How Does the Site Development Process Work?

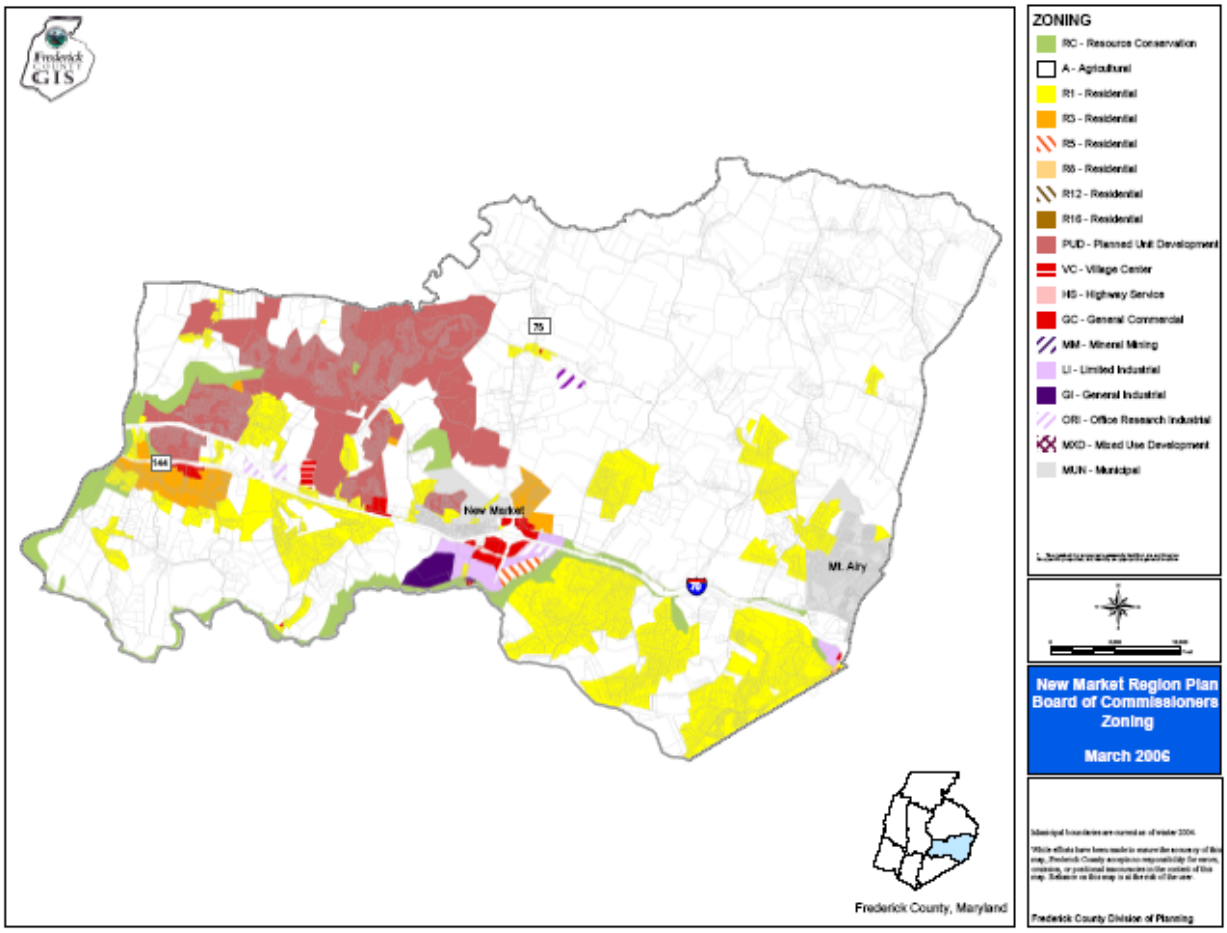
Each year, over 1.5 million acres of land in the U.S. is developed (CWP, 1998). In most cases, this occurs as conversion of agricultural or forest land for urban and suburban uses. The majority of decisions regarding these types of land use changes are not regulated at the federal or even state levels in the U.S. Often, land use is determined at the city, county, town, or township levels—these local governments are often referred to as jurisdictions or municipalities. The exact structure and powers allotted to these local jurisdictions vary widely because they are set by the states. However, most local governments have power over land use planning and the local development process.

In order to better understand how the development process affects watersheds (and how to reduce these impacts), a basic understanding of how land use planning is implemented and how the land development process works is needed. This fact sheet provides an overview of land use planning at the local level and discusses the major elements of the site development process: site plan submittal, review and approval, the construction process, and occupancy of the site after construction. These elements include critical decisions about where to develop, how to develop, and how to manage the land after development.

