

CHAPTER FOUR

The physical geography of an area affects the amount, type, and direction of development. Natural factors such as climate, topography, geology, hydrology, and soils are important because they influence the costs of development and determine the suitability of an area for a given use. The purpose of this section of the comprehensive plan is the identification of environmental resources and the assessment of developmental impacts on these resources.

Rapid growth and development can have dramatic and long-term adverse effects on the physical and social environment. As Campbell County and the City of Alexandria continue to grow, many environmental issues will continue to arise. Issues such as water quality, air quality, noise and light pollution, increased storm water runoff, and decreased open space can combine to effect the overall quality of life for residents. The depletion of natural features such as wooded hillsides, scenic valleys, rivers, creeks, and open fields will become increasingly important as residents realize that these elements contribute to the unique character of the area and are unrecoverable once a parcel of land is developed. In addition, these types of amenities also provide less visible qualities, such as cleaner air, recreational areas and wildlife habitat that are equally important to the community.

LOCATION

Located in Northern Kentucky, Campbell County is bordered by the Ohio River on the north and east, Kenton County on the west and Pendleton County to the south. The City of Alexandria serves as one (1) of two (2) county seats in Campbell County and is centrally located eight (8) miles south of Newport. It is estimated that the city was settled around 1793 and was beginning to develop by 1819.

CLIMATE

Long term climatological data is available from the Covington weather station. The following discussion is based upon the period between the years 1961 - 1990 for extremes and the years 1948 - 1990 for averages. The coldest days occur in January when the monthly mean temperature is 28.1° F. The warmest days occur in July with a monthly average temperature of 75.1° F. During the period



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from June to September, an average of 22.3 days are 90° or above. The minimum temperature is expected to be 32° F or less an average of 104.4 days from October through April. The coldest temperature on record for the period is -25° F which occurred on January 18, 1977. The hottest recorded temperature was 103° F on July 14, 1954.

Precipitation averages 41.33 inches annually. Records indicate that July and May tend to be the wettest months and January and February the driest. Precipitation in general is evenly distributed throughout the year. An average of seven (6.6) days per month will have precipitation of .10 inches or more. The record for the wettest day occurred on March 9, 1964 when precipitation was 5.21 inches.

AIR QUALITY

Air quality is monitored by the Division of Air Quality Control of the Kentucky Natural Resources and Environmental Protection Cabinet, Department for Environmental Protection. The “*Kentucky Ambient Air Quality Report*” which is produced by the Technical Services Branch of the Kentucky Division of Air Quality is issued annually. The last report issued summarizes statistical results of monitoring conducted during the year 2002 to measure outdoor concentrations of air pollutants in the Commonwealth. The primary source of data for the report is the Air Quality Surveillance Network operated by the Kentucky Division for Air Quality which has operated an air quality monitoring network since July 1967. The 2002 network included 117 monitors in 33 counties (this total includes monitors operated by the Louisville Metro Air Pollution Control District and the National Parks Service at Mammoth Cave). The monitoring station locations are selected with U.S. Environmental Protection Agency guidance and, in general, are established near high population areas or air pollution sources. Each year the sites are reviewed to ensure that adequate coverage is being provided. Overall, the division monitors compliance of six (6) criteria pollutants including carbon monoxide, sulfur oxides, nitrogen dioxide, lead, ozone, and particulate matter. In 2002, there were only three (3) exceedances of particulate matter standards. All three (3) occurrences were located in Louisville.

Pursuant to the provisions of the CAA of 1990, EPA designated a seven (7) county area in the OKI region as a moderate nonattainment area for ozone under the one-hour ozone standard. The non-attainment area included Butler, Clermont,

