Piedmont Triad Scenario Planning and Growth Allocation Guidebook

Implementation and Process Documentation

This document details the implementation of the CommunityViz Scenario planning tool in the Piedmont Triad for the purpose of developing socio-economic data for the Regional Travel Demand Model.

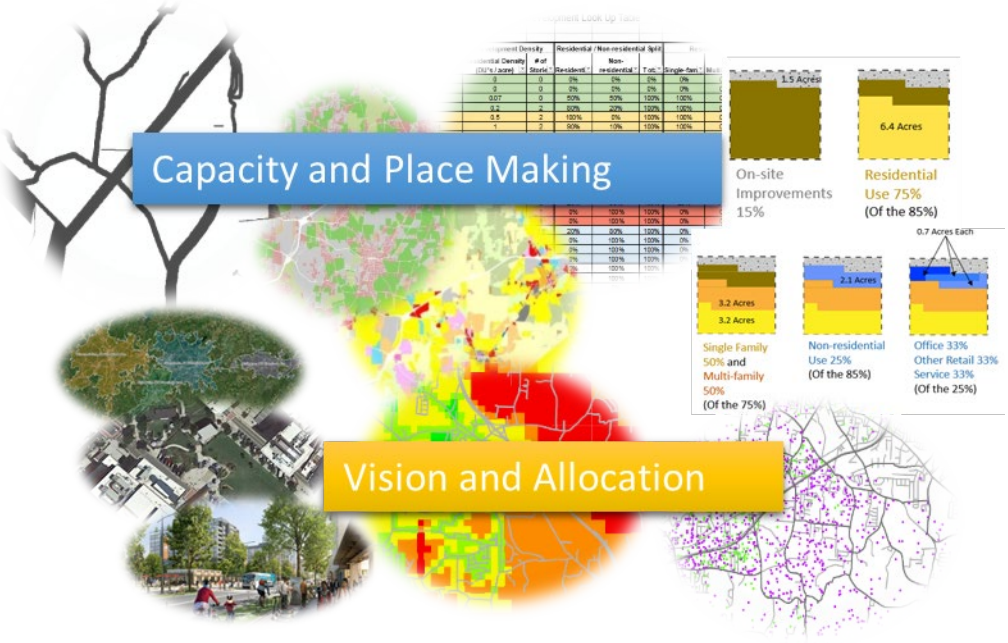

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TABLE OF CONTENTS

List of Figures

List of Tables

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Purpose of this Document

This document details the implementation of regional scenario planning in the Piedmont Triad. The principal purpose of which is to generate socio-economic data as an input to the *Regional Travel Demand Mode (RTDM)l*. This document is revised periodically. It serves to document decisions made during the model's development, provide sufficient detail to replicate the process, and as a training manual.

Project Background

Project History

In 2014 the Piedmont Triad regional completed a regional planning study called Piedmont Together. One element of the plan used scenario planning to visualize the impact of planning policies on growth allocation or development patterns. The scenario planning process utilized a tool called CV (CV). In April 2016 land use planning and transportation planning staff in the region began discussing the use of the tool to enhance regional planning efforts and to provide a more accurate and meaningful way to generate socio-economic data for the RTDM.

In early 2017, a regional project steering committee was formed. They contracted with City-Explained and had a guidebook in implement CV prepared. Later that year the *Piedmont Authority for Regional Transportation (PART)*, who serves as the *RTDM* custodian, was tasked the leading the development of a CV model and a scenario planning process for the region. By 2020, the region's RTDM Model Team acknowledged CV and Transit Boarding Estimation and Simulation Tool (TBEST) as part of an overall regional modeling program designed to enhance transportation planning in the Piedmont Triad. After more than a year of learning, testing and decision making in May 2022, the region began preparing to officially use scenario planning to develop socio-economic data for a PTDM 2022 Base Year Update.

Project Study Area

The *Piedmont Triad Scenario Planning and Growth Allocation (SPGA)* project area is expansive, covering 6,162 square miles and over 800,000 parcels (Figure 1). The geography includes 61 cities or towns ranging in size from large, metropolitan centers to suburban bedroom communities to rural crossroads. Environmental features — lakes, rivers, water basins, prime agricultural soils, and air quality — could bind the region together and potentially blur political boundaries. To effectively manage data collection and maintenance to develop socio-economic data for the regional travel demand model, sub-regions need to be developed.

Figure 1: Project Area for Regional Piedmont Triad Scenario Planning and Growth Allocation Project

