for the needed review expenses.
____Other

B. Site Visit

Towns should specify a site visit either as part of Pre-Application or Master Plan, in order to review the results of the preliminary mapping and site analysis. The best time for a site visit, as well as its focus, depends on the size and complexity of the property and the amount of available information. There are two basic options. One, is to visit the site after the Pre-Application submission to simply verify Steps 1-3 and to make sure all the character-defining features have been identified. However, this could be time-consuming on large parcels, and use up valuable effort in touring areas that may be preserved anyway. The second option is to visit the site after the applicant has more clearly identified conceptual areas for conservation and development as part of Step 5. Occurring about halfway through the Master Plan stage, this site visit would focus on the resources that need to be preserved within the areas to be developed -- not the entire site.

In either case, the site visit should include the members of the reviewing board(s), relevant town staff, the applicant, and the town's consultants. Copies of the maps and overlays should be brought along -- at a minimum, a print out of the aerial photograph with topography and property lines, and overlays showing the potential areas for conservation and development identified in Step 3.

The following checklist can be used during the site visit to review the presence of particular features or resources, and to indicate which should be studied in further detail. Some towns, for example, require Global Positioning System (GPS) mapping of significant trees and other features identified during the Site Visit. Additional checklist items are included for other site visits occurring during the Master Plan stage.

1.____Wetlands, vernal pools, water bodies, and streams.
2.____Boundaries of wooded areas, open fields, and location of valuable trees.
3.____Locally important or unique wildlife habitat, and the presence of fish in water bodies.
4.____Topography, slopes, valleys and ridgelines, high and low points.
5.____Unique geologic formations, e.g. rock out crops etc.
6.____Existing drainage and drainage structures.
7.____Active or potential agricultural uses.
8.____Active or potential forestry uses.
9.____State, regional, or community greenways and greenspace priorities.
10.___Scenic areas or features, scenic roads, special views and vistas into or out from the parcel.
11.___Historic stone walls, cemeteries, cellar holes, structures, roads or trails, and other landscape features.
12.___Existing hiking, biking, and bridle trails within and adjacent to site.
13.___Boat launches, stream access points and water trails.

Additional items for a site visit during Master Plan:

14.___Summary map of potential conservation-areas.
15.___Calculations of maximum number of units by formula or yield plan.
16.___Conceptual development alternatives.

Conclusions/outcomes from Site Visit

____Agreement on areas for further investigation, necessary detail of field surveys, etc.
____Agreement on general location of natural, cultural and recreational resources within the site and the need for further surveys.
____Review of general boundaries of potential conservation and development areas.
____Agreement on the general visual and social character of the neighborhood, and the type of development that would best fit in.

C. Master Plan Review

Each of the ten steps in the Conservation Development process is reflected in Master Plan Review. Many of the same maps and overlays submitted for Pre-Application can be reused as they are, or updated with such additional field surveys and research as may be agreed to by the applicant and the town during Pre-Application review. Looking ahead to Preliminary and Final Plan submissions, the applicant may commission detailed topographic, wetlands, and boundary surveys - especially for areas of the site where development is sure to happen.

Base Map

The base map for Master Plan Review should be drawn at a scale sufficient to clearly show all of the information required - no more than 1" = 100' and ideally 1" = 50'. At this stage the basic features such as roads, parcel boundaries, topography, vegetation and water features are best redrawn as a clean base map, or used as overlays on an aerial photograph.

1.____Name of the proposed subdivision.
2.____Name and address of property owner and applicant.
3.____Date of plan preparation, with revision dates.
4.____Graphic scale and true north arrow.
5.____Plat and lot numbers(s) of the land being subdivided.

6.____Zoning district(s)of the land being subdivided.
7.____Boundary lines of the parcel, drawn so as to distinguish them from other property lines.
8.____Location of public rights-of-way and/or easements.
9.____Area in acres of the parcel.
10.___Names of abutting property owners and property owners immediately across any adjacent streets.
11.___Location, width and names of existing streets.
12.___Location and approximate dimensions of existing structures.
13.___Known surface waters including rivers, streams, lakes, ponds, wetlands and vernal pools. It is advisable to have wetland edges field surveyed at this point, especially adjacent to proposed development zones.
14.___Approximate boundaries of wooded areas.

Step 1: Site Analysis Map

Topography and Slopes
After review of Pre-Application materials and the Site Visit, the town and the applicant should agree on the necessary accuracy and detail of topographic data for the Master Plan submission. 10' contours (elevation lines) based on USGS surveys can be traced manually or digitized for use as an overlay, and may be sufficient if proposed development zones fall in areas of moderate slopes. For planning roads and building sites within areas over 8% grade, or to discern gently-sloping areas near wetlands, vernal pools or intermittent streams, a field survey of topography to map the 2' or 5' contour interval may be necessary to ensure a buildable Master Plan. This can be the basis for a more accurate slope map depicting a general assessment of development suitability, or potential hazards, based on slope or hydrologic conditions.

15.___Topography with contour lines at 10' interval, or more detailed, if necessary.
16.___Slopes grouped according to five categories based on development suitability: 0-3%, 3-8%, 8-15%, 15-25%, and over 25%. Steeper slopes should be shown in progressively darker colors or shades of gray.
17.___Existing drainage and drainage structures.

Natural Resource Inventory
Based on the preliminary designation of development zones, further site investigation and surveys may be necessary to establish the limits of natural resource areas such as wetlands, streams, vernal pools, and vegetation. These overlays can be updated with the more accurate information, using the same graphic schemes as the Pre-Application submission. Subsurface aquifers and surface water supplies should be indicated in a gradation of colors, tone or hatching where the reservoir or aquifer is darkest and its watershed or recharge areas are progressively lighter. Farmland and forested land should be shown in light and dark green, with an indication of underlying soil types with hatching and/or labels. Natural Heritage areas can be shown with a red outline around the designated area.

18.___Public drinking supply watershed. Name and location of surface watershed and subwatershed boundaries, water quality classification and existing condition of nearest surface water(s).
19.___Groundwater aquifers, including state-designated "groundwater reservoirs," recharge areas, wellhead protection areas and groundwater elevation, or "water table."
20.___State-designated Natural Heritage Sites, wildlife habitat and fish presence in streams that could be affected by nearby development.
21.___Unfragmented forest tracts.
22.___Prime farmland soils.
23.___Areas in active farm use, with annotations for cropland, pasturage, orchard, etc.
24.___Large or unusual trees, shrubs or other unique vegetation.
25.___State, Regional, or community greenways and greenspace priorities.
26.___100-year floodplains as shown on federal flood protection maps.

An accurate survey of field edges and stone walls (yellow line) is often important to fitting new development into former agricultural lands.

Cultural Resource Inventory
Cultural features identified on the site, such as stone walls, agricultural elements, historic houses and outbuildings, and other landscape features may need to be more carefully surveyed in the field, along with other special features, views, etc. identified during the Site Visit and Pre-Application review. This is especially important if

these features fall within proposed development areas, and could be incorporated into the proposed development.

27.___State or locally-designated historic sites, districts, cemeteries, or landscapes.
28.___Archaeological sites.
29.___Scenic road corridors and state-designated scenic areas.
30.___Location of stone walls, structures, outbuildings, roads or trails, and other historic features on the parcel.

Recreational Resource Inventory
Trails identified in Pre-Application may need to be more carefully surveyed in the field, especially where they cross proposed development areas. Trails should be graphically separated into existing (solid line) and potential (dashed line), and colored green for hiking, red for biking, blue for boating, etc.

31.___Existing hiking, biking, and bridle trails within the site, or in the vicinity, where there is an opportunity to link the site with established trails.
32.___Boat launches, stream access locations and water trails.
33.___Existing play fields and playgrounds adjacent to the site.

Utilities and Infrastructure (if available)
Utility should be shown to the level of detail necessary for planning the most efficient connections to the development, but need not be surveyed in the field. Documentation of capacities of various services should be provided, if applicable.

34.___Size and location of public water lines.
35.___Size and location of public sewer lines.
36.___Gas service.
37.___Electrical service.
38.___Telephone, cable, and other communication services.
39.___Width and surfacing materials of existing road(s) at access points.

Step 2: Site Context Map

Using 1997 RIGIS orthophotos, or more recent aerial photography if available, show the area within 1 or 2 miles of the site at a scale of l"=400' or 1" = 500'. Outline the parcel boundary. Surrounding parcels, 10' contours, surface waters and wetlands from RIGIS may be overlaid with the photograph if available. After Pre-Application Review, the town may request that other resources be overlaid with the context map in order to better understand how the development will affect its surroundings. This may be particularly important in showing how the site fits into surrounding ecological or cultural systems. These may include regionally-important surface or subsurface water supplies, large stream/wetland systems, continuous blocks of forested land, or extended areas in agricultural use.

Step 3: Potential Conservation Areas

The Pre-Application Review, especially Step 3, the designation of potential conservation and development areas, will serve to focus the more detailed mapping of potential conservation areas during Master Plan. More detailed assessment of soils and slope constraints should be based on the specific character of the site and the type of development proposed. Conclusions about "non-buildable" and "partially-constrained" areas of the site will thus be calibrated to fit the specific situation. At a minimum, the town and the applicant should agree as to the method for evaluating soil constraints, using either the RIGIS suitability model or a soil-hydrology scheme, depending on site conditions. At the same time, the town can identify locations where field testing of soils and water table will be necessary, and the extent of such investigation required for the Master Plan submission.

Non-Buildable Areas

1.____Wetlands and surface waters including local and state regulated setbacks.
2.____Surface waters - can be mapped in blue, wetlands in blue/green and setback lines in darker blue/green.
3.____Hydric soils - can be mapped collectively in red cross-hatching rather than individual soil types.
4.____Ledge/outcrops - can be mapped in brown.
5.____Slopes greater than 25% - can be mapped in orange.
6.____Existing land restrictions such as utility easements, power line right-of-ways, etc.

Partially Constrained Areas
(Physical Constraints to Development)

7.____Slopes between 15-25% - can be mapped in yellow.
8.____100-year flood plains - can be indicated with blue cross-hatching
9.____Soils with seasonal high water table less than 3.5 feet or slowly-permeable "hardpan" soils - can be shown with orange cross-hatching.

Important Natural, Cultural and Recreational Resource Areas

Identify the resources in each category which are the most important to protect; these can be indicated with transparent tones and/or written annotations on the map.

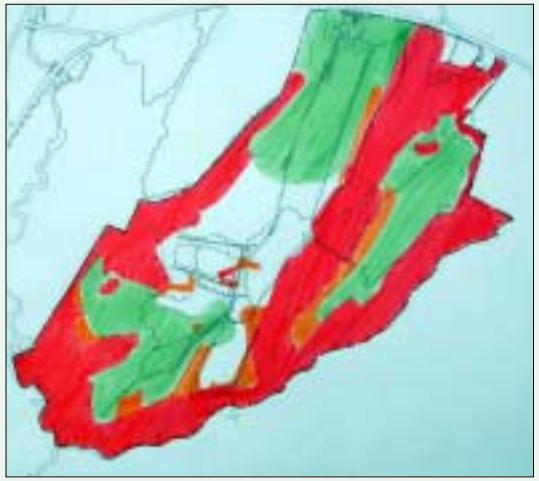
10.___Natural resource areas can be shown in green transparent tones. The natural, cultural, and recreational inventories from Step 1 should be used here, and supplemented as necessary with field surveys.
11.___Cultural resource areas can be shown in red transparent tones.
12.___Recreational resources can be shown with solid and dashed lines, hatching for areas, and annotations, as appropriate.

Summary Map

A Summary Map should be prepared, combining non-buildable, partially-constrained and important resource areas into a single overlay. The Summary Map represents a synthesis of the principal conclusions drawn from the previous maps. It therefore serves as a record of what the applicant and the town agree are the areas which should be preserved as open space, and likewise clearly identifies the areas most suited for development. It also allows for an agreement on what areas of the site may need to be investigated in further detail, either to better locate the edges of a sensitive resource, or to perform a more detailed survey of features which might be incorporated in the proposed development.

The Summary Map simplifies the previous overlays into three colors:

13.___Non-Buildable Areas - shown in red or red hatching
14.___Partially-Constrained Areas - shown in orange or orange hatching
15.___Important Natural, Cultural and Recreational Resource Areas - shown in green tone or line work, as appropriate.



The Summary Map for the Kenyon parcel shows potential conservation areas in three categories: red indicates unbuildable land, orange is partially-constrained, and green represents important natural, cultural and recreational resources. In the white areas, conversely, development would have the least impact.

Step 4: Determine Maximum Number of Units

The applicant and the town agree on the method for determining the maximum number of units, using either a formula or yield plan approach, as appropriate to the site and specified in local ordinances. Specific methodology for the selected method, and any supporting site investigation required, should be clearly identified. The determination of the methodology to be used may also be done during the Pre-Application Review. However, the maximum number of units must be determined no later than the Master Plan stage. Refer to the discussion of Step 4 in the manual for further information regarding each method.

16.___Formula method, number of units, or
17.___Yield Plan method, number of units.

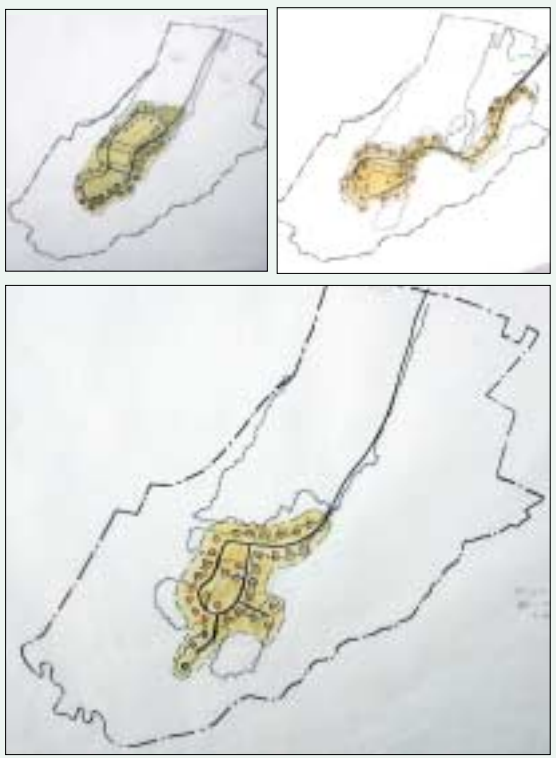
This yield plan for the Kenyon Farm was prepared by applying the requirements of the town's zoning ordinance and other development regulations to the site, while avoiding non-buildable areas. This results in a total of 34 potential homes on the property.

Step Five: Locate Development Areas and Explore Conceptual Alternatives.

Development of a conceptual neighborhood layout can provide a framework to tie the proposed community together into a unified whole, and to link it with the larger neighborhood of which it is a part. Based on the results of Steps 1-3, the applicant prepares a Sketch Plan showing the potential development areas, and at least three conceptual alternatives, where applicable, for the general layout of the proposed development. The focus of this Sketch Plan is to demonstrate how the development areas will avoid or minimize impacts to the potential conservation areas as shown on the Summary Map in Step 3. The plan should also demonstrate how the proposals would fit into the context as described in Step 2. Some communities may wish to require a simple Sketch Plan prior to a site visit to

verify that the proposed development areas will not adversely impact the desired conservation areas.

18.___Potential development areas - show as a tone or boundary line.
19.___Conceptual alternatives - specify number and variables, if possible.
20.___Describe overall themes and organizing principles.
21.___Describe house types and/or architectural themes.



Even after a thorough analysis of the site and its context to identify the best general location for development, the arrangement of roads and houses within that area can vary a great deal. By quickly sketching up a number of alternatives, the designer can identify the approach that meets the overall conservation goals of the project while creating a vibrant new neighborhood.

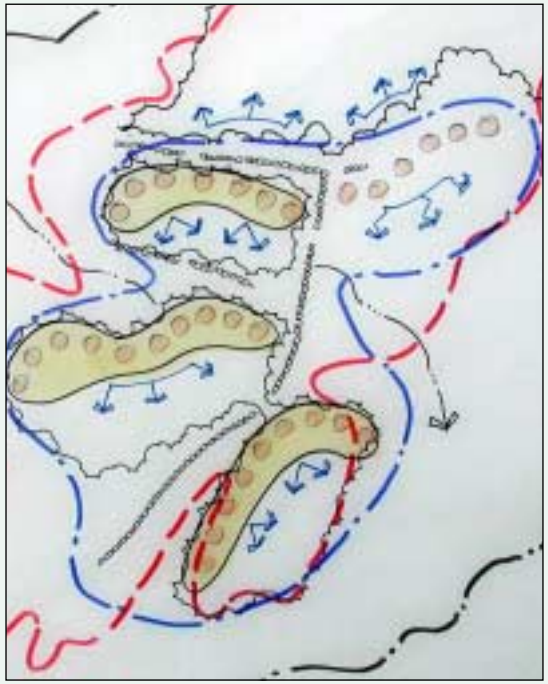
Step 6: Locate House Sites

Once a preferred concept is in place, attention turns to selecting house sites that provide high value to potential buyers, with opportunities for creative design, privacy, attractive views and yard space. Potential house sites are also evaluated for potential access, drainage, availability of utilities, and suitability for wells and septic systems. The process of locating house sites should be documented by describing the potential of proposed locations to avoid or minimize impacts to the resources identified in Steps 2 and 3, as well as the visual effect from within and outside the development, and livability for future residents.

Communities may wish to reduce and/or specify the limits of the building envelope, to further reduce disturbance to the site. The building envelope may be drawn as a limit of disturbance line surrounding each house, yard, driveway and potential outbuildings, or a smaller area where the house must be placed. They are sometimes placed on the plans only as a guideline; they may also be made part of the official plan approvals, and enforced during construction by the local building inspector.

A site visit may also be desirable at this point and prior to establishing final locations to verify that locations avoid or minimize impacts to the conservation areas identified in Steps 2 and 3.

22.___Development Suitability - annotate plans to indicate site scale differences in microclimate (such as north-facing areas sheltered from the summer sun but affected by winter winds, or southern exposures good for solar heating), soils, hydrology, or special features affecting construction, such as unique trees or stone walls to be preserved.
23.___Proposed water supply and wastewater disposal.
24.___Views and visual character of house sites - describe with arrows and annotation.
25.___Yard spaces and activity areas - distinguish public and private areas, annotate potential uses.
26.___Indicate site access, service and parking alternatives.
27.___Indicate how the house sites will be connected to or benefit from the dedicated open space.



While the conceptual layout for the Kenyon Farm prepared in Step 5 explores the integration of roads and houses with the landscape, in Step 6 the designer is focused on identifying the best individual house sites. Suitability for construction must be balanced with long-term savings on heating and cooling costs that may be realized in the more sheltered locations. Meanwhile, potential yard space, privacy, and views are critical elements in building value for individual house lots.

Step 7: Lay Out Streets, Trails and other Infrastructure

The layout of streets and trails is based on providing efficient access to the preferred house sites, organized by the overall design concept or theme. Several alternatives may need to be explored to find the best balance of community design with physical goals of minimizing pavement and limiting disturbance of the site.

28.___Alternatives for location and alignment of proposed roads and pedestrian system.

29.___Cross-section of proposed streetscape, including buildings, plantings, fences, curbs, etc. on both sides of the street, along with the width of pavement and shoulders, if any.

30.___Alternatives for stormwater treatment and management with an emphasis on maintaining the natural hydrology, and encouraging the infiltration of precipitation as close to the point of origin as possible. Refer to Step 5 in the manual for further information regarding alternative stormwater treatment methods. The most recent edition of the Rhode Island Stormwater Design and Installation Standards Manual should be consulted.

31.___Concept for lighting of streets and homes, placement of utilities including transformer boxes and other access points.

In Step 7, several alternatives may again need to be explored in order to identify a street layout that fits the site while enhancing the visual character and economic value of the proposed neighborhood. The scheme shown above places most houses near to the ideal locations identified in Step 6, but the preferred scheme, shown below, balances house locations with a street layout that creates a more interesting design, with a stronger community focus.

Step 8: Design Open Space

Proposed uses and design guidelines for open space areas to be preserved by the project should be carefully planned to take advantage of existing natural, cultural and historical features and the potential for active agriculture and forestry, and active or passive recreation. The design of open space should flow directly from its proposed use -- farming, stormwater management, habitat protection, recreation, etc. - and respond to the needs of the community.

In preserving so much of the site as open space, the conservation development plan for the Kenyon Farm requires careful planning for the design and use of each area. Access to farm fields must be maintained, and fences and buffer areas planned to avoid conflicts. Recreational trails are designed to provide access to wild areas while avoiding the most sensitive habitats.

32.___Map the proposed open space and indicate the proposed uses and design criteria.

33.___Show proposed recreational trails and any potential links to other trails, natural features or amenities on the site or in the context area, and sidewalk connections to other neighborhoods, schools, etc. Rec-

reational trails should be developed at the time the subdivision is built and a bond or other surety can be held, as is done with subdivision roads, to insure the trails are built properly and do not readily erode.

34.___Show proposed facilities for active sports, playgrounds, stream fishing access, etc.

35.___Plan for active agriculture, or forestry.

36.___Conceptual management criteria, including protection of the natural and cultural resources identified in Step 3.

Step 9: Draw in the Lot Lines

As one of the last steps in the design process, the location of lot lines should flow logically from the location of resources, proposed house sites, and existing features of the site. Lot lines should reflect logical boundary locations in the field, such as drainages, stone walls, and tree lines. Easements for utilities and trails are also set down to preserve access to important corridors. If the best locations for lot lines are still unclear at the Master Plan stage, criteria or guidelines for their placement should be described.