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Hamilton, and Warren Counties in Southwest Ohio, and Boone, Campbell, and Kenton Counties in Northern Kentucky. OKI's eighth county, Dearborn, Indiana was designated as unclassifiable/attainment and was not subject to conformity requirements. However, on July 5, 2000, the U.S. EPA determined that the Cincinnati-Hamilton area had attained the one-hour ozone National Ambient Air Quality Standard. The attainment determination was based on three (3) years of (1996-1998) ambient air monitoring data that demonstrated the area had attained NAAQS. The area has also been in attainment for the period from 1998 to 2000). At the present time, the area is covered by a ten-year maintenance plan. In the year 2002 (latest available data), Kentucky Air Monitoring Sites in Campbell County, operated by the National Park Service, monitored for sulfur dioxide, nitrogen dioxide, ozone, and particulate matter. In 2002, all Kentucky Counties were in attainment for carbon monoxide, sulfur dioxide, nitrogen dioxide, and ozone. It is important to note that monitoring of carbon monoxide ended for the Northern Kentucky region in 2001.

NOISE

High noise levels can impact the health and safety of residents. Excess noise can cause impacts ranging from the nuisance of interrupting a conversation to causing physical and psychological harm. The primary consideration for noise in terms of new development is the community noise level. According to "The Noise Guidebook" issued by the Department of Housing and Urban Development, the main contributors to a community noise problem are transportation sources such as highways, railroads, and airports. These sources are the most pervasive and continuing of the noise sources. The main issues involved in any noise analysis are how much noise a site is exposed to, what types of activities are affected, and what design or attenuation measures can be used to keep noise to an acceptable level. Outdoor noise levels are of greatest concern in residential areas especially at night when sleep is disrupted.

The easiest way to mitigate noise is to separate noise sources from noise receptors. This can be accomplished by requiring greater minimum setbacks from major highways and railroads. For example, HUD recommends that no occupiable buildings be constructed within 100 feet of a railroad due to the impact of noise and vibration. Noise levels can be attenuated by noise barriers, site design, and



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soundproofing buildings. It is recommended that a noise analysis be conducted when noise sensitive uses such as residential development or hospitals are proposed near railroads, airports or highways with considerable truck traffic. In Campbell County, the major facilities of concern are the CSX Railroad, AA Highway, I-275, U.S. 27 and the large commercial districts along the Ohio River. Within the city of Alexandria, primary noise generators are the AA Highway, U.S. 27 and associated commercial districts.

PHYSIOGRAPHY AND GEOLOGY

Campbell County and the City of Alexandria are part of the Bluegrass Region that is underlain by rocks of Ordovician geologic age. A portion of Campbell County is located in the Hills of the Bluegrass, with the more level areas being located in the Outer Bluegrass Region. The land formations of Campbell County can be divided into four (4) basic groups. The first groups are glacial outwash terraces. These terraces are typically located in areas immediately surrounding the Ohio River and consist of deposits of silt, sand, and gravel. The second formation is that of alluviated valleys in which the Ohio and Licking Rivers flow. These valleys are filled with unconsolidated silt, sand, and gravel that have been deposited by the streams occupying them. The third formations are the limestone plateaus. The plateaus are characterized by upland areas with relatively flat slopes and steep side slopes. The rock formations have enabled the limestone plateaus to resist weathering and erosion over the years. These plateaus are found in the northern part of Campbell County where close stream spacing produces fine topographic textures. Finally, the shale uplands, found mostly in the southern portion of Campbell County, are located where streams are farther apart and less deeply incised.

The City of Alexandria extends over a low plateau of about 800 feet Mean Sea Level (MSL). The continual erosion of the plateau has developed the numerous ridges and sharp narrow valleys that characterize the City of Alexandria Planning Area and significantly effect land development. Land areas between the 600 and 800 foot MSL are the result of heavy erosion of the high plateau and comprise a majority of land within the planning boundary. These areas are generally found along steep slopes of the major river valleys and comprise the narrow, winding, V-shaped valleys extending in from the two major rivers. Extensive areas classified in

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this elevation range are also located in the southern portion of Campbell County. For this reason, a large amount of the developed and undeveloped land within the county and city can be classified as environmentally sensitive. These areas, which limit the potential for intensive urban development, should be identified, mapped, and require special precautions during the development review process.

SOILS

Detailed soil information and soil maps can be found in the *Soil Survey of Boone, Campbell, and Kenton Counties, Kentucky* published by the U.S. Department of Agriculture, Soil Conservation Service. The general soil map found in the Soil Survey shows that there are five (5) soil associations in Campbell County and three (3) within the City of Alexandria.

