



March 22, 2022

**Medway Planning & Economic Development Board
Meeting**

Other Information

1. As part of the Town's MS4 requirements for this year, the Town has to complete two reports for the EPA by June. One report is an assessment of the Town's current land use rules, regulations, design standards, zoning, etc. to determine if they are conducive to promoting low impact design/ green infrastructure etc. The other report will review the same rules, regs, etc. but to determine if they promote impervious cover. Medway DPW is lead on the Town's MS4 plan and compliance; Planning, Building, and Conservation are part of this endeavor. Woodard and Curran are helping DPW with these reports and have recommended using the Maryland Center for Watershed Protection Code and Ordinance Worksheet as a way to organize and assess Medway's standards. See attached. That review is now underway; staff will meet on April 5th to regroup. Woodard and Curran will summarize the data and recommend ways to improve Medway's codes and regulations so that we are promoting green infrastructure and less impervious cover.
2. Fran Hutton Lee, Medway's GIS Coordinator is working with our office on 2 projects, both of which will be incorporated into the Town's web site:
 - Compiled map showing Medway residential developments. See attached.
 - Story mapping element to share info on development projects under construction. This would include photos, links to the decision and approved plans, etc.



CENTER FOR
WATERSHED
PROTECTION

The Code & Ordinance Worksheet

*A Tool for Evaluating
the Development Rules
in Your Community*

2017





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The Center would like to acknowledge the following sources that were useful in developing the revised Code and Ordinance Worksheet questions:

- *Tackling Barriers to Green Infrastructure: An Audit of Local Codes and Ordinances* (University of Wisconsin Sea Grant, and 1,000 Friends of Wisconsin, 2014)
- *Water Quality Scorecard: Incorporating Green Infrastructure Practices at the Municipal, Neighborhood and Site Scales* (EPA, 2007)
- *Ordinance Assessment* (Chicago Metropolitan Agency for Planning, 2013)

Introduction to Better Site Design and the Code and Ordinance Worksheet

Published in 1998, the Center for Watershed Protection's Better Site Design Handbook outlines 22 model development principles for site design that act to reduce impervious cover, conserve open space, prevent stormwater pollution, and reduce the overall cost of development. The model development principles were created through a national Site Planning Roundtable, a consensus-based process initiated to create more environmentally sensitive, economically viable and locally appropriate development. The roundtable consisted of over 30 influential individuals from various organizations around the nation, including environmental groups, transportation officials, planners, realtors, homebuilders, land trusts, fire officials, county managers and more.

For each model development principle, the Better Site Design Handbook summarized practices that were recommended around the nation at the time, outlined their economic and environmental benefits, addressed perceived and real barriers, and presented national case studies. The Better Site Design Handbook also presented a process for evaluating local development regulations based on the model development principles so that strategic code changes could be made in the community. The tool provided to facilitate an in-depth review of codes and ordinances at the local level was the Code and Ordinance Worksheet (COW). Since its creation, the COW has been used by the Center to conduct 13 local site planning roundtables and review local development regulations in over 75 communities in Maryland, Pennsylvania, Virginia, South Carolina, Ohio, Wisconsin, New York, Alabama, and the District of Columbia. Other organizations, such as the Cumberland River Compact, Southeast Watershed Forum, Pennsylvania Environmental Council, Potomac Conservancy, James River Association, and Tennessee Valley Authority, have used the Better Site Design process to make updates to their local codes or to conduct their own roundtables.

Runoff Reduction Practices

Runoff reduction practices, often interchangeably referred to as Green Infrastructure practices or Low Impact Development practices, are stormwater treatment strategies that aim to replicate pre-development hydrology by reducing runoff volume. Many runoff reduction practices integrate trees and other vegetation, and runoff volume is reduced through disconnecting impervious cover, infiltration, evapotranspiration, collection and re-use, and other mechanisms.



Green rooftop



Porous asphalt



Rain garden



Cistern

Why an Update?

Much has happened in the world of stormwater management and site planning since the release of the Better Site Design Handbook in 1998. Programmatic and regulatory changes driven by the advent of the National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer system (MS4) program have advanced the thinking about how stormwater is managed on development sites. The result has been a shift from primarily using ponds, wetlands and other large practices that detain and slowly release runoff to the integration of small stormwater management practices throughout the landscape to promote infiltration and reduce runoff. This shift has necessitated another look at how local development regulations can influence and sometimes create barriers to the use of these “runoff reduction” practices.

Since the Better Site Design Handbook was published, the development of total maximum daily loads (TMDLs) for numerous urban streams and rivers has created a need for MS4s to install stormwater management practices on developed sites as retrofits. Stormwater ordinance language that creates barriers to installing runoff reduction practices on new or redevelopment sites can also act to discourage their use as retrofits.

The 22 model development principles and the COW were developed during a time when seminal research on the important connection between impervious cover and stream health had recently been published (CWP, 1998; Schueler, 1994). New suburban development was widespread, and many communities were concerned that their local codes and ordinances created standards that resulted in excessive impervious cover (Figures 1-3). Therefore, the original COW was primarily intended to influence new residential and commercial development and, as a result, most of the COW questions applied to low or medium density (suburban) neighborhoods. The update recognizes that while the overall goals of reducing impervious cover, conserving natural areas and preventing stormwater pollution can apply to any community, some of the COW questions are not relevant for certain types of development. The instructions for using the revised COW explain how to determine which questions are most applicable for the type of development that is most prevalent in your community (e.g., new rural, suburban or urban development, redevelopment).



Figure 1. This low-density residential street accommodates two travel lanes and two on-street parking lanes, despite the fact that each house has a three-car garage and large driveway and will rarely if ever need that much on-street parking.



Figure 2. This cul-de-sac with a 50-foot radius creates a large bulb of rarely-used impervious cover.



Figure 3. This commercial parking lot sits largely empty because it was not designed for local parking demand (Photo credit: Todd Gill, Fayetteville Flyer).

The COW update also considered revised standards and supporting research on topics such as recommended stream buffer widths, parking ratios, parking stall dimensions needed to accommodate today's vehicle sizes, differing setbacks for fire-prone regions versus humid regions, and the impact of state water law on the use of rainwater harvesting practices.

Who Should Use the COW?

The COW is intended to help communities evaluate their local development regulations to identify revisions that allow or require site developers to minimize impervious cover, conserve natural areas and use runoff reduction practices to manage stormwater. The COW can be completed by municipal staff or by non-governmental organizations who wish to improve the environmental footprint and character of development in their community. It is a tool that can be used by communities who are experiencing or anticipating moderate to high pressure for new development (urban, suburban, or rural) or redevelopment.

In addition to the environmental benefits of reduced runoff and protection of natural areas, other benefits of using this tool to revise local codes and ordinances include:

- Stormwater permitting agencies are increasingly requiring the use of Runoff Reduction practices to the maximum extent practical, so removing barriers to their use can facilitate meeting permit requirements. Some state MS4 Permits (e.g., Maryland, Georgia, California, Connecticut, West Virginia) even require that permittees review their local codes and ordinances and revise them to remove barriers and better integrate Runoff Reduction practices.
- Communities who are embracing Runoff Reduction, either voluntarily or to meet volume-based stormwater management requirements or to help reduce combined sewer overflows, can better meet their goals by removing local code barriers.
- Reducing the impact of new and redevelopment can help MS4s with local or regional TMDL requirements to stay “under the cap” while still allowing for growth.
- Changing regulations to promote developments that conserve natural areas and use runoff reduction practices can support both resiliency planning and sustainability planning efforts.
- Better Site Design can reduce construction costs for developers and increase profits.
- Better Site Design also results in safer streets, neighborhood designs that promote a sense of community, more open space for recreation, and more walkable neighborhoods.

How to Use the COW

The COW allows an in-depth review of the codes and ordinances (i.e., the development rules) that shape HOW development occurs in your community. Programs, institutional frameworks and informal policies are not included in this review unless specifically documented in the codes or in a plan, manual, or other document referenced by the code. Additional resources on conducting local stormwater, forestry, wetland or other local environmental program reviews are provided in the Resources section of this document.

The model development principles and the COW are not intended to address WHERE development occurs. Rather, the assumption is that development is already planned and communities completing the COW wish to reduce the impact of expected development on local water resources, while improving neighborhood character and reducing construction costs. Many other tools and resources are available for communities who wish to change where development happens, most of which fall under the umbrella of watershed planning and Smart Growth. A list of resources is provided in the Resources section of this document.

The COW worksheet is subdivided into four categories:

1. Residential Streets and Parking Lots (Principles 1 - 10)
2. Lot Development (Principles 11 - 16)
3. Conservation of Natural Areas (Principles 17 - 22)
4. Runoff Reduction

The first three sections consist of a series of questions that correspond to each of the model development principles. Section four contains new questions added to address stormwater management standards, particularly the inclusion of runoff reduction practices. Points are assigned based on how well the current development rules agree with the site planning practices identified in the questions. The revised COW provides some

background and rationale for each principle and related questions. The Better Site Design Handbook (CWP, 1998) provides additional background and research on each principle.