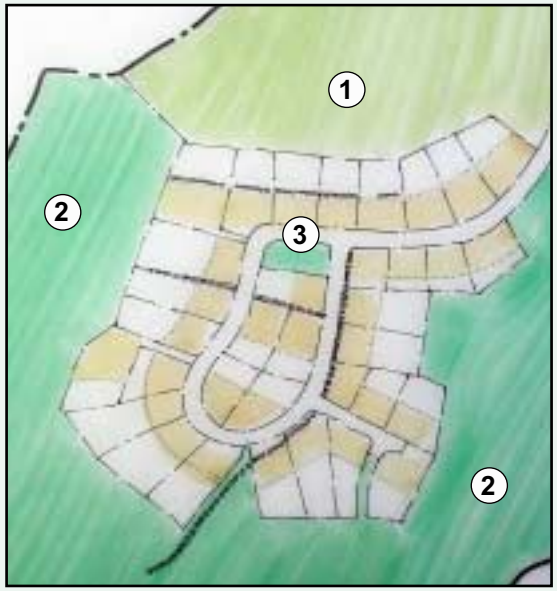
Depending on the size of individual lots, building envelopes may be necessary to ensure that houses are built in the desired area of each lot. This can take the form of a "build-to line" showing where the front wall of each house should be placed, a "limit of disturbance line" showing the area that should not be altered, or a building envelope zone, within which the builder can vary the final location and orientation of the house and appurtenances.

37.___Alternatives for location of lot lines.

38.___Criteria or statement of design intent for locating lot lines.

39.___Location of rights-of-way, utility or trail easements.

40.___Building envelopes or build-to lines.



The lot lines for the Kenyon Farm project are drawn where existing walls and tree lines create natural boundaries that will make sense to future residents. While each lot averages about a half-acre, a building envelope (tan) shows the preferred location for the houses. Separate lots for open space are also shown, including the area to be leased or owned by the farmer (1), areas to remain in forest (2) and a small park area within the neighborhood(3).

Step 10: Establish Ownership and Maintenance of Open Space

In the final step of the process, the applicant should suggest the alternatives for ownership and maintenance of designated open space areas. This may only be conceptual during Master Plan stage, with the goal of revealing opportunities for ownership that may take advantage of unique site features, or which makes a particularly good fit with one of the design alternatives under consideration.

41.___Preferred ownership scheme, whether public, private, non-profit, or homeowner's association. Recent changes in state law also allow a single landowner to own the open space if certain conditions are met.

42.___Maintenance alternatives, including potential funding sources.

43.___Show potential open space to be preserved, conservation easements or other restrictions.

Conclusions/outcomes from Master Plan Review

Following certification of a complete Master Plan submission, the town has 120 days to approve the Master Plan as submitted, deny the plan, or approve with conditions. As this formal approval proceeds, it is critical to the ongoing design process that the applicant and the town reach a clear and mutual understanding about the character of the site and the best way to develop it. Whether incorporated into the written approvals or not, these agreements record the conclusions of the Master Plan review and establish review criteria for the Preliminary Plan:

____Agreement on areas for further investigation, soil tests, borings, necessary detail of field surveys, etc. to be done for the Preliminary Plan submission.

____Agreement on location and function of natural, cultural and recreational resources.

____Agreement on function and value of resource systems within the site's larger context.

____Agreement on location of potential conservation and development areas.

____Agreement on maximum number of units

____Agreement on design and uses of open space areas, trail connections, and other shared amenities.

____Agreement on location and design of streets, homes and other elements.

____Agreement on criteria for establishing lot lines, pending further site surveys and analysis.
____Agreement on ownership, maintenance and management responsibility of open space areas.
____Agreement on relevant town goals for the area.

D. Preliminary Plan Review

Under state law, submission requirements for Preliminary Plan are determined by each town, but should include the following, as listed under Section 45-23-41:

"…engineering plans depicting the existing site conditions, engineering plans depicting the proposed development project, a perimeter survey, all permits required by state or federal agencies prior to commencement of construction, including permits related to freshwater wetlands, the coastal zone, floodplains, preliminary suitability for individual septic systems, public water systems, and connections to state roads."

Preliminary Plan Review is thus concerned with the details of engineering and permitting necessary to ensure construction of the plans set down by the Master Plan. Barring surprises that turn up in more detailed surveys of the site, the conclusions reached in Master Plan will not change much, but they will need to be developed in more detail to explain exactly how each feature of the proposed development will be constructed. Under Section 45-23-44, state law lists requirements towns may adopt for physical design:

"Such requirements may include, but shall not be limited to, requirements and policies for rights-of-way, open space, landscaping, connections of proposed streets and drainage systems with those of the surrounding neighborhood, public access through property to adjacent public property, and the relationship of proposed developments to natural and man-made features of the surrounding neighborhood."

Section 45-23-45 expands this list to include standards for public design and improvements, including "…specifications for rights-of-way, streets, sidewalks, lighting, landscaping, public access, utilities, drainage systems, fire protection, and soil erosion control." What these requirements and standards imply is that the focus on community context and the environment that was so important to the development of the design during Pre-Application and Master Plan should not be lost as the project proceeds into Preliminary and Final Plan. Rather, as each aspect of engineering and construction is worked out, the Master Plan can and should continually be the basis of decision making, and the means by which each of the various aspects of construction, drainage, and environmental protection are coordinated into a unified whole.

At the conclusion of Master Plan all ten steps of the Conservation Development design process have been completed. The purpose of the Preliminary Plan stage is to do the detailed engineering and any remaining site analysis to determine that the Master Plan works. If not done previously, further site surveys may be required for a thorough assessment of whether there are additional natural or physical constraints, such as vernal pools or presence of ledge, that will require the Master Plan to be revised.

The following checklist repeats those elements of the Master Plan submission that are necessary to describe the basic information about the project and summarize existing conditions on the site. The Preliminary Plan submission will include these maps, and additional plans describing proposed conditions, as well as supporting materials necessary to record review and approvals by various state and local boards and officials.

A. Base Information

The Preliminary Plan documents should be drawn at a scale of 1"=40' on sheets no larger than 24" by 36". The information below should appear on all sheets.

1.____Name of the proposed subdivision, including phase number.
2.____Name and address of property owner and applicant.
3.____Name, address, and telephone number of engineer, land surveyor, and landscape architect.
4.____Date of plan preparation, with revision dates.
5.____Graphic scale and true north arrow.
6.____Plat and lot numbers(s) of the land being subdivided.
7.____Names of abutting property owners and property owners immediately across any adjacent streets, with plat/lot numbers.
8.____Boundary lines of the parcel, with dimensions and bearings, drawn so as to distinguish them from other property lines.
9.____Zoning district(s)of the land being subdivided.
10.___Certification by a Registered Land Surveyor that a perimeter survey of the land being subdivided has been performed and conforms to the survey requirements of state and local regulations.
11.___Location of public rights-of-way and/or easements.
12.___Area in acres of the parcel.
13.___Location, width and names of existing streets.

B. Existing Conditions Plan(s):

1.____Streams and water bodies.
2.____Wetland lines with regulated setbacks, including areas within 200 feet of the perimeter of the project site.
3.____Existing topographic contours at intervals of two feet in elevation.
4.____Boundaries of wooded areas with notation of species of existing vegetation.
5.____Large or unusual trees, shrubs or other unique vegetation.
6.____Prime Farmland Soils and areas in active or recent agricultural use, with notation of use and condition.
7.____Location and approximate dimensions of existing buildings or significant above ground structures on or immediately adjacent to the subdivision.
8.____Location and dimension of all existing utilities within and adjacent to the subdivision, including sewer, water, gas, electric, phone, cable TV, fire alarm, hydrants, utility poles, stormwater drainage facilities or other above or underground utilities.
9.____Location of any unique natural and/or historic features, including stone walls, cemeteries, and archaeological sites.
10.___Base flood elevation data and floodplain lines.
11.___Notation on plan if the subdivision is located within or contains any of the following areas:

a.____Natural Heritage Areas (RIDEM).
b.____Area of Planning Concern (Town).
c.____Special Area Management Plan (CRMC).
d.____Groundwater Protection Overlay District (Town).
e.____Public Drinking Supply Watershed.
f.____ Groundwater aquifers, state-designated "groundwater reservoirs," recharge areas and wellhead protection areas.
g.____State, regional, or local greenways and greenspace priorities.

C. Proposed Design Conditions Plan(s):

1.____Proposed improvements, including streets, trails, sidewalks, lots, lot lines, with approximate lot areas and dimensions. Proposed lot lines shall be drawn so as to distinguish them from existing property lines. Proposed building envelopes or build-to lines, if applicable.
2.____Grading plan showing existing and proposed contours at two-foot intervals for all grading proposed for on and offsite street conditions, drainage facilities, and grading on individual lots if part of the proposed subdivision improvement.
3.____Stormwater management plan and drainage calculations prepared by a Registered Professional Engineer. The stormwater management plan should emphasize infiltration and the low impact design, as discussed in Part 3 of the manual, and how the selected management techniques will be operated and maintained during and after construction.
4.____Utilities plan, including sewer, water, gas, electric, phone, cable TV, fire alarm, hydrants, utility poles, or other proposed above or underground utilities as applicable.
5.____Landscaping plan, to show all significant proposed clearing of land, removal of existing vegetation, revegetation and/or landscaping on street right-of-way and upon individual lots, if part of proposed subdivision improvements. Include proposed street tree plantings and sidewalks, trails, or bike paths. All proposed plantings should use only non-invasive plants (see URI Cooperative Extension's "Sustainable Plant List".
6.____Open space plan, showing location, use and proposed improvements for any land proposed to be set aside as open space, with connections to house lots and the surrounding neighborhood.
7.____Limit of disturbance line/ limit of clearing, with method of tree protection if applicable.
8.____Sedimentation and erosion control plan, including inspection and maintenance provisions.
9.____Construction plans for access road(s) or routes(s), temporary parking and storage areas, location of construction trailers, and stockpiles of soil, stone, or waste materials.
10.___Proposed street plans and profiles drawn at a scale of 1"=40' horizontal and 1"=4' vertical.
11.___Proposed street cross section(s).
12.___Other(s)

D. Supporting Materials

1.____Filing Fee
2.____Written confirmation from the RI Department of Environmental Management pursuant to the RIDEM Rules and Regulations Governing the Enforcement of the Freshwater Wetlands Act, and any subsequent amendments thereto, that plans of the proposed subdivision, including any required offsite construction, have been reviewed and indicating that the Wetlands Act either does not apply to the proposed site alteration or that the approval has

been granted for the proposed site alteration.

3.____In lieu of item 2 above, an affidavit signed by a qualified professional (a Wetlands Biologist, Registered Professional Engineer or Registered Landscape Architect) stating that there are no freshwater wetlands present or within 200 feet of the property being subdivided.

4.____A vicinity map drawn to a scale of 1" = 200' or as necessary to show the area within one-half mile of the subdivision parcel showing the location of all streets, existing lot lines, and zoning district boundaries. Schools, parks, fire stations and other significant public facilities shall be indicated on the locus map by shading and labeling the specific use.

5.____Written confirmation that the appropriate water company or district has reviewed the plan and is able to provide water service (if proposed).

a. Water Company or District:

_____

b. Date of Letter:

_____

6.____Written confirmation that the Department of Public Works has reviewed and approved the plans for proposed sewer service, stormwater management, erosion and sediment control, road construction and indicating any bond or surety amounts to be posted by the applicant.

7.____Written confirmation that the Fire Chief has reviewed and approved all plans and proposed improvements (dry hydrants etc.) for fire protection.

8.____If Individual Sewage Disposal Systems are proposed, confirmation from the State Department of Environmental Management , and the town (if it requires a permit under a local ordinance), that each proposed lot is suitable to support an on-site wastewater treatment system.

9.____A Physical Alteration Permit (PAP) issued by the State Department of Transportation for any connection to or construction work within a State highway or other right-of-way, if applicable.

10.___Certificate of the Tax Collector showing that all taxes due on the parcel being subdivided have been paid and that there are no outstanding municipal liens on the parcel.

11.___The names and addresses of all property owners, agencies or communities requiring notification as required by state or local regulations.

12.___Copies of return receipts for certified mail notices.

13.___Either of the following:

a.____A letter to the Planning Board of the subdivider's intent to complete the required improvements prior to endorsement of the final plat; or,

b.____A letter to the Planning Board requesting that security sufficient to cover the cost of required improvements be established by the Board according to the regulations.

14.___Owner Authorization Form.

15.___Subdivision Notification Form.

16.___Water Quality Certification for construction activities that may temporarily affect surface waters in the vicinity of the site work to be performed.

17.___Any permits required under federal statute, including Section 404 Clean Water Act for Fill of Wetlands and Waters of the U.S. issued by the U.S. Army Corps of Engineers.

18.___Draft copies of all legal documents describing the property, proposed easements and rights-of-way, dedications, restrictions, or other required legal documents.

19.___Written comments from the Technical Review Committee (provided by the Administrative Officer), plus the following:

a.____Planning Department
Date:_____

b.____Public Works Department
Date:_____

c.____Zoning Enforcement Officer
Date:_____

d.____Fire District
Date:_____

e.____Conservation Commission
Date:_____

f.____ Land Trust
Date:_____

g.____School Department
Date:_____

h.____Other
(specify)_____

20.___Proposed ownership scheme for open space areas, with draft legal documentation, such as Homeowner's Association bylaws.

20.___Open Space Management and Maintenance Plan, including standards and methods, specific responsibilities, and funding sources.

21.___Plan Location and draft legal language of Proposed Conservation Easements or Restrictions to be applied to open space areas.

Publications

American Association of State Highway and Transportation Officials. 2001. A Policy on Geometric Design of Highways and Streets

Arendt, Randall. 1994. Conservation Design for Subdivisions. Island Press, Washington DC.

Arendt, Randall. Growing Greener. 1999. Island Press, Washington, DC.

Center for Watershed Protection. 1998. Consensus Agreement on Model Development Principles to Protect Our Streams, Lakes, and Wetlands. Center for Watershed Protection, Ellicott City, MD.

Delaware Department of Natural Resources and Environmental Control. 1997. Conservation Design for Stormwater Management. Delaware NREC and the Environmental Management Center of the Brandywine Conservancy. Delaware, MD.

Flinker, Peter, 1997. South Kingstown Residential Design Manual. Town of South Kingstown, RI.

Flinker, Peter, 2001. South County Design Manual. Rhode Island Department of Environmental Management. Providence, RI

Gibbons, Jim. Undated. Addressing Imperviousness in Plans, Site Design and Land Use Regulations. University of Connecticut NEMO. Technical Paper No. 1. Haddam, CT.

Grow Smart Rhode Island. 1999. The Costs of Suburban Sprawl and Urban Decay in Rhode Island. Providence, RI.

Kulash, Walter. 2002. Residential Streets, 3rd Edition. The Urban Land Institute, Washington, DC.

Prince George's County, MD. 2000. Low-Impact Development: An Integrated Design Approach. Department of Environmental Resources, Programs and Planning Division. Largo, MD.

Olympia, City of. 1994. Impervious Surface Reduction Study. Technical and Policy Analysis Report. Public Works Department Water Resources Program. Olympia, WA.

Prince George's County, MD. 2000. Low-Impact Development Hydrologic Analysis. Department of Environmental Resources, Programs and Planning Division. Largo, MD.

Prince George's County, MD. 1997. Low-Impact Development Design Manual. Department of Environmental Resources, Programs and Planning Division. Largo, MD.

Rhode Island Department of Environmental Management. Rhode Island Community Nonpoint Source Pollution Management Guide. RIDEM, Providence, RI.

Rosenblatt, Adam. 2000. Hydric Soil Patterns in Riparian Corridors of the Glaciated Northeast: Groundtruthing the Soil Survey Geographic Data Base (SSURGO). Masters Degree Thesis, Department of Natural Resources Science. University of Rhode Island. Kingston, RI.

Online Resources in Planning and GIS

Americans with Disabilities Act
ADA Home Page:
http://www.usdoj.gov/crt/ada/adahom1.htm

American Planning Association: www.planning.org.

American Society of Landscape Architects: www.asla.org.

Center for Watershed Protection: www.cwp.org.

DEM Internet Map Server: Rhode Island Department of Environmental Management's Geo-Data Viewer allows you to make custom maps using any web browser (www.state.ri.us/dem/maps/index.htm).

Natural Resource Defense Council on Low Impact Development: www.nrdc.org/water/pollution/storm/chapter12.asp).

RI Atlas: The Environmental Data Center at URI has prepared printer-friendly maps of critical environmental resources for each town and watershed in the state (www.edc.uri.edu/riatlas).

RIGIS: The Rhode Island Geographic Information-System provides a central clearing house for geographic data for the entire state (www.edc.uri.edu/rigis).

URI Cooperative Extension's "rapid site assessment" project demonstrates a streamlined design/review process for towns and developers (see: www.uri.edu/ce/wq/mtp/rapid/rapid.html).

USDA Natural Resource Conservation Service
60 Quaker Lane, Warwick, RI 02886
401-828-1300

Greenspace Planning & Conservation Development Ordinance Status

Community	Greenspace Plan*	Cons. Dev. Ordinance
1. **Barrington**		Adopted
2. **Bristol**		Adopted (March 2010)
3. **Burrillville**	---	Adopted (12/12/07)
4. **Charlestown**	*Yes – Pawcatuck Watershed*	Draft Completed***
5. **Coventry**	---	Draft Completed**
6. **Cumberland**	---	Adopted**
7. **Exeter**	*Yes – Pawcatuck Watershed*	Adopted***
8. **Foster**	*Yes – Scituate Reservoir Watershed*	Draft Completed**
9. **Glocester**	*Yes- Woonasquatucket Watershed & Scituate Reservoir Watershed*	Adopted** (11/15/07)
10. **Hopkinton**	*Yes –Pawcatuck Watershed*	Draft Completed***
11. **Jamestown**		Draft Completed
12. **Johnston**	*Yes- Woonasquatucket Watershed & Scituate Reservoir Watershed*	Adopted (Nov. 2011)
13. **Little Compton**	---	Draft Completed
14. **Middletown**	*Yes (Community Funded)*	Adopted (May 2008)
15. **New Shoreham**		Adopted
16. **North Kingstown**	*Yes –Pawcatuck Watershed*	Adopted** (4/10/06)
17. **North Smithfield**	*Yes – Woonasquatucket Watershed*	Adopted**
18. **Richmond**	*Yes - Pawcatuck Watershed*	Adopted** *** (2003)
19. **Scituate**	*Yes - Scituate Reservoir Watershed*	Draft Completed**
20. **Smithfield**	*Yes – Woonasquatucket Watershed*	Adopted**
21. **South Kingstown**	*Yes - Pawcatuck Watershed*	Adopted**
22. **Tiverton**	---	Adopted
23. **West Greenwich**	*Yes - Pawcatuck Watershed*	Adopted (Dec. 2003)
24. **Westerly**	*Yes - Pawcatuck Watershed*	Draft Completed**
25. **Woonsocket**		Adopted

25 out of 28 Eligible RI Communities (Non-Urban and Not Fully Developed)

*Greenspace Planning as part of a DEM-funded watershed-wide mapping project; **Financial & technical Assistance provided by DEM; *** Financial & Technical assistance provided by Grow Smart RI and Washington County Regional Planning Council

Conservation Development FAQs

(Frequently Asked Questions)

1.) What is conservation development?

Conservation development is a more flexible way to accommodate growth while avoiding impacts to the environment and community character. It identifies and protects a minimum of 50% of the land that could otherwise be developed as permanently protected open space. The protected open space provides meaningful community assets such as scenic views, unique habitats, farms, forests, historical sites and other important features.

2.) How does conservation development differ from a cluster development?

Conservation development differs from a cluster subdivision in three important ways:

- Conservation development sets much higher standards for the quantity and quality of protected open space. Typically 50-70% of the land, without development constraints, is permanently set aside using conservation development versus 25-30% for cluster zoning. Cluster subdivisions do not always protect meaningful open space and often include unusable or non-buildable areas as protected open space.
- Conservation development is a flexible design process where unique site features of the parcel are identified and preserved in perpetuity. The "cookie cutter" approach, where building sites are created without regard to the natural characteristics of the land, is eliminated. Instead, development is directed to where the land is most suitable and where impacts to natural resources and community character can be avoided.
- Conservation development can be used to create an interconnected network of protected open space throughout the community. This adds value to each open space parcel and helps to create buffers between development, habitat, parks, surface water, farms and forests.

3.) Does Conservation development change density?

No, conservation development is density neutral. Unlike conventional development, where lot size (such as two acres) is identical to density, in conservation development lot sizes can vary. As required by State Law, the overall density allowed by zoning must not be exceeded. Therefore, conservation development permits smaller lot sizes but no additional lots.

4.) How does the community ensure permanent protection of the open space?

A conservation easement is placed on the chain of title (deed) to the land and cannot be removed, ensuring it will remain as open space in perpetuity. The conservation easement prescribes allowable uses for the parcel (including farming, forest management, or recreation) but prevents the property from being developed. It is recommended that multiple parties such as the community, homeowners association and a land trust be party to the conservation easement to make it easier to enforce over time.

5.) Who owns and maintains the open space?

Rhode Island law allows for four different ownership options:

- Private ownership, under the terms of a written management plan (deeded conservation easement).
- Homeowners Association.
- A non-profit conservation group such as a land trust, Nature Conservancy, or Audubon Society.
- Municipality.
- Combinations of the above. This provides flexibility for open space management and conservation easement enforcement.

6.) How is a conservation development taxed?

Conservation development lots are assessed at equal or greater value than conventional subdivision lots. Due to their proximity to open space and other amenities, conservation development lots have a greater value than lots in conventional subdivisions.

7.) Do conservation development lots have the same value and consumer appeal as conventional large lots?

A Rhode Island study has documented that lots in conservation development sell for as much as 17% more than conventional subdivision lots due to the added amenities of open space and aesthetics. Moreover, conservation development lots sell faster and hold a greater value over time than conventional large lots.

8.) What are the cost comparisons between conventional and conservation development?

Conservation development saves money! A RI study determined that the initial construction costs are lower for conservation development versus conventional subdivision lots. The operation and maintenance cost savings to communities are also lower since there is less road and stormwater infrastructure to maintain. There can also be lower transportation costs (time and gasoline) for school, police, and fire and rescue vehicles.

9.) Will conservation development encourage more growth?

No. There are construction cost savings to developers but these can be balanced by an increased investment in planning, design and amenities. Communities that have adopted conservation development have not experienced an increase in growth.