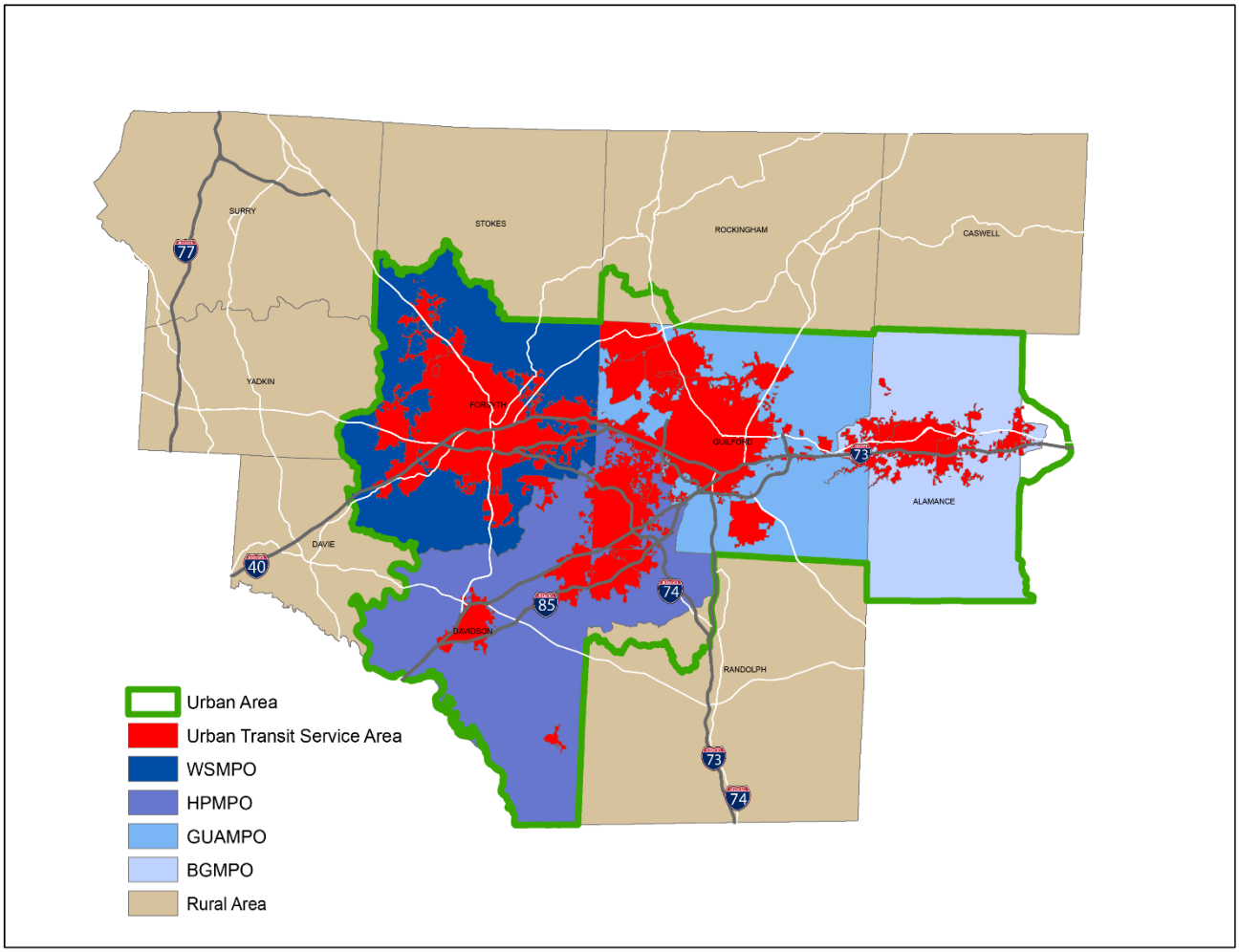
The following sub-regions have been identified for the inclusion in the project. Initially it includes the Core Area with the expanded area being included in the future. Figure 2 illustrates the extents of the current, *RTDM* Area, the Urban Transit Service Area and the Expanded Area represented in the *SPGA*.

Regional Travel Demand Model Area – Portions of the twelve-county region inside the study area for the *RTDM*. Socio-economic data allocated to traffic analysis zones will be updated every five years to coincide with updates to the *Piedmont Triad Regional Travel Demand Model and Metropolitan Transportation Plans*.

MPO Areas – Each MPO has a boundary determined by regions urbanization. The entirety of the four Piedmont Triad MPO's all included in the RTDM Area. However, the RTDM Area does include area outside the MPO's including a portion of a fifth MPO. This creates sub-regions withing the RTDM Area.

Urban Transit Service Area – Cities and towns served by transit and included in the study area for PART's Transit Boardings Estimation and Simulation Tool (TBEST). Parcel-level and use and market

Figure 2: extents of the current, *RTDM* Area, the Urban Transit Service Area and the Expanded Area represented in the *SPGA*.



data used in the *Piedmont Triad CV Model* (parcel-level data) should be reviewed and updated annually to keep the TBEST model up to date for a variety of planning tools, studies, and applications.

Expanded Area – Portions of the twelve-county region outside the study area for the *RTDM*. Data should be updated periodically to coincide with updates to the Northwest Piedmont RPO and Piedmont Triad RPO Comprehensive Transportation Plans. This area is under the process of being included in the *RTDM*. (As of December 2022, it is believed that the socio-economic data for the

Expanded Area will be developed through the traditional top-down method for the 2022 Base Year Update due to limited resources for parcel data collection.)

Reporting Geographies

Summarizing data output from the *SPGA* by sub-geography or areas of interest can support plans and studies prepared regularly by agencies in the region: metropolitan transportation plans, comprehensive transportation plans, congestion management processes, NEPA studies, transit master plans, comprehensive plans, etc. The number and extent of sub-geographies or areas of interest represented in the scenario model is limitless.

Grid cells used by CV can be assigned any number of specific traits — representing the different metropolitan planning organizations, rural planning organizations, jurisdictions, traffic analysis zones, etc. in the region — and summed by trait to report results for the geography or area of interest. Raw data from CV can also be clipped and exported in ArcGIS shapefile format for use by agencies in the region.

Official Model Location & Status

CV is the scenario modeling tool being used to create a region-wide scenario planning model that quickly and efficiently creates socio-economic data for the *RTDM*. The official version of the model used in the *SPGA* project *is* maintained by PART. Copies of the RTDM are available to the MPOs, NCDOT, and transportation planning consultants for their use.

