

Wilmington – New Hanover County
2006 CAMA Plan Update



APPENDIX C:
LAND SUITABILITY ANALYSIS

Introduction

In the CAMA land use planning process, *land suitability analysis* (LSA) is a mandatory component of the local land use plan. It is a process for determining a planning area's approximate supply of land that is suitable for development. The analysis includes consideration of a number of factors, including natural system constraints, compatibility with existing land uses and development patterns, existing land use policies, and the availability of community facilities. A key output of the analysis is a *land suitability map* that shows vacant or under-utilized land that is suited for development. This map is part of the foundation for the development of local land use policies and the land classification map.

The CRC requirements for CAMA land use plans are the basis for identifying the data that are used in the LSA model. In the CAMA planning requirements, there are six categories of factors that must be considered in analyzing development suitability [.0702 (c)(5)]. These factors are listed below.

CAMA Land Use Plan – Land Suitability Factors

1. Water quality;
2. Land classes I, II, and III summary environmental analysis;
3. Proximity to existing developed areas and compatibility with existing land uses;
4. Potential impact of development on areas and sites designated by local historic commissions or the North Carolina Department of Cultural Resources as historic, culturally significant, or scenic;
5. Land use and development requirements of local development regulations, CAMA use standards and other applicable state regulations, and applicable federal regulations; and
6. Availability of community facilities, including water, sewer, stormwater, and transportation."

Land suitability analysis involves the application of criteria to the landscape to assess where land is most and least suitable for development of structures and infrastructure. By inspection, one can see how a layer depicting environmentally sensitive areas relates to a layer of sewer pipes, or how a layer showing flood hazard areas relates to roads. The Land Suitability Analysis uses GIS applications and data from state and local sources to classify undeveloped land with a rating based on its suitability for development. The computer model divides the planning jurisdiction into 1-acre grid cells. Each grid cell is measured for suitability based on a mathematical treatment of all factors affecting the cell. Many factors on or adjacent to undeveloped land affect the degree to which it is suitable for development. For example, suitability is influenced by whether the site has access to water and sewer infrastructure (positive factor) or has coastal wetland located on the parcel (negative factor). Final ratings fall into one of four categories: least suitable for development; low suitability; medium suitability, and high suitability for development.

Criteria

The planning staff defined criteria for the Land Suitability Analysis based on the CAMA Guidelines and modified criteria according to available datasets. The criteria for suitability for development (high, medium, low, and least suitable) were identified as follows:

Areas...

- Within **Beneficial Non-Coastal Wetlands** have low suitability
- Within **Substantial Non-Coastal Wetlands** have low suitability
- Within **Storm Surge Areas** have low suitability
- With **Severe Septic Limitations** (based on soils data) have low suitability moderate limitations have medium suitability; slight limitations have high development suitability
- Within 100-year **Flood Zones** have low development suitability
- Within **HQW/ORW Watersheds** have low suitability
- Within **Water Supply Watersheds** have low suitability
- Within 500 feet of a **Significant Natural Heritage Area** have low suitability
- Within 500 feet of a **Hazardous Substance Disposal Site** have low suitability
- Within 500 feet of an **NPDES Site** have low suitability
- Within 500 feet of a **Wastewater Treatment Plant** have low suitability
- Within 500 feet of a **Municipal Sewage Discharge Point** have low suitability
- Within 500 feet of a **Land Application Site** have low suitability
- Within 500 feet of an **Airport** have low suitability
- Within a half-mile of **Primary Roads** have high suitability; within a half-mile to a mile have medium suitability; areas greater than one mile outside of primary roads have low suitability
- Within a half-mile of **Developed Land** have high suitability; areas within a half-mile to a mile have medium suitability; areas further than one mile away from developed land have low suitability
- Within a quarter-mile of **Water Pipes** have high suitability; areas within a quarter-mile to a half-mile of water pipes have medium suitability; areas further than a half-mile away from water pipes have low suitability
- Within a quarter-mile of **Sewer Pipes** have high suitability; areas within a quarter-mile to a half-mile of sewer pipes have medium suitability; areas further that a half-mile away from water pipes have low suitability
- Within **Coastal Wetlands** are LEAST suitable
- Within **Exceptional Non-Coastal Wetlands** are LEAST suitable
- Within **Military Areas** are LEAST suitable
- Within **Protected Lands** are LEAST suitable
- Within **Estuarine Waters** are LEAST suitable

According to these criteria, values for layers are quantitatively scored in the LSA model according to suitability for development. For example, an area that is inside a storm surge area or within 500 feet of a Significant Natural Heritage Area has low suitability. These areas receive a score of **-2** (negative two). An area that is close to existing infrastructure (roads, sewer lines, existing development, etc.) has high suitability for development. These areas receive a score of **+2** (positive two).