10.) Is the review of conservation development projects going to be more time consuming for the town?

Initially it may take more time for community officials to review conservation development projects, but as familiarity with the process increases time spent decreases. By identifying and avoiding issues of concern early on in the design of a project conservation development can actually save time by speeding up the review process. Rhode Island law also allows communities to charge reasonable review and inspection fees so that the town can hire third party consultants to assist them. A model fee ordinance is available from the DEM Sustainable Watersheds Office. **Conservation Development Training** is also available from DEM and the Narragansett Bay Watershed Coastal Training Program (a program of the Narragansett Bay National Estuarine Research Reserve).

11.) Can smaller lots protect onsite wells from septic systems?

DEM will allow septic systems and wells on lots as small as one half acre. Conservation development directs growth to the most appropriate areas to avoid placing septic systems in marginal soils wherever possible.

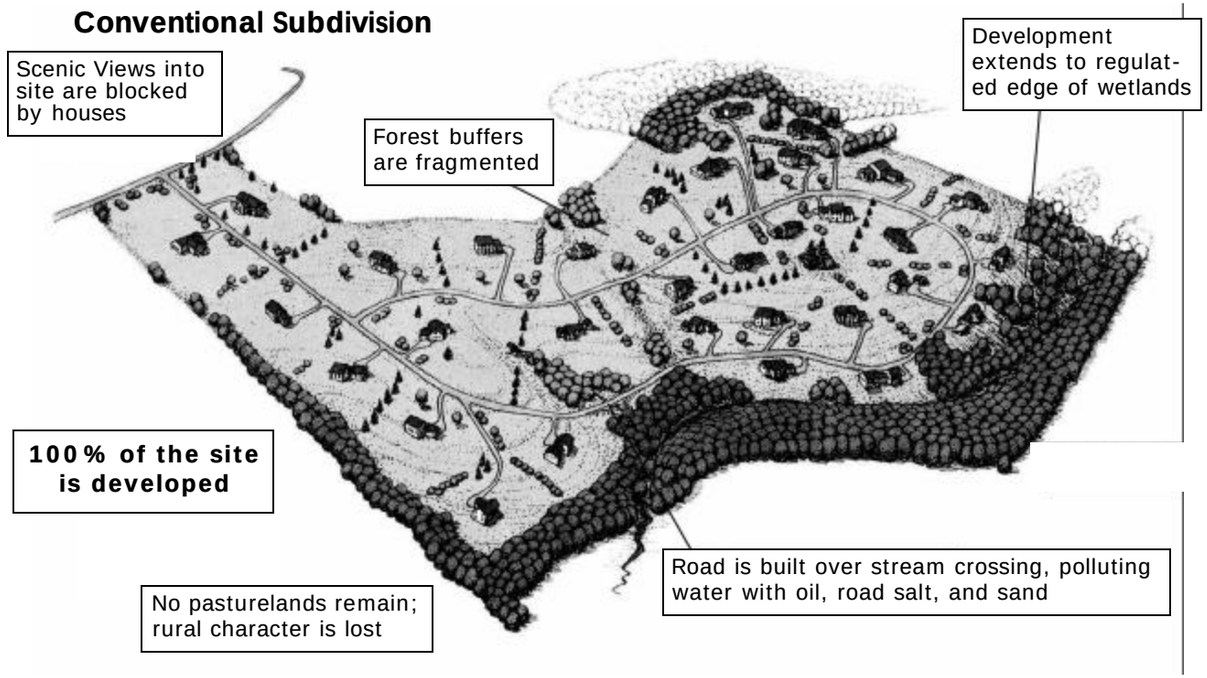
12.) Does conservation development involve a “taking”?

NO. Conservation development does not constitute “a taking of land without compensation” for landowners or developers. Using conservation development does not involve greater density restrictions than traditional zoning, since the same number of lots can be developed.

Conventional Zoning
A Need for Change

Most of the development in Rhode Island follows a conventional subdivision scheme. Local ordinances mandate rigid requirements for large lot size, setback distance, and road frontage, which leads to uniform, grid-like development patterns. Since there are no provisions to preserve any open space, all the land in a community will eventually be developed, making it impossible to protect the area's unique features and meaningful open space. Developing land in this way actually encourages loss of community character and increases negative impacts to the environment. It is inevitable that development will occur, but the problem is not growth itself, rather the way it is happening.

Conventional Subdivision



Key Features of Conservation Development:

1. Important natural, cultural, and recreational resources are identified for permanent protection.
2. Development is flexibly designed from the context of the site, neighborhood, and community.
3. Development is guided to the areas of the site that are the most appropriate.
4. Preserved Open Space is carefully planned for links to adjacent parcels to form continuous open space corridors.

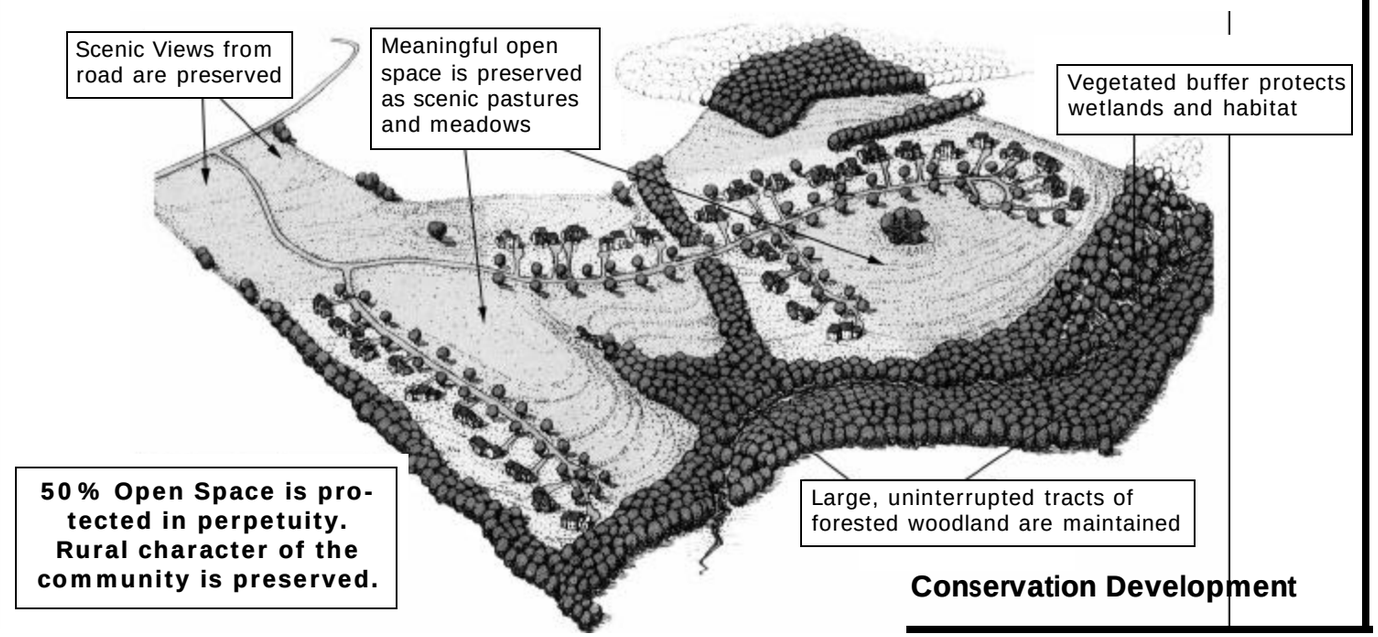
Conservation Development
Growing Greener

There ***is*** an alternative. Conservation Development is a creative land use technique that allows a community to guide growth to the most appropriate areas within a parcel of land, in order to minimize negative impacts to the environment and preserve community character. The goal is to protect at least fifty percent of the parcel in perpetuity as meaningful open space, with no cost to the community.

As more of Rhode Island is developed, protecting open space is getting harder and more expensive for communities.

With Conservation Development, towns do not have to buy or maintain the open space. Moreover, the planning flexibility of Conservation Development allows common open space areas to be linked to existing greenways to form continuous corridors.

By carefully situating houses and lot lines, Conservation Development protects natural and cultural amenities that add not only to the economic value of the property, but to the quality of life as well.



Conservation Development

Advantages of Conservation Development

Economic Advantages:

§ Preserves land without buying it.

§ Reduces town services costs for road maintenance and school transportation.

§ Hastens review process by avoiding sensitive areas early on.

§ Reduces development costs with shorter utility lines, streets, driveways and sidewalks.

§ Increases value and marketability of site.

Environmental Advantages:

§ Preserves vegetated buffers along wetlands, streams, and ponds to protect water quality.

§ Reduces polluted runoff by cutting down on impervious surfaces like streets and driveways.

§ Protects critical habitat and travel corridors for wildlife.

§ Reduces fragmentation of forest blocks and other unique habitats.

Social and Recreational Advantages:

§ Protects historical and cultural features.

§ Preserves aesthetic features and scenic views.

§ Provides both passive and active recreation areas-- walking, biking, hiking, sport fields.

§ Promotes a neighborhood/community atmosphere.

§ Provides gathering spaces for neighborhood functions-- community buildings, gazebos, etc.

The Conservation Development Manual

· RI DEM has developed a guidance manual that walks you through the process of building a Conservation Development subdivision, step by step.

· Each step addresses the who, what, where, when, and how of each part of the process. It provides checklists to keep you on track, resources to help guide you, and ideas of how to identify and preserve features of the landscape.

FOR MORE INFORMATION CONTACT:

DEM Sustainable Watersheds Office at 401-222-3434 or visit our web site at *www.rib-asins.org*

Not ready to lose your town's special places?

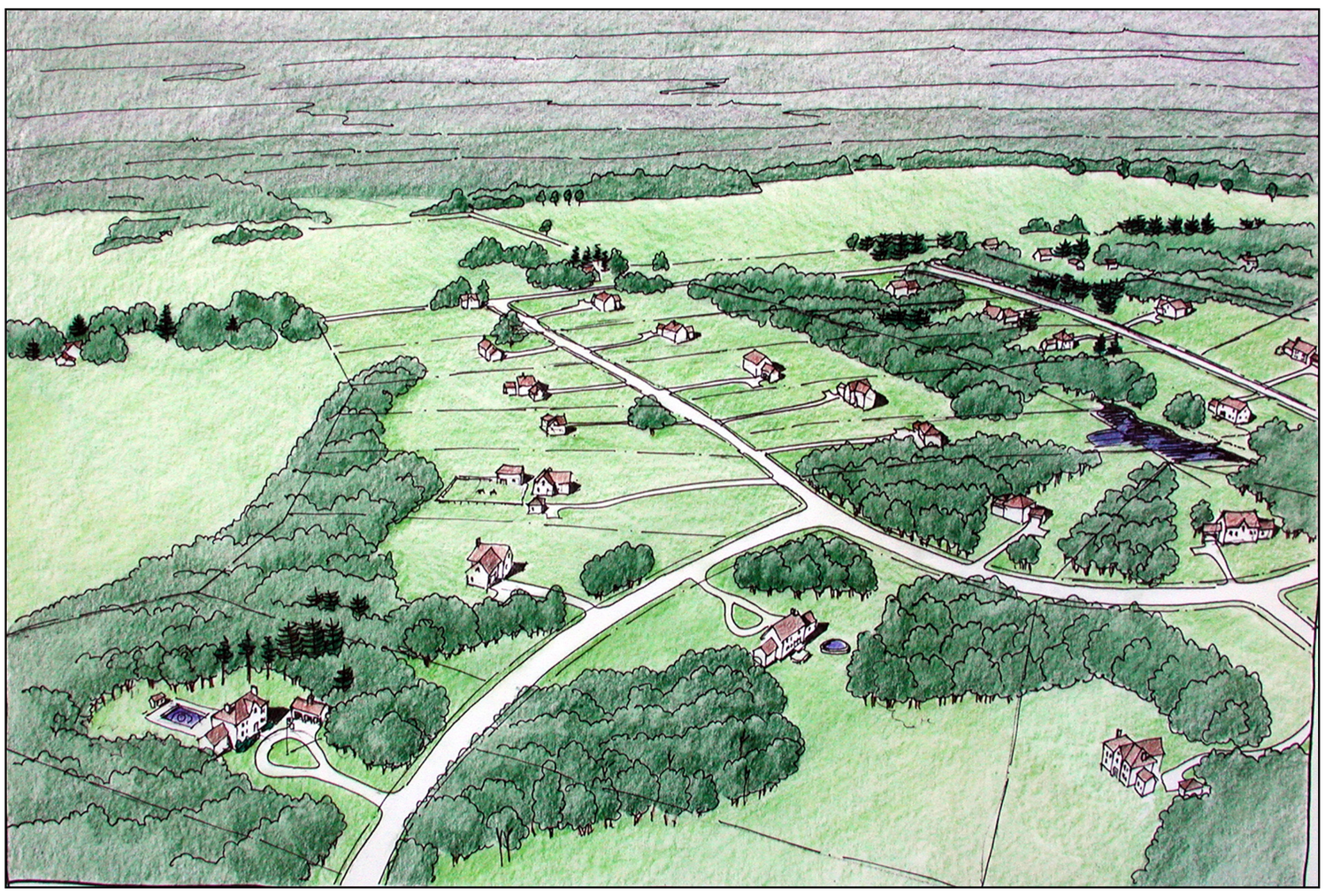
CONSERVATION DEVELOPMENT

A CREATIVE WAY TO GROW WHILE PRESERVING COMMUNITY CHARACTER

Visualizing Conservation Development at the Site Scale

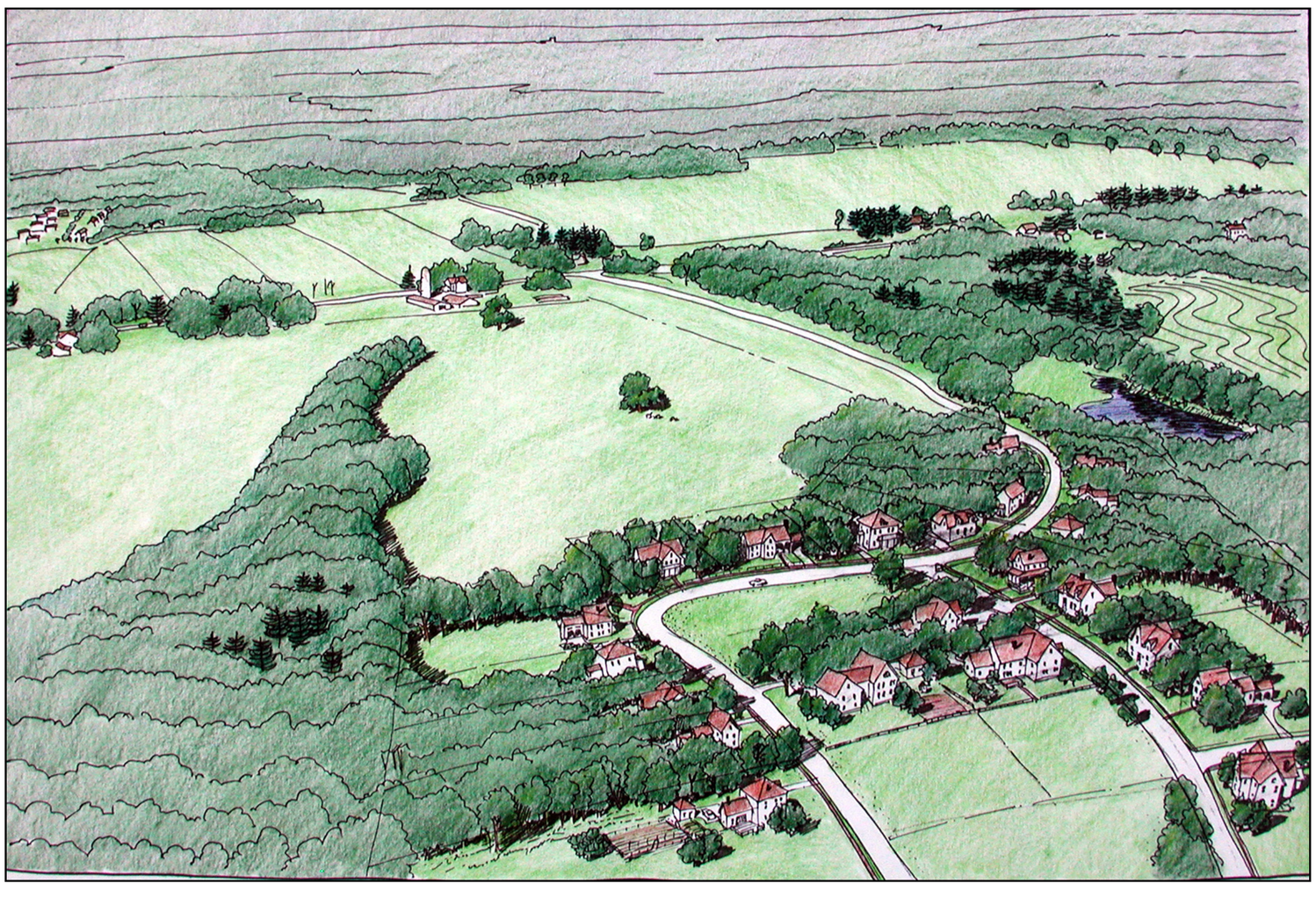
Existing Condition

The site is made up of a varied landscape of farmland, forest, and wetlands, totaling about 175 acres. Ecologically, the site is embedded in a rich matrix of meadows, wetlands, and upland forest. Economically, the active dairy farm on the site is central to one of the last remaining agricultural areas in Rhode Island -- a land use that gets harder to maintain as farms are isolated from each other by development. The visual character of the site reflects this remarkable variety of land uses: it includes historic farmsteads along the state highway, long views across cultivated land, and a series of small meadows and woodlots. Adding further variety to the mix are isolated large trees and hedgerows dividing the fields, as well as streams, ponds, and wetland corridors.



Conventional Development

Applying the five acre minimum lot size required in this district produces a subdivision of 34 lots (some out of sight below the frame of this illustration). Development of these lots and new roads to access them destroys the agricultural use of the land. The open character of the landscape, particularly on the more visible northern end (top of illustration), would make it difficult to hide the houses. At best, what results is a more spread out version of a typical suburban subdivision, with lots too large to be easily maintained, but too small for continued agricultural use.

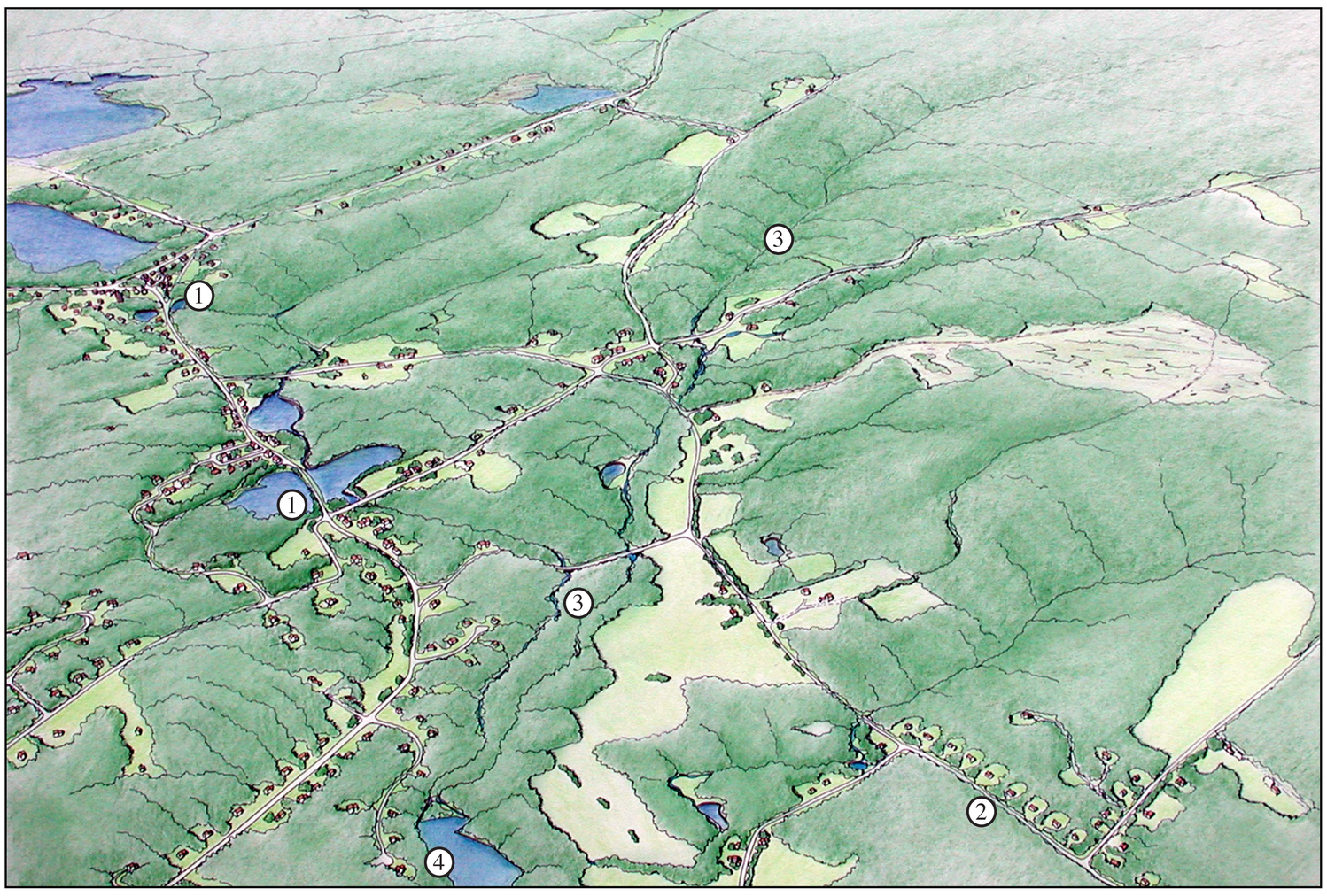


Conservation Development

The Conservation Development approach allows the farmer, the residents, and the public all to benefit. Most of the areas in active cultivation remain so and are managed by the same family now operating the farm. The same 34 units allowed under current zoning for the site are constructed on lots averaging half an acre. The remaining open space is set aside for conservation of stream corridors and wetlands, while a network of pedestrian trails allows residents to enjoy this common land. Homes in the new neighborhood would each face out onto a small park, as well as having views and physical access to common open space in the rear of each property. The quality of life this affords keeps lot values high, even though the lots themselves are smaller.