Preparing to Complete the Code and Ordinance Worksheet

The first step is to identify the development rules that apply in your community. Few communities include all of their rules in a single document. Rather, the development process is usually shaped by a mix of local regulations and policies, each of which may be administered by a different agency. In some cases, state and federal agencies may also exercise some authority over the local development process (e.g., wetlands, design of larger roads, stormwater management). Where this is the case, the local code will reference these state or federal standards. This task can be streamlined by having a knowledgeable person (e.g., a local land use planner or plan reviewer) read through the COW questions and make an initial list of codes and ordinances that apply for the particular community. A list of potential documents to gather is provided in Table 1.

Six Steps for Using the Code and Ordinance Worksheet

1. Gather codes, ordinances, and other documents
2. Identify authorities who administer the rules
3. Select the appropriate COW questions for your community
4. Review the regulations to find answers to the COW questions
5. Use the COW Scoring Spreadsheet to record answers, points and notes
6. Identify priority actions for the short and long term

The next step is to gather the relevant codes and ordinances. Most municipal ordinances, as well as state and federal regulations, are available online. The COW Scoring Spreadsheet provided at <https://owl.cwp.org> includes a worksheet to list the relevant codes and the link where each can be found. As you complete the review, you may find it necessary to also obtain design manuals, review checklists, guidance documents or specifications that are referenced in the codes in order to answer the COW questions. So identifying and gathering the relevant documents is an iterative process.

Table 1. Relevant Documents for Completing the COW

Zoning Ordinance
Subdivision Ordinance
Street Standards or Road Design Manual
Parking Requirements
Building Code
Stormwater Management, Rainwater or Drainage Ordinance
Stormwater Management Design Manual
Buffer or Floodplain Regulations
Environmental Regulations
Tree Protection or Landscaping Ordinance
Erosion and Sediment Control Ordinances
Fire Code
Grading Ordinance
Health Codes

Next, you must identify the local, state, and federal authorities that actually administer or enforce the development rules within your community. This step should be relatively easy and will provide a better understanding of the intricacies of the development review process and helps identify key members of a future local

roundtable focused on changing the development rules. The COW Scoring Spreadsheet provides a worksheet for recording the agencies that influence development in your community and listing specific contacts. Space is provided for local agencies, as well as state and federal agencies.

Completing the Worksheet

Once you have located the documents that outline your development rules and identified the authorities responsible for development in your community, you are ready for the next step. You can now use the COW Scoring Spreadsheet to compare your development rules to the model development principles. This may be a good project for an intern or graduate student to work on with input from municipal staff. In many communities that have used the COW, a non-profit organization has taken the lead on completing the worksheet, in partnership with municipal staff. Both approaches can greatly reduce the time commitment by local staff.

The worksheet is presented in the next section of this document and includes 94 questions, as well as the 22 model development principles for reference. Each question focuses on a specific site design standard, such as the minimum diameter of cul-de-sacs, the minimum width of streets, or the minimum waterway buffer width. The codes, ordinances, and other related documents you have compiled will be used to answer the questions. If your development rule agrees with the site planning benchmark, you are awarded points. If your development rule does not agree with

Selecting the COW Worksheet that Best Fits Your Community

The developed landscape is a continuum from natural areas to the urban core. Some regional planners identify transects in land use forms across this continuum with multiple breaks in their classifications. The COW Scoring Sheet simplifies these breaks with four categories: rural, suburban, urban and highly urban.



Rural

The rural landscape is characterized by open space dominated by woodland, agriculture, and other open areas. It contains scattered residential lots and subdivisions on relatively large lots. There is an auto-oriented land use pattern with limited non-

residential uses. Development is primarily served by on-lot sewer and water systems. (Photo credit: Dorothy Cappiella)



Suburban

The suburban landscape is dominated by residential subdivisions containing primarily single-family housing, as well as concentrations of non-residential land uses. This landscape has an auto-oriented transportation network and can be served by public

sewer and water systems or by on-lot systems. Open areas are present with the opportunity for conservation practices, buffers for natural areas and open space management. (Photo credit: Matt Rath)



Urban

The urban landscape includes historic population centers that provide commerce, civic, and cultural activities for the surrounding area. These landscapes have a pedestrian-orientation with sidewalk systems and are often served by mass transit.

Public sewer and water systems are the norm here. Urban landscapes include both medium and high density areas and may experience redevelopment as well as some new construction on the few remaining unbuilt areas.



Highly Urban

Highly urban landscapes are similar to urban landscapes except that the primary development activity here is redevelopment. (Photo credit: Ted Eytan)

the site planning benchmark, or does not address it at all (in other words, the code is “silent” on the issue) you are not awarded points.

The COW can be used by rural, suburban and urban communities experiencing new development, as well as urban communities where redevelopment is prevalent. However, not all questions will be applicable in all communities. The COW Scoring Spreadsheet provides space in which to record your answers to the COW questions. The spreadsheet contains a separate section for each major community type: rural, suburban, urban and highly urban. Select the worksheet that is most appropriate for the type of development occurring in your community. Questions that are not applicable to each type of development have been grayed out and the total possible score has been adjusted accordingly.

If the mix of questions contained in the rural, suburban, urban and highly urban worksheets aren't quite right for your community, it is possible to tailor the COW questions and scoring for your municipality. Simply complete all the relevant questions in any of the four worksheets (overriding the grayed out cells where necessary). Then adjust the scoring by changing the number of total possible points to reflect the total possible score for the questions you answered. This tailoring may be useful when a specific set of questions do not apply to your community (e.g., tree conservation or tree planting questions in an arid desert environment, or rainwater harvesting questions in a state where water rights law prohibits this practice) or where local conditions are such that the pre-assigned questions for your community type are not an exact fit.

For each question, if the answer is Yes, enter the associated number of points in the “Yes” column. Most questions are worth one point for a Yes answer, but BLUE questions are worth two points and ORANGE questions are worth 0.5 points. If the answer is No; the question is not applicable (for example, the question is about a requirement in the open space ordinance but your community does not have an open space ordinance); or the codes do not address the question at all, enter an “x” in the appropriate column (No, N/A, or Codes are Silent). No points are given for these answers. Note that “Codes are Silent” is only an option for certain questions. Other questions will have a clear Yes or No answer (e.g., Does the buffer ordinance outline prohibited and allowable uses?).

Use the Notes column to record details about your responses, such as specific code language or a reference to the specific code section where the answer was found. Other notes that could be made in this column include whether or not the recommended standard is something the municipality has authority over versus a state or federal authority, and notes on any impending updates to the local codes or ordinances. This will assist later on with determining the next steps and prioritizing the necessary changes.

Calculating Your Score

The total number of points possible varies with the community type; therefore the final score is presented as a percentage of the total possible points. The COW Scoring Spreadsheet automatically calculates the total points received as well as the percentage. Your overall score provides a general indication of your community's ability to support environmentally sensitive development. As a general rule, if your overall score is lower than 80%, then it may be advisable to systematically reform your local development rules. However, it is important not to get hung up on the score or to compare it to other jurisdictions. The COW is intended to provide a constructive assessment of the current development regulations and identify the top opportunities for improvement.

How to Use the Results

Once you have completed the worksheet, go back and review your responses. For COW questions with “No” or “Codes are Silent” answers, evaluate their relative importance in your community. The next step is to use the COW benchmarks to develop short-term (1-3 years) and long-term (3-5 years) action items for the most important items. These action items can be recorded in the Action Items worksheet of the COW Scoring Spreadsheet. Some factors to consider in determining relative importance and whether actions are short or long term include:

- Time the revisions with planned updates to codes and ordinances
- Focus on the code changes that are under municipal control
- Focus on codes that give you the most bang for your buck
- Target specific areas that need the most improvement first (e.g., development rules that govern road design)
- Consider local support/local importance of specific principles
- Prioritize changes that remove direct barriers
- Consider relative ease of proposed changes (e.g., adopting a stream buffer ordinance may be a longer road than changing parking lot design standards)

When State or Federal Rules Apply

The goal of the local code and ordinance review is to identify changes that can be made at the local level. However, sometimes the local codes reference a state or federal standard which cannot be changed through a local site planning roundtable process. Communities may be able to address the identified problems through adoption of a local ordinance but the authority granted to local governments to do so varies by state.

In some states, cities, municipalities, and/or counties are granted the ability to pass laws to govern themselves as they see fit (so long as they obey the state and federal constitutions). In other states, municipalities only have the rights that are expressly granted to them by the state legislature. In these states, a city or county must obtain permission from the state legislature if it wishes to pass a law or ordinance which is not specifically permitted under existing state legislation.

https://en.wikipedia.org/wiki/Home_rule_in_the_United_States

It is important to remember that the Better Site Design principles and therefore the COW questions are not independent of each other. For example, reducing lot sizes to allow for clustering of homes can preserve significant open space and reduce overall impervious cover, but the higher density may mean having to use curb and gutter rather than open section roads, limiting some opportunities for stormwater treatment. Similarly, reducing front yard setbacks can reduce overall imperviousness by reducing driveway length; however, this may result in a need to provide on-street parking, making road widths wider and ultimately cancelling out the reduction in impervious cover achieved through shorter driveways. In each situation, tradeoffs must be made. Users of the COW may want to decide which specific design principles are more important for their communities given the advantages and potential drawbacks of each practice. This can assist with identifying the top code changes to move forward on once the COW has been completed.