The *SPGA* project includes two major components: a base year data management tool discussed here, and a future year allocation tool discussed in the next section of the document. The base year data management tool organizes point, line, polygon, and numeric data created by MPOs for the RTDM portion of the SPGA study area into a single, comprehensive data set. Information summarized in the RTDM data set would include dwelling units (households), dwelling unit population, group quarters population, students, and employees (the control total subcategories included in the RTDM).

The base year for the *CV Model* should match the base year for the RTDM. General topics addressed for the base year data management tool include unit of analysis, starting data, model architecture, data output and calibration activities.

Data Analysis & Inventory

Unit of Analysis

Parcels

The base unit of analysis for the CV Model is parcels. Every parcel of land that is to be considered in the growth allocation phase of the CV model outputs must be tagged with a Development Status and land use use designation or Place Type. Both items are defined in later in the document.

Grid Cell

Grid cells are used as a common geography in the future year allocation tool to address size and complexity issues for modeling in a large study area. They are used to aggregate parcel-level data and support several calculations focused on the study-area-as-a-whole.

The size of grid cells used in the RTDM portion of the SPGA study area vary to reflect different development types, patterns and intensities in the study area. Smaller size grid cells, generally ten acres each, are used to represent the planning areas for cities and towns throughout the study area (defined by the boundaries used for the Future Land Use Map in locally adopted comprehensive plans). Larger size grid cells, generally ranging between 40 acres and 160 acres, are used for more rural areas (primarily unincorporated areas) and land held in permanent conservation. Increasing the size of grid cells in areas where development types, patterns and intensities are slower to change reduces the total number of features in the data set.

The rules used to create grid cell sizes are summarized in Table 1. Grids have not been established in the Expanded Area. A relatively small number of grid cells in the RTDM portion of the SPGA study area do not conform to the simple area rules highlighted in Table 1. These grid cells are located at the boundary of the study area and are smaller in size because they are clipped to eliminate representation outside the study area.

Table 1: Rules for Assigning Grid Cells

Grid Cell	Dimensions	Area	General Rule	Quantity
⅛-mile	660’ x 660’	10 acres	Land inside city or town planning boundaries (consistent with the Future Land Use Map boundary presented in locally adopted comprehensive plans)	97,438
¼-mile	1,320’ x 1,320’	40 acres	Land outside city or town planning boundaries but generally within ½-mile of a US Highway or NC Highway	17,086
½-mile	2,640’ x 2,640’	160 acres	Land outside city or town planning boundaries and generally greater than ½-mile away from a US Highway or NC Highway	18,609
1 mile	5,280’ x 5,280’	640 acres	Land not likely to develop in the future (e.g., large water bodies, state parks, etc.)	0

Use of graduated grid cells for the RTDM portion of the study area would improve overall model performance and allow stakeholders greater flexibility for assigning values and reporting results. Overall, the use of grid cells over parcels in the CV model would reduce the number of records in the database to something manageable for region-wide planning and analysis.

Traffic Analysis Zone

The unit of analysis for the base year data management component of the CV model is the traffic analysis zone (TAZ). Dwelling units (households), dwelling unit population, group quarters population, student and employee data would be aggregated to this unit of analysis for data reporting.

Unit of Analysis Exception

The unit of analysis for the future year allocation component of the SPGA Project is the grid cell except for two instances: student growth allocation (six categories) and group quarters population allocation (one category). Both processes should rely on traffic analysis zones to approximate available supply, store land suitability scores (averaged from underlying grid cells) and allocate future year growth.

Data Inventory

Partnerships have been formed with local governments and MPO's for exchanging data that would benefit both the CVSPGA project and other plans, studies, and initiatives underway (e.g., comprehensive plan updates, comprehensive transportation plans, development ordinance updates, water and sewer master plans, etc.)

A file transfer site and protocol has been established for exchanging data in the RTDM portion of the SPGA study area. Data will be kept up to date by participating local governments and PART with quality control provided by PART. Any government agency, research group or project team working in the study area will have access to the data.

Data collected for the *SPGA Project* is described here under three general headings: GIS data, policy and plan documents and resource documents.

GIS Data

Geographic Information System (GIS) data is collected and updated through NC One Map and through partnerships with local and state government agencies in the SPGA project area . Data is collected for three general categories: base map layers, analysis layers and reference layers. Other data will be added to the database as the model building process evolves. GIS data needed to build the CV Model are summarized in Appendix B.

Policies & Plan Documents

Policies and plan documents are be collected from local governments in the RTDM portion of the SPGA study area; including comprehensive plans, small area plans, corridor studies or zoning ordinances. This repository will be developed over time.

Resource Documents

Resource documents will be used to refine the model architecture, validate assumptions, and write equations for CV. These include:

- *Piedmont Triad Regional Travel Demand Model User's Guide*
- *Piedmont Triad Scenario Planning and Growth Allocation Guidebook*