Because local governments vary in how they are structured, a variety of departments, commissions or boards may influence the land use planning process. Planning departments and elected planning commissions are two examples of entities that commonly play a critical role in making local land use decisions. Other factors such as the size of the community, local politics, and interest of citizens will often dictate the local stance on development. For example, development may be desirable for communities interested in attracting more citizens or growing their economic base. Other communities may wish to curb development due to a desire to preserve community green spaces or special natural resources. No matter the structure or local politics, key elements of local land use planning include zoning, development codes, and comprehensive planning.

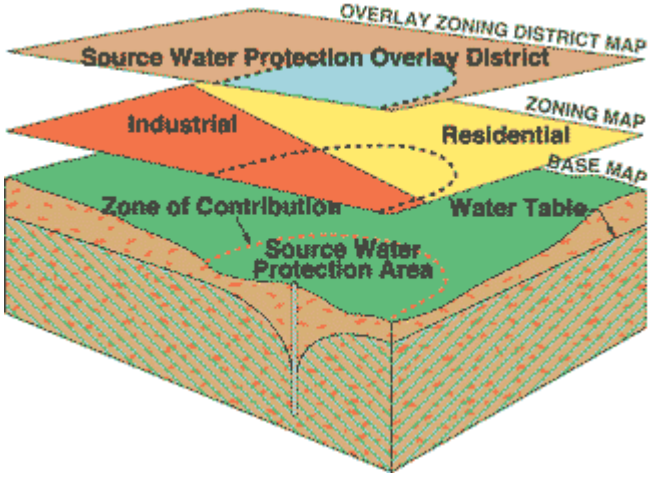
Most local jurisdictions specify which land use activities are allowable in specific zones within the jurisdiction. This process of defining zones and allowable land uses is referred to as zoning, and is usually specified in a local zoning ordinance. The first zoning ordinance was passed in New York City in 1916 and by the 1930s, most states had adopted zoning laws (Legal Information Institute, 2006). The local zoning ordinance spells out all the criteria and regulations that apply in each individual zone, such as allowable density, and building height and area. Each defined zone is referred to as a zoning category; typical zoning categories include residential, commercial, industrial, transportation, agricultural, and institutional (e.g., schools and government buildings) land uses. These are usually broken down into more specific zoning categories. For example, residential zones are defined by the allowable housing density. So an area that is zoned R-1 means the allowable use is residential use with a density of one lot per acre. Figure 1 shows a zoning map from Frederick County, Maryland.

Figure 1. Zoning Map for the New Market, Maryland Region
(Source: Frederick County, MD 2006
http://www.co.frederick.md.us/Planning/CompPlan/NewMarket/BOCC-PR-ZON-NM.pdf)



In addition to the traditional zoning ordinances, jurisdictions will sometimes implement overlay, cluster, mixed use, or other special zoning. Overlay zoning superimposes additional regulations or development criteria on top of the existing zoning. This method is often used to protect a sensitive area, such as steep slopes. The overlay zoning approach allows the local government to impose these additional regulations in specific areas without having to change the zoning ordinance or re-zone all the areas that would be affected. The criteria in the overlay zone supercede any conflicting requirements outlined in the regular zoning ordinance for areas included in the overlay zone. Figure 2 illustrates the overlay zoning concept.

Figure 2. A sample overlay zoning district
(Adapted from: Jon Witten, Horsley and Witten)



Cluster zoning allows for buildings, especially housing, to be "clustered" into one section of the parcel while preserving a larger portion of the site as open space. Clustering does not increase the amount of housing, but does make the space within which development occurs on the parcel more dense. In contrast, mixed use zones allow for a mixture of commercial, residential, or other land uses that are typically separated by zoning. One reason that this type of zoning may be desirable is because it could promote less automobile travel and more pedestrian travel if commercial areas are mixed in with residential areas. Some other zoning types can include environmental preservation zones, planned unit developments, and conservation zones. Depending on the community, how each zone is utilized and applied may differ.

Comprehensive planning determines where future growth will occur and results in a plan that is usually updated every 5-10 years. Comprehensive Plans, also known as Master Plans or General Plans, guide the placement of infrastructure such as roads, schools, sewer and water lines. These plans can be used to define urban growth boundaries and take into account the long-term potential for growth and development in the community.

Not all communities conduct comprehensive planning, but communities that write comprehensive plans are usually required by the state to do so. Some common elements of a comprehensive plan include community visioning, land use regulations, transportation guidance, infrastructure plans (including housing, utilities, stormwater master plans, sewer plans, and water supply), public facilities plans, natural resource management plans, and open space plans (including greenways, recreational space, etc.).