Source: RIDEM The Rhode Island Conservation Development Manual

Visualizing Conservation Development at the Regional Scale



Existing Condition

This drawing shows a typical rural area as it now exists. Like many areas in Rhode Island, it contains a mix of small farms and forested lands, interspersed with historic mill villages (1) and more recent frontage development (2). At the center of the image (3), a stream drains a narrow valley, collecting runoff from surrounding farms and woodlots and draining into the pond at the bottom of the picture (4). Each of the "undeveloped" parcels in this image is thus part of several larger ecological and cultural systems. For example, the rural highway at the left side of the image forms a continuous corridor of historic mill villages, while the rural road to the right connects a series of small farms into a continuous agricultural corridor. The stream valleys and wooded ridges that separate these cultural corridors form the backbone of an environmental system that supports native plants and animals and protects water supplies from contamination.

Conventional Development

This drawing shows the same rural area after development under conventional two-acre zoning. Most of the farmland -- often the easiest land to build on -- is developed first, along with existing road frontage. While large areas of wetlands and land already protected remain undeveloped, the new subdivisions and roadside frontage lots fragment wildlife habitat and replace rural vistas with suburban house lots. Meanwhile, the lack of two-acre lots in existing village centers brings growth to a halt in the places most suited to community life. The result is a landscape where existing natural and cultural resources are replaced by single-family house lots, with a resulting loss of rural character and quality of life.

Conservation Development

This drawing shows a creative approach to development of the area, using the Conservation Development process to build the same number of new homes allowed by current zoning in a pattern shaped by existing networks of natural and cultural resources. Development of parcels adjoining existing village centers (1) is laid out as an extension of the existing village: streets and sidewalks are connected, lot sizes and setbacks are based on the existing neighborhood, and open space is protected at the periphery to create a permanent greenbelt. In more rural areas (2), new homes are tucked into the edges of meadows or woods, or gathered into small hamlets designed according to local traditions of building walkable, livable communities. Open space is consolidated to buffer wetlands and sensitive stream corridors, and scenic roadside farmland is protected. Large tracts of protected forest are extended and connected to maintain movement corridors for wildlife and recreation.

Source: RIDEM The Rhode Island Conservation Development Manual

These guidelines are meant to supplement the

Rhode Island Conservation Development Manual: A Ten-Step Process for Planning and Design of Creative Development Projects

by the DEM Sustainable Watersheds Office

The following design guidelines are intended to illustrate some basic open space preservation principles and to show plans from actual sites.

How These Sketch Plans Evolved

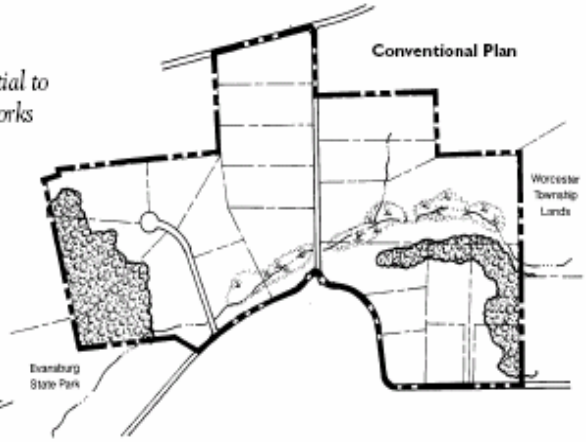
These conservation subdivision studies illustrate the design principles behind Pennsylvania's statewide planning program *Growing Greener:Conservation By Design.* This program, created to help improve local development patterns, is a partnership between the Pennsylvania Department of Conservation and Natural Resources; the Governor's Center for Local Government Services; Natural Lands Trust, a regional land conservancy located in Media, Pennsylvania; and an advisory committee comprised of officials from state and local agencies including the Pennsylvania Environmental Council; The Pennsylvania State University Cooperative Extension, and other non-profits and the private sector. Since it's inception in 1996, Natural Lands Trust staff and program partners have worked with communities to show them how to incorporate parks and conservation lands into the design of residential developments through a new generation of municipal open space plans, zoning standards and subdivision requirements.

The sketch plans and open space preservation guidelines are courtesy of the Natural Lands Trust:

Natural Lands Trust
1031 Palmers Mill Road
Media, PA 19063
tel: 610-353-5587 ~ *fax:* 610-353-0517
info@natlands.org ~ www.natlands.org

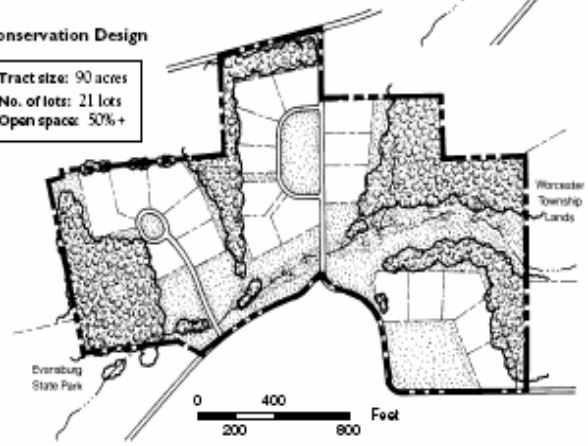
Evansburg Area

Conservation Design Illustrates the Potential to Create Interconnected Open Space Networks



Worcester Township, Montgomery County

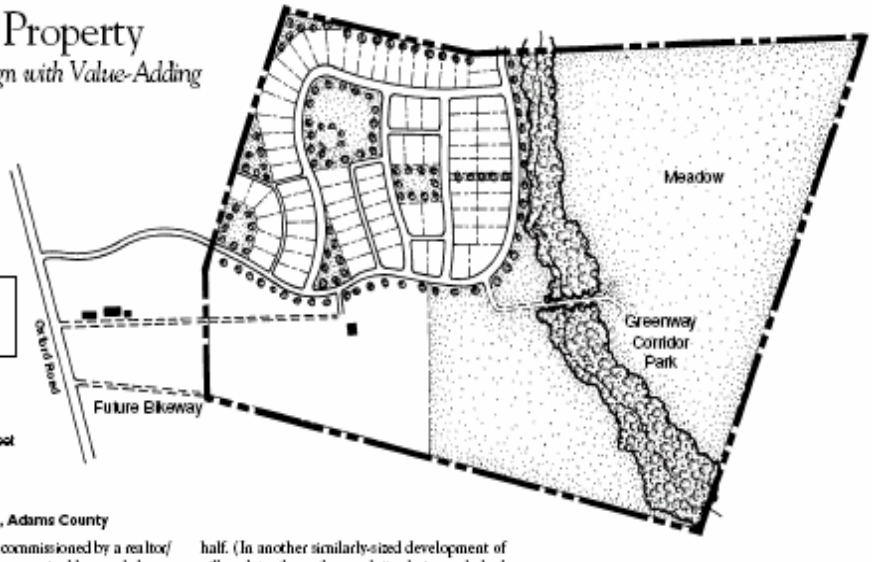
After seeing an early version of the *Growing Greener* slide presentation at Temple University, several supervisors from Worcester Township asked Natural Lands Trust staff to visit a property proposed for complete coverage by three-acre lots and recommend an alternative layout that would conserve significant open space. Their concern had been heightened by the fact that this property adjoined not only a parcel of township land intended for future park development, but also abutted the Evansburg State Forest. Moreover, a limestone stream noted for its trout fishery flowed through the property and essentially connected the township land with the state forest. After visiting the property and evaluating the importance of the woodland habitat (which was closely associated with the stream valley tributaries), the design solution practically suggested itself. All of the forested areas were "designed around", in addition to reserving a "foreground meadow" in a highly visible farm field — which was an important element in conserving the community's rural character. The possibility of a trail linking the two public landholdings remains a distinct possibility. No further action on the property has yet been taken by the owner who is considering several conservation options.



NATURAL LANDS TRUST

Sheaffer Property

A Village Design with Value-Adding Open Space



Conewago Township, Adams County

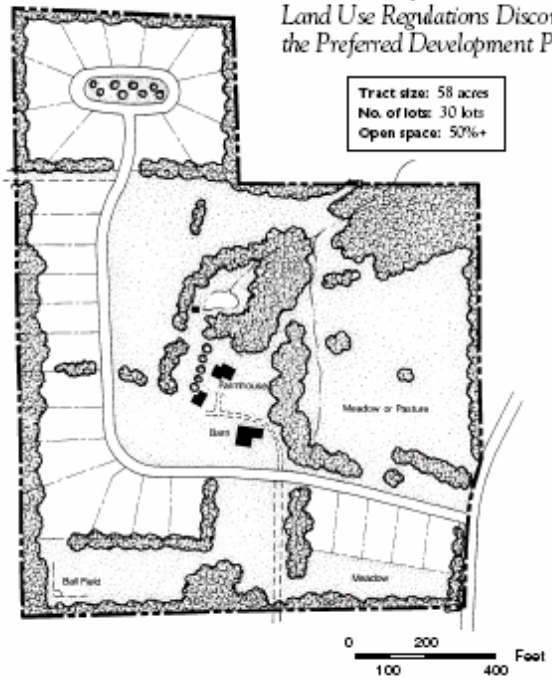
This design was commissioned by a realtor/developer who recognized he needed assistance in devising a plan that would achieve his goal of creating a distinctive neighborhood which would corner the local market for homes built in a neighborhood with a special sense of community. With water and sewer availability, lot sizes could easily be reduced to the village scale, enabling the development "footprint" to be about one-quarter of what it would otherwise have been. In addition to conserving value-adding open space that will increase marketability and boost sales, this approach cuts street construction and site grading costs by more than half. (In another similarly-sized development of village lots, the author and site designer slashed grading costs by more than 80% simply by designing with the terrain and scraping only half of the land area.) The major loop road serving this development is largely "single-loaded" (homes on one side only) to maintain the open feel of the property, which is critical during the sales phase. The original brick farmhouse is sited to form "terminal vistas" from three different directions, and the strategic use of back lanes (alleys) enables 16 homes to front directly onto neighborhood greens with no street frontage per se. Very progressive ordinances permit such design innovations, with officials recognizing that fire access is easily achieved by pulling hoses across the modest open space from the street, or through rear access drives (which most developments fail to provide at all).

For further information about this design approach, see Arendt, Randall. *Crossroads, Hamlet, Village, Town: Design Characteristics of Traditional Neighborhoods, Old and New.* Chicago: American Planning Association, Planning Advisory Service Report No. 487/488, 1999.

NATURAL LANDS TRUST

Blosinski Property

A Community Discovers That Its Land Use Regulations Discourage the Preferred Development Plan



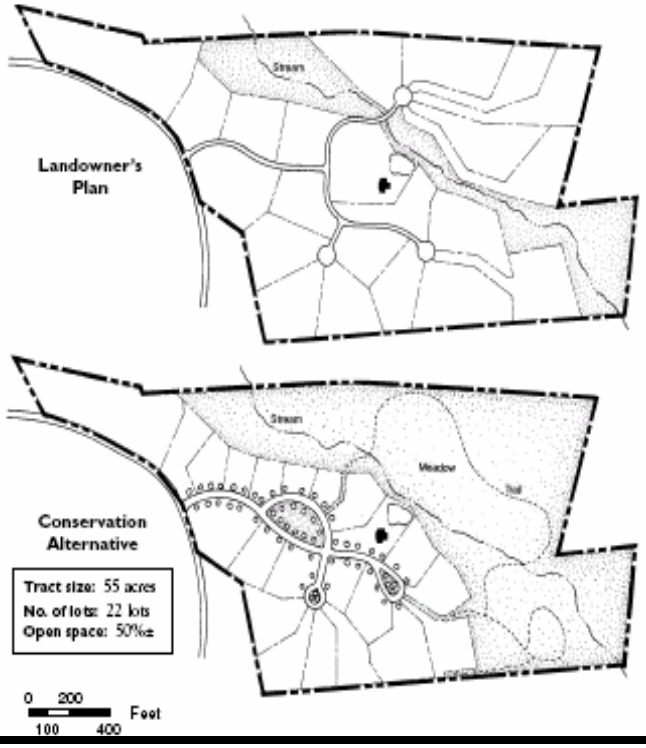
Edgmont Township, Delaware County

This redesign was requested by the township manager, who was deeply interested in introducing the *Growing Greener* principles to her community. Although the landowner consented to this demonstration exercise, he expressed no particular preference for a layout that would protect the essential features of his property, stating at one point that he did not care what happened to the place after he sold it. The design took advantage of the several hedgerows on the property, using them to separate distinctive neighborhoods, and to separate yards from adjacent open space. However, by far the most salient aspect of the design involved its retention of the original stone farmhouse and barn (both in good structural condition), surrounded by meadows, pastures, and locust groves. The intention was to create a very high-value "conservancy lot" to be purchased by a gentleman farmer who might enclose his property with a white board fence and bring horses back onto the land. The principal (southern) view from the farmhouse, past the barn, was also to have been protected, as noted on the accompanying plan. Except for a dozen homes centered around a neighborhood green, all of the lots were situated to face onto very attractive major open space (and nine of them were also to enjoy backyard open space views as well). Unfortunately, the developer simply wanted to divide the land into large suburban lots, and was not interested in discussing alternative layouts. In the absence of any strong municipal regulations actively discouraging such land-consumptive practices (as through the *Growing Greener* density disincentives applied to conventional plans), communities remain impotent in issues involving the pattern of future development and its impact upon their diminishing open space and rural character.

NATURAL LANDS TRUST

Schultz Property

A Redesign Emphasizes the Importance of Ordinance Standards for Open Space



London Britain Township, Chester County

This design was tendered to a speculative landowner who complained to Natural Lands Trust about the difficulties he was experiencing with a Planning Commission he said was not impressed with his submission, which he described as containing substantial open space. The drawing he subsequently sent to the Trust for its informal review, however, missed significant opportunities to site homes with lesser impact upon the landscape and natural resources. In fact, its extensive street system, long driveways, and needless stream crossing deeply fragmented the resource areas and scattered the house sites across almost the entire property. The alternative layout was prepared by the Trust to show the landowner how the same number of homes could be more sensitively arranged to both enjoy highly marketable views of protected open space and to better protect the property's special features. However, by this point in his interactions with local officials, he was unwilling to consider changes to his initial plan. Township officials were pleased with the alternative layout but were unable to influence the applicant to submit a conservation design with less sprawling lots, because their existing ordinances did allow large-lot layouts, albeit with certain dimensional requirements not met on the landowner's plan. Precisely because the original proposal did not fully comply with those existing ordinances, that plan was not approved. The landowner neither challenged the Township's position nor submitted a revised plan. This unsettling and unsuccessful experience convinced officials they needed to restructure their codes so they would be able in the future to actively discourage proposals with inadequate or highly fragmented open space, and more effectively persuade applicants to follow the conservation design approach. They accomplished this restructuring over the subsequent fifteen months.

NATURAL LANDS TRUST

Weatherstone[SM]

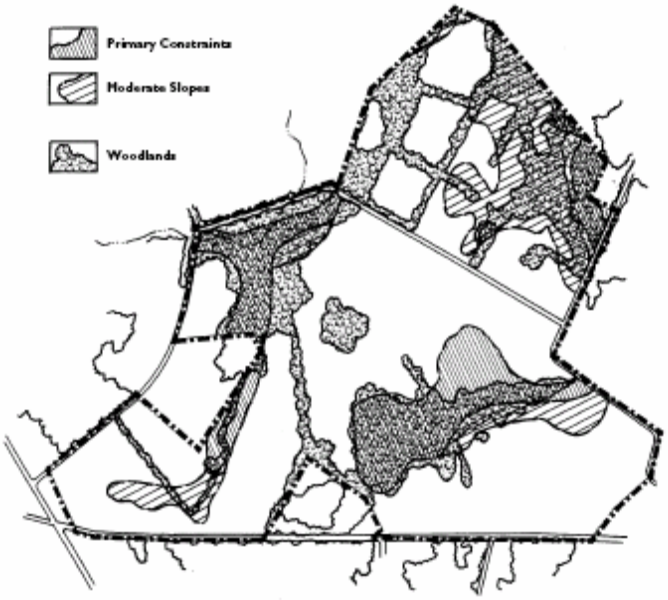
Village Design Respects a Township's Conservation Lands Map

West Vincent Township, Chester County

This large 300-acre parcel is located at Ludwig's Corner, a major intersection of two state highways (Routes 100 and 401) in West Vincent Township, Chester County.

This development by the Hankin Group of Exton, Pennsylvania, is important for several reasons. First, the extensive conservation lands (totaling 195 acres, or more than 65% of the total tract area) were laid out with reference to the Township's *Map of Potential Conservation Lands*. This map, which is a key element of the *Growing Greener* conservation planning process, identifies both Primary Conservation Areas (unbuildable wetlands, floodplains, and steep slopes) plus conservation opportunities on significant portions of the remaining developable acreage.

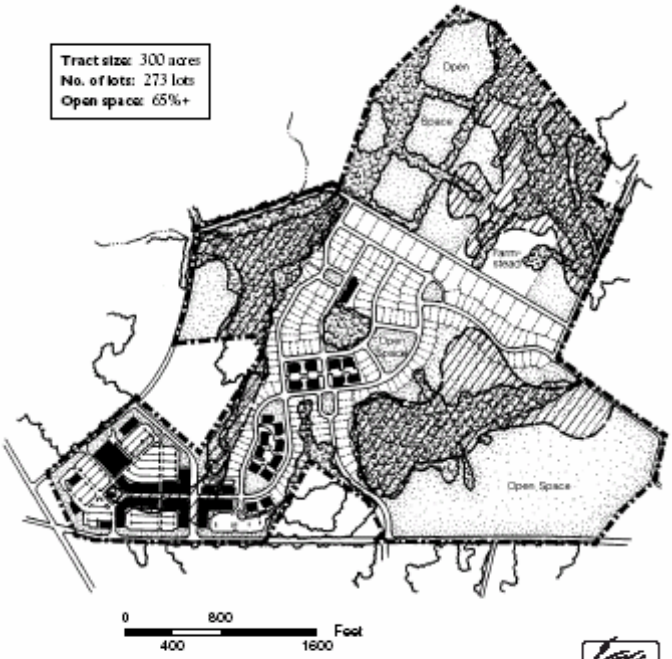
The Township map was originally created by Natural Lands Trust and Castle Valley Associates, Doylestown, PA to demonstrate the four-step conservation design process. Weatherstone assists the municipality in achieving its comprehensive, long-range conservation goal of securing protection of a township-wide network of open space. This open space is being used for a variety of approved purposes, including agricultural production, grazing, forest habitat, and both active and passive recreation (including acreage dedicated to the municipality). Equally important, all of Weatherstone's development areas are located in those parts of the property that were indicated on the community's maps as appropriate for such uses.



Another notable aspect of this landmark development is its recharge of groundwater supplies through the use of spray irrigation (fully-treated wastewater applied to conservation lands) and stormwater management techniques featuring infiltration measures rather than employing the more conventional "catch-and-release" approach that does little or nothing to replenish the underlying aquifer. The project's advanced stormwater management design also filters discharges to the sensitive headwaters streams emanating on the property.

The plan reflects the Hankin Group's assemblage of a team of talented designers to carry out the initial village concept. From a development perspective, Weatherstone is noteworthy for blending different but compatible land uses, including a mixture of 273 single-family and attached residential units, 240,000 sq. ft. of retail and office space, and a new branch of the county library system.

This property carried a long history of controversy and several development scenarios were put forth over the years. Credit goes to the Township Supervisors who, faced with inevitable development, approved a plan that upholds high standards for conservation and development in their community.