Model Architecture and Processes

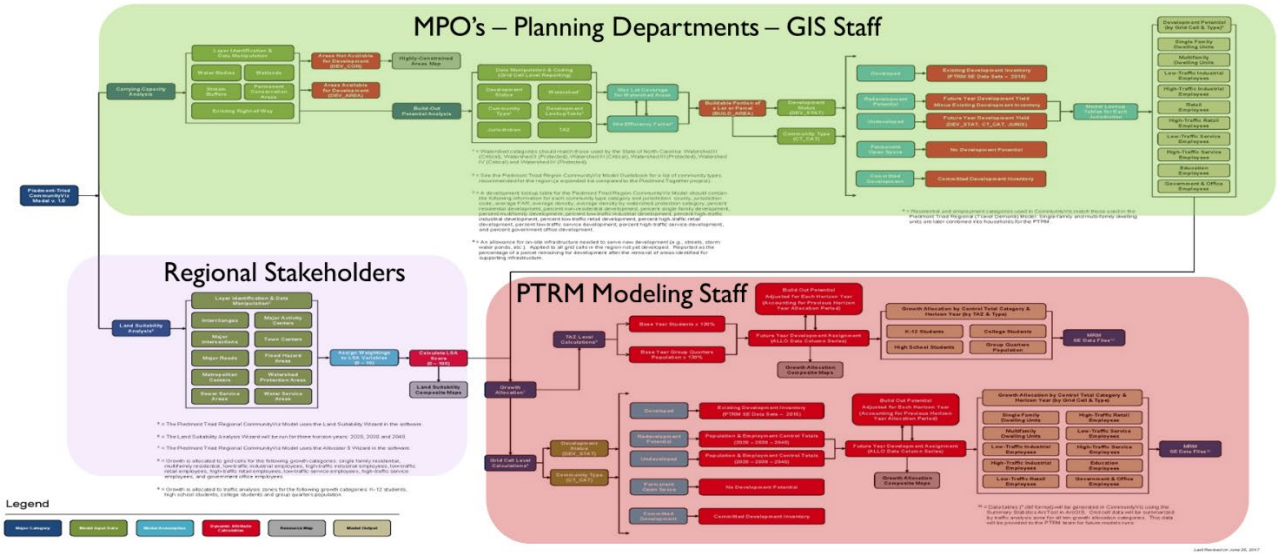
Architecture

The future year allocation component of the CV Model uses a region-wide modeling platform to run growth scenarios. Certain variables and values used in the calculations are linked to CV via lookup tables, which account for the different rules or policies local governments use to regulate development potential.

Growth by control total category is allocated to grid cells (for dwelling units and employees) and traffic analysis zones (for students and group quarters population) in the Model for one or more growth scenarios. Grid level data is summarized in CV by traffic analysis zones and exported to a database format (*.dbf) for creating socio-economic data in the RTDM. The specific components of the model architecture are provided on the following pages. A map of the model architecture for the future year allocation tool is shown in Figure 4.

Tasks within the model architecture are broken down into three major groups: Local Users (MPO's, planning and GIS departments), Regional Stakeholders, Modeling Staff. Some tasks performed by a Local User can be customized to reflect conditions with a specific community. These include how parcels are tagged and the Development Lookup Table. The Regional Stakeholders are responsible for setting the Growth Control Total data source, Employee Space Ratio,common Suitability Factors for running the growth allocations. The Modeling Staff is responsible and generating the socio-economic data.

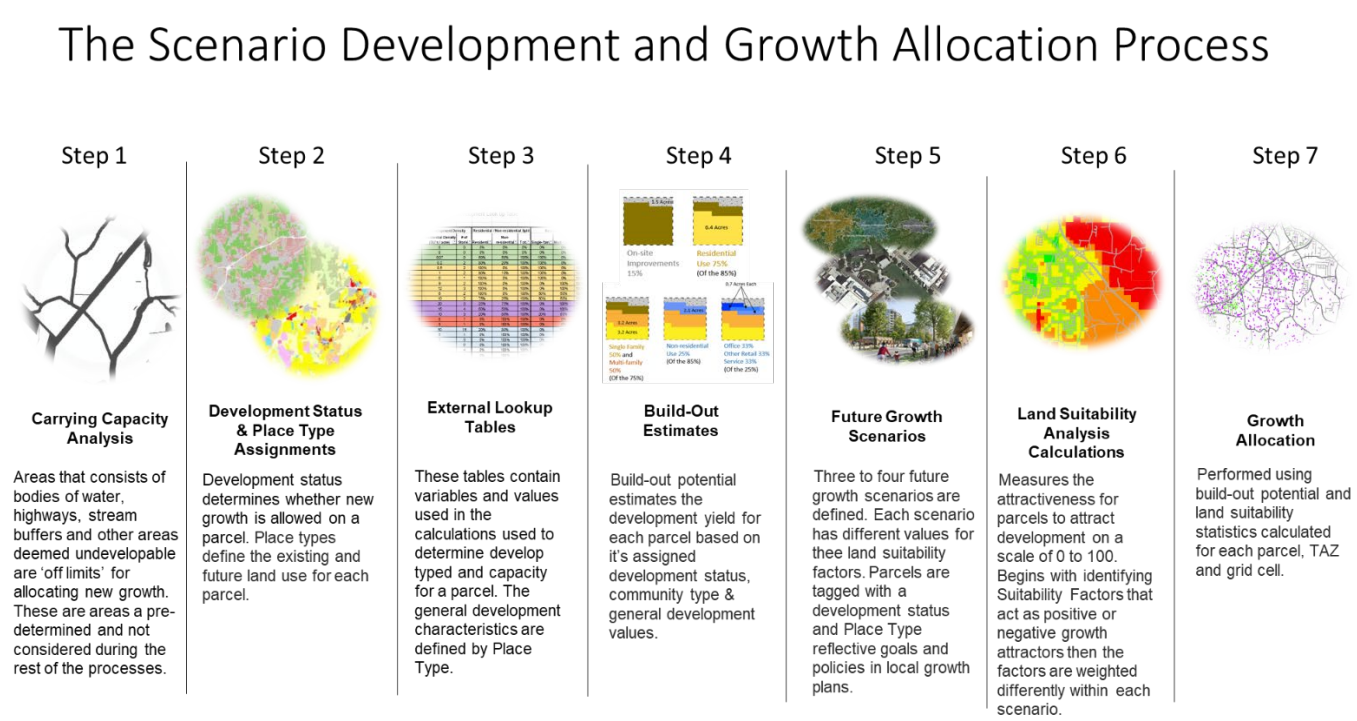
Figure 3: Piedmont Triad CV Model Architecture



Processes

The future year allocation component of the *CV Model* would include six major processes: carrying capacity analysis, external lookup tables, development status and Place Type Assignment, build-out potential analysis, land suitability analysis, growth allocation, refer to Figure 4.