This review also directly leads into the next step: making the recommended changes. Municipal staff may simply proceed with the short-term changes through their usual process of updates. Another option is a site planning roundtable process conducted at the local government level. The primary tasks of a local roundtable are to systematically review existing development rules and then determine if changes can or should be made. By providing a much-needed framework for overcoming barriers to better development, the site planning roundtable can serve as an important tool for local change. The Better Site Design Handbook (CWP, 1998) provides detailed information on how to conduct a site planning roundtable.

The COW is a useful tool to identify actions for improving local development regulations. However, having “good” codes and ordinances only works if their provisions are actually implemented. Therefore, the importance of implementing and enforcing the codes cannot be overstated. Some useful publications for designing effective code and ordinance language are listed in the Resources section of this document.

Code and Ordinance Worksheet

Residential Streets and Parking Lots

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

1. Street Width

Principle: 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.

In many cities and jurisdictions, local street design manuals and standard plans require or incentivize roadways that are overbuilt for motor vehicle traffic, with wide travel-ways and large corner radii that increase impervious surfaces while increasing risk to street users. Revising local street standards to consider design speed, street type and traffic volume presents a significant opportunity to reduce impervious cover, by allowing for more compact roadways and intersections. When curb extensions are permitted, they unlock street space to introduce pervious surface and integrate runoff reduction practices within the street environment.

Permeable pavements in roadways also provide a means to retain stormwater away from the street surface.

While there may be opportunities to reduce street widths on arterial roads, high volume roads and/or non-residential streets, their design is often determined by state standards and are therefore not addressed in this local code review.



Figure 4. Road widths are minimized in this Savannah, GA neighborhood; yet are wide enough to allow access for emergency vehicles

Questions

Points

1	Is the minimum roadway width allowed for streets in neighborhoods with low volume roads (less than 400 average daily trips according to AASHTO, 2001) between 18-22 feet (where bicycle lanes are not present)?	
	YES	1
	NO	0
	CODES ARE SILENT	0
2	Are curb extensions that narrow the roadway (such as pinchpoints, gateways, and chicanes) permissible?	
	YES	1
	NO	0
	CODES ARE SILENT	0

Questions

Points

3	Are permeable paving materials allowable on low-volume streets and/or parking lanes?	
	YES	1
	NO	0
	CODES ARE SILENT	0

2. Street Length

Principle: Reduce total length of residential streets by examining alternative street layouts to determine the best option for increasing the number of homes per unit length.

Minimizing street length in residential neighborhoods can reduce the overall imperviousness created by the development and also minimize the associated land disturbance. The most common street network types include grid and curvilinear (which uses a hierarchical street pattern that includes cul-de-sacs) as well as various hybrids of the two. Although grid patterns are generally less efficient than curvilinear patterns (Canada Mortgage and Housing Corporation, 2002), the grid pattern has advantages such as greater dispersal of traffic, being more pedestrian friendly, and providing greater direct access.

The best street layout option for most neighborhoods will utilize some aspects of the grid and curvilinear systems; however, there is no one street layout that is guaranteed to minimize total street length in residential developments. Generally, a more compact street network can be achieved by reducing frontage distances and side yard setbacks and by allowing narrower lots. Smaller lots clustered together (e.g., open space developments) can also reduce the total street length. Reducing the number of non-frontage roads is another strategy for minimizing street length. Traditional Neighborhood Development is another type of design that lends itself to reduced street length because of the focus on walkability and connectedness. Long streets serving only one or two homes should be discouraged.

Types of Curb Extensions

Pinchpoints



Curb extensions at mid-block or intersection corners that narrow a street by extending the sidewalk or widening the planting strip. These can include mid-block crossing locations. (Photo credit: Kevin

Robert Perry)

Gateways



A curb extension located at the entrance to a neighborhood street narrows the crossing length for pedestrians and reinforces a low-speed operating environment. (Photo credit: Dongho Chang,

Seattle Department of Transportation)

Chicanes



A series of narrowings or curb extensions that alternate from one side of the street to the other forming S-shaped curves can be implemented to reduce motor vehicle speeds and unlock roadway space

for pervious surface or bioretention (Photo credit: thisbossi)

Questions		Points
4	Does the subdivision, Planned Unit Development, or Unified Development ordinance identify reducing street length as a goal of neighborhood street design?	
	YES	1
	NO	0
	CODES ARE SILENT	0

3. Right-of-Way Width

Principle: 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.

Similar to street width, many communities' codes specify right-of-way widths that are based on blanket application of high-volume street design standards. This results in very wide rights-of-way that require greater clearing during road construction and consume more land that could be used for housing lots. Reducing right-of-way widths can result in less clearing and encourage more compact site design.

One component of the right-of-way that actually has a benefit to being wide is the planting strip between the sidewalk and the street as well as any median strips. These areas not only provide opportunity for storm-water treatment using bioretention or other runoff reduction practices, but they can be planted with large trees to provide shade, capture rainfall, and generally beautify and improve our neighborhoods. Increasing the width of these planting strips to at least six feet (to accommodate large shade trees) can increase the overall right-of-way width but is a tradeoff that is well worth it, especially if some existing trees can be preserved.

Questions		Points
5	Is the recommended right-of-way width for a low-volume residential street less than 45 feet?	
	YES	1
	NO	0
	CODES ARE SILENT	0
6	Does the code allow utilities to be placed under the paved section of the right-of-way to limit clearing and allow a compact development footprint?	
	YES	1
	NO	0
	CODES ARE SILENT	0

Questions

Points

7	If street trees are required, is the planting area required to be at least 6 feet to provide sufficient rooting space to support large trees?	
	YES	1
	NO	0
	CODES ARE SILENT	0
	N/A	0

4. Cul-de-Sacs

Principle: 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.

A cul-de-sac is a local street open at only one end. A large “bulb” is located at the closed end to enable emergency and service vehicles to turn around without having to back up. Cul-de-sacs are a prominent feature in many contemporary residential developments and many communities require that the bulb be 60 feet or more in radius, creating a large circle of impervious cover that is never fully utilized for turning movements. The research on cul-de-sac radii shows the following:

- AASHTO (2011) recommends a 30 foot minimum radius for residential areas. However, some state transportation agencies (e.g., Pennsylvania Department of Transportation) will not provide road maintenance funds to municipalities if cul-de-sac radius is less than 40 feet.
- The International Fire Code (IFC) (ICC, 2015) specifies a minimum 48 foot radius for dead end roads greater than 150 feet in length. However, the IFC also gives the local fire department authority to determine the turning radius and to select equipment that has a more narrow turning radius. Cities and towns across the country with narrow streets and tight turns have purchased specialized emergency vehicles that can operate in these environments (City and County of San Francisco Board of Supervisors, 2015). These vehicles are designed to incorporate features that improve their operability, such as rear-mounted pumpers on fire engines and use of short-jacked ladders on fire trucks.
- The National Fire Protection Association's 2017 standard for fire protection infrastructure for land development in wildland, rural and suburban areas (standard NFPA 1141) requires a 60 foot minimum radius. This standard is applicable for hard-to-access and rural areas as well as those communities who may not already have adopted local building or fire codes.

Neighborhoods that use cul-de-sac turnarounds (typically suburban but sometimes urban or rural developments) can produce less impervious cover if local codes are revised to reduce the minimum cul-de-sac radius to the IFC recommendation of 48 feet. Local fire officials can also determine whether this radius can be further reduced through investment in specialized emergency vehicles.

Questions		Points
8	Do the street or subdivision standards allow street layouts that minimize the use of cul-de-sacs?	
	YES	1
	NO	0
	CODES ARE SILENT	0
9	Is the minimum radius for cul-de-sacs 48 feet or less?	
	YES	1
	NO	0
	CODES ARE SILENT	0
10	Can a landscaped island be created within the cul-de-sac?	
	<i>YES, and the cul-de-sac must be graded to the island with an overflow to the storm drain system, so that it can be used for stormwater treatment</i>	2
	<i>YES, but curbing is required or the island must be raised, limiting its use for stormwater treatment</i>	1
	NO	0
	CODES ARE SILENT	0
11	Are alternative turnarounds such as hammerheads and loop roads allowed?	
	<i>YES, alternative turnarounds are specifically mentioned in the ordinance with specific design/construction guidance provided by reference</i>	1
	<i>YES, alternative turnarounds are allowed, but no specific guidance provided on design</i>	0.5
	NO	0
	CODES ARE SILENT	0

Cul-De-Sac Alternatives

Each of the options shown below serve about four homes.