Additionally, most of the data layers are ranked according to how important they are to the overall analysis. In the criteria spreadsheet developed by planning staff with input from the Advisory Panel, layers were ranked as 1, 2 or 3, with 3 being very important. Other values may be used, but keep in mind the advantage of keeping the factors relatively uncomplicated for presentation and explanation in public meetings.

The least suitable areas (protected lands, military areas, coastal wetlands, estuarine waters, and exceptional non-coastal wetlands) are treated differently. They are given scores of 0 or 1. Areas within protected lands, coastal wetlands, etc., receive a score of 0. Areas outside of these sensitive areas receive a score of 1.

The overall suitability rating score for each acre of undeveloped land will be the composite of the suitability ratings for each factor.

Input Factors

Default Scenario

This scenario was run using the default data provided with the model software. This is the input recommended by NC Division of Coastal Management for New Hanover County. Although the CRC and DCM decided on criteria that establish the suitability levels for each factor, the planning jurisdiction may vary the relative importance of each factor in the overall analysis.

Scenarios analysis.

A series of scenarios was run to attempt to incorporate the input from the Advisory Panel into the model and to test the sensitivity of the analysis to changing various factors. Output maps were generated for each scenario and a set of four scenarios was presented to the Advisory Panel for review and to illustrate how changing input factors affected the output.

Advisory Panel Survey

The Wilmington New Hanover County CAMA Plan Update Advisory Panel was asked to provide input to the land suitability analysis by completing a survey that allowed them to provide an importance weighting for each factor. This was done by ranking the factors as follows: not very important; very important; and highest importance. Surveys filled out by Panel members were analyzed and the mode of responses was used to determine the weighting for the different variables. There was considerable variability between member responses. The primary difference from the default was splitting substantial non-coastal wetlands from exceptional non-coastal wetlands and assigning it a low suitability rather than "least suitability;" reducing the positive weighting for some proximity factors (hazardous substance sites, WWTP, sewer discharge points); reducing the weighting for streets, and eliminating the negative stigma for not being proximal to developed land, primary roads, water, and sewer.

Table 1 shows the weighting assigned to each factor based on the sensitivity analysis and the ranking of factors by the Advisory Panel.

Final Draft Map

Staff re-evaluated the input data for the multiple scenarios and from the Advisory Panel inputs and produced a draft land suitability analysis map for public review. The Land Suitability Map is presented in Figure 1.