Figure 4: Model Process Components



Carrying Capacity Analysis

Some land in the RTDM portion of the SPGA study area would never develop because of physical conditions on the site, land ownership, or the existence of state and local policies that prohibit development. These areas referred to as highly constrained for development' are removed from the model area to more accurately approximate buildable area in the study area. Refer to Appendix C.

Internal scripts in the model would remove 'highly constrained areas for development' from the build-out calculations using an overlap function. A site efficiency factor (specific to each Place Type category) would be applied to vacant grid cells in the RTDM portion of the SPGA study area to account for land typically set aside for on-site improvements (e.g., internal streets, utility easements, storm water management, open space, etc.) to support new development. Site efficiency factors would be lowered for grid cells located in critical or protected watersheds to limit the maximum buildable area (or maximum lot coverage) consistent with state and local rules or policies.

[Highlight item above is function that is not currently part of the process. Watershed Critical Areas are identified as a Land suitability Factor with a negative growth attraction.]

The portion(s) of a grid cell remaining after the removal of highly constrained areas for development' and the application of factors for on-site infrastructure (if vacant) and watershed protection areas (if applicable) would be used to approximate buildable area for the study area.

Recommended features in the RTDM portion of the SPGA study area used to represent highly constrained areas for development should include Water Bodies; Wetlands; Stream Buffers; Permanent Conservation Areas; and Existing Rights-of-Way.

External Lookup Tables

Some variables and values used in the calculations within the CV model are linked to the analysis via external lookup tables, which automatically update every time a change is made outside the software. The tables are used to capture general development characteristics associated with the different Place Types, and enumerate household, employee, student, and group quarters population control totals for the growth allocation process.

L DEVELOPMENT LOOKUP TABLE

The Development Lookup Table is linked to the *Piedmont Triad CV Model* using Place Type categories and jurisdictional codes. Statistics in the table vary by jurisdictions represented in the RTDM portion of the SPGA study area; reflecting small differences in characteristics or expectations for each Place Type category specific to the jurisdiction's local comprehensive plan and/or land development controls. Without a customized development lookup table, jurisdictions would use. The Regional Development Lookup Table. This table can be found in Appendix D. If jurisdictions develop their own Development Look-up Table, they will be added to Appendix D.

The Employment Categories in the Regional Development Lookup Table are defined in the RTDM. The chart below defines the types of businesses that make up each Employment Category or Type.

Table 21 Employment Data Crosswalk from SIC Code to NAICS Code

Employment Type	SIC	NAICS	LEHD File name
Industrial	1-49	11, 21, 22, 23, 31-33, 48-49	CNS01,02,03,04,05,08
Retail	50-54, 56, 57, 59	42, 44-45	CNS06, 07
Highway	55, 58, 70	72	CNS18
Office	60-67, 91-97	52, 53, 92	CNS10, 11, 20
Services	71-81, 83-89, 99	51, 54, 55, 56, 62, 71, 81	CNS09,12,13,14,16,17,19
School	82	61	CNS15

Source: https://www.naics.com/wp-content/uploads/2014/10/SIC-to-NAICS-Crosswalk.pdf

Customized development lookup tables would use the same data columns, naming convention and formatting features to streamline the modeling process. The only variations in the table would be associated with the density and floor area ratio (FAR) values assumed for the variables. Build-out potential factors calculated in the lookup table would streamline calculations inside CV by multiplying factors outside the model environment.

Recommended information to include in the lookup includes:

General Characteristics

- County Name
- Growth Tier
- Place Type Category
- Jurisdiction Code
- Jurisdiction Name
- % Residential Development
- % Non-Residential Development