1. This cul-de-sac with a 50-foot radius creates about 8,250 square feet of impervious cover



2. This loop lane reduces the need for backing up of vehicles and creates about 10% less impervious cover than Option 1.



3. This cul-de-sac also has a 50-foot radius but incorporates a vegetated island. This alternative creates about 15% less impervious cover than Option 1.



4. This hammerhead or t-shaped turnaround produces about 80% less impervious cover than Option 1. This alternative is good for very short (< 200 feet) streets. (Photo Source: Google Earth)

5. Vegetated Open Channels

Principle: 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.

Many jurisdictions require curb and gutter systems along residential streets to direct stormwater runoff. By contrast, vegetated open channels that incorporate runoff reduction practices such as dry swales, bioretention, biofilters, or vegetated swales, are often prohibited in subdivision codes. Vegetated open channels remove pollutants by allowing infiltration and filtering to occur, encourage groundwater recharge and reduce the volume of runoff generated from a site. These are generally only applicable in low or medium density developments. In neighborhoods with medium to high housing densities or other conditions that limit the use of vegetated open channels, runoff reduction practices can be integrated into curb extensions or landscape strips.

Questions

Points

12	Are open section vegetated channels allowed where density, topography, soils, and slope permit?	
	YES	1
	NO	0
	CODES ARE SILENT	0
13	Are runoff reduction practices permissible within curb extensions or landscape strips?	
	YES	1
	NO	0
	CODES ARE SILENT	0

6. Parking Ratios

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

Parking demand is defined as “the number of spaces that should be provided to serve a particular land use, given factors such as the prices of parking and the availability of alternative travel modes” (ULI 2014). Parking ratios found in parking codes are intended to reflect parking demand for a particular land use and are typically stated as the number of spaces per square foot of building space, number of dwelling units, persons, or building occupancy. In reality, parking ratios in many communities do not accurately reflect the local parking demand, because they may be taken directly from another community’s parking code, be based on studies of parking demand from another region, and/or do not consider local factors that can affect parking demand (e.g., price of parking, availability of public transportation, density or economic vitality). In addition, parking ratios are typically set as minimums, even when drawn from studies of peak parking demand. The result is that some parking lots have far more spaces than are actually needed, particularly in areas of mixed land use, where there are good travel options, and parking is managed for efficiency or cost (Litman, 2016).

One approach to estimate parking demand is to start with industry standards—such as those identified in the Institute of Transportation Engineers (ITE) Parking Generation document and the Urban Land Institute (ULI) and National Parking Association (NPA)’s *The Dimensions of Parking*—and adjust these values to reflect local characteristics. The ITE values are based primarily on suburban sites with isolated single land uses with free parking, and not intended for highly developed areas, although the more recent editions have begun to segregate the data into various factors that influence parking demand (ITE, 2012; Kimley Horn, 2016). ULI and NPA (2010) provides recommended base parking ratios for the most common land uses found in mixed-use developments. With either source, the values should be considered base ratios to be adjusted based on local data following the process outlined in ULI and NPA (2010). A second approach to estimate parking demand (often used for event facilities) is to forecast the number of person-trips or vehicle-trips or the number of people expected to be present at peak and off-peak hours (ULI and NPA, 2010).

Communities with Reduced Parking Ratios

As part of the Citywide Zoning Update effort, the City of Oakland, CA recently updated its regulations related to off-street parking and loading. These regulations had not been comprehensively reviewed since 1965 and the “one size fits all” approach to parking ratios often resulted in too much parking. The revisions have addressed this problem by eliminating parking requirements in certain zones and in other zones the amount of parking provides is determined on a project-by-project basis to reflect local demand. These updates to the parking regulations were developed based upon an evaluation of existing parking policies and issues in Oakland, as well as a review of strategies implemented in other cities.

<http://www2.oaklandnet.com/Government/o/PBN/OurOrganization/PlanningZoning/OAK030572>

Other cities such as Fayetteville, AR are also addressing the problem of “excess” parking by changing their codes to eliminate minimum parking requirements for non-residential properties.

<https://www.fayettevilleflyer.com/2015/10/07/fayetteville-eliminates-minimum-parking-requirements/>

Questions		Points
14	Do parking ratios reflect local parking demand?	
	YES, they are based on a local study of parking demand, or are based on ITE or ULI values and adjusted for local conditions	1
	NO, we simply use the ITE or ULI values, base them on a neighboring community's standards, or we do not know where they came from	0
15	Are parking requirements set as maximums?	
	YES	1
	NO	0
	CODES ARE SILENT	0

7. Parking Codes

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

Parking demand represents the actual number of parking spaces required to accommodate parking needs of a particular land use. Mass transit can lower parking demand directly by reducing the number of vehicles driven, and therefore, vehicles parked. Cervero, Adkins, and Sullivan (2010) found there is an oversupply of parking near Transit Oriented Developments (TODs), sometimes by as much as 25–30%, when compared to parking generation rates from the ITE. Similarly, Ewing et al. (2017) found that the ratio of demand to supply was between 58 and 84% for five TODs across the country, even with parking built at 23 to 61% of ITE's guidelines.

Shared parking is a strategy that reduces the number of parking spaces needed by allowing a parking facility to serve multiple users or destinations. This approach is most successful when destinations have different peak periods during the day or week, or if they share patrons that can park at one facility and walk to multiple destinations (Litman, 2016).

Questions		Points
16	Are shared parking arrangements allowed?	
	YES, shared parking is allowed by-right	2
	YES, shared parking is allowed with special exception	1
	NO	0
	CODES ARE SILENT	0

Questions		Points
17	Are parking ratios reduced if shared parking arrangements are in place?	
	YES	1
	NO	0
	CODES ARE SILENT	0
	N/A	0
18	Is the parking ratio reduced when multi-modal transit (e.g., mass transit, bike share or car share programs) is provided?	
	YES	1
	NO	0
	CODES ARE SILENT	0
19	Can the number of parking spaces be reduced and additional parking be maintained as green space until needed for redevelopment projects?	
	YES	1
	NO	0
	CODES ARE SILENT	0
20	Are parking credits provided when nearby on-street parking is available?	
	YES	1
	NO	0
	CODES ARE SILENT	0

8. Parking Lots

Principle: 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.

The size of a parking lot is driven by stall geometry, lot layout, and parking ratios. Many parking codes require a standard stall dimension that is geared toward larger vehicles, ranging from 162-190 square feet – often 10 feet wide and 19 feet long. The Parking Consultants Council has adopted a 6'7" wide by 17'3" long vehicle as their "design vehicle" for determining parking space and aisle dimensions (ULI and NPA, 2010). These dimensions represent the 85th percentile vehicle, which has varied slightly since 1999 but remained within an inch or two of the stated dimensions (ULI and NPA, 2010). Therefore, many communities may be able to reduce their standard parking stall dimensions while still accommodating the vast majority of today's vehicles.

Parking codes can also be amended to require that a fixed percentage of all stalls be dedicated for compact cars, with correspondingly smaller dimensions. The number of cars on the road that can comfortably fit in a compact stall has decreased considerably, from about 40-50% in 1994 to less than 20% in 2014 (ITE, 1994;

ULI and NPA 2010). However, compact stalls create up to 30% less impervious cover than standard stalls so can be an important strategy for reducing impervious cover in large parking lots.

Impervious cover can also be reduced through the use of alternative paving materials (e.g., permeable pavement, grass pavers) on regularly used parking stalls and parking lanes as well as in spillover areas for larger parking lots. Most parking codes do not distinguish between regular parking areas that are used most of the time and spillover parking, which is used only a few days per year or for special events. These are ideal locations for permeable pavers, reinforced turf products or other permeable parking options. However, if no distinction is made in the parking code, the result can be creation of enormous paved parking areas that stand empty the vast majority of the year. Communities may wish to require designation of spillover parking areas for larger parking lots and promote the use of alternative paving materials in these areas.



Figure 5. Concrete grid pavers are a good option to reduce runoff from parking lots

Questions

Points

21	Is the minimum stall width for a standard parking space 9 feet or less?	
	YES	1
	NO	0
	CODES ARE SILENT	0
22	Is the minimum stall length for a standard parking space 18 feet or less?	
	YES	1
	NO	0
	CODES ARE SILENT	0
23	Is a fixed proportion (e.g., 15%) of the spaces at larger commercial parking lots required to have smaller dimensions for compact cars?	
	YES	1
	NO	0
	CODES ARE SILENT	0
24	Can pervious materials be used for parking areas, including spillover or special event parking?	
	YES	2
	NO	0
	CODES ARE SILENT	0

9. Structured Parking

Principle: Provide meaningful incentives to encourage structured parking to make it more economically viable.

Vertical parking structures can reduce impervious cover by reducing acreage converted for parking. However, in suburban and rural areas where land is relatively inexpensive, surface parking costs much less than a parking garage. In highly urban areas, garages are generally more economical to build than purchasing additional land. In urban and urbanizing areas, local governments should consider using incentives to encourage the building of multi-level, underground, and under the building parking garages. These incentives could come in the form of tax credits; stormwater waivers; or density, floor area, or height bonuses.