Soil associations are generalized groupings of similar soils with common relief and drainage patterns. While specific soil information must be consulted to determine the suitability of a particular site for various land uses, soil associations can provide information for general planning purposes. The following paragraphs summarize the five (5) associations found within the county.

EDEN-CYNTHIANA ASSOCIATION

This soil association is typically located on steep, highly dissected hilly areas in the southern part of the county and along the steep hillsides bordering the Ohio and Licking Rivers. Slopes range from 12 to 30 percent in most of the association, but can be even steeper in the areas bordering the rivers.

The Eden association covers approximately 61% of Campbell County with the Eden soils accounting for 80% of this association, Cynthiana 10% and the minor soils 10%. Eden soils are very well drained and deep but somewhat droughty. They have a silty clay loam surface layer over a dark yellowish brown silty clay subsoil that has slow permeability. Cynthiana soils are somewhat excessively drained and are shallow to limestone. They have a flaggy silty clay loam surface layer and dark yellowish-brown flaggy silty clay subsoil that has moderately slow permeability. The majority of land in this association is used for pasture with the other half remaining as wooded or brushy. The slopes are usually too steep to be used for row crops and are hard to mow.



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FAYWOOD-NICHOLSON ASSOCIATION

This association is primarily located in the large rolling area of central Kenton County and southeastern Boone County, with a few areas of located in Campbell County. In the county, the Faywood-Nicholson association can be found on the ridgetops around Cold Spring, Persimmon Grove, and within the jurisdiction of the City of Alexandria. This association accounts for 2 to 20% of the soils in Boone County, 18% of Campbell County, and 44% in Kenton County. The association consists of Faywood soils (60%), Nicholson soils (36%), and minor soils (4%). The Faywood soils occur on the narrow ridges and moderately steep side slopes bordering the Nicholson soils. The Nicholason soils are gently sloping to sloping on ridgetops. Areas of urban and gullied land are also included in this association.

Faywood soils are well drained and moderately deep to rock. They have a light silty clay loam or silt loam surface layer over a dominantly yellowish-brown silty clay loam to clay subsoil that has moderately slow permeability. Nicholson soils are well drained to moderately well drained and are deep to rock. They have a silt loam surface layer over a dominantly yellowish-brown silty clay loam subsoil and are moderately deep to slowly permeable fragipan.

A large part of the northern part of this association has been converted to urban use. The built-up areas are developed on the ridgetops and more gentle side slopes. Although much of the topography is suitable for building, the shrinking and swelling of the clays in the lower layers of the soil may be a limitation for building foundations. Many wet spots occur as a result of a seasonal high water table and slow permeability in the subsoil. The southern part of this association is used mostly for farming, with hay and pasture being the primary uses.

ROSSMOYNE-JESSUP ASSOCIATION

The Rossmoyne-Jessup Soil Association occupies broad, nearly level to sloping ridges and moderately steep side slopes in a glaciated area in the northern part of Boone County and the northwestern part of Kenton County. In Campbell County there are a few small areas on hilltops near the Ohio River and within the City of Alexandria. This association covers approximately 40% of Boone County, 4% of Campbell County, and 8% of Kenton County. The Rossmoyne soils make up approximately 57% of the association, Jessup soils about 33%, and minor soils 10%.

The Rossmoyne soils are nearly level to sloping and occupy the major part

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of ridgetops. Jessup soils are moderately steep and located on side slopes. Small areas of urban land and gullied area are also included in this association.

Rossmoyne soils are moderately well drained and are deep to rock. They have a silt loam surface layer over a dominantly yellowish-brown silty clay loam subsoil that is mottled in the lower part. They are moderately deep to a slowly permeable fragipan about two (2) feet thick. Jessup soils are well drained and deep. They have a silt loam surface layer and a dominantly yellowish-brown subsoil. The subsoil is silty clay loam in the upper part and silty clay in the lower part. Both the Rossmoyne and Jessup soils are underlain by clayey glacial till.