Residential Development Characteristics

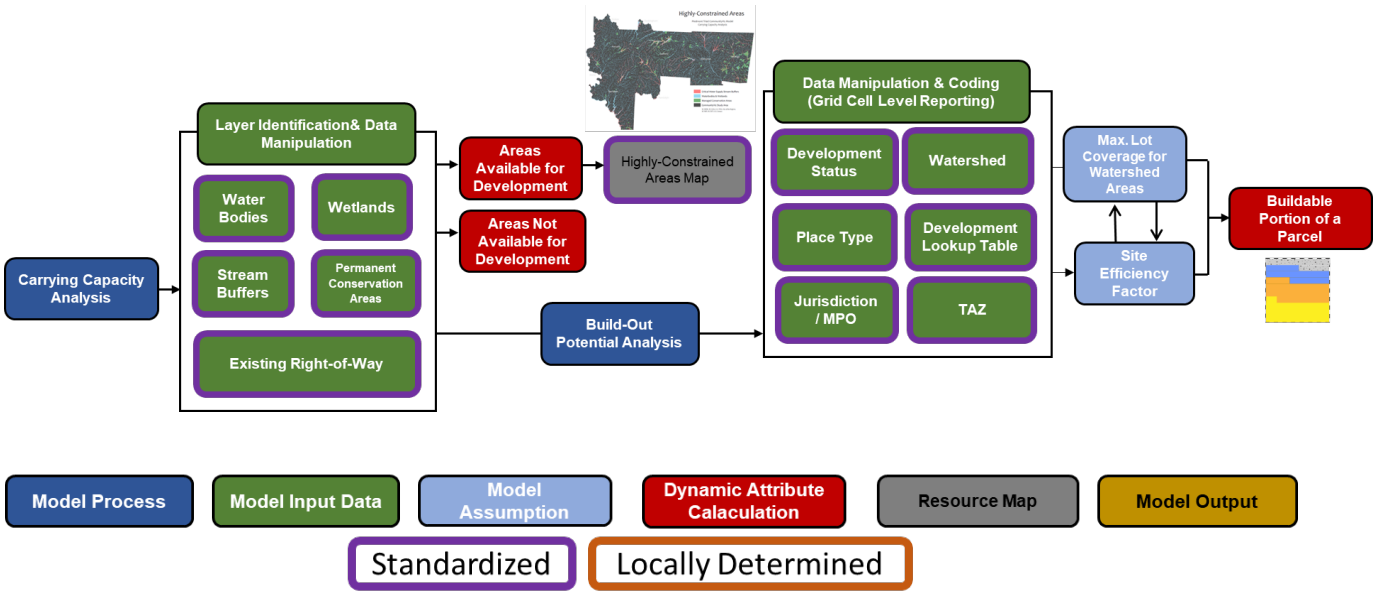
- Average Density Outside Watershed Areas
- Average Density Inside Watershed Areas (six categorical conditions)
- % Single-Family Development
- % Multi-family Development

Non-Residential Development Characteristics

- Average Floor Area Ratio
- % Highway Retail Development
- % Other Retail Development
- % Industrial Development
- % Service Development
- % Office Development
- % Education (K-12) Development

Build-Out Potential Factors

- Single-Family Development
- Multi-family Development
- Retail (High) Development
- Retail (Other) Development
- Industrial Development
- Service Development
- Office Development
- Education Developmen



Site Efficiency & Watershed Protection Maximum Lot Coverage Factors Lookup Table

Site efficiency factors in the lookup table would be used to account for land typically set aside for on-site improvements (e.g., internal streets, utility easements, storm water management, open space, etc.) to support new development. They would be reported in the lookup table as the percentage of land remaining for development after deducting for on-site infrastructure (e.g., a site efficiency factor of 80% means 20% of the land is assumed for on-site infrastructure). Site efficiency factors would vary by Place Type category. They would be constant for all jurisdictions in the RTDM portion of the SPGA study area.

Maximum lot coverage factors, for critical and protected watershed categories in the lookup table, would be used to score maximum lot coverage requirements (representing maximum impervious surface) by Place Type category. They would be consistent for all jurisdictions in the RTDM portion of the SPGA study area. Statistics assumed in the lookup table would be consistent with rules and ordinances enforced by state agencies or local governments in North Carolina

Site efficiency factors and maximum lot coverage factors for watershed protection areas could both be used in the buildable area calculation, which is part of the carrying capacity module in CV (see page 42).

[Highlight item above is function that is not currently part of the process. Watershed Critical Areas are identified as a Land suitability Factor with a negative growth attraction.]

Parcel Growth Allocation Tagging

Development status and Place Types are unique attributes created for the SPGA. The attributes are assigned by the MPO or individual jurisdiction to each parcel in the project area. The process for tagging parcels is detailed Appendix E.

Parcel tagging for the SPGA Project was copied from a regional planning effort in 2013 called *Piedmont Together*. The parcel data has been reviewed, edited and updated in 2018, and 2021 through 2022. With over 500,000 parcels in the data set a tagging accuracy of 95% could be considered adequate for countywide runs of the model. For smaller areas 99% to 100% should be the target. A description of both attributes and information used to create the attributes is provided on the following pages.

MPO's are responsible for providing updated parcel tagging information based upon the schedule established by the PTRM Model Team. This is usually no later than five months following the end of the assigned Based Year Update. For example, for the 2022 Base Year Update parcel data set would need to include all parcels existing on December 31, 2022, tagged with a Place Type and Development Status. The MPO would then have until May 31, 2023 to provide the 2022 Base Year Updated Parcel Dataset. The dataset should include the current Place Type and Development Status for parcels as of the end of Base Year as well as a parcel layer reflecting proposed Place Types and Development Status as of the last horizon year of the Base Year Update.

Development Status Assignments

Development status is assigned to parcels in the RTDM portion of the SPGA study area using the current aerial photography, property appraiser data, and topic-specific GIS data sets (e.g., existing land use, farmland, or vacant land inventories, etc.). Emphasis on one or more of the data sets would vary by the development status category being coded, which is highlighted in the category

descriptions below. Values for development status are recorded in a new column created for the parcel files. Internal scripts in the CV model would transfer values from parcels to grid cells using an overlap-most function.

Development status in the RTDM portion of the PTCM study area tells CV what density rules to use for estimating the development yield (build-out potential) of a grid cell. And when combined with the land suitability scores and Place Type assignments, it would establish the order and supply available for a grid cell to receive future growth in the model.