While zoning ordinances and comprehensive plans determine where development will occur, several other types of local regulations govern what the resulting development will look like. These regulations are found in the form of codes, ordinances, and design manuals and may relate to the following elements:

- Construction of streets and drainage structures
- Subdivision design
- Landscaping
- Stream buffers/floodplains
- Building codes
- Septic systems
- Parking lot design
- Signs
- Utilities
- Forest conservation
- Wetland protection
- Stormwater management

Many of the above ordinances set criteria for individual parcels or lots regarding density, building size and height, landscaping, side and front yard setbacks, road frontages, driveway width, sidewalks, road width, curb and gutters, number and size of parking spaces, and septic system design and location. Figure 3 illustrates some of the typical criteria that apply for a residential lot.

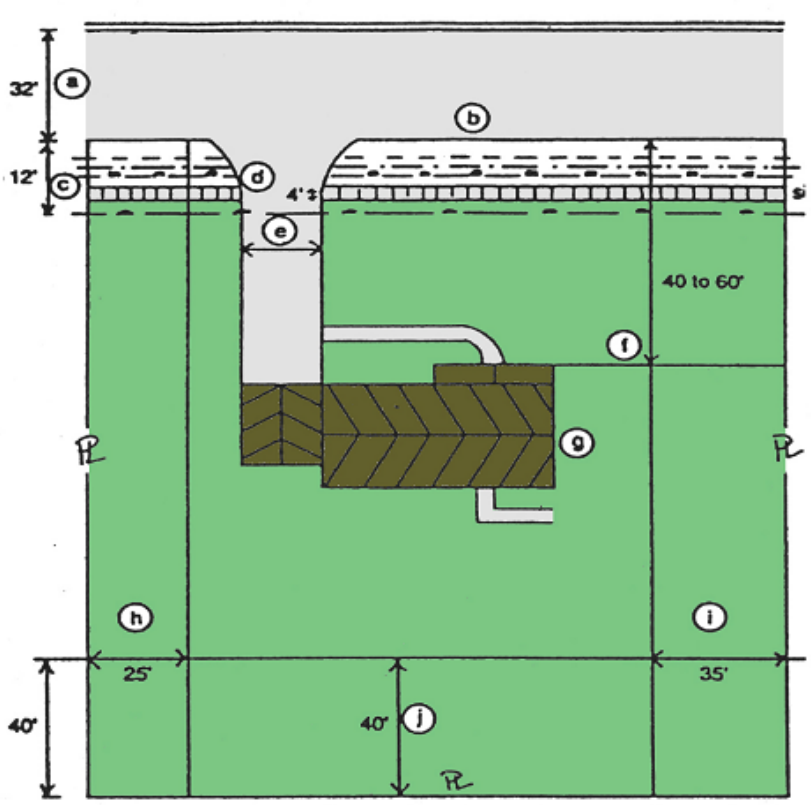
When a new development is proposed, a person who wishes to develop a parcel of land must first submit a site plan. Site plans are required to determine whether a development meets a community's development codes, ordinances, and standards. The typical process for site plan submittal, review and approval is described below. This is not necessarily the same procedure applied for redevelopment, road construction, or other unique projects. In addition, commercial site reviews may differ significantly from residential ones.

The site plan review process will ideally include a concept plan stage where the permit applicant (e.g., developer) meets with the approval authority (e.g., the local planning department) to check for code compliance before the applicant makes any significant investments. Elements that are usually included in a concept plan include:

- Location map
- Parcel boundaries
- Streets, alleys, parking lots, building footprints
- Soil map
- Resource protection areas
- Stormwater management plan

Figure 3. Typical criteria for a residential lot (Source: Schueler, 1995)

a minimum street width 32'
b minimum lot frontage 150'
c minimum right-of-way 12'
d minimum driveway length 20'
e minimum driveway length 4'
f front yard setback minimum 40-60'
g impervious cover footprint - 5% minimum
h side yard setback 25'
i side yard setback 35'
j rear yard setback 40-60'



After the concept plan stage, any permits required by non-local sources, such as EPA or the Army Corps of Engineers, must be obtained. An example of a non-local permit that might be required is a Section 404 permit for impacts to wetlands. Section 404 of the Clean Water Act requires a permit for deposits of dredge or fill material into waters of the U.S, including wetlands. Therefore, if a wetland is located on the site, an official delineation of its boundaries must be completed, and a Section 404 permit obtained for any proposed impacts before a formal site plan is submitted. Other non-local permits may require environmental impact statements and public hearings for large projects due to transportation issues and controversial developments.

Next, a formal site plan is submitted to the local approval authority for review. Because so many different codes and ordinances regulate development, various departments may also review the plan. The reviewers are responsible for determining what, if any, changes need to be made to the plan to conform to local, state, and federal regulations. Table 1 lists the local departments that may review site plans and the elements of the site plan they typically review.