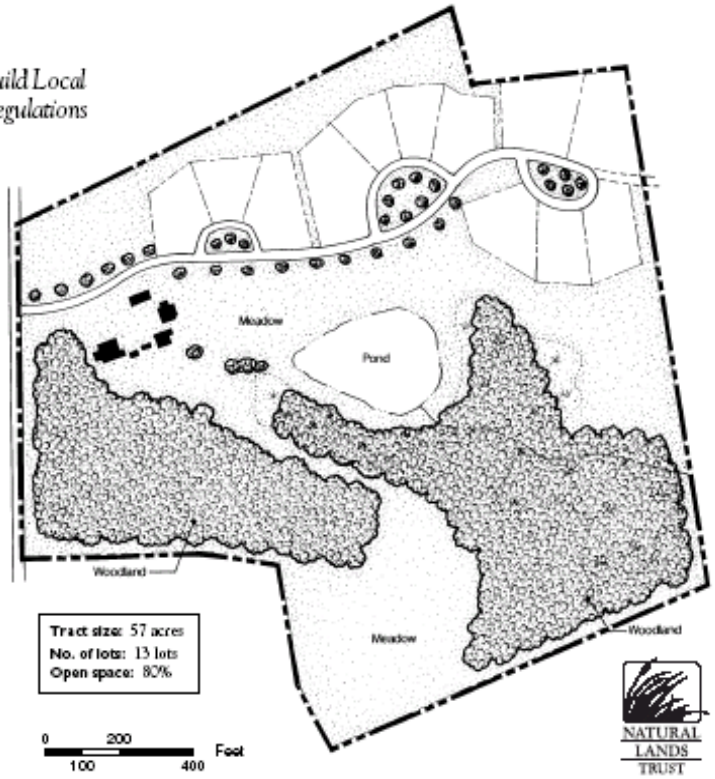
NATURAL LANDS TRUST

Frankel Property

A Conservation Design Helps Build Local Support for Flexible Land Use Regulations

Honey Brook Township, Chester County

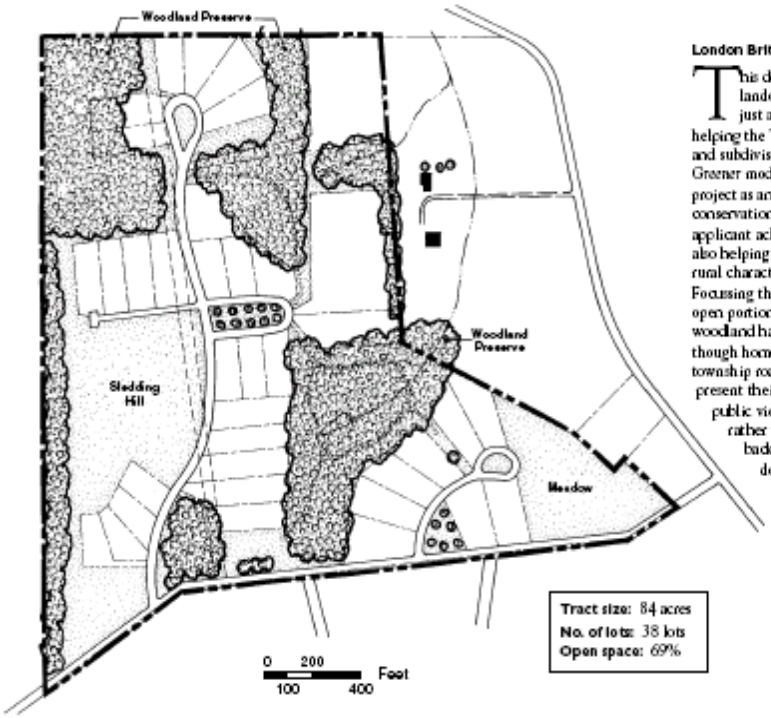
The veterinarian who lived on this property requested design assistance from Natural Lands Trust while its staff was helping Township officials draft improved language for their new zoning ordinance. This landowner welcomed the opportunity to create a dozen houselots on his land in a way that would minimize visual and environmental impacts, as well as keeping development costs down. The layout was accomplished in an elegant "single-loaded" fashion (with homes on one side of the street only) to preserve open space views both front and back from most of the houses. Additional variety was provided by two crescents where road widths could be minimized by designating them as private common driveways. This landowner and others like him voiced their support for the proposed zoning and subdivision ordinance changes, which are currently undergoing adoption.



NATURAL LANDS TRUST

Lang Property

A Community's New Growing Greener Ordinances Permit a Landowner to Preserve the Woods and Neighborhood Sledding Hill



Tract size: 84 acres
No. of lots: 38 lots
Open space: 69%

London Britain Township, Chester County

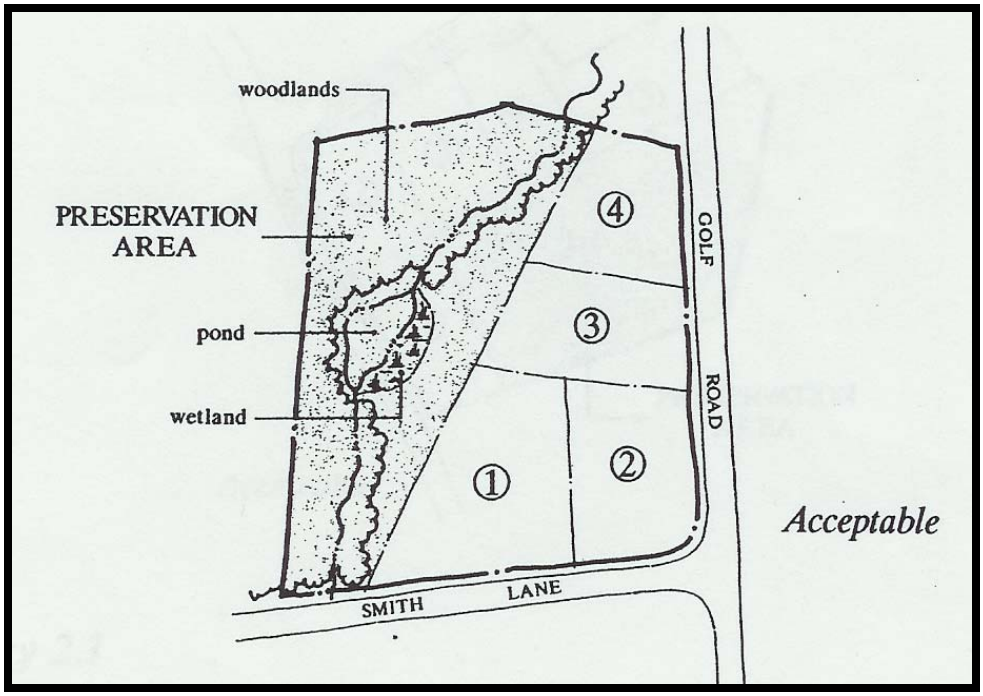
This design was commissioned by the landowner, who grew up on the property, just at the time Natural Lands Trust was helping the Township officials update their zoning and subdivision ordinances to include the Growing Greener model language. Both parties viewed the project as an opportunity to demonstrate how the conservation design approach could help the applicant achieve his financial objectives while also helping the community to accomplish its rural character and resource preservation goals. Focusing the vast majority of the houselots on the open portions of the site has enabled most of the woodland habitat to remain undisturbed. Although homes will be visible from the existing township roads, they are carefully oriented to present their most attractive faces toward the public viewshed, across "foreground meadows", rather than displaying their less attractive backsides (with decks and sliding glass doors). Two other noteworthy design features are the preservation of the neighborhood sledding hill and the substitution of a "loop lane" with a central landscaped green instead of a standard cul-de-sac.

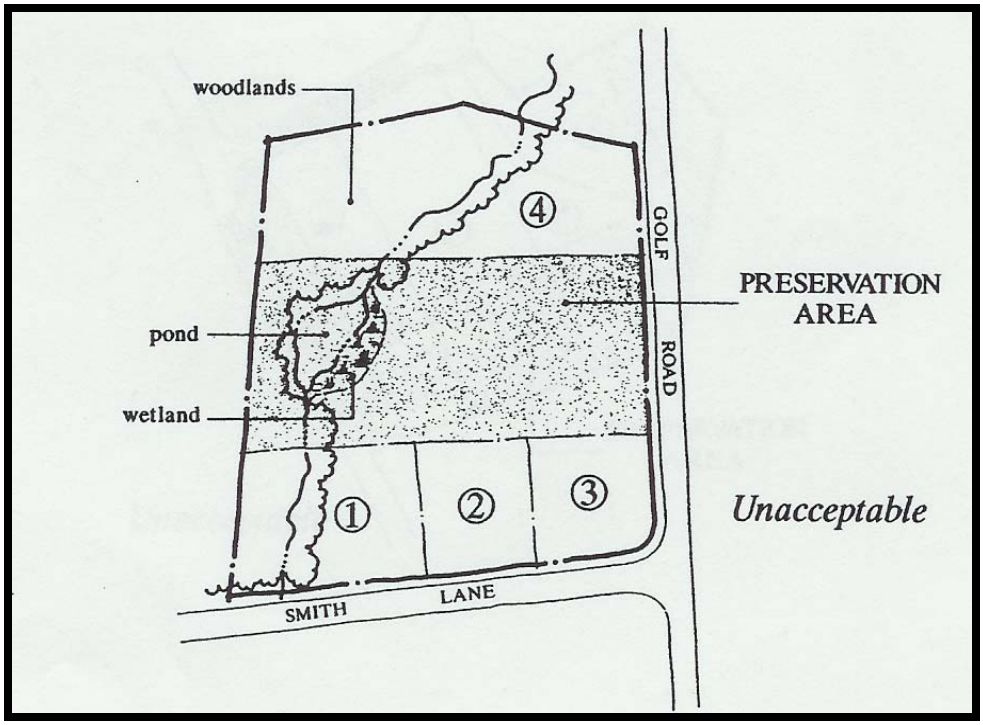
NATURAL LANDS TRUST

Designs are adapted with permission from the Natural Lands Trust.

<u>Guideline Principle #1</u>

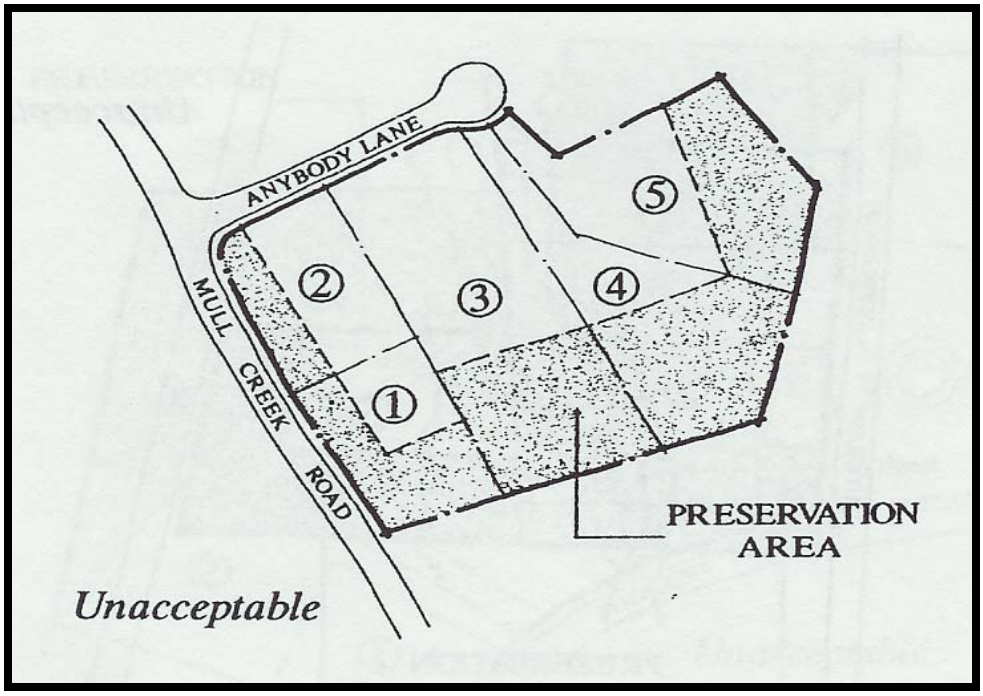
Preservation Area should include the most sensitive resource areas of the property.

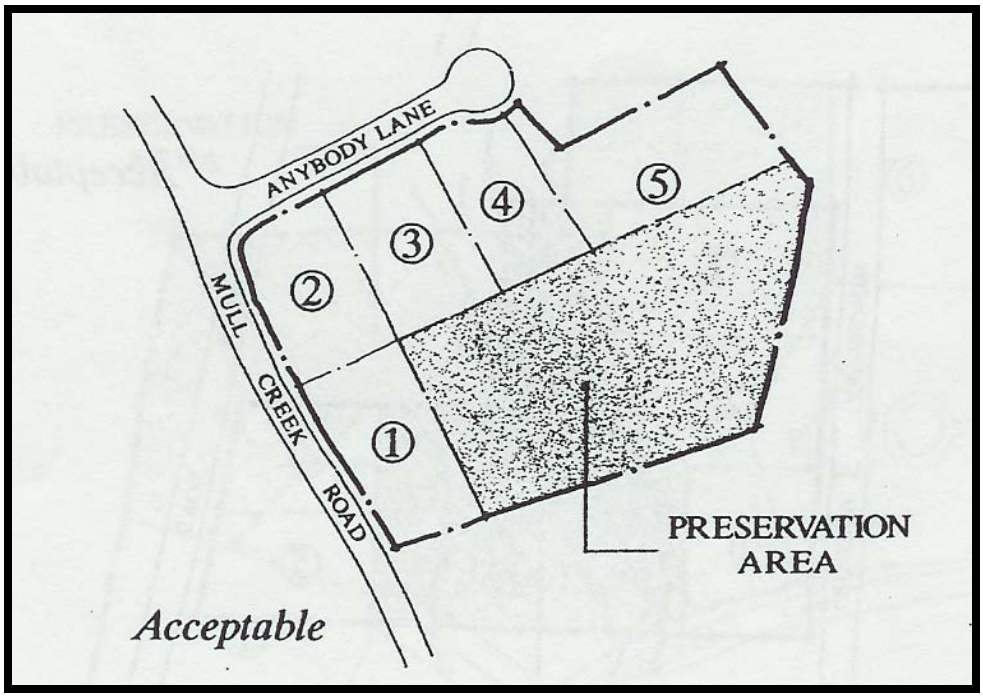




Guideline Principle #2

Preservation Area should be designed as one, large block of land with logical, straightforward boundaries.

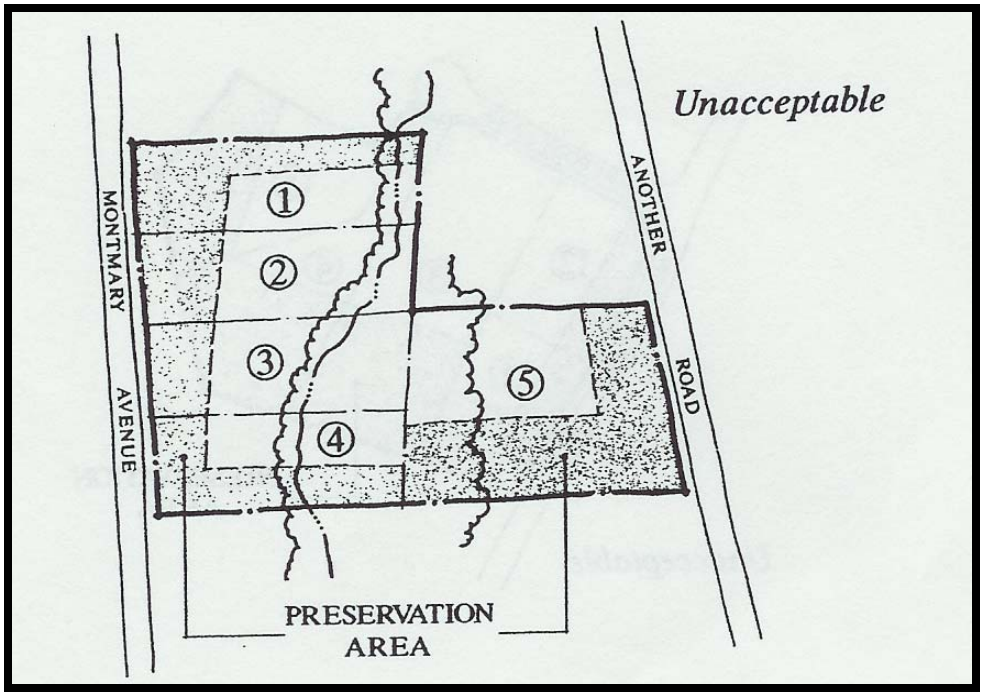


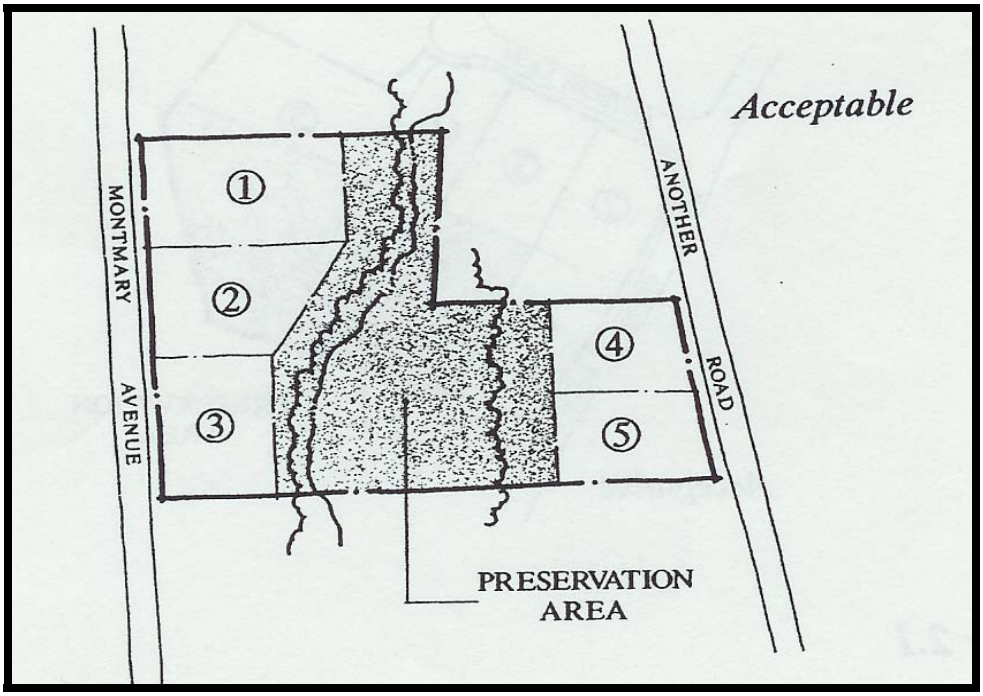


Example 1

Guideline Principle #2

Preservation Area should be designed as one, large block of land with logical, straightforward boundaries.

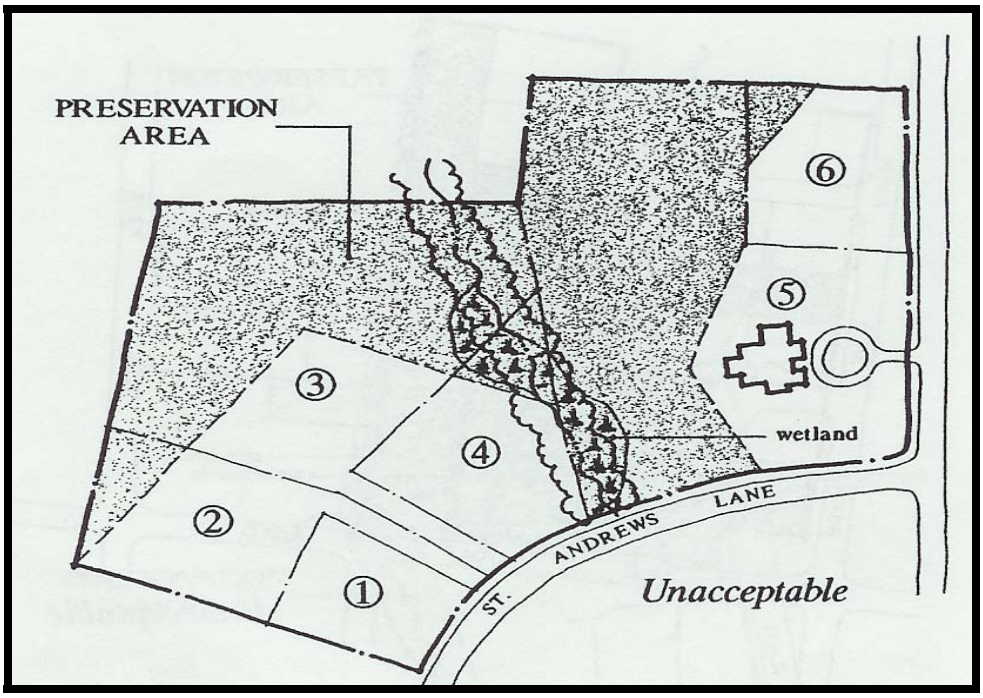


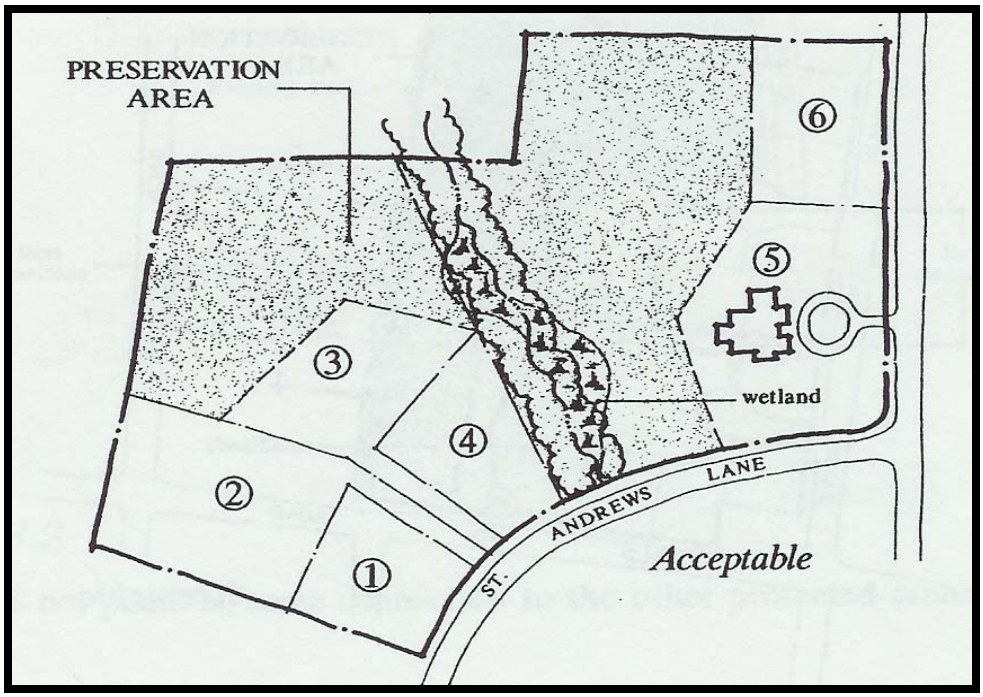


Example 2

Guideline Principle #2

Preservation Area should be designed as one, large block of land with logical, straightforward boundaries.





Example 3

*Under no circumstances should Preservation Areas extend into small corners of lots.