Development status is assigned to parcels in the PTCM study area using current aerial photography, property appraiser data, and topic-specific GIS data sets (e.g., existing land use, farmland, or vacant land inventories, etc.). Emphasis on one or more of the data sets would vary by the development status category being coded, which is highlighted in the category descriptions below. Values for development status are recorded in a column created for the parcel files. Internal scripts in the CV model would transfer values from parcels to grid cells using an overlap most function.

Development status categories used for the RTDM portion of the PTCM study area include open space, developed, undeveloped, redevelopment area and committed development. A summary of the development status categories is below followed by a description of each category.

Development Status	Future Growth Allocated	Notes
Developed	No	Includes Working Farms, parks, anything with a building or active use.
Open Space	No	Active or passive land dedicated to permanent or semi-permanent open space, including water bodies, state parks, conservation areas, and land set aside for open space in residential neighborhoods, commercial centers, business parks, etc.
Undeveloped	Yes	Growth allocation will be based Place Type, DLT and Land Suitability Factors
Underdeveloped	Yes	Must have % developed as a parcel attribute
Redevelopment Area	Yes	N/A
Committed Development	No	Growth in a “committed development” that will occur prior to the first horizon year will be “hard coded” into the model

<u>Open Space</u>
Active or passive land dedicated to permanent or semi-permanent open space, including water bodies, state parks, conservation areas, parks and recreation fields, and land set aside for open space in residential neighborhoods, commercial centers, business parks, etc. GIS data (water bodies,

conservation easements, points of interest, etc.) and/or land ownership information in a property appraiser database could be used to assign permanent open space status.

Future year growth would not be allocated to parcels/grid cells identified as open space.

[This status is not currently being used. Open Space could be considered Developed.]

Developed
Lots or parcels largely built-out with permanent buildings or structures. Developed status would also be assigned to surface parking lots that serve adjoining buildings, or to sliver lots adjacent to developed parcels (appearing to be part of the same development or home site) where size, shape or access limitations would generally keep them from developing in the future.

Then current aerial photography, GIS data (existing land use inventory, building footprints, points of interest, etc.) and/or land ownership information in a property appraiser database could be used to assign developed status.

Future year growth would not be allocated to parcels/grid cells identified as developed.

Undeveloped
Lots or parcels without permanent buildings or structures. Undeveloped status would also be assigned to more rural parcels with temporary structures (e.g., pole barn, large storage shed, etc.) that could easily be removed to accommodate new development. Then current aerial photography, GIS data (vacant lands inventory, building footprints, etc.) and/or land ownership information in a property appraiser database would be used to assign undeveloped status. The assumption is the 100% of the parcel has build-out potential.

Future year growth could be allocated to 100% of a parcel/grid cells identified as undeveloped.

Underdeveloped
Lots or parcels with permanent buildings or structures that occupy only a small portion of the property; leaving significant area available for future development. The initial test would be limited to space efficiency, or a mismatch between existing land use and future land use (e.g., residential home in a commercial district). The condition of buildings or structures on the property would not be a consideration for underdeveloped status except for obvious cases of neglect. Refer to Redevelopment Area below.) Current aerial photography, GIS data (and/or land value and building value information in a property appraiser database could be used to assign underdeveloped status.

Future year growth could be allocated to the portion of the lot that is not developed. If tagged underdeveloped, the parcel must contain an existing building square footage attribute.

Redevelopment Area
There are times when a jurisdiction identifies an area for 'redevelopment.' This could be because the condition of building is poor, or they have been condemned and/or there is a mismatch between prior or existing land use and a land use desired in the future. The distinguishing factor between underdeveloped and redevelopment area is that buildings would be removed as part of the development of the property.

Future year growth could be allocated to 100% of the parcel/grid cells identified as a Redevelopment Area.

Committed Development

Local governments in the region are continually approving development projects that are expected to start construction between the *RTDM* base year and first horizon year. These "committed developments" of a certain size can be hardcoded in the CV Model to alleviate any concerns about development patterns and intensities assumed for the first planning period.

Developments below the thresholds noted in Table 2 are assigned using the Allocator 5 wizard in CV software.

Table 2: Project Thresholds for Committed Development Inventory

Category	Threshold
Residential Neighborhoods	> 250 d.u.'s
Multifamily Development	> 150 d.u.'s
Commercial Centers	> 250,000 sq.ft.
Office Centers	> 250,000 sq.ft.
Industrial Centers	> 250,000 sq.ft.
Mixed-Use Projects	> 250,000 sq.ft. & 150 d.u.'s

Place Types

Place Types in the RTDM portion of the SPGA study area tell CV which set of equations to use for estimating the development yield (build-out potential) of a grid cell. And when combined with the land suitability analysis scores and development status assignments, it would establish the order and supply available for a grid cell to receive future growth in the model.

Place Type Assignments

Place Types must be assigned to all parcels in the project area. The assignments are made based on a parcels existing land use or based on a future use envisioned by the base year's horizon year(s). Guidance for determining which Place Type should be assigned to a parcel is provided in Appendix F.