Much of this association has been converted to urban use. Many of the unimproved areas are potential sites for housing development. Some of the gently sloping areas are used for industrial development; however, steep slopes can be a limitation. In addition, there can be problems with building foundations due to the shrinking and swelling of the clays in the lower soil layers. Many wet spots occur as a result of a seasonal water table and the slowly permeable subsoil. In Campbell County, the western and southern part of this association is used mostly for farming with hay and pasture being the primary uses. The main cash crop is tobacco.

LICKING-CAPTINA ASSOCIATION

This association is located primarily on stream terraces and in bottoms along the Licking River. In addition, a large area of this association has also been found in the central part of Campbell County. This formation appears to be an old lakebed because the area is surrounded by hills that are higher in elevation. The Licking-Captina Soil Association covers approximately 11% of Campbell County. Licking soils make up approximately 46% of the association, Captina soils 18%, and minor soils account for 36%.

Licking soils are primarily gently sloping to moderately steep in the more dissected areas and are predominately gently sloping in the less dissected areas. The Licking soils are moderately well drained and deep. They have a surface layer that ranges in texture from silt loam to silty clay. The subsoil is silty clay loam in the upper part but clayey in the lower part; being yellowish brown throughout. Permeability is moderately slow. Captina soils are moderately well drained and deep to rock with a silt loam surface layer. The subsoil is yellowish brown in the



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upper part and mottled gray and brown in the lower part. Texture of the subsoil is silty clay loam. Captina soils are moderately deep to a slowly permeable fragipan.

The northern part of this association is used mostly for industry, residences and other non-farm purposes. Slow permeability and high shrink-swell potential are the main limitations for various land uses. Some of the minor soils in this association are subject to flooding. The southern part of this association is primarily used for farming with much of the land being cultivated for pasture and hay. Some areas are also used for the production of corn and tobacco.

WHEELING-HUNTINGTON-ALLUVIAL LAND, STEEP ASSOCIATION

This association consists of soils located in stream terraces and bottoms along the Ohio River (and a few of its small tributaries) and covers approximately 6% of Campbell County. The soil association consists of Wheeling (18%) soils, Huntington soils (17%), and steep alluvial land (14%). A variety of minor soils comprise 50% of the association.

Some of this land has been used for urban and non-farm purposes. Where flooding is not a hazard, the soils of this association are well suited to these uses. Some areas in the association are used for gardens, commercial vegetables and corn. Other areas are used for fruit trees, ornamental trees or flowers. In general, these soils are well suited to both farming and horticulture uses.

HYDRIC SOILS

Hydric soils are those soils which are saturated, flooded or ponded long enough during the growing season to develop anaerobic conditions in the upper layers. The presence of hydric soils is an indication that wetlands may exist in an area. Under currently accepted definitions, an area is considered a wetland if it has hydric soils, hydrophytic vegetation (plants that are adapted to growing in wet conditions), and wetlands hydrology. Wetlands hydrology means that the area is either permanently or periodically inundated or the soil is saturated to the surface at some time during the growing season. The only hydric soil in Campbell County is Robertsville silt loam. It is hydric due to saturation. Three (3) other soils that may have inclusions of hydric soils are Avonburg silt loam, Lawrence silt loam, and Newark silt loam.

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This means that an area mapped as one of these soil types may include small area of hydric soils in poorly drained low spots. Robertsville soils are found only in very limited locations and only account for .2% of all soils in Campbell County. There are a few small areas of Robertsville soils along the Licking River. Due to the hilly nature of the area and limited existence of hydric soils, wetlands are not normally a limiting factor for development in Alexandria.

PRIME FARMLAND SOILS

According to the U.S. Department of Agriculture, Soil Conservation Service, prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is also available for these uses. Prime farmland can be cropland, pastureland, rangeland, forest land or other land but not urban built-up land or water.

Prime farmland has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed according to acceptable farming methods. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time. They either do not flood frequently or are protected from flooding.

The following soils found in Campbell County are considered to be potential prime farmlands.