Questions

Points

25	Are there any incentives for developers to provide parking within garages rather than surface parking lots?	
	YES	1
	NO	0
	CODES ARE SILENT	0

10. Parking Lot Runoff

Principle: 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.

Many parking lots are almost completely impervious and they represent a significant source of stormwater pollutants and runoff. In addition to reducing the amount of impervious cover, another option is to require onsite stormwater management. Landscaping areas used to enhance the appearance of a parking lot and associated development can also be used for stormwater management. Some options include: bioretention, bio swales, perimeter sand filters, filter strips, and structural soils with trees.

Another option is to plant large trees within the landscaped areas due to their ability to reduce stormwater runoff, promote infiltration, and take up nutrients and other pollutants. A minimum width of 6 feet is recommended to support large, mature trees (Cappiella et al, 2006). Layouts that cluster trees and allow them to share rooting space are also encouraged. Lastly, even the paved portion of the lot can provide stormwater treatment through the use of permeable pavement (e.g. porous asphalt, pervious concrete or permeable pavers) in parking lot driving lanes and parking stalls.



Figure 6. This landscape area is designed to accept and treat stormwater runoff in this Portland, OR parking lot

Questions		Points
26	Is a minimum percentage of a parking lot required to be landscaped?	
	YES	2
	NO	0
	CODES ARE SILENT	0
27	Is the use of runoff reduction practices within landscaped areas, setbacks, or parking areas allowed?	
	YES	2
	NO	0
	CODES ARE SILENT	0
28	Are flush curbs and/or curb cuts and depressed landscaped areas allowed so that runoff can be directed into vegetated landscaped islands or runoff reduction practices?	
	YES	1
	NO	0
	CODES ARE SILENT	0
29	Are dimensions for landscaped areas sufficient to plant large trees?	
	YES, a minimum width 6 feet or greater is specified	1
	NO, a minimum width less than 6 feet is specified	0
	CODES ARE SILENT	0
	N/A	0
30	Do vegetated stormwater management areas count toward required landscape minimums?	
	YES	1
	NO	0
	CODES ARE SILENT	0
	N/A	0

Lot Development

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

11. Open Space Design

Principle: Advocate open space development that incorporates smaller lot sizes to minimize total impervious area, reduce total construction costs, conserve natural areas, provide community recreational space, and promote watershed protection.

Open space design accommodates the same number of lots on one portion of a site and conserves the remaining half or more as protected land (Figure 7). When applied in rural or low-density suburban areas, open space design (also referred to as Conservation Design in these landscapes) first identifies unbuildable wetlands, floodplains, and steep slopes, preserves all of them, and then protects half of the remaining buildable lands. The same concept applies in higher density/sewered suburban and urban landscapes, except that less land is protected. The minimum goal of conserving 50% of the buildable land has been incorporated into model ordinances adopted by several states (e.g., Pennsylvania, North Carolina, and several New England states).

In open space design, conservation of open space is achieved in part by clustering lots. It should be noted that simply using the technique of clustering lots is not sufficient to qualify as open space design. With clustering, lot standards are more flexible; but in the absence of open space design standards, the resulting open space often consists of leftover bits of unusable property.

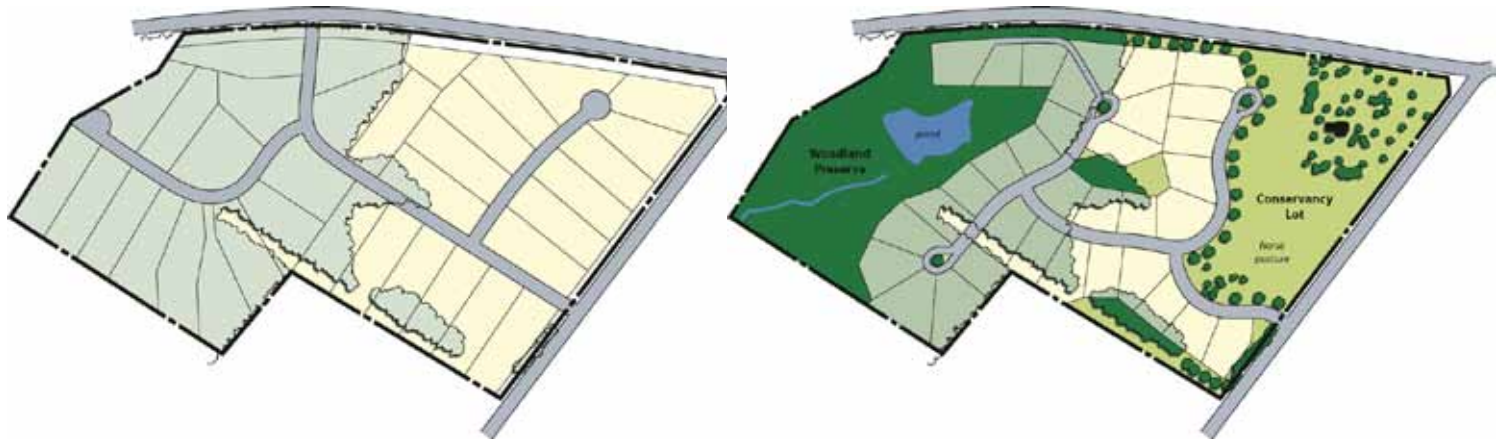


Figure 7. Conventional and open space design options for the Stratford Hall development in Weddington, NC. In both figures, 35 homes are shown on a 35-acre parcel served by public sewer. The figure on the left (conventional development) consists entirely of lots of nearly one acre in area, at a density of one dwelling unit (du)/acre. The figure on the right clusters smaller lots (about 15,000 square feet) on half the parcel, so that the other half can be preserved as open space. The density on the developed portion is about two du/acre, and the density on the other half is 0 du/acre, for an average density of one du/acre, the same as in the conventional option (Source: Randall Arendt, graphics by Natural Lands Trust).

Open space design is most applicable in suburban and rural landscapes but can be used in urban landscapes, with some caveats. Where public sewer is not available, the minimum lot size should be sufficient to provide space for on-site sewage disposal systems, unless alternatives to on-lot septic systems are allowed. Such alternatives may be off-lot individual drainfields located in the common open space, or private central sewage treatment facilities. Open space developments may rely on public sewer if located in a current service area in which case the minimum lot size becomes irrelevant. In rural districts, the extension of water/sewer service beyond currently approved boundaries is not advisable.

Questions		Points
31	Do the ordinances require or allow open space subdivisions?	
	YES, they are required in a designated open space zoning district	2
	YES, open space designs are an allowable option (through an overlay zone)	1
	NO	0
	CODES ARE SILENT	0
32	Is land conservation or impervious cover reduction a major stated goal or objective of the open space design ordinance?	
	YES	1
	NO	0
	N/A	0
33	Is a minimum percentage of the buildable portion of the site required to be set aside as open space?	
	YES, at least 50%	2
	YES, less than 50%	1
	NO	0
	N/A	0
34	Is the open space determined through a stepwise design process where open space is identified first?	
	YES	1
	NO	0
	N/A	0
35	Is open space design a by-right form of development versus a more burdensome conditional use or warrant?	
	YES	1
	NO	0
	N/A	0

Questions		Points
36	Are flexible site design criteria available for developers that utilize open space or cluster design options (e.g., setbacks/lot lines, road widths, lot sizes and shapes)?	
	YES	1
	NO	0
	N/A	0
37	Are density bonuses and/or penalties used to encourage use of open space design?	
	YES, density penalties are given for conventional development	2
	YES, density bonuses are provided for open space designs that exceed the minimum requirements for open space protection, up to an established maximum	2
	YES, density bonuses are provided for open space designs that exceed the minimum requirements for open space protection, with no cap on density bonuses	1
	NO	0
	N/A	0

12. Setbacks and Frontages

Principle: 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.

Conventional zoning standards usually dictate that each house be set back a minimum distance from property lines and require a minimum road frontage width. Together, these standards tend to increase the total site impervious cover. For example, frontage widths and side yard setbacks directly influence the length of roads and sidewalks, while front yard setbacks influence driveway length. Relaxing these minimum requirements can reduce site imperviousness and allow site designers flexibility in residential lot design while also addressing parking, traffic, and fire safety concerns.



Figure 8. Reduced front yard setbacks result in shorter driveways and reduced frontage distance and side yard setbacks result in shorter streets in this Savannah, GA development.

Questions		Points
38	Are irregular lot shapes (e.g., pie-shaped, flag lots, zipper lots) allowed in the community?	
	YES	1
	NO	0
	CODES ARE SILENT	0
39	Does the code allow for variances to setback and frontage requirements?	
	YES	1
	NO	0
	CODES ARE SILENT	0

13. Sidewalks

Principle: Promote more flexible design standards for residential subdivision sidewalks.