Table 1: Land Suitability Analysis Data Input Summary

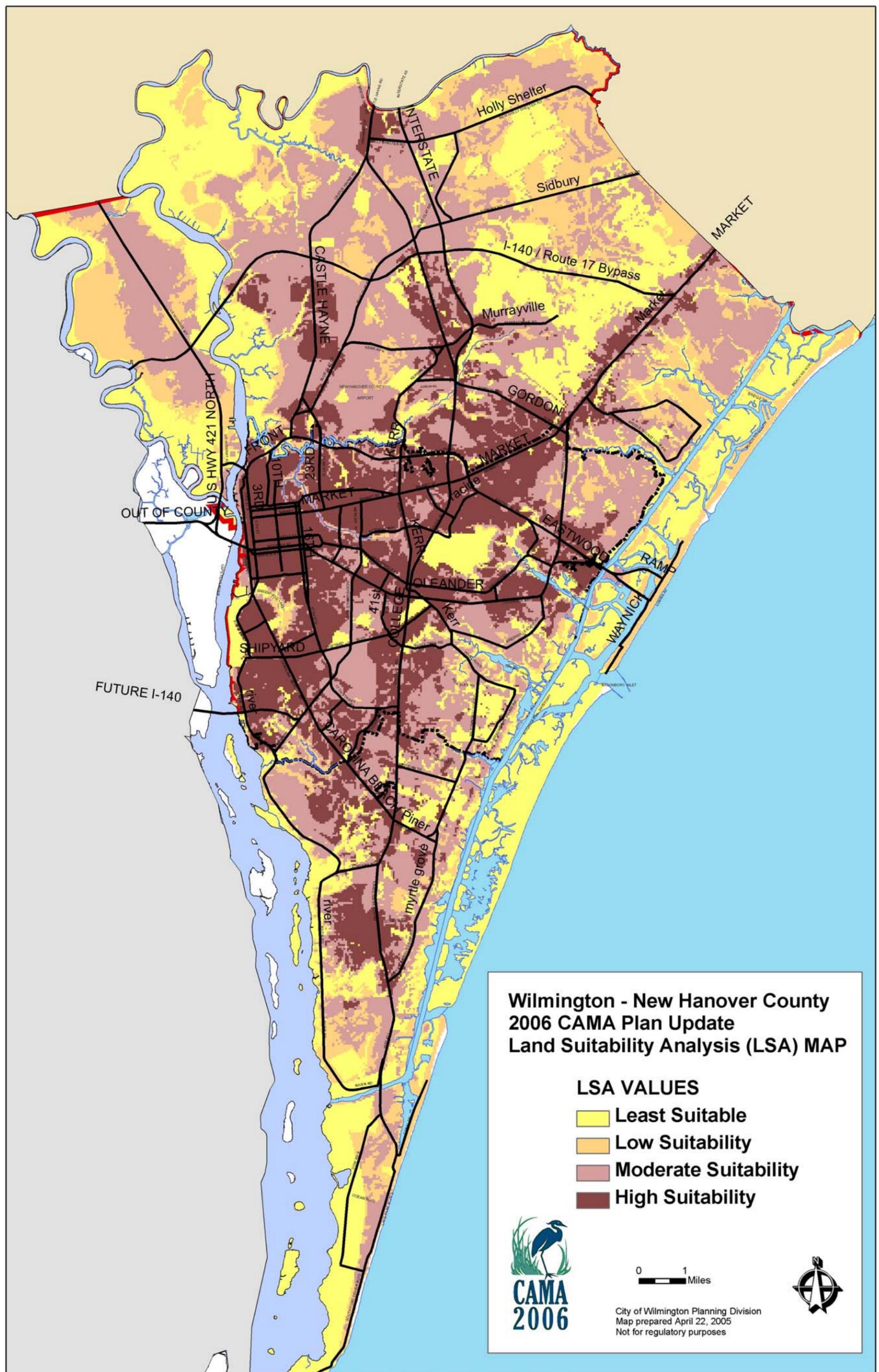
LSA INPUT		-----Criteria and Rating-----				
Layer Name	Treatment	Least Suitable	Low Suitability	Medium Suitability	High Suitability	Assigned Weight
		0	-2	1	2	
Coastal Wetlands	Exclusion	Inside		Outside		
Exceptional Noncoastal Wetlands	Exclusion	Inside		Outside		
Estuarine Waters	Exclusion	Inside		Outside		
Protected Lands	Exclusion	Inside		Outside		
Federal Lands	Exclusion	Inside		Outside		
State Lands	Exclusion	Inside		Outside		
Substantial noncoastal wetlands	Weighted		Inside	Outside		3
Beneficial Noncoastal Wetlands	Weighted		Inside	Outside		2
High Quality Waters	Weighted		Inside	Outside		2
Storm Surge Areas	Weighted		Inside	Outside		2
Soils with septic limitations	Weighted		Severe	Moderate	Slight	1
Flood Zones	Weighted		Inside	Outside		3
Water Supply Watersheds	Weighted		Inside		Outside	1
Significant Natural Heritage Areas	Weighted		< 500'	-	-	2
Hazardous Substance Disposal Sites	Weighted		< 500'		-	1
Wastewater Treatment Plants	Weighted		< 500'		-	1
Municipal Sewer Discharge Points	Weighted		< 500'		-	1
Airports	Weighted		-		> 500'	1
Developed Land	Weighted		-	.5 - 1 mi	< .5 mi	1
Primary Roads	Weighted		-	.5 - 1 mi	< .5 mi	2
Water Pipes	Weighted		-	.25 - .5 mi	< .25 mi	3
Sewer Pipes	Weighted		-	.25 - .5 mi	< .25 mi	3
Total						29

Assigned weight: 1 = Important 2 = Very important 3 = Most important for development

Layers Not Used in New Hanover County:

Land Application Sites
NPDES Sites

CAMA 2006 Land Suitability Analysis Map



Implications of the Land Suitability Analysis

The results of the LSA are best used for evaluating sizable tracts of undeveloped land as to their suitability for development, and by use of map layers showing the natural constraints or infrastructure availability.

This analysis has considerable applicability with respect to guiding future development decisions. This map is intended as a planning tool and not as a regulatory map. The Land Suitability Map was used as a guide for the revision to the Urban Service Area and revisions to the Land Classification Map.