Table 1. Local Site Plan Review Responsibility

Department	Review Responsibility
Planning and Zoning	Site plans
Environmental Division	Erosion and sediment control, stormwater, wetland protection
County Engineer	Private roads, conservation easements
Landscape Planner	Landscape plan
Sewer Authority	Utility plans
Fire Department	Fire protection enforcement
Dept. of Transportation	Public roads, traffic analysis
Health Department	Utility plans, septic systems

The formal site plan amplifies the detail provided in the approved concept plan. The applicant will need to show evidence that they have:

- Secured environmental permits (e.g., Section 404 permits)
- Made legal arrangements for future management of common areas
- Paid the appropriate fees for plan review and inspection

The construction process involves a number of different contractors, each who deal with a different portion of the construction, such as clearing and grading, environmental management, paving, utilities, building construction, and landscaping. All parties involved must be aware of and follow the development regulations. Ideally, during construction, the process includes marking any natural areas to be preserved on the site, installing erosion and sediment practices, and then commencing with clearing and grading phase. Landscaping is usually the last major portion of the construction process.

Throughout the construction process, environmental criteria must be met to reduce potential impacts to natural resources. These criteria are set forth in forest conservation, erosion and sediment control, wetland protection, stream buffer, and stormwater management regulations. Ideally, the local government will inspect the site during construction to ensure that approved plans are actually constructed to meet environmental and other requirements. For example, the EPA's NPDES regulations require that regulated sites be inspected every 14 days to make sure erosion and sediment control practices are installed, maintained, and in good working condition. Not all communities have environmental regulations, but even where they do exist, impacts to the land may still occur during the construction process. These impacts include loss of native vegetation, removal of topsoil, soil compaction, alteration of natural drainage patterns, soil erosion and transport into local waters, and creation of new impervious cover, which increases the volume of runoff that leaves the site and reaches local waters.

At many development sites, the entire parcel is cleared to allow access for construction equipment, to install drainage infrastructure, and make building more efficient. While it is not always necessary to clear the entire site to build lots, this has become a standard practice in many locations (Figure 4). Notable exceptions include communities that have forest conservation or open space requirements. Next the site is graded, meaning that the natural topography is altered to accommodate the placement of roads, and buildings, and to direct runoff away from these areas. Grading includes cut and fill, where large amounts of soil are removed or cut from one portion of the site and used to fill in another area to bring it up to the desired elevation. Soils take many years to form and consist of various layers, including a fertile topsoil layer that contains organic matter and nutrients. When cut and fill activities occur, this topsoil is often removed or buried, thus reducing the fertility of the resulting soil.

Figure 4. Mass clearing, grading, and removal of topsoil at a construction site (Photo by Center for Watershed Protection)

Grading activities also result in soil compaction from heavy equipment use. Some portions of the site are actually intentionally compacted to meet engineering standards for bearing structures or traffic loads. Soil compaction is frequently evaluated by measuring the soil bulk density. Bulk density is defined as the mass of dry soil divided by its volume, and is expressed in units of grams per cubic centimeter (g/cc) (Schueler, 2000). Bulk density is a useful indicator of the structure of a soil and can help predict its infiltration rate and water-holding capacity. In general, as bulk density increases, its infiltration rate decreases and a greater proportion of the rain that falls on it is converted to runoff. The surface bulk density of most undisturbed soils ranges from 1.1 g/cc to 1.4 g/cc, while many urban soils have bulk density of 1.5 g/cc or greater (Schueler, 2000). Compacted soils not only produce more runoff, but they also make it difficult for vegetation to grow.

The clearing and grading process also alters the natural hydrology of a site, and may include filling in depressions and relocating streams. The addition of impervious cover greatly increases

the amount of runoff generated at the site. Site designers usually try to move this water off the site as quickly as possible. This means putting runoff into storm drainage pipes and installing curbs and gutters along streets. The runoff is then moved swiftly and efficiently off the site into the storm drainage system, which in most cases ultimately discharges into a local stream wetland, lake or river.

After construction is complete, a final inspection is conducted to determine whether the site meets all the code requirements. A local government that has an effective environmental management program will inspect stormwater management practices to ensure they have been installed and are functioning properly. If the site passes inspection, an occupancy permit is issued. In a best-case scenario, the reviewing authority will issue occupancy permit based on the following criteria:

- Temporary sediment controls have been removed
- Stormwater treatment practices are in good working order
- Permanent vegetative cover on all exposed areas
- Any damage to resource protection areas and buffers restored
- As-built plans submitted
- Should not be issued until all obligations have been met

A final note of consideration in the land use and development process is that while the construction process itself is potentially the most damaging phase, post-construction activities may continue to contribute additional impacts. Activities such as turf management, spills and illegal dumping, and improper maintenance of septic systems are a few examples.

References

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