Where practical, consider locating sidewalks only on one side of the street and provide common walkways linking pedestrian areas.

The intent of this principle is to ensure that sidewalk design standards for residential areas are flexible and do not result in excessive impervious cover. While locating sidewalks on only one side of the street may be appropriate in some rural neighborhoods, sidewalks represent only a small proportion of total site impervious cover (from 1% to 7% of total impervious cover, depending on density, based on analysis of data from Cappiella and Brown 2001). Therefore, communities may get more “bang for their buck” by focusing on reducing roadway widths rather than eliminating or reducing sidewalk widths to reduce impervious surfaces while at the same time achieving better safety and mobility outcomes.



Figure 9. The roadway comprises a significant portion of impervious cover in this neighborhood, compared to sidewalks (Photo credit: Dorothy Cappiella)

Sidewalk widths of 5 feet may be appropriate in some neighborhoods but wider walkways will be needed as density increases. Road type, land use/density, roadway characteristics and other variables are important factors to consider in determining suitable sidewalk widths. Some guidance is provided below:

- The United States Access Board's Guidelines for Pedestrian Facilities in the Public Right-of-Way include a continuous clear width of at least 4 feet for sidewalks. If sidewalk width is less than 5 feet, passing spaces must be provided at set intervals. These accessibility guidelines for safe passage can usually be met through driveways, intersections and other methods. <https://www.access-board.gov/guidelines-and-standards/streets-sidewalks/public-rights-of-way/proposed-rights-of-way-guidelines/chapter-r3-technical-requirements>
- The recommended minimum width to allow two people to walk side by side is 5-6 feet (NACTO, 2013, PBIC, 2015).



- Wider sidewalks of 8-10 feet may be desirable where sidewalks are located on only one side of the street, sidewalks are directly adjacent to moving traffic, streets are within walking distance of schools, or where higher pedestrian traffic is expected (PBIC, 2015; NACTO, 2013).
- Higher density residential neighborhoods (e.g., downtown residential areas that are walkable to commercial areas) may need increased widths of up to 10-12 feet. <http://www.sfbetterstreets.org/design-guidelines/side-walk-width/>

Figure 10. This paved trail connecting neighborhood streets provides a pleasant alternative to walking along the street to travel to nearby parks, bus stops and other locations.

Questions

Points

40	Can minimum sidewalk widths for residential neighborhoods be reduced to 5 feet where safe and appropriate?	
	YES	2
	NO	0
	CODES ARE SILENT	0
41	Can alternate pedestrian networks (e.g., paved trails through common areas, walkways and bike trails connecting from cul-de-sacs to other streets) be substituted for sidewalks in the right-of-way?	
	YES	1
	NO	0
	CODES ARE SILENT	0
42	Are alternative sidewalk designs that provide sufficient soil rooting volume for street trees (e.g., pop-outs or bulb-outs, curving sidewalks, tree islands) allowed?	
	YES	1
	NO	0
	CODES ARE SILENT	0
43	Are alternative sidewalk construction materials that increase infiltration allowed?	
	YES	1
	NO	0
	CODES ARE SILENT	0

14. Driveways

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

Questions		Points
44	Are minimum driveway widths 9 feet or less (one lane) or 18 feet or less (two lanes)?	
	YES	1
	NO	0
45	Can pervious materials (e.g., grass, gravel, permeable pavements, etc.) be used for residential driveways?	
	YES	2
	NO	0
	CODES ARE SILENT	0
46	Can a “two track” design be used for residential driveways?	
	YES	1
	NO	0
	CODES ARE SILENT	0
47	Are shared driveways permitted in residential developments?	
	YES	1
	NO	0
	CODES ARE SILENT	0



Figure 11. This shared driveway in Jordan Cove, CT helps to reduce impervious cover and is also constructed using permeable materials.



Figure 12. A “two-track” driveway is another way to reduce driveway imperviousness

15. Open Space Management

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

If open space developments are not allowed in your community, select N/A for each question below.

Questions		Points
48	Does the open space design ordinance require identification of an entity (e.g., conservation organization, community association) who will be responsible for managing the open space?	
	YES	2
	NO	0
	N/A	0
49	Can open space be managed by a land trust or other qualified public or private land conservation organization (e.g., municipal parks department) through conservation easements or transfer of ownership?	
	YES	1
	NO	0
	CODES ARE SILENT	0
	N/A	0
50	If open space cannot be managed by a third party, are there enforceable requirements to establish an association that can effectively manage the open space?	
	YES	1
	NO	0
	N/A	0
51	Are secure and permanent funding arrangements required to be established for the long-term management and maintenance of open space?	
	YES	1
	NO	0
	N/A	0

Questions		Points
52	Are there standards for the open space requiring interconnections, prioritized lists of resources to be conserved, and access standards?	
	YES	1
	NO	0
	N/A	0
53	Are allowable and unallowable uses for open space in residential developments defined?	
	YES	1
	NO	0
	N/A	0
54	Are long-term management plans that conserve natural systems required for all open space areas?	
	YES	1
	NO	0
	N/A	0
55	Is open space in a natural condition required to be protected in perpetuity by a binding conservation easement or similar legal instrument?	
	YES	1
	NO	0
	N/A	0

16. Rooftop Runoff

Principle: 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.

Use of rainwater harvesting practices in the arid and semi-arid West may be prohibited by water rights law. The complex legal landscape associated with the doctrine of prior appropriation complicates the process of determining whether rainwater harvesting is allowable. For example, some states clearly have jurisdiction over atmospheric rainwater, while others do not or may only under certain circumstances. In states that have jurisdiction over precipitation, some require a permit for harvest and use of rainwater, while others do not require a permit or specifically exempt rainwater harvesting. In states where a permit is required, only some actually outline a formal process by which a property owner can apply, while others do not accept permit applications. If you live in a state that prohibits or requires a permit for rainwater harvesting, some of the rooftop practices below may not be applicable in your community. EPA's Green Infrastructure in Arid and Semi-Arid Climates is a good resource to evaluate how water law may impact rainwater harvesting in your state: https://www3.epa.gov/npdes/pubs/arid_climates_casestudy.pdf.

Questions	Points
56 Can downspouts be disconnected such that rooftop runoff flows to storage tanks, pervious areas, runoff reduction practices, etc.?	
YES	2
NO	0
CODES ARE SILENT	0
57 Do current grading or drainage requirements allow for temporary ponding of stormwater on front yards or rooftops?	
YES	2
NO	0
CODES ARE SILENT	0
58 Is temporary storage of rainwater in storage tanks (e.g., rain barrels or cisterns) permitted?	
YES	1
NO	0
CODES ARE SILENT	0
59 Do the stormwater BMP design specifications for green roofs address structural concerns (e.g. how to determine design load of roof)?	
YES	1
NO	0
CODES ARE SILENT	0
60 Do local plumbing codes allow harvested rainwater for exterior uses such as irrigation and non-potable interior uses such as toilet flushing?	
YES	1
NO	0
CODES ARE SILENT	0



Figure 13. Three options for managing rooftop runoff in Washington, DC: 1) rain barrel, 2) green roof, and 3) disconnected downspout directed to a rain garden

Natural Areas

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

17. Buffer Systems

Principle: 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.

Vegetated systems along shorelines, wetlands, and streams can protect water quality, reduce flooding impacts, provide wildlife habitat, serve as a recreation resource, and offer economic benefits to the local community. Optimal buffer widths vary with the type of waterway and the desired benefit (e.g., water quality protection versus habitat).



Figure 14. A forested buffer on either side of the stream helps to protect water quality and habitat (Photo credit: Dorothy Cappiella)

Questions

Points

61	Do the development standards in the community require a vegetated buffer along waterways?	
	YES	2
	NO	0
62	Is the definition of waterway, or the regulated buffer, expansive enough to include (check all that apply):	
	Perennial streams	0.5
	Ephemeral and intermittent streams	0.5
	Lakes	0.5
	Estuaries and shorelines	0.5
	Wetlands	0.5
	Vernal ponds	0.5
	NO	0
	CODES ARE SILENT	0
	N/A	0

Questions		Points
63	Is the minimum buffer width 50 feet or more?	
	YES, width is 100 feet or greater	2
	YES, width is between 50 and 99 feet	1
	NO, width is < 50 feet	0
	CODES ARE SILENT	0
	N/A	0
64	Are buffer widths greater for sensitive resources (e.g., designated high quality streams) or in certain zones (e.g., drinking water protection)?	
	YES	1
	NO	0
	N/A	0
65	Is expansion of the buffer to include adjacent wetlands, steep slopes, or the 100-year floodplain required?	
	YES	1
	NO	0
	N/A	0

18. Buffer Management

Principle: The riparian stream buffer should be preserved or restored with native vegetation that can be maintained throughout the plan review, delineation, construction, and occupancy stages of development.

The key to effective buffer preservation and management is the adoption and active enforcement of a strong buffer ordinance that requires a plan that outlines the legal rights and responsibilities for the long-term management of the buffer. Education of landowners is vital to preventing encroachment within the buffer, as well as real penalties for violation of buffer requirements to emphasize the importance of maintaining buffer integrity.