Guideline Principle #2

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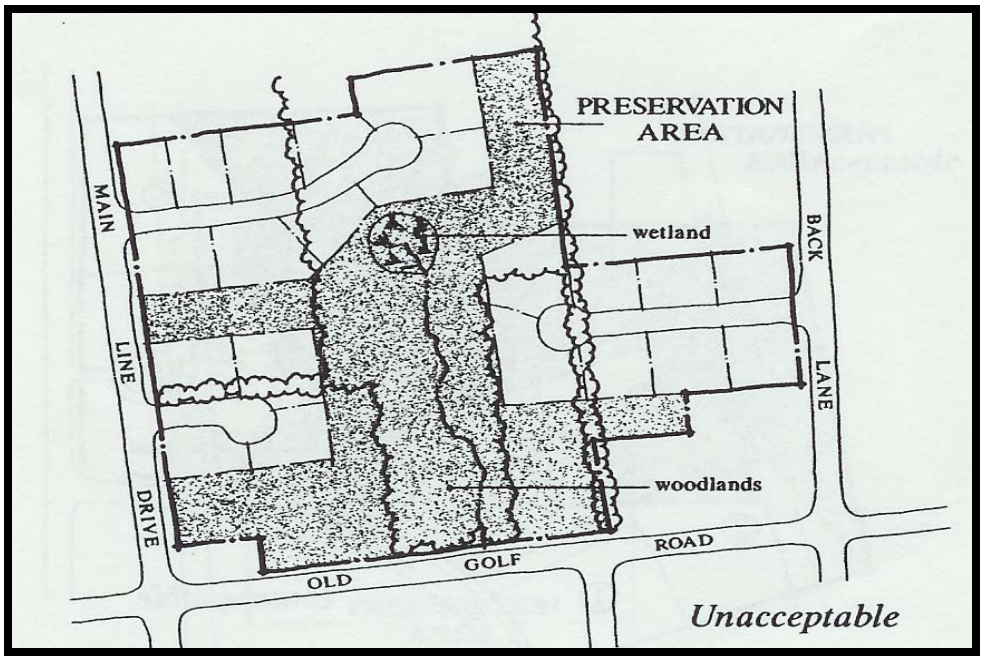
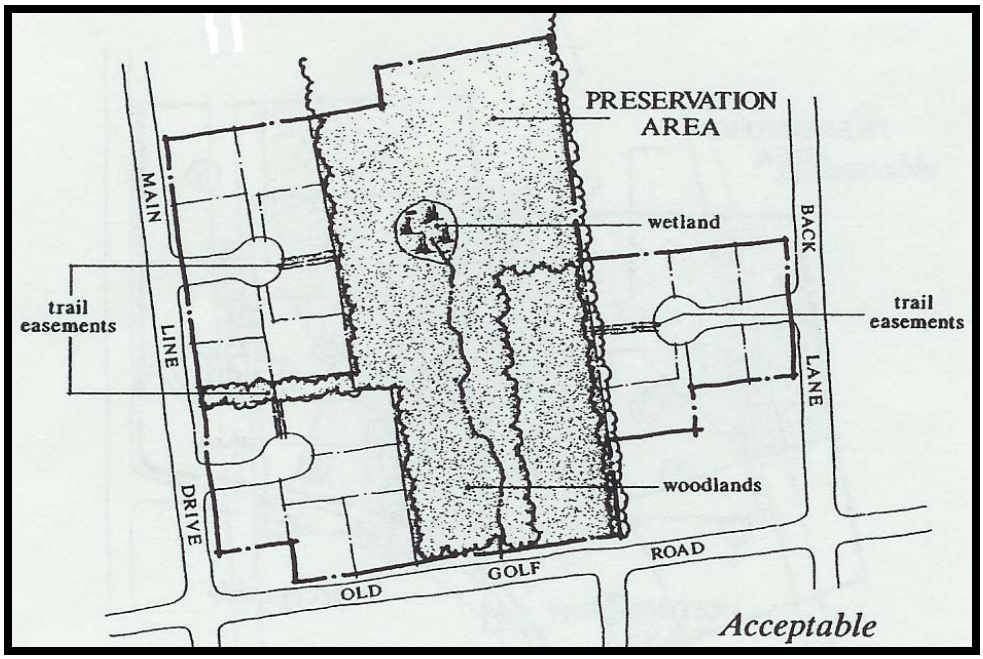


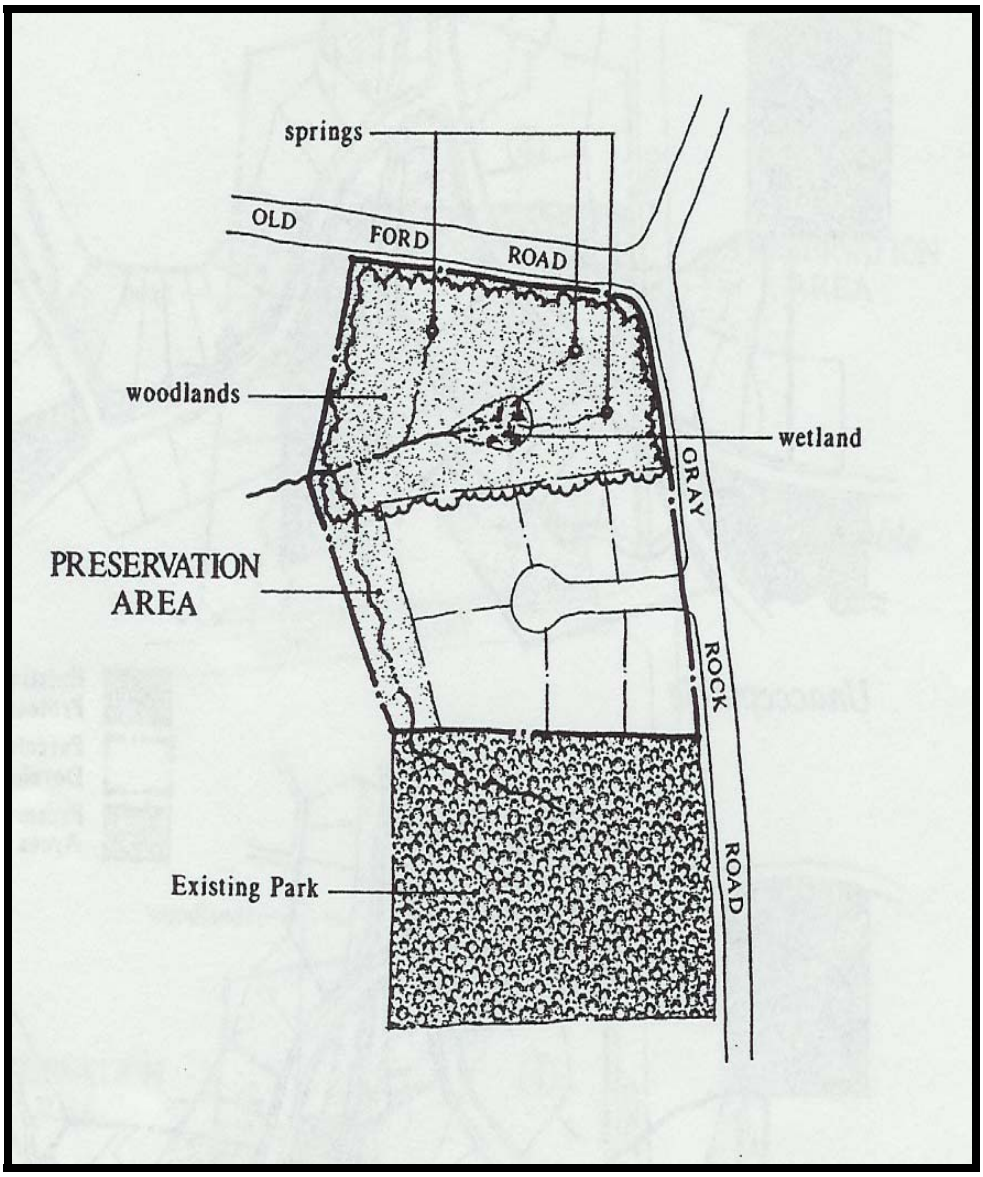


Example 4

*The boundaries of Preservation Areas should be designed to be as simple and short as possible, so they can easily be found in the field and enforced. Where possible, natural boundaries or existing features of the land should be used.

Guideline Principle #3

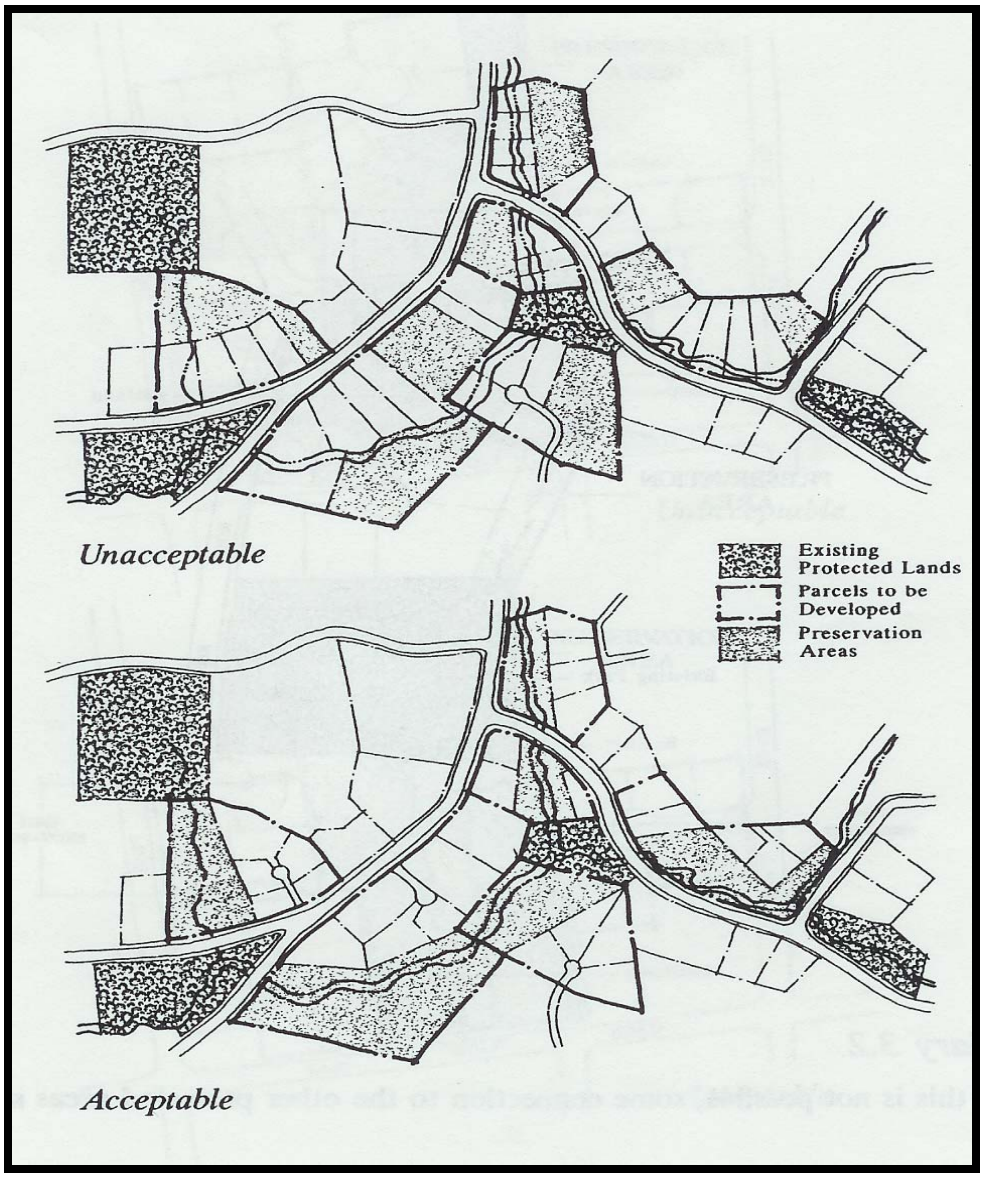
Preservation Area should be designed as part of a larger continuous and integrated open space.



* Where this is not possible, some connection to the other protected areas should be made.

Guideline Principle #3

Preservation Area should be designed as part of a larger continuous and integrated open space.



*The Preservation Area should be contiguous to other protected areas on adjoining lands.

The Economics of Conservation Subdivisions

Price Premiums, Improvement Costs, and Absorption Rates

By: Rayman Mohamed, Wayne State University

A scientific study based on 184 randomly selected lots built and sold in South Kingstown, Rhode Island between 1993 and 2002.

Several Key Points:

- "In addition to preserving agricultural land, open space is now expected to serve important ecological roles by providing natural habitat, reducing runoff volumes, limiting landscape and lawn maintenance, and providing natural cooling."
- Communal ownership is important "strips of open space behind backyards simply encouraged residents on either side of the strip to consider portions as private."
- "Americans can be comfortable with higher density subdivisions provided that other environmental, aesthetic, and communal concerns are addressed…"
- Construction costs are 40% less per lot.
- Lots sell 47% faster.
- Average price of a lot per acre is 17% higher in a conservation subdivision lot. That equates to a $42,000 increase on a $250,000 home.

To access the full article please visit:
http://www.landchoices.org/conservationsubs/consubs_pdfs/consubs_economics1.pdf

THE ECONOMICS OF CONSERVATION SUBDIVISIONS
Price Premiums, Improvement Costs, and Absorption Rates

RAYMAN MOHAMED
Wayne State University

The environmental benefits of less land consumption and a growing interest in addressing the negative economic and social impacts of sprawl have resulted in calls for more sensitive subdivision designs. One such design is conservation subdivisions. However, not much is known about these subdivisions, in particular about their economics. This article addresses the issue by examining price premiums, investment costs, and absorption rates for lots in conservation versus those in conventional subdivisions. The results show that lots in conservation subdivisions carry a premium, are less expensive to build, and sell more quickly than lots in conventional subdivisions. The results suggest that designs that take a holistic view of ecology, aesthetics, and sense of community can assuage concerns about higher density. However, the potential negative consequences of conservation subdivisions require further study.

Keywords: *conservation subdivisions; open space; developers; Smart Growth; New Urbanism*

The environmental benefits of less land consumption and a growing interest in addressing the negative economic and social impacts of sprawl have resulted in calls for more sensitive subdivision designs (Randolph 2004, 39; Rocky Mountain Institute 1998). One such type of design is "conservation

AUTHOR'S NOTE: *Many thanks are due to South Kingstown town officials who were generous with the data and time necessary to complete this research. These include Carol Baker, Tony Lachowicz, Vincent Murray, Ginny Paul, Jon Schock, Ed Vigliotti, and Dennis Vinhateiro. Thanks are also due to Tony Brinkman, George Galster, Allen Goodman, Kami Pothukuchi, Laura Reese, Gary Sands, Lyke Thompson, and Avis Vidal of Wayne State University, and Deborah Davenport of Mississippi State University. They all provided invaluable comments. David Lewis, Rolf Pendall, and Richard Schuler of Cornell University provided comments on earlier drafts.*

URBAN AFFAIRS REVIEW, Vol. 41, No. 3, January 2006 376-399
DOI: 10.1177/1078087405282183

subdivisions." These subdivisions are defined by their use of the natural landscape as the basis for overall design (Arendt 1999a). Their advantages over conventional "cookie-cutter" subdivisions include reduced land consumption, less damage to the environment, and the preservation of open space (Arendt 1999a; Arnold and Gibbons 1996; Berke et al. 2003; Odell, Theobald, and Knight 2003). Figure 1 shows a generic conventional subdivision and compares it to a generic conservation subdivision.

Beyond these broad generalizations, however, not much is known about conservation subdivisions. An exchange between Arendt (1997) and Daniels (1997) highlighted some of the unknowns related to conservation subdivisions, including their role in controlling sprawl and preserving agricultural land and their effects on the environment and land prices. This exchange presaged a growing interest in gaining a deeper understanding of the effects and policy implications of utilizing conservation subdivisions as a component of land use policies.

The issues related to conservation subdivisions are wide-ranging and require further study before a comprehensive picture of the policy implications of using these subdivisions can emerge. One of these issues is the economics of conservation subdivisions. In broadly discussing the economics of new subdivision designs, Pauker (1997) lists price premiums, investment costs, and absorption rates as three of the unknowns that hinder adoption by developers.

This article contributes to our understanding about conservation subdivisions by addressing these unknowns from three directions: First, it examines whether there is a price premium for lots in conservation versus conventional subdivisions. Although the natural and social features of conservation subdivisions are appreciated by residents (Kaplan, Austin, and Kaplan 2004), higher-density development is viewed negatively by most Americans (Danielsen, Lang, and Fulton 1999). How these two competing features of conservation subdivisions are resolved in the market is not clear.

Second, this article examines whether lots in conservation subdivisions are less expensive to build than lots in conventional subdivisions. Although smaller lot sizes reduce infrastructure costs, requirements to build around the natural features of a parcel might increase the overall cost of conservation subdivisions, offsetting any premiums such lots may carry.[1] The industry's experience with novel projects can explain developers' reluctance to undertake projects with uncertain costs. For instance, imaginative projects such as Reston, Columbia, and Kentlands almost failed because the rate of disposal of finished property was not sufficient to cover upfront costs (Fulton 1996).

Third, this article examines absorption rates for lots in conservation versus conventional subdivisions to ascertain if lots in the former sell at a faster

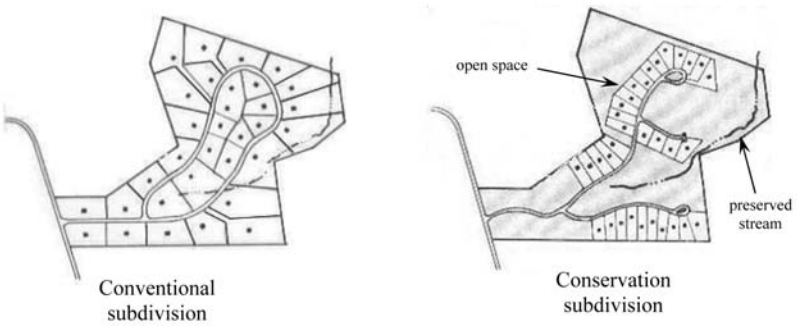


Figure 1: Generic Conventional and Conservation Subdivisions
SOURCE: Reprinted from Arendt et al. (1996).

rate. Differences in absorption rates will corroborate results from the analysis of prices. Although the research reported in this article does not ascertain the exact profits associated with conservation subdivisions, an examination of price premiums, improvement costs, and time on the market permits a ranking of the profitability of conservation subdivisions relative to other designs. Together, the results show that conservation subdivisions are more profitable to developers than conventional subdivisions.

The need for a convincing business case for developers is not trivial. Developers have long been known to be risk averse (Baerwald 1981; Kenney 1972; Leung 1987; Wiewel, Persky, and Sendzik 1999), and the relatively new conservation subdivision model can present additional risks. Indeed, in general, one of the key challenges facing policy makers is to convince developers of the profitability of alternatives to conventional subdivisions (Gyourko and Rybczynski 2000). Demonstrating the economic advantages of conservation subdivisions can contribute toward this larger objective, and the methodology employed in this article can be replicated to study other subdivision designs.

It is important to note that this article does not address the role of conservation subdivisions in Smart Growth or New Urbanism, the potential for negative socioeconomic consequences that result from their use, or whether the purported environmental benefits of conservation designs will be realized.[2] Moreover, this article is an accounting of benefits and costs only from the perspective of developers; it is not an accounting of benefits and costs to society that result from the use of conservation subdivisions. However, the results of this research are intended to inform these discussions and the larger discourse about adopting alternative subdivision designs.

DIFFERENCES FROM PREVIOUS STUDIES

Most previous research on the value of open space is concerned with open space that lies outside subdivisions (see, for example, Correll, Lillydahl, and Singell 1978; Hammer, Coughlin, and Horn 1974; Li and Brown 1980; Lindsey and Knaap 1999; Nelson 1985). Those studies are different from this study for two reasons. First, as noted by Thorsnes (2002) and Hammer, Coughlin, and Horn (1974), the price effects of open space are localized. Thus, extrapolating from open space outside subdivisions (even if it is close) will not lead to accurate estimates of this amenity within conservation subdivisions.

Second, conservation subdivisions contain a grouping of design and social features, such as exclusivity, privacy, and a perception of prestige, that are collectively valued by households (Kaplan, Austin, and Kaplan 2004) and should be reflected in the value of the lots. Moreover, properly designed conservation subdivisions could offer environmental and aesthetic benefits superior to those of other open space (Thompson 2004).

Peiser and Schwann (1993) addressed the issue of open space within subdivisions and found that developers' reluctance to leave internal open space was the result of the low value placed on such space by homeowners. However, the subdivision that the authors examined, Greenway Parks in Dallas, Texas, is very different from the design, ecological, and social constructs of today's conservation subdivision. For example, in Greenway Parks, lot sizes are large and open space consists of strips of land between the backyards of houses. Newer conservation subdivisions have large communal spaces that evoke a stronger sense of social and environmental benefits. In addition, whereas conservation subdivisions are designed with the natural features of the parcel in mind, there is no indication of this in Greenway Parks.

Finally, as far as I am aware, there is no research that simultaneously determines price premiums for innovative subdivision designs, improvement costs, and absorption rates. Thus, this study fills a critical knowledge gap by addressing the complexity of pricing and market issues related to conservation subdivisions and by providing a methodology that can be replicated to study the profitability of other subdivision designs.

CONSERVATION SUBDIVISIONS, SPRAWL, AND DEVELOPERS' CONCERNS

Conservation subdivisions can be traced to the past use of cluster subdivisions that were primarily concerned with protecting agricultural land (Nelson

and Duncan 1995, 67). Over time, however, this design theme has evolved into today's conservation subdivisions. In addition to preserving agricultural land, open space is now expected to serve important ecological roles by providing natural habitat, reducing runoff volumes, limiting landscaping and lawn maintenance, and providing natural cooling (Berke et al. 2003; Burchell et al. 2002; Dramstad, Olson, and Forman 1996). These ecological benefits in turn translate into higher levels of residential satisfaction (Kaplan, Austin, and Kaplan 2004).

Using the expansive label of "conservation design," Arendt (1999a) formalized the design elements of conservation subdivisions. Moving beyond isolated treatments of agricultural land preservation and ecological sustainability, Arendt (1999a) argued that conservation subdivisions are a subset of traditional neighborhood designs (TNDs) that form part of the history of New England. Called villages and hamlets, TNDs are smaller versions of New England towns. According to Arendt (1999a), these villages and hamlets have the ultimate goal of conservation design.