- AsA- Ashton silt loam, 0 to 2% slopes
- AsB- Ashton silt loam, 2 to 6% slopes
- Av- Avonburg silt loam
- Bo- Boonesboro silt loam
- CaB- Captina silt loam, 2-6% slopes
- Cg- Chagrin gravelly silty clay loam
- ChB- Chavies fine sandy loam, 0-6% slopes
- Eg- Egam silty clay loam
- FaB- Faywood silt loam, 2-6% slopes
- Hu- Huntington silt loam
- JeB- Jessup silt loam, 2-6% slopes



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- Lc- Lawrence silt loam
- LkA- Licking silt loam, 0-2% slopes
- LkB- Licking silt loam, 2-6% slopes
- Ln- Linside silt loam
- NeB- Negley silt loam, 2-6% slopes
- Nk- Newark silt loam
- NIB- Nicholson silt loam, 0-6% slopes
- No- Nolin silt loam
- Ro- Robertsville silt loam
- RsB- Rossmoyne silt loam, 0-6% slopes
- WhA- Wheeling silt loam, 0-2% slopes
- WhB- Wheeling silt loam, 2-6% slopes

In addition to prime farmland, the Soil Conservation Service has also identified farmlands of statewide importance. This is land, in addition to prime farmland, is of statewide importance for the production of food, feed, fiber, forage and oilseed crops. Generally, farmlands of statewide importance include those that are nearly prime farmland and that economically produce high yields of crops when treated and managed according to acceptable farming methods. Some may produce as high of a yield as prime farmlands when conditions are favorable. The following soils in Campbell County may indicate farmland of statewide importance:

- BrC- Brashear silty clay loam, 6-12% slopes
- ChC- Chavies fine sandy loam, 6-12% slopes
- FcC- Faywood silty clay loam, 6-12% slopes
- JeC- Jessup silt loam, 6-12% slopes
- LIC- Licking silty clay loam, 6-12% slopes
- NeC- Negley silt loam, 6-12% slopes
- NIC- Nicholason silt loam, 6-12% slopes
- RsC- Rossmoyne silt loam, 6-12% slopes
- WhC- Wheeling silt loam, 6-12% slopes
- WoC- Woolper silty clay loam, 6-12% slopes

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STEEP SLOPES

Land uses vary in their sensitivity to slope. Virtually flat land can be used for intensive activity, while slopes in excess of 20% present limitations so great that development is not feasible, both practically and financially. Residential development can take place on small scattered sites utilizing land that industrial development, with its more expansive land requirements must bypass. In addition, the location and concentration of slopes in the forms of hills, ridges, valleys and plains can force development into large clusters or break it up into dispersed patterns. Visual indications of unstable slopes include previous slides or slumps; cracking of the top of the slope; tilting of fences, retaining walls, utility poles or trees; new cracks in foundations and sidewalks; and slowly developing and widening cracks in the ground or paved areas. The variation in topography in Campbell County has structured the form of its cities and guided the location of major transportation arterials. The suitability of different degrees of slope for development is shown in Table 4-1.

It is important to note that development on steep slopes can accelerate erosion, increase runoff, and decrease the volume of water absorbed and filtered as groundwater. Damage to buildings and other man-made structures can occur on unstable slopes. Commercial and industrial development should be restricted on slopes steeper than 12%. Developers of residential property on such slopes should be required to prove that the construction techniques employed can overcome a site's limitations. In certain instances, the city may consider requiring a submittal of a geotechnical report prior to approving a site plan or subdivision plat.

To date, most development in Campbell County has occurred on land with minimal slopes. Within the City of Alexandria, areas that include steeper slopes have been included within residential subdivisions. These steep sloped area are typically used as the undeveloped rear portions of house lots or as common open space. Steep slopes within the planning area are shown on Figure 4-2

TABLE 4-1
SLOPE SUITABILITY FOR URBAN DEVELOPMENT

Limitations	Suitability	Residential	Commercial	Industrial Park
Slight	Optimum	0-6%	0-6%	0-2%
Moderate	Satisfactory	6-12%	6-12%	2-6%
Severe	Marginal	12-18%	12-18%	6-12%
Very Severe	Unsatisfactory	18%+	18%+	12%+