Questions		Points
66	Does the buffer ordinance specify that a minimum percentage of the buffer be maintained with native vegetation?	
	YES	2
	NO	0
	N/A	0

Questions		Points
67	Does the buffer ordinance outline prohibited uses and permitted uses that have little impact to the vegetated buffer?	
	YES	1
	NO	0
	N/A	0
68	Does the ordinance specify enforcement mechanisms?	
	YES	1
	NO	0
	N/A	0
69	Does the buffer ordinance specify a preference for buffers to be located on a parcel of common ownership (e.g., a homeowners' association)?	
	YES	1
	NO	0
	N/A	0

19. Clearing and Grading

Principle: 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.

Conservation of natural areas within a site can reduce erosion and sediment and clearing and grading costs while maintaining natural features of the site. Common ordinances that can be adapted to limit clearing include: erosion and sediment control, grading, forest conservation or tree protection, and open space development.

Questions		Points
70	Is there any ordinance that requires the preservation of native soils, hydric soils, natural vegetation, or steep slopes at development sites?	
	YES	2
	NO	0
71	Do regulations limit the total portion of the site that can be cleared?	
	YES	1
	NO	0

Questions		Points
72	Are the limits of disturbance required to be shown on construction plans and physically marked at the site?	
	YES	1
	NO	0
73	Are reserve septic field areas allowed to be left undisturbed until needed?	
	YES	1
	NO	0
	CODES ARE SILENT	0

20. Tree Conservation

Principle: 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 to promote natural vegetation.

Native trees, shrubs, and grasses are important contributors to the overall quality and viability of the environment. Preservation and restoration of natural areas can provide aesthetic, environmental, and economic benefits. These will accrue as increased land values, reduced small drainage complaints, creation of habitat for wildlife, better stormwater management, lower ambient temperature, increased safety for residents, and provision of passive recreation space.

In regions of the country where trees are not the predominant native cover, the questions below may not be applicable or can be adjusted to promote preservation and planting of plants that are native to the landscape. For example, xeriscaping is an option for parts of the country where water supplies are limited. This technique uses drought tolerant native plants to landscape and can greatly increase water conservation compared to lawn-focused landscaping.

Questions		Points
74	Is a natural resources inventory required to identify and map natural areas?	
	YES, and significant natural areas such as high quality forest stands, wildlife habitat and travel corridors, productive cropland, and specimen trees must be identified	2
	YES, but no requirements to assess resource quality	1
	NO	0

Questions	Points
75	Is there an ordinance that requires conservation of some portion of forests, specimen trees, or other native vegetation at development sites?
	YES, specific conservation thresholds are identified 2
	YES, no specific conservation thresholds identified 1
	NO 0
76	Do tree conservation requirements identify or reference methods for delineating and protecting the critical root zone of trees (sometimes referred to as “drip line”)?
	YES 1
	NO 0
	N/A 0
77	Do forest/tree conservation requirements specify planting new trees at sites where none exist?
	YES 1
	NO 0
	N/A 0
78	Are trees and native plant materials permissible for landscaping in yards, common areas, and other open spaces?
	YES, some portion of landscaping must include trees and other native vegetation provided in recommended species list 2
	YES, trees and native vegetation are allowed per recommended species list 1
	NO, landscaping ordinance requires turfgrass or includes vegetation height standards that preclude use of native plants 0
79	Does the community have an urban forestry plan that supports/is referenced by the landscaping ordinance?
	YES 1
	NO 0
80	Do landscaping requirements identify or reference specifications for soil amendments, planting methods, species selection, and maintenance?
	YES 1
	NO 0

21. Land Conservation Incentives

Principle: 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.

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



Figure 15. Maryland's unique Forest Conservation Act helps to protect forest from development impacts and required planting new trees at sites where there is little forest to conserve

Questions

Points

81	Are there any incentives to developers (e.g., open space design, density bonuses, stormwater credits, or expedited design review) to conserve land above and beyond what is already required (e.g., steep slopes, wetlands)?	
	YES	2
	NO	0
	CODES ARE SILENT	0
82	Is flexibility to meet land conservation requirements (e.g. density compensation, buffer or lot averaging, by-right open space development, transferable development rights, off-site mitigation) offered to developers?	
	YES	2
	NO	0
	CODES ARE SILENT	0

22. Stormwater Outfalls

Principle: New stormwater outfalls should not discharge unmanaged stormwater into jurisdictional wetlands, sole source aquifers, or other water bodies.

Stormwater runoff generated at development and redevelopment sites can represent a significant threat to the quality of streams, wetlands, and other surface and groundwater resources. Programmatic and regulatory changes, including MS4 Phase II and the adoption of TMDLs, have occurred in the field of stormwater management since the initial National Site Planning Roundtable. As a result, stormwater is required to be

treated for quality before discharge from most new development and redevelopment projects. Therefore, this principle should be a common practice in most development situations.

On the other hand, there are no federal laws that prohibit discharge of stormwater directly into a jurisdictional wetland without pretreatment (Section 404 regulates discharge of dredge or fill material but not stormwater). The definition of what is "jurisdictional" may not include all wetland types or sizes so it is important for local governments to fill this gap in wetland protection. Other types of natural resources may be sensitive to inputs of stormwater and could be better protected by adopting special stormwater criteria. The questions below are intended to address this changing landscape of regulations regarding stormwater discharges to natural areas.



Figure 16. This tidal wetland in coastal Virginia is protected through a setback and buffer, and the adjacent development benefits from the spectacular view and access for recreation.

Questions

Points

83	Does the stormwater code contain special treatment criteria for discharges to impaired or sensitive waters, such as natural wetlands, lakes, trout streams, nutrient-sensitive estuaries, drinking water supplies, etc.?	
	YES	2
	NO	0
84	Does a floodplain management ordinance exist that restricts or prohibits development within the 100-year floodplain?	
	YES	2
	NO	0
85	Is there a local wetland protection ordinance?	
	YES	1
	NO	0

Runoff Reduction

Due to changes in federal, state, and local environmental regulations and in the thinking regarding the best strategies for dealing with stormwater impacts, several new questions have been added to the COW to address potential code barriers to implementation of runoff reduction techniques.

Sections 23-25 focus on the regulations that pertain to stormwater management standards, particularly the inclusion of practices that reduce runoff.

23. Stormwater Codes

The questions in this section are intended to ensure that runoff or volume reduction is included in the stormwater code.

Traditionally, stormwater codes require detention (control of peak rates of runoff), and, more recently, water quality treatment. A newer generation of stormwater codes also addresses runoff volumes through a focus on retention so that post-development runoff characteristics replicate pre-development conditions. Examples of specific code requirements include reduce post-construction runoff volume associated with a particular rainfall depth (e.g., 1 inch) or a range of design storms, or not exceed the volume associated with a forested or pasture condition. Newer codes that address runoff reduction are likely to be complementary to more traditional peak rate/detention and water quality treatment standards.

One prerequisite for runoff reduction standards and their associated runoff reduction practices is they must be introduced early in site planning in order to be integrated with the rest of site plans and layout. Processes such as pre-application meetings can help with this early integration. Clear and local or regionally-based design guidance, such as an updated stormwater design manual, is also essential for the proper application and design of the practices. It is also essential that the local code is internally consistent regarding drainage and stormwater treatment in order to avoid conflicting or confusing design standards.

Questions		Points
86	Do codes define rainwater harvesting and establish acceptable uses for rainwater (e.g., irrigation and toilet flushing) and corresponding treatment requirements?	
	YES	1
	NO	0
	N/A	0
87	Does the stormwater code include specific standards to reduce post-construction runoff volume (not just peak rate)?	
	YES, runoff/volume reduction is required for most new development and redevelopment sites	2
	YES, the standards apply to some sites or are included as an alternative compliance method	1
	NO	0
	N/A	0
88	Does the code require or have incentives for consideration of runoff reduction concepts early in the site planning process?	
	YES, there are provisions for a pre-application meeting or similar	2
	YES, but the meetings are not mandatory for applicants	1
	NO	0
	N/A	0

Questions	Points
<div data-bbox="94 359 152 411">89</div> <p>If the code includes post-construction runoff reduction standards, is there reference to clear, understandable, and local or regionally-based design guidance or manual?</p> <p>YES, the code references design guidance or a manual</p> <p>YES, such a manual exists but it is not referenced in the code</p> <p>NO</p> <p>N/A</p>	<p></p> <p>2</p> <p>1</p> <p>0</p> <p>0</p>
<div data-bbox="94 716 152 768">90</div> <p>Are drainage and treatment standards all in one place within the code and internally consistent?</p> <p>YES, codes are consolidated and consistent regarding applicability and methods</p> <p>NO, various code sections are conflicting or inconsistent</p> <p>N/A</p>	<p></p> <p>1</p> <p>0</p> <p>0</p>

24. Installation and Maintenance of Practices

The questions in this section are intended to ensure that post-construction (runoff reduction) practices are installed properly and that there are provisions to ensure long-term maintenance.