Taking their cue from TNDs, conservation subdivisions lay the groundwork to "protect streams and water quality, provide habitat for plants and animals, preserve rural 'atmosphere,' provide recreational areas, protect home values, and reduce costs of municipal services" (Arendt 1999b, 7). Conservation subdivisions are thus distinct from the mere clustering of lots where environmental concerns, aesthetics, history, and culture are given relatively short shrift.

The role of conservation subdivisions in addressing issues related to sprawl has, however, attracted some controversy. The observation by Berke et al. (2003) that conservation subdivisions are sometimes built in greenfields highlights a criticism of these subdivisions: their potential to promote leapfrogging and socioeconomic disparities (Nelson and Duncan 1995, 67–68; Sutro 1990). Authors who propose a regional view of land-use planning argue that conservation subdivisions have to find their place in the context of social concerns and planning for habitats, corridors, transportation, and mixed-used development (Calthorpe and Fulton 2001).

The use of conservation subdivisions to preserve farmland has also emerged as a point of contention. Daniels (1997) took a critical view of such subdivisions in agricultural areas, claiming that they focus on site-specific rather than comprehensive land-use planning. He argued in favor of comprehensive planning that zones farming areas exclusively for agricultural use. Similar concerns about the efficacy of conservation subdivisions to save agricultural land were noted by Mennito (1995, cited in Daniels (1997)), who observed that their use in Howard County, Maryland, has not resulted in parcels that are amenable to farming. In addition, Nelson and Duncan (1995, 67)

noted that residents in conservation subdivisions may place restrictions on the use of farming inputs and eventually oppose farming altogether. As a result, using conservation subdivisions to save farmland can backfire and turn the open space into an unsightly field.

In response to criticisms that conservation subdivisions can be detrimental to farming, Arendt (1997) argued that the debate should focus on the appropriate use of conservation subdivisions at suitable densities and configurations. For example, in rural areas with strong commercial farming, conservation subdivisions may not be appropriate. Instead, other techniques such as urban growth boundaries should be utilized. However, in areas with intermediate agricultural strength, conservation subdivisions are appropriate when they specify maximum lot sizes to ensure that critical amounts of farmland are preserved (Arendt 1997). Finally, Arendt (1997) argued that areas with suburban densities should employ conservation designs primarily for the provision of open space. The latter two situations are found across the nation, and it is in these two types of areas that lessons about conservation subdivisions can be applied.

Although discussions amongst planning academicians are informative, they do not address issues of concern to developers and have not had a major effect on developers' decisions. Intuitively, developers should welcome conservation subdivisions because they are believed to carry higher selling prices and to be less expensive to build. Higher selling prices should result from access to communal open space that makes full use of the natural landscape, superior aesthetic and environmental qualities, and a sense of higher socioeconomic standing (Kaplan, Austin, and Kaplan 2004). Lower construction costs should result from smaller lot sizes (Arendt 1999b; Arendt et al. 1996, 10–13; National Association of Homebuilders 1986). However, no hard evidence has been presented to support these hypotheses.

THE STUDY AREA: SOUTH KINGSTOWN, RHODE ISLAND

Rhode Island is one of a few states to have significantly updated state planning legislation from the first land-use planning efforts of the 1920s (American Planning Association 1999).[3] The Town of South Kingstown (Figure 2) has taken its cue from state legislation and revamped its subdivision regulations and zoning ordinances.[4] Under the rubric of "Smart Growth," the town has adopted open space preservation as a central feature of its land-use policies (Town of South Kingstown 2000). The town believes that open space preservation can lead to fiscal health and reduced sprawl and create a better

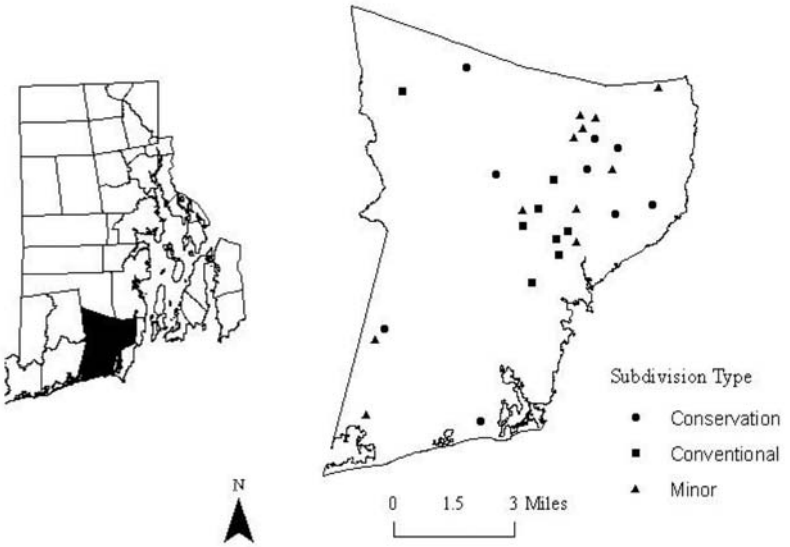


Figure 2: Locations of Different Subdivisions in South Kingstown, RI

delineation between the central core of the town and the periphery. One avenue for preserving open space is the use of conservation subdivisions.

It is important to note that the town's definition of conservation subdivisions follows the generally accepted model (Arendt 1999b). Referred to as *Flexible Design Residential Projects* (FDRPs) in the town's Subdivision Regulations, these subdivisions are required to set aside a minimum of 30% to 70% of a parcel as open space. Although 30% is smaller than the minimum 50% proposed by Arendt (1999b, 139), the lower percentage applies only to lot sizes that are typically found in built-up areas—10,000 to 20,000 square feet. When lot sizes approach those typically found in suburban and exurban areas—an acre or more—developers are required to set aside between 50% and 70% of the parcel.

Requirements for FDRPs in South Kingstown also take other cues from archetypical conservation subdivisions discussed by Arendt (1999b): conditions for ownership of the open space (usually homeowners' associations or a land trust), access to the open space (direct access for as many lots as possible), interconnections between the open spaces of different subdivisions, preservation of sensitive lands, and limited permitted uses of the open space. The town's criteria for projects to be approved and designated as conservation subdivisions are therefore consistent with the archetypical model.

In addition, South Kingstown is typical of areas in which conservation subdivisions might be considered a useful policy tool to address the loss of open space. First, the town's recent development could be considered exurban in that it extends from the edge of built-up suburbs into environmentally fragile land (Nelson and Duncan 1995, 71–72). Second, utilizing geographic information systems (GIS), I found that in Washington County, where South Kingstown is located, the percentage of land that is classified as forested had fallen from 54% to 51% between 1988 and 1995. Third, analyses of census and land-use data showed that between 1990 and 2000 the 13% increase in population was accompanied by a 20% increase in land consumed for residential development. Thus, like other sprawling areas, the town is consuming environmentally sensitive land in the periphery at rates that exceed the growth of its population. In summary, South Kingstown is a town where conservation subdivisions might be considered a useful policy tool for preserving open space; this is the reason it was chosen for study.

DATA AND APPROACH TO ANALYSIS

This article takes a three-pronged approach to discussing the financial implications for developers of conservation subdivisions. First, the *value added* to developed lots in conservation subdivisions was determined relative to lots in other subdivision types. This analysis was performed using ordinary least squares (OLS) regressions where the dependent variable was the price per acre of developed lots. The results obtained from the OLS regressions were corroborated by an analysis of covariance (ANCOVA) of the price per acre of developed lots.

In the absence of interaction effects, OLS regressions are equivalent to ANCOVA (Cohen and Cohen 1983, 4; DeMaris 2004, 126). However, the advantage of ANCOVA is that it determines the actual mean selling price of lots in different subdivisions and whether the differences in those means are statistically significant, while controlling for other covariates. On the other hand, OLS regressions present the results in a form that is familiar to policy makers and expresses the premium for conservation subdivisions in terms of a percentage over conventional subdivisions, a figure that is more robust than actual values. To monitor multicollinearity, the variance inflation factor (VIF) was observed for each variable in each regression.[5]

Second, costs for producing lots in different subdivision types were compared through analyses of variance (ANOVA). Finally, again using ANOVA, absorption rates were determined by analyzing the time it took for lots in different subdivision types to sell after being recorded.

This study utilized data from 184 randomly selected vacant developed lots in South Kingstown built and sold between 1993 and 2002.[6] The lots represent the finished product that was sold by developers.[7] Data were obtained from six sources: four departments or programs within the town government; the Rhode Island Geographic Information System (RIGIS), a database maintained at the University of Rhode Island; and the U.S. Census Bureau.

First, records from the Tax Assessor's Office provided information on sale prices for finished lots, the dates lots were recorded, and the dates they were sold. The sample was screened to ensure that all transactions were "arms length." Screening was performed by checking that the transaction price per acre of each lot deviated by no more than one-third from the median price per acre of all lots in the subdivision to which it belonged. No anomalous prices were observed.

Second, files maintained by the town's planning department were reviewed to determine each subdivision type (conservation, conventional, or other), utilities provided, and the number of lots in each subdivision. Third, basic data such as lot sizes were obtained from a parcel-based GIS maintained by the planning department. Fourth, for comparing improvement costs between different subdivision types, data were obtained from performance bond estimates prepared by the public works department. These data assess the costs of public improvements required in each subdivision, such as landscaping, drainage, roads, and public water and sewer services.[8] To provide a common point in time to compare costs, the estimates were inflation-adjusted to year 2000 dollars using cost indices obtained from *R. S. Means* (2001) for Providence, RI, the closest location for which data were available.

Fifth, RIGIS provided location information on roads, scenic districts, the coastline, water bodies, the seasonal high-water table, and steep slopes. GIS software was utilized to ascertain the distance between developed lots and roads, scenic districts, and the coastline, respectively. The software was also utilized to determine the percentage of lot area that contained water bodies, a seasonal high-water table, and steep slopes. When combined, these three variables provide a proxy for on-lot costs to be incurred by buyers of lots. Finally, data from the U.S. Census Bureau provided information on the socioeconomic status of the census block group in which the subdivision was located.

THE OLS REGRESSIONS AND ANCOVA MODEL

Equation 1 shows the model utilized to perform the OLS regressions and ANCOVAs for the price of developed lots. "P_L" is the price per unit area of developed lots, $X_{i,1}^{\alpha_1}$ is the area of the lot, α_1 is the regression coefficient associated with lot size, and *i* and *j* are measures of the *j*th attribute for the *i*th lot, respectively. Variations of this model have been used in the past, for example, by Adams and Milgram (1968), Colwell and Sirmans (1980), Chicoine (1981), and Guntermann (1997).

$$P_L = \alpha_0 X_{i,1}^{\alpha_1} \exp\left(\sum_{j=2}^{n} \alpha_j X_{i,j}\right) \tag{1}$$

Transforming gives:

$$\ln P_L = \ln \alpha_0 + \alpha_1 \ln X_{i,1} + \sum_{j=2}^{n} \alpha_j X_{i,j} \tag{2}$$

This specification has three advantages: It sets prices equal to zero when parcel size equals zero, detects plottage and plattage, and allows for an interpretation of inflation in land prices. Plottage signifies additional value that can be obtained from combining more than one parcel, whereas plattage is additional value that can be obtained from dividing a parcel (Colwell 1999; Colwell and Sirmans 1980). If $\alpha_1 > 0$ there is plottage, but if $-1 < \alpha_1 < 0$ there is plattage.

The review of subdivision files revealed that in addition to conservation and conventional subdivisions, there are also minor subdivisions of five or fewer lots. (These are not discussed in detail because they are included in the analyses only for control purposes and they constitute only a small portion of the subdivisions built in South Kingstown.) For the three types of subdivisions, two dummy variables were utilized in the OLS regressions. The first variable, CONS, is assigned a value of 1 if the lot is in a conservation subdivision and 0 otherwise. This is the key test variable. The second variable, MIN, is assigned 1 if the lot is in a minor subdivision and 0 otherwise. Minor subdivisions benefit from a less onerous approvals process and fewer road standards. Although a less onerous approvals process will affect prices for the undeveloped parcel, it will not have any effect on prices for developed lots. Fewer road standards, however, often results in shared driveways that are expected to reduce the value of lots in minor subdivisions. In addition, minor subdivisions are often built on irregularly shaped parcels that are sometimes near busy streets, again reducing the value of their lots.

CONTROL VARIABLES

The same control variables used in the OLS regressions were employed in the ANCOVAs as covariates. Table 1 contains all variables in the OLS and ANCOVAs and their expected signs. Table 2 provides summary statistics.

Natural log of lot size. Several scholars have noted a concave relationship between price and land area that leads to the declining marginal value of land, the phenomenon of plattage referred to above (Brownstone and Devany 1991; Chicoine 1981; Colwell and Sirmans 1993; Nelson and Knaap 1987). Thus, the sign on this variable is expected to be negative.

Year of transaction. Regression models of land prices routinely include a variable to account for inflation. For this research, the year in which the first sale took place is assigned the number 1, and each subsequent year is assigned 2, 3, and so on. The study period, 1994 to 2001, is one of steadily increasing property values associated with the longest U.S. economic expansion on record. There were no years in this period during which land prices decreased. Thus, a single variable to represent time is sufficient, and dummy variables for each year that capture annual changes in price are not necessary.[9]

Public water and sewer infrastructure. On developed lots, public water and sewer infrastructure are unambiguously expected to be capitalized into prices because of their inherent advantages and conveniences (Adams et al. 1968; Knaap 1985; Nelson and Knaap 1987).

Accessibility. Research has found that homeowners pay a premium for locations close to jobs or downtowns, though these studies appear to mix undeveloped parcels with developed lots in the same sample (Adams et al. 1968; Brigham 1965). The distinction is important because developers might pay more for undeveloped parcels near major roads, where fewer infrastructure extensions are required. However, households may pay less for locations near busy streets (Adams et al. 1968; Asabere 1990; Hughes and Sirmans 1992).

The study area contains a web of roads that allows easy access to the major highway, I-95, and major employment centers at the University of Rhode Island and downtown. Two important roads in this web are US-1 and Route 138, and the shortest distance from a developed lot to either of these roads was used as a proxy for accessibility. Because of the important role that these roads play in providing access, being closer to them is expected to carry a premium.

Distance to scenic districts. This variable measures the distance of each lot to state-designated scenic districts. Premiums are expected for lots close to these districts (Correll, Lillydahl, and Singell 1978; Hammer, Coughlin, and Horn 1974; Li and Brown 1980; Lindsey and Knaap 1999; Nelson 1985).

TABLE 1: Determinants of Developed Lot Prices

Independent Variables	*Variable Name*	*Expected Signs*
Main variables		
Subdivision in which lot is located: 1 if conservation subdivision, 0 if conventional or minor subdivision	*CONS*	Positive
Subdivision in which lot is located: 1 if minor subdivision, 0 if conservation or conventional subdivision	*MIN*	Negative
Control variables		
Natural log of lot size, acres	*NLLS*	Negative
Year developed lots were sold	*YEAR*	Positive
Public water: 1 if yes, 0 if private well	*WATER*	Positive
Public sewer: 1 if yes, 0 if private septic system	*SEWER*	Positive
Accessibility: mean distance to Rt. 138 and U.S. 1, feet	*ACC*	Negative
Mean distance to scenic districts, feet	*SD*	Negative
Mean distance to coastline, feet	*COAST*	Negative
Relative socioeconomic status of subdivision as determined by median housing price in 1990 census block group, $1,000s	*MHP*	Positive
Number of lots in each subdivision	*LOTS*	Positive
Percentage of lot with difficult building conditions	*UNBUILD*	Negative
Time for lots to sell after subdivision (or phase of) was recorded, months	*TIME*	Negative

It is important to control for this variable because conservation subdivisions located close to scenic districts may reflect the value placed on these districts rather than the intrinsic value of the subdivision.

Distance to coastline. The effect of this variable on prices could be difficult to determine because of special permits required to build close to coastal areas. As Brownstone and Devany (1991) noted in their study of undeveloped land sales in Southern California, the insignificant coefficient obtained for this variable, when regressed against prices, was most likely a result of difficulties in obtaining permits from the California Coastal Commission. In South Kingstown, there is a marked lack of undeveloped land sales close to the coast. This is not coincidental, because development in these areas requires additional approvals from the Rhode Island Coastal Resources Management Council (CRMC), increasing the costs of approvals. Thus, there are few developed lots available close to the coast, and the nearest one in the sample is more than 6,000 feet away (Table 2). Nonetheless, a premium is expected the closer a lot is to the coast.

TABLE 2: Descriptive Statistics of Independent Variables

Independent Variables	*Mean Value*	*Standard Deviation*	*Minimum Value*	*Maximum Value*
Conservation subdivisions (1 if yes, 0 if no)	0.47	0.50	0	1
Minor subdivisions (1 if yes, 0 if no)	0.08	0.27	0	1
Average lot size, acres	0.62	0.32	0.22	1.64
Year in which developed lots were sold	5.18	2.02	1	8
Public water (1 if yes, 0 if no)	0.78	0.42	0	1
Public sewer (1 if yes, 0 if no)	0.40	0.49	0	1
Accessibility: Mean distance to Rt. 138 and U.S. 1, feet	2,995	1,869	113	6,348
Mean distance to scenic districts, feet	3,591	2,721	0	9,921
Mean distance to coastline, feet	19,476	5,623	6,143	28,415
Relative socioeconomic status of subdivision as determined by median housing price in 1990 census block group, $1,000s	158	7	144	171
Number of lots in each subdivision	52.2	34.9	3	89
Percentage of lot with difficult building conditions	6.4	20.1	0	100
Time for lots to sell after subdivision (or phase of) was recorded, months	12.0	12.12	0.03	58.4

Relative socioeconomic status of the neighborhood. There is evidence that locations of higher socioeconomic status carry a premium (Brigham 1965). This article uses self-assessed housing values from the 1990 census at the block group level to represent relative socioeconomic status. This variable is not endogenously determined because the values were determined in 1990, before the period covered by this study.

Number of lots. This variable is an indication of the ability of developers to control neighborhood characteristics. Previous research has found that the control of subdivision characteristics can increase property values, for example, through the use of restrictive covenants (Hughes and Turnbull 1996; Speyrer 1989). Thorsnes (2000) corroborated these findings in his research, but he used the size of the entire subdivision as a proxy for the effect. This analysis utilizes the number of lots as a proxy for subdivision size, and, in turn, as a proxy for the degree to which developers can control neighborhood characteristics. It is a more appropriate measure than the size of the entire subdivision because it isolates the effects of open space in conservation subdivisions while at the same time reflecting the size of conventional and minor subdivisions.

Difficult building conditions. This variable is a composite measure of the percentage area of a lot that contains water bodies, a high water table, and steep slopes. These characteristics limit the layout of houses unless the buyer invests in substantive landscaping. Thus, the presence of difficult building conditions will reduce the value of developed lots. However, it is evident that there are errors in the GIS measurements of water bodies because the data in RIGIS were found to be significantly different from those reported on developers' approved plats. This discrepancy suggests that other measures related to the buildability of lots may also be erroneous, thus affecting the validity of the results. Indeed, RIGIS reports that one lot was 100% unbuildable (Table 2), clearly a situation that is not possible.

Time for lots to sell after the subdivision was recorded. This variable accounts for the effects of the market on prices. It is expected that as lots take longer to sell, prices will be negatively affected.

RESULTS OF THE OLS REGRESSIONS AND ANCOVAs

Four regression models (Table 3) show that developed lots in conservation subdivisions carry additional value ranging from 12% to 16% per acre over lots in conventional subdivisions. Not surprisingly, lots in minor subdivisions are heavily discounted because, as discussed earlier, they have some undesirable features. As shown in Table 3, multicollinearity was not a problem in any of the regression models.

In the ANCOVAs, the subdivision type is the main variable of interest (the fixed factor), and the other variables are controls. In each of the four models, subdivision type significantly affects land prices (Table 4), as revealed by F-statistics that are significant at greater than the 0.001% level.

In addition, Bonferroni post hoc analyses found that mean selling prices of developed lots in the three subdivision types are significantly different from each other at the 5% level. Table 5 shows that lots in conservation subdivisions sold for $122,000 to $125,000 per acre whereas lots in conventional subdivisions sold for $107,000 to $109,000 per acre. These numbers translate into premiums for lots in conservation subdivisions ranging from $13,000 to $18,000 per acre over lots in conventional subdivisions (Table 6).

These results confirm the attractiveness of conservation subdivisions to developers from the demand side. However, more definitive statements about the relative profitability of conservation subdivisions cannot be made until investigations are performed on the costs of producing lots in different

TABLE 3: Results from OLS Regression Models on Price per Acre of Developed Lots

	Model 1 Adj. r^2 = *0.94*		*Model 2* Adj. r^2 = *0.94*		*Model 3* Adj. r^2 = *0.94*		*Model 4* Adj. r^2 = *0.94*	
Independent Variables	β	*VIF*	β	*VIF*	β	*VIF*	β	*VIF*
Main Variables								
CONS	0.16	6.1	0.13	6.2	0.12	6.5	0.13	7.1
MIN	–0.27	2.9	–0.27	2.5	–0.28	2.6	–0.26	3.2
Control Variables								
NLLS	–0.78	2.9	–0.73	3.2	–0.74	3.3	–0.74	3.4
YEAR	0.08	1.3	0.08	1.4	0.08	1.4	0.08	1.6
WATER	0.26*	3.0	0.20	3.0	0.20	3.0	0.20	3.0
SEWER	0.08*	4.8	0.11	5.5	0.11	5.5	0.12	5.7
ACC	1.90E–05*	4.0	4.12E–06**	2.1	1.08E–06**	2.3	4.04E–08**	2.3
SD	–5.93E–05	7.7	–4.62E–05	5.5	–4.58E–05	5.5	–4.60E–05	5.5
COAST	6.10E–06**	6.7						
MHP			2.86E–03**	1.9	3.33E–03*	2.0	3.97E–03*	2.4
LOTS			1.66E–03	2.7	1.69E–03	2.7	1.62E–03	2.8
UNBUILD					–7.42E–04**	1.2	–7.70E–04**	1.2
TIME							7.90E–04**	2.0
CONSTANT	10.50		10.15		10.09		9.99	

NOTE: N = 184. *Significant at the 10% level.
**Not significant. All other coefficients are significant at greater than the 5% level.