Source: Kiefer, Ralph W. "Terrain Analysis for Metropolitan Area Planning" *Journal of the Urban Planning Division, Proceedings of the American Society of Civil Engineers, Dec. 1967*



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FLOODPLAINS

Floodplains are low lying areas that are susceptible to flooding. Development must be restricted or prohibited in floodplains to prevent property damage. According to current floodplain maps, the City of Alexandria does not contain any land that has been officially designated by the Federal Emergency Management Agency (FEMA) as a flood hazard. However, it is important to note that drafts of revised FIRMs (Flood Insurance Rate Maps) for Campbell County, were released for review on February 28, 2003. Although not formally approved, these maps show small areas in the city and planning area that are considered to be flood hazard and floodway areas. Floodways in or adjacent to the Alexandria Planning Area, as shown on Community Panel Number 210391 Panel 0081, include the Licking River, and areas along Tug Creek (northern planning area boundary), and Pond Creek (southern portion of the planning area). These floodways are defined as channels of a stream, plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood (100 year flood or base flood) can be carried without substantial increases in flood heights. There are other flood areas located in the planning boundary that are identified (“Zone X”) as having a 0.2% annual chance of flood or 1% annual chance of flood with average depths of less than one (1) foot or with drainage areas less than one (1) square mile. These areas can be found along Tug Creek, Riffle Creek, Four Mile Creek, Fuller Creek, Willow Branch, Lick Branch, Brush Creek, and Twelve Mile Creek. In some locations along these creeks, no base flood elevations have been determined.

When revising the city’s zoning ordinance and subdivision regulations these areas should be classified as non-development or conservation areas with additional setbacks or buffers required. It is recommended that the regulations of the Sanitation District No. 1 be consulted when revising these regulations. In addition, it is important to mention that no buildings or homes should be constructed within a 100-year floodplain or floodway. Doing so may not only cause property damage and bodily harm, but can increase flood heights or obstruct the flow of water thus aggravating flooding conditions in these areas.

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ENDANGERED SPECIES

The primary concern for the impacts of development on plant and animal life are the effects on rare and endangered species. There are fourteen (14) animal species of potential concern in Campbell County according to the Kentucky Department of Fish & Wildlife Resources. A listing and a brief description of each species follows:

**TABLE 4-3
SPECIES OF CONCERN**

COMMON NAME	SPECIES	STATUS
Alabama Shad	<i>Alosa alabamae</i>	State endangered
Trout Perch	<i>Percopsis Omiscomaycus</i>	State special concern
Dark-eyed Junco	<i>Junco Hyemalis</i>	State special concern
Elktoe	<i>Alasmidonta Marginata</i>	State threatened
Fanshell	<i>Cyprogenia Stegaria</i>	Federal endangered State endangered
Forkshell	<i>Epioblasma Lewisii</i>	State extirpated
Lake Sturgeon	<i>Acipenser Fulvescens</i>	State endangered
Pocketbook	<i>Lampsilis Ovata</i>	State endangered
Red-Breasted Nuthatch	<i>Sitta Canadensis</i>	State endangered
Ring Pink	<i>Obovaria Retusa</i>	Federal endangered State endangered
Rough Pigtoe	<i>Pleurobema Plenum</i>	Federal endangered State endangered
Salamander Mussel	<i>Simpsonaias Ambigua</i>	State threatened



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Sharp Shinned Hawk	<i>Acciper Striatus</i>	State special concern
Sheepnose	<i>Plethobasus Cyphus</i>	State special concern

SUMMARY

As the City of Alexandria continues to grow it can be expected that physical changes to the environment will occur if the need for additional housing and commercial areas continue to increase and as the city annexes these area. As part of this process, areas that are categorized as scenic or environmentally sensitive in the comprehensive plan should be preserved and protected to the greatest extent possible so that the city can continue to develop without detriment to local natural resources and quality of life. More specific development standards should be created that outline procedures and methods necessary to protect the environment and mitigate potential environmental hazards. In addition, a review process that includes local environmental agencies should be created to ensure that environmental issues are resolved prior to the approval of new development.