Installation and maintenance can be the “Achilles heel” of stormwater practices, especially small-scale runoff reduction practices. Many practices have failed due to these issues, and thus are not providing the hydrologic and water quality benefits they are intended to provide. For construction and installation, it is critically important that erosion and sediment control standards are integrated with the post-construction stormwater plan. For instance, areas designated for post-construction stormwater control must be protected from heavy equipment, compaction, and sediment during construction, especially if the post-construction practice will rely on infiltration or soil treatment. Post-construction practices, such as filter strips and riparian buffers, should be outside of the limits of disturbance during active construction. Performance bonds are important tools to ensure that installations are completed as per the approved plan.



Figure 17. Mulch replacement is one activity that may be included in a maintenance agreement for stormwater practices such as bioretention.

Long-term maintenance is another vital issue related to stormwater practice performance. The code can help ensure proper maintenance by making sure that practices are within easements (unless designed to be on private lots), inspectors have right-of-entry, maintenance agreements are in place that spell out the responsibilities of the property owner, and that there are periodic inspections during the post-construction phase.

Questions		Points
91	Do erosion and sediment control standards specify protection of post-construction practice sites during active construction?	
	YES, erosion control standards include these provisions	2
	YES, the code is not explicit but it is addressed during plan review	1
	NO	0
	N/A	0
92	Does the code mandate performance bonds and periodic inspections to ensure proper installation of practices based on the approved plans?	
	YES, the code includes bonding requirements and inspections during stormwater practice installation	2
	YES, the code includes bonding or inspections, but not both	1
	NO	0
	N/A	0
93	Does the code include provisions for runoff reduction practice easements, inspector right-of-entry, maintenance agreements, and post-construction inspections?	
	YES, all the provisions are included	2
	YES, 3 out of the 4 are included	1
	NO	0
	N/A	0

25. Off-Site Compliance

The question in this section is intended to ensure that off-site compliance or trading mechanisms are used judiciously and do not compromise local water quality.

States, regions, and localities are turning increasingly to off-site compliance strategies, such as pollution trading, banks, or allowing stormwater requirements to be met at alternative sites. These provisions can add flexibility and innovation, especially for tricky sites or areas where the local comprehensive plan calls for infill and redevelopment. However, overuse of these strategies can compromise local water quality because the treatment is happening elsewhere. A balanced off-site compliance program will require a certain level of "due diligence" treatment on-site wherever possible, while allowing flexibility for full compliance. Documentation should be provided to verify that on-site options are infeasible.

Questions		Points
94	If off-site stormwater compliance is authorized, is some percentage of treatment required on-site?	
	YES, applicants must provide on-site treatment to some level and provide documentation	2
	NO, many sites have automatic access to off-site compliance	1
	N/A	0

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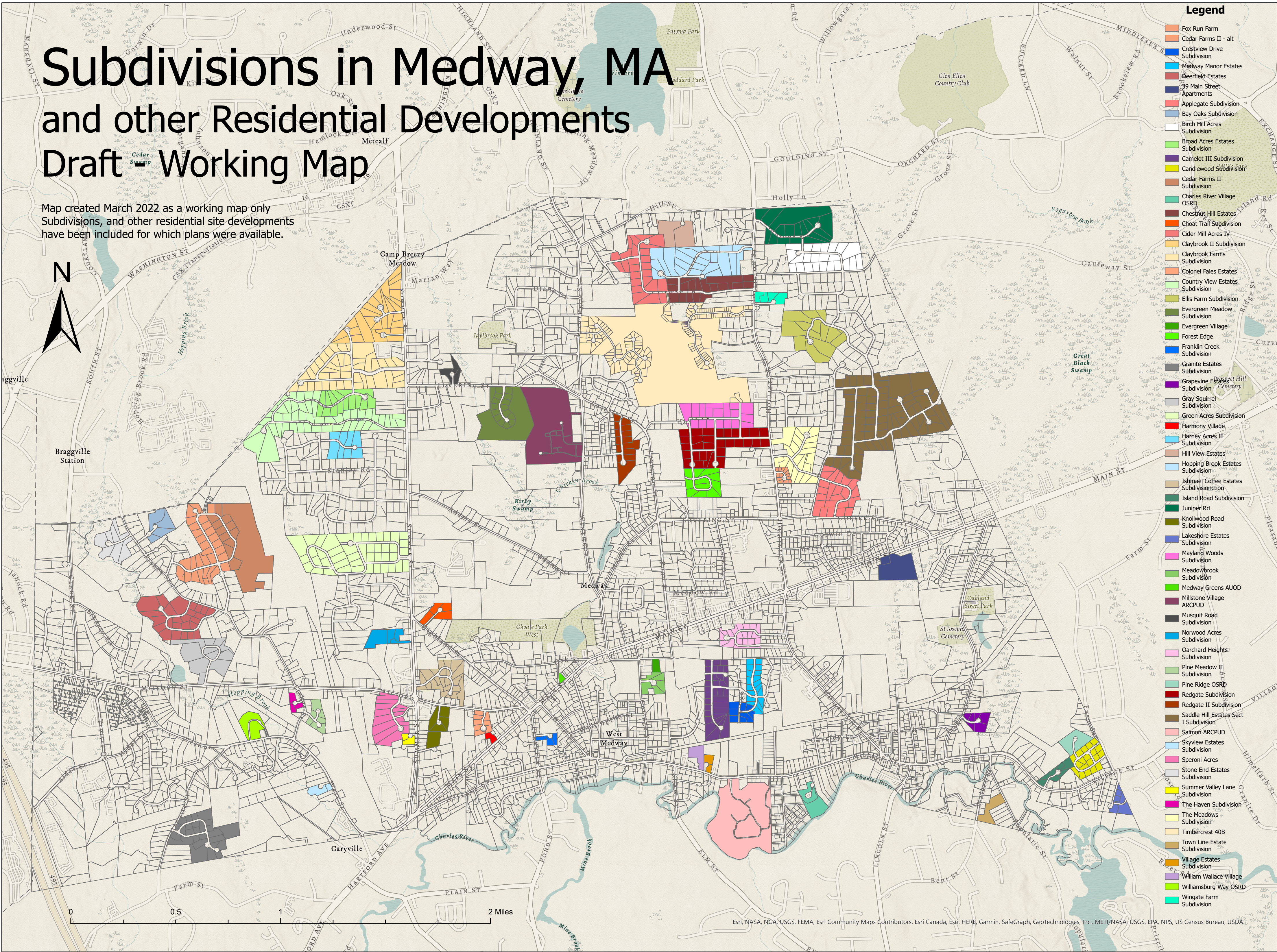
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Subdivisions in Medway, MA

and other Residential Developments

Draft - Working Map

Map created March 2022 as a working map only
Subdivisions, and other residential site developments
have been included for which plans were available.



Legend

- Fox Run Farm
- Cedar Farms II - alt
- Crestview Drive Subdivision
- Medway Manor Estates
- Beerfield Estates
- 39 Main Street Apartments
- Applegate Subdivision
- Bay Oaks Subdivision
- Birch Hill Acres Subdivision
- Broad Acres Estates Subdivision
- Camelot III Subdivision
- Candlewood Subdivision
- Cedar Farms II Subdivision
- Charles River Village OSRD
- Chestnut Hill Estates
- Choat Trail Subdivision
- Cider Mill Acres IV
- Claybrook II Subdivision
- Claybrook Farms Subdivision
- Colonel Fales Estates
- Country View Estates Subdivision
- Ellis Farm Subdivision
- Evergreen Meadow Subdivision
- Evergreen Village
- Forest Edge
- Franklin Creek Subdivision
- Granite Estates Subdivision
- Grapevine Estates Subdivision
- Gray Squirrel Subdivision
- Green Acres Subdivision
- Harmony Village
- Harney Acres II Subdivision
- Hill View Estates
- Hopping Brook Estates Subdivision
- Ishmael Coffee Estates Subdivision
- Island Road Subdivision
- Juniper Rd
- Knollwood Road Subdivision
- Lakeshore Estates Subdivision
- Mayland Woods Subdivision
- Meadowbrook Subdivision
- Medway Greens AUOD
- Millstone Village ARCPUD
- Musquit Road Subdivision
- Norwood Acres Subdivision
- Oarchard Heights Subdivision
- Pine Meadow II Subdivision
- Pine Ridge OSRD
- Redgate Subdivision
- Redgate II Subdivision
- Saddle Hill Estates Sect I Subdivision
- Salmon ARCPUD
- Skyview Estates Subdivision
- Speroni Acres
- Stone End Estates Subdivision
- Summer Valley Lane Subdivision
- The Haven Subdivision
- The Meadows Subdivision
- Timbercrest 40B
- Town Line Estate Subdivision
- Village Estates Subdivision
- William Wallace Village
- Williamsburg Way OSRD
- Wingate Farm Subdivision