TABLE 4: Results of ANCOVAs for Price per Acre of Developed Lots Where Subdivision Type is the Fixed Factor

	Model 1	*Model 2*	*Model 3*	*Model 4*
F-statistic	39.19	40.53	38.67	35.12
p-statistic	< 0.001	< 0.001	< 0.001	< 0.001

subdivision types and the rate at which these lots are sold. Before moving onto these analyses, other results from the OLS regressions and ANCOVAs are discussed.

RESULTS FOR CONTROL VARIABLES IN THE OLS REGRESSIONS AND ANCOVAs

Importantly, the existence of plattage, around –0.75 across the four models, shows that there is diminishing marginal value from additional lot size. The results suggest that developers would rather not build large lots, but instead, they may prefer the opposite, that is, to take area from the lots and convert it into open space. These results differ from those of Peiser and Schwann (1993), who found that strips of open space directly behind backyards added little value to property.

Other variables are significant, as expected. Many lots are located in close proximity to state-designated scenic districts, and buyers pay a premium for this amenity. Across Models 1 through 4, the premium ranges from 4.5 to 5 percent per acre of lot for every 1,000 feet closer to a scenic district. Lots in areas of higher socioeconomic standing carry a premium of around 3.5% per acre of lot, though these results are significant only at the 10% level (Models 3 and 4).[10]

As expected, lots with public water and sewer sell for more. For the former, the premium ranges from 15% to 26% per acre of lot, while for the latter the premium ranges from 8% to 12%. Inflation averages about 8% per year. Each additional lot in a subdivision increases the per acre price of lots by less than 0.25% in all the models. This demonstrates households' preferences for living in larger projects where developers are able to internalize amenities but the absolute effect is small.

Accessibility, distance to the coastline, percentage of the lot that is unbuildable, and the time it takes for lots to sell after recording are not significant in any of the models in which they were considered. In the case of

TABLE 5: Results of ANCOVAs for Price per Acre of Developed Lots in Different Subdivision Types

	Model 1	*Model 2*	*Model 3*	*Model 4*
Average price per acre of lots in conservation subdivisions ($1,000s)	125.3	123.5	122.3	123.3
Average price per acre of lots in conventional subdivisions ($1,000s)	107.1	108.5	109.2	108.4
Average price per acre of lots in minor subdivisions ($1,000s)	81.7	82.5	82.6	83.6

TABLE 6: Results of ANCOVAs for Differences in Price per Acre of Developed Lots in Conservation versus Other Subdivision Types

Subdivision Type	*Model 1*	*Model 2*	*Model 3*	*Model 4*
Conventional ($1,000s)	18.2	15.0	13.6	14.9
Minor ($1,000s)	43.5	41.0	40.1	39.6

accessibility, the results may reflect the web of roads in the study area that allow for quick access to I-95 and major sources of employment in the downtown and at the University of Rhode Island, regardless of where development takes place. For distance to the coastline (Model 1), the results most likely reflect the fact that there was too little construction near the coast during the study period to provide sufficient variation in the data. The percent of the lot that is unbuildable may be insignificant owing to errors in RIGIS measurements of this variable (Models 3 and 4), as discussed earlier. Finally, the time it takes for lots to sell after being recorded is not significant (Model 4).

The results indicate that, in general, the fundamentals of the land market in South Kingstown are fairly typical. Putting aside the coefficients on subdivision type, the other results are for the most part consistent with results obtained elsewhere. For example, there is general agreement that in a variety of land markets, values increase when infrastructure such as public water and sewer are provided, the property is located in areas of higher socioeconomic standing, scenic areas are in close proximity, and neighborhood amenities are internalized (as measured by the size of the subdivision—in this article, the number of lots). In addition, as has been observed elsewhere, there is diminishing marginal value to additional land, and in recent years there has been a steady increase in residential land prices across many land markets in the United States.

COMPARISON OF COSTS FOR PRODUCING DIFFERENT LOT TYPES

Using data from performance-bond estimates, an ANOVA was performed on improvement costs per lot within conservation, conventional, and minor subdivisions.[11] The results shown in Table 7 are statistically significant at the 1% level, showing that lots in conservation subdivisions cost on average about $7,400 less to produce than lots in conventional subdivisions. The results for minor subdivisions are lower, as expected; these typically do not require internal infrastructure and are often located alongside existing roads. A direct comparison between lots in conservation and conventional subdivisions using a *t*-test also results in statistically significant differences at the 1% level. Together with the results obtained from the OLS regressions and ANCOVAs, these results show that there are higher profits to be made from conservation subdivisions.

COMPARISON OF TIME FOR DIFFERENT LOT TYPES TO SELL

The earlier results are sufficient to show that developers should prefer conservation subdivisions. However, corroborating evidence could be obtained by analyzing the time it takes for lots in these subdivisions to sell when compared to lots in other subdivisions. The time interval starts when lots are first recorded (taking account of any phasing in the subdivision), thus making delays purely a function of the market, not the subdivision review process.

The results of the ANOVA are presented in Table 7. Lots in minor subdivisions sold the fastest (on average, 1.1 months) because they are usually sold in sets at a time, followed by lots in conservation subdivisions (9.1 months), and then lots in conventional subdivisions (17.0 months).[12] The differences are statistically significant at the 1% level. That lots in conservation subdivisions sold in about half the time as lots in conventional subdivisions must be advantageous to the cash flow of developers.

When lots in conservation subdivisions were compared only against lots in conventional subdivisions using a *t*-test, the statistical difference was maintained at the 1% level. This was also the case when they were compared to lots in conventional and minor subdivisions combined; the average time for lots to sell in conventional and minor subdivisions was 14.5 months, still considerably more than the 9.1 months for lots in conservation subdivisions. The strong demand for lots in conservation subdivisions corroborates the price premium observed in the OLS regressions and ANCOVAs.

TABLE 7: ANOVA of Mean Improvement Costs per Lot and Mean Selling Time for Lots for Different Subdivision Types

Subdivision Type	*Sample Size*	*Mean Improvement Costs per Lot ($1,000s)*	*Mean Selling Time (months)*
Conservation	87	18.7	9.1
Conventional	82	26.1	17.0
Minor	15	5.5	1.1

CONCLUSIONS

Innovative subdivision designs continue to be viewed by developers as financially risky (Gyourko and Rybczynski 2000). This article, however, shows that one type—conservation subdivisions—can provide higher profits to developers. Lots in conservation subdivisions carry a price premium, are less expensive to build, and sell more quickly than lots in conventional subdivisions. The methodology used in this article could be easily applied to other subdivision designs to ascertain whether, from the perspective of developers, they are preferable to conventional subdivisions.

The results from this study are instructive when compared to other studies that examine the value of open space. For example, whereas Peiser and Schwann (1993) show that residents prefer private backyard space to communal open space, this study indicates that buyers of lots in conservation subdivisions would pay less for additional lot size and more for amenities associated with conservation subdivisions.

The possible reasons for these differences have implications for subdivision layout and the use of open space. Designs that take a holistic view of ecology, aesthetics, and sense of community may assuage concerns about density. In comparing this case to other attempts to create open space in subdivisions, such as that examined by Peiser and Schwann (1993), three important differences emerge:

- Concentrating open space in one or a few locations matters: In contrast to open space that is laid out such that each household gets to "claim" a small portion, conservation subdivisions provide concentrated open space accessible to a maximum number of households and discourage claims of individual ownership.
- Communal ownership is important: When the ownership of open space is ambiguous, it may not be as well appreciated as when ownership, rights, and responsibilities are clear. For example, Peiser and Schwann (1993) found that

strips of open space behind backyards simply encouraged residents on either side of the strip to consider portions as private, leaving a small communal greenbelt of little use. With their backyards effectively enlarged, there was little reason to value the remaining greenbelt. Moreover, when boundaries are not properly demarcated, it is not clear which neighbor is responsible for preservation. This is clarified in the communal setting of conservation subdivisions. In addition, the concentrated layout of open space in conservation subdivisions may lead to economies of scale in its management.

That communal open space in conservation subdivisions may be better preserved appears to be at odds with contemporary views of property rights, which argue that the private ownership of property leads to better management. However, conditions in conservation subdivisions are consistent with some of the criteria spelled out by Ostrom (1990, 91–102) as necessary for successfully managing communal property. These include: 1) physical boundaries and rights and responsibilities of households that are clearly defined; 2) households affected by operational rules can participate in changing those rules; 3) households and officials have low-cost mechanisms to resolve conflicts; and 4) households have the right to organize their own managerial institutions.

- High density can be acceptable: Americans can be comfortable with higher density subdivisions provided that other environmental, aesthetic, and communal concerns are addressed, as observed by Kaplan, Austin, and Kaplan (2004). Although the negative sign of the coefficient of lot size is usually attributed to the diminishing utility of additional land, the relatively large value of the coefficient obtained in this research suggests that the utility of additional land falls faster when open space is available than when it is not. The size of the coefficient reflects the intuition that there is little value to additional yard space given the existence of concentrated open space in conservation subdivisions (and nearby scenic districts). This result suggests that lot sizes in conservation subdivisions may be somewhat endogenously determined, and that the choice of lot size is not entirely a function of zoning or the availability of infrastructure.

For municipalities that seek to address issues related to sprawl by using conservation subdivisions, the results of this study are encouraging. However, the role of conservation subdivisions in promoting Smart Growth and New Urbanism is uncertain. In particular, the socioeconomic implications of conservation subdivisions need to be addressed. Further, the potential environmental benefits may not be realized if the open space is misused, and conservation subdivisions may be a hindrance rather than a boost to agriculture. These issues require further research.

NOTES

1. Designing around natural landscapes is a new concept not only to developers, but also to engineers, planners, and attorneys, who have long been accustomed to conventional designs (Gyourko and Rybczynski 2000). Thus, engineering, approvals, and attorney fees may be more onerous. However, these costs are not considered in this article because data are not available. These costs are not expected to affect the results presented in this article.

2. A common concern among the anonymous reviewers of this article is the potential negative socioeconomic consequences of conservation subdivisions. In general, the concerns center on whether conservation subdivisions are just a mechanism for ensuring class separation by building another form of "gated communities."

3. This was achieved through the passage of the Rhode Island Zoning Enabling Act of 1991, Chapter 45, Sections 24–27 through 24–72 and the Rhode Island Land Development and Subdivision Review Enabling Act of 1992, Chapter 45, Sections 23–25 through 23–74.

4. See the Town of South Kingstown Subdivision Regulations (February 14, 1995, with amendments through 2002).

5. A VIF above 10 indicates that the variable is collinear with others in the model (Gujarati 1995).

6. Some of the lots in this sample were developed before more rigorous standards for conservation subdivisions, following (Arendt 1999b), were adopted by the Town.

7. In a few instances (about 15% during the study period) the builders were the developers. These observations are not included in the sample because a price for the vacant developed lot could not be observed; the product that was sold consisted of a house and a lot.

8. The purpose for requiring performance bonds from developers is that in the event developers default on their projects, the town can utilize the bond to complete the subdivision. Performance bond estimates do not include engineering, approvals, and attorney fees. In addition, performance bond estimates do not include on-lot costs that are borne by buyers, such as costs for building the house and on-site landscaping.

As far as I am aware, this is the first time that performance bond estimates have been used in scholarly research to analyze the costs of subdivision development.

9. Preliminary regressions that used dummy variables for each year during the study period revealed that inflation rates did not vary dramatically from one year to another, further justifying the use of a single variable.

10. Alternative regressions where the median household income was used instead of the median housing value produced similar results.

11. Another approach to comparing improvement costs is on the basis of costs per area of lot. However, lots in conservation subdivisions are smaller than lots in conventional subdivisions and thus in the former case improvement costs will be concentrated on smaller areas. Indeed, on this basis the mean cost per acre of lots in conservation subdivisions ($45,600) is virtually the same as in conventional subdivisions ($45,500).

12. An anonymous reviewer suggested that minor subdivisions may be at a different "price point" than other subdivisions, explaining why they sell faster despite being the least valued.

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Published June 2006 By: Christine Rombouts

REAL ESTATE: The Benefits of Conservation Development

Beyond environmental considerations, benefits such as tax incentives, streamlined approvals and eager buyers await

As our country's population continues to grow and new development encroaches into such environmentally sensitive places as agricultural areas and woodlands, it has become increasingly important to preserve what open space we have left to maintain our quality of land and life. One way to blend conservation with development is simply called conservation development (CD), or conservation easement.

Conservation development is a growing trend, particularly in the Western U.S. in such states as California, New Mexico, and Colorado. Conservation development is a far-sighted approach to real estate development in which efforts are made to protect the existing natural resources within a proposed development as well as minimize the impact of natural assets such as woodlands, watersheds, view sheds, agricultural lands and wildlife corridors.

Although still few in number, conservation developments are growing more common as developers seek ways to secure entitlement for environmentally sensitive land that might otherwise not be developed. In many instances, establishing a conservation development easement was the difference between a developer gaining entitlement for a project within an environmentally sensitive area, and having to walk away. One such project in California is the Santa Lucia Preserve in Monterey.

Set on 20,000 acres of the former Rancho San Carlos in Monterey County, the Santa Lucia Preserve was envisioned as a small residential development of 350 homes on 11/2-to-2-acre lots. The development strategy embraced three goals: 1) Long-term protection of the property's scenic and habitat values. 2) construction of a residential community integrated into the preserve and compatible with the natural ecosystem. 3) assured, permanent financial support for the preservation of the property's natural resources.

The developers created the Santa Lucia Conservancy to oversee preservation of the initial 10,000 acres of land designated as permanent open space, with the size eventually reaching 18,000 acres. The conservancy has three principal duties: 1) To hold title to conservation easements in order to maintain the ecological integrity of the preserve, 2) to develop and manage public access to the preserve, and 3) to engage in environmental education and outreach in Monterey County.

Today, the Santa Lucia Preserve encompasses large expanses of native habitat and wildlife mingled with low-key developments, including estate homes, a golf course, equestrian center, a sports complex, and lodging and dining services. The residential

element of the preserve consists of 300 homelands sited to ensure the environmental and esthetic integrity of the landscape, providing privacy and the ability to see without being seen.

As successfully demonstrated at the Santa Lucia Preserve, the purpose of conservation development is to utilize the concept of a non-profit stewardship entity such as the Santa Lucia Conservancy to ensure a balance between conservation and development objectives. This concept allows for limited development while protecting an area's environmental features, providing open space, and maintaining farmland and the agrarian character of communities. Typically, development is clustered, leaving 50 percent or more of the land as open space.

A conservation development is established by a contract between a landowner and a community stewardship entity or government entity that contains permanent restrictions on the use or development of land, usually through the establishment of a conservation easement. The conservation easement is recorded in the real estate records, and is binding upon future landowners. There must be a public benefit associated with a conservation development, and a landowner may reserve home sites for present and future use.

"We really need to encourage land developers and production builders to increasingly utilize conservation development programs by taking every opportunity to showcase the benefits, especially economic values, obtaining approvals/entitlements, and developing value-added communities with features such as open space, trails, and wildlife," notes Tom Keith, principal and vice president, EDAW, Inc., the world's largest land planning and environmental analysis firm. EDAW is a leading proponent of conservation development and last year co-hosted a major CD symposium with the Urban Land Institute in Colorado Springs, Colo.

Ed McMahon, a nationally renowned authority on sustainable development, land conservation and urban design who serves as the Urban Land Institute's Charles Fraser Senior Resident Fellow for Sustainable Development, states that our nation must pay more attention to conservation development because of the accelerated consumption and fragmentation of open space. "We are using more land than we should for our population growth," he says, and adds that open space preservation has a higher rate of voter approval than any other issue, including highway and school construction.

McMahon points out that regulators and developers must strive to create and implement a more strategic approach to utilization of conservation development principles, stating that conservation development offers significant benefits to both the public and private sectors, including:

- Preservation of open space
- Reducing infrastructure costs
- Increasing property values
- Expediting the entitlement process

"Ongoing land management is extremely important to successful conservation development," explains Jeff Milder, Ph.D., a professor at Cornell University's Department of Natural Resources. "Conservation development integrates protection of natural resources and open space with development needs of the communities. Residents appreciate the natural beauty, open space, trails, and plant and wildlife that conservation developments preserve."

Focusing on the future potential of conservation development, Keith asks, "Can we move conservation development to the mainstream? Clearly it's happening, but it's not really there yet." He points to states such as Colorado, California and New Mexico as examples of states that are leading the way. "There are approximately 1.6 million acres that have been preserved using an array of conservation development tools," he notes. "When it's done properly, we can achieve real contributions to land and resource conservation."

Brooke Warrick, principal of San Francisco–based American LIVES, Inc., says there is definitely a market for communities that incorporate conservation development. "Other conservation-sensitive communities in which we have been involved are successful because they tend to attract what we call cultural creative residents, who are characterized by a focus on environmental responsibility and community participation," he says.

Warrick states that buyers seem to invest in sustainable communities for one of two reasons. Either they believe it's important to lead a more sustainable lifestyle, or they believe they can save money. According to national surveys by American LIVES, 85 percent of homebuyers questioned said they are willing to pay $2.25 more per square foot for sustainable housing, and 73 percent are willing to pay $4.50 more. "It may vary by a percentage point or two, but not very much," Warrick points out. "These numbers are indicative of other parts of the country; buyers want some measure of sustainability."

The long-term savings delivered by some Green elements can be partially reflected in increased sales price if clearly communicated to the buyer. Warrick says that for Green development to be effective, both buyers and builders need to be informed about the benefits of using Green products and practices.

The Valley Breeze *Tuesday, October 10, 2006*

First conservation development gets nod from board

By LUCILLE BENOIT, Breeze & Observer Managing Editor

SMITHFIELD – A strip of forest off Burlingame Road could have become a collection of cookie-cutter house lots but instead will retain more than 100 acres of open space and greenery with last week's master plan approval of the town's first conservation development.

Developer William Santaro was headed to a cluster concept three years ago when Burlingame Estates was first introduced. The subdivision hearings drew more than 100 residents opposed to the plan early in the process. When complete, the 52-lot subdivision would have stretched from Log Road to Latham Farm Road.

"It was a very contentious project initially," recalled Frederick Presley, director of planning and economic development.

The Planning Board gave it master plan approval three years ago but required the subdivision road tie into Log Road, he said. The road issue caused the project to languish. The Town Council finally determined that the road requirement would not go forward. It vetoed the Log Road crossing because it would have crossed major wetlands, Presley said.

Meanwhile, Santaro agreed to step back and began numerous meetings with Presley. This year a new tool, conservation development, recently supported as an ordinance by the Town Council, emerged as an option for the project.

The conservation zoning was similar to the cluster plan the developer had already proposed. The process, however, included a much more formulated process and fewer things left to the developer's whims, said Presley.

The first step of the conservation plan was to see what the project would look like under a conventional development layout. The cluster development and a conventional development both would have allowed 52 lots of about 2 acres on the 139-acre property.

The final number of lots approved last week under the conservation plan is 38 lots, mostly a half acre, with 114 acres put into the hands of the Smithfield Land Trust.

"It's a win/win for everyone," said Presley.

Although Santaro will create fewer lots, the development costs will be lower with fewer roads, from 9,000 feet of roadways to 3,000, less site work, creation of a community

atmosphere with the closer grouping of homes and less impact on the environment. The entire development will have only five small detention ponds instead of the significant wetlands impacts it could have if developed under conventional project lines.

"This is a lot better project at the end of the day," said Presley.

Planning Board members heard the description of the conservation proposal and unanimously gave it master plan level approval Thursday, Sept. 28.

It now has to continue through the rest of the process but the developer's attorney Brian Thalmann said they hoped to start the first phase in the spring of 2007. The development will be done in five phases beginning at the intersection of Latham Farm Road and Cedar Forest Road and now looping back into Burlingame Road.

The first phase will involve six houses but market conditions will dictate the timeframe for the next phases, said Thalmann.

Santaro credited the work of Presley in directing the plan.

"The credit goes to Fred," he said, "for his creativity and vision."

Santaro, a town resident since 1965, said he was willing to work with the concept to try to move forward with something the town wanted to accomplish. Instituting the conservation zoning where feasible seemed to fill that bill, he said, after the meeting.

Additional Information on Conservation Development can be found at these Websites:

(listed in no certain order)

Dodson Associates
http://www.dodsonassociates.com/work/growth.html

State of Massachusetts
http://www.mass.gov/?pageID=ocdhomepage&L=1&L0=Home&sid=Eocd

National Association of Counties – Local Tools for Smart Growth (PDF)
http://www.naco.org/Content/ContentGroups/Programs_and_Projects/Community_Development/Center_for_Sustainable_Communities/LocalTools_SmartGrowth.pdf

NOAA Coastal Services Center
http://www.csc.noaa.gov/alternatives/conserve_info.html

Mississippi – Twice Green (PDF)
http://www.pearlrivercounty.net/planning/files/PRC%20Web%20Brochure.pdf#search='conservation%20developments'

Smart Communities Network
http://www.smartcommunities.ncat.org/greendev/subdivision.shtml

Milwaukee River Basin Partnership
http://clean-water.uwex.edu/plan/openspace.htm

Jordan Cove, CT Annual Report (PDF)
http://www.uni-groupusa.org/jcoveannual03a.pdf

The Conservation Fund – Green Infrastructure (PDF)
http://www.sprawlwatch.org/greeninfrastructure.pdf#search='conservation%20developments'

NIPC.ORG
http://www.nipc.org/environment/sustainable/content.htm#Conservation

Land Choices
http://www.landchoices.org/conservation_design.htm

ARC's Conservation Subdivisions Tool (PDF)
http://www.atlantaregional.com/cps/rde/xbcr/SID-3F57FEE7-42F61DE1/arc/CONSERVATION_SUBDIVISION_TOOL.pdf

Georgia DNR - Green Growth Guidelines
http://crd.dnr.state.ga.us/content/displaycontent.asp?txtDocument=969

Links to Other Websites
http://greenerprospects.com/links.html