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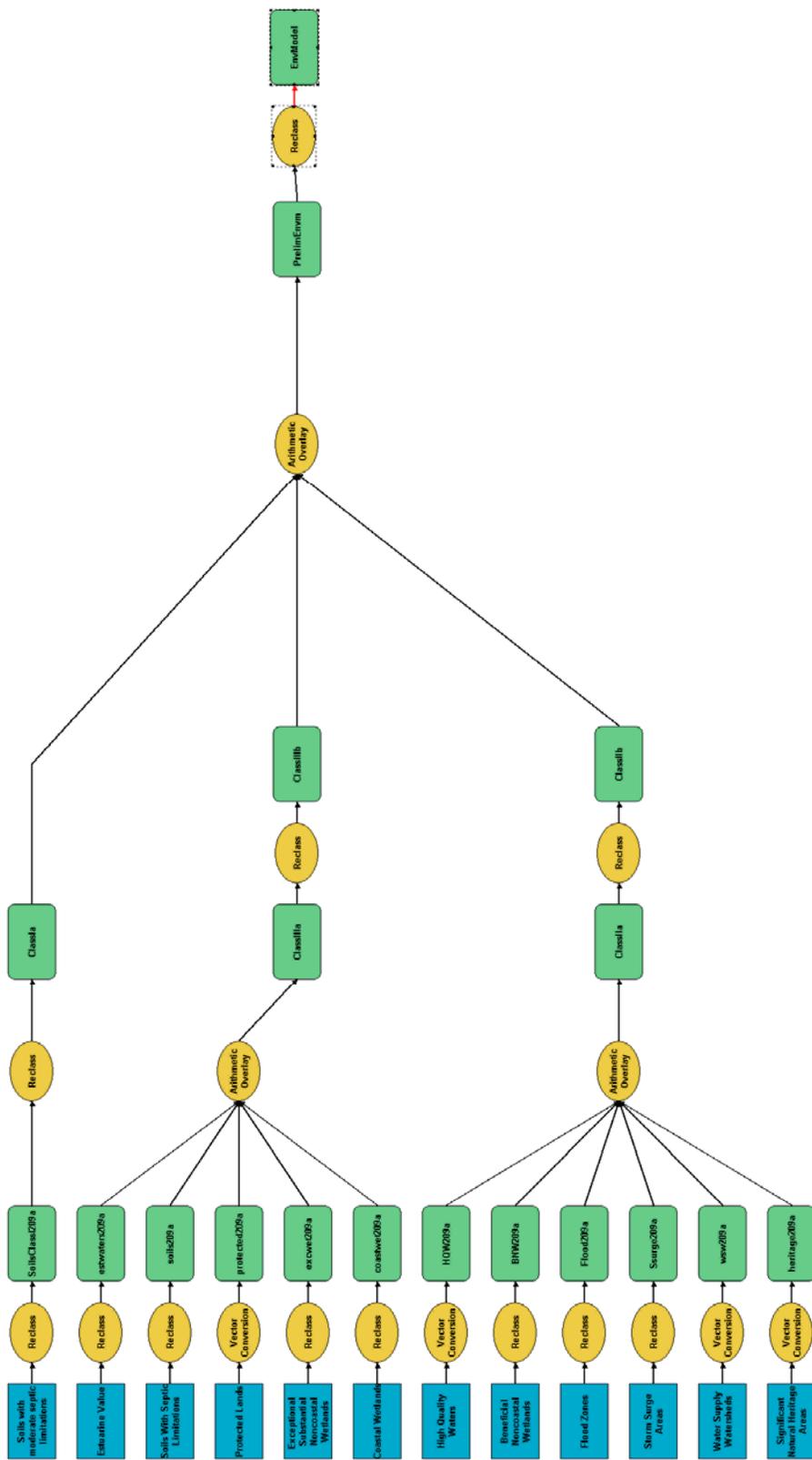
APPENDIX D: COMPOSITE MAP OF ENVIRONMENTAL CONDITIONS

The Environmental Composite Map on the next page depicts the coverage and intersection of the environmental and natural features discussed in Part II of this plan. The natural features constraints and opportunities on the land were modeled to produce the composite map, which divides the County into three basic land classes as required in the CAMA planning rules:

- **Class I:** Land containing only minimal hazards and limitations that may be addressed by commonly accepted land planning and development practices
- **Class II:** Land Containing development hazards and limitations that may be addressed by methods such as restrictions on types of land Uses; special site planning; or the provision of public services
- **Class III:** Land containing serious hazards for development or lands where the impact of development may cause serious damage to functions of natural systems.

Figure 1 is a graphical representation of the model that was applied using GIS layers for the environmental features required to be analyzed. Figure 2 is the output of the model showing the land classes. It should be noted that the inputs to this model were modified by changing the soil types that are included in the grouping of “soils with septic limitations” to include only the Class IV soils as defined by the New Hanover County Health Department as providing severe septic limitations. The Class IV soils are Johnston, Dorovan, Pamlico Much and Tidal Muck. This modification significantly changed the amount of land shown to be in Class III, particularly in the northeast part of the County.

Figure 1: Environmental Composite Model



CAMA 2006 Update Environmental Composite Map