Place Type Category Descriptions

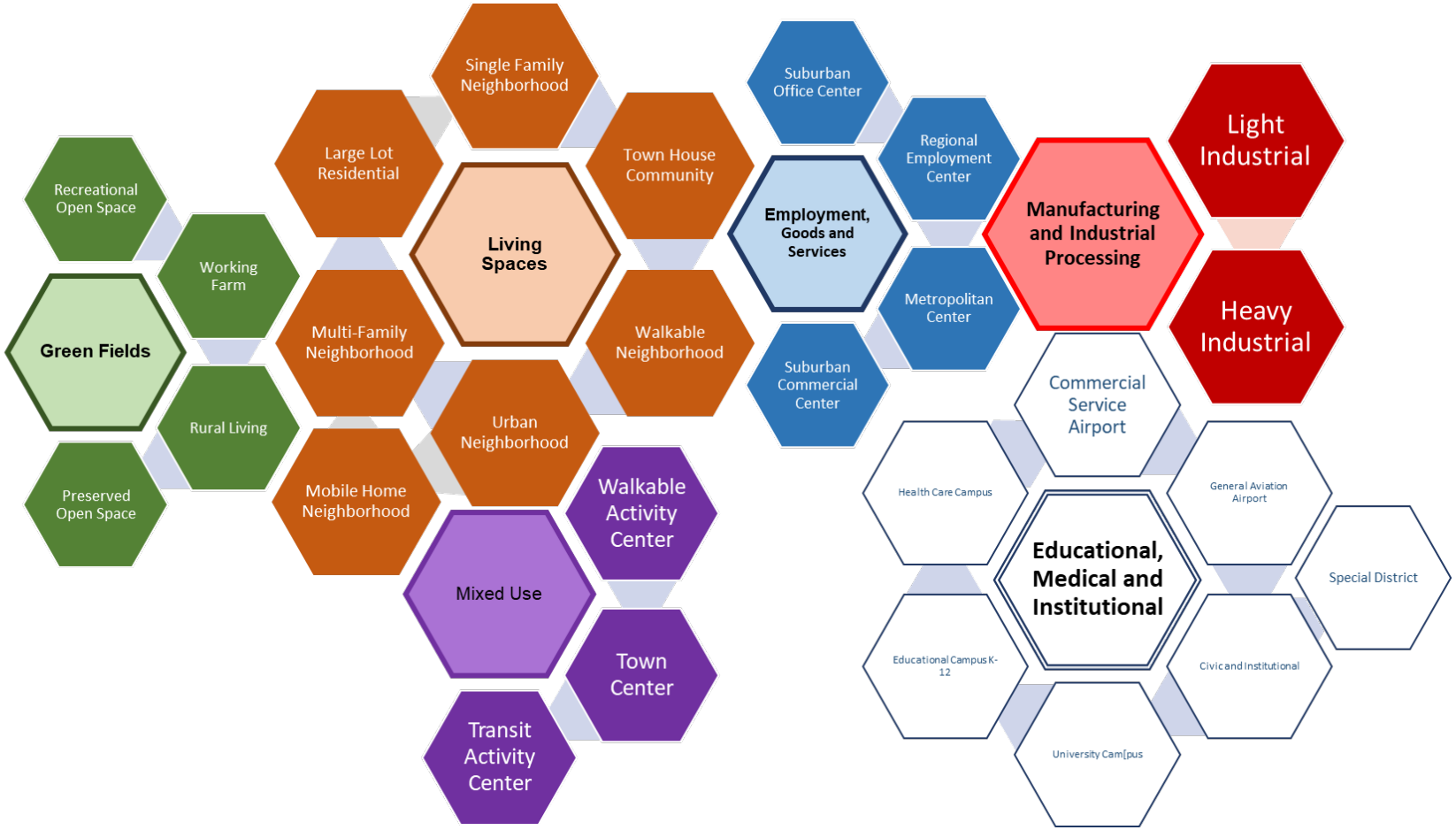
Twenty-seven Place Types capture different development types, patterns and intensities observed in the RTDM portion of the SPGA study area. Each Place Type is associated with one of six Community Patterns. A description of each Place Type is provided on the following pages. The Place Types and their relationships to each other are detailed in Figure 3 followed by a description of the information found in each summary. The Place Types are listed in order by the intensity of land use it describes within each Community Pattern.

Description: Each Place Type has a written description and representative picture.

Land Uses: Primary and secondary land uses listed for the Place Type represent typical development in the category. They are not meant to be an exhaustive list of all permitted or conditional uses that would be allowed in the Place Type.

Form & Pattern: The form and pattern table inventories generalized development characteristics associated with the Place Type. Working together, these elements reinforce a sense of place and community brand important to distinguishing development in this category from others in the region. Abbreviations found in the Form & Pattern chart are DU = Dwelling Unit, FAR = Floor Area Ratio, SF = Square Feet, LF = Linear Feet, and GPD = Gallons per Day.

Figure 5: Community Patterns and Place Types



PRESERVED OPEN SPACE (POS)

COMMUNITY PATTERN – "GREEN" FIELDS

Description of the Preserved Open Space

Land dedicated to permanent conservation by legal means. These areas may be preserved because of their outstanding natural beauty, or because they serve environmental stewardship or wildlife management purposes. The areas are undisturbed or undeveloped and have been protected from development by federal, state or local agencies; or by public, private or non-profit organizations. In the RTDM portion of the SPGA study area, these areas would include state parks, permanent conservation areas, and cemeteries and (at a smaller scale) dedicated open space within residential neighborhoods.

Preserved Open Space

Land Uses Typically Found in a Preserved Open Space

Primary Land Uses

- state park/wildlife refuge area
- permanent conservation areas
- natural area
- wildlife corridor
- stormwater retention/detention area

Secondary Land Uses

- cemetery
- dedicated open space in residential neighborhoods

Form & Function of the Preserved Open Space	
General Development Pattern	Separated Uses
Site Efficiency Factor	N/A
Typical Lot Coverage	N/A
Residential Density	N/A
Non-Residential Intensity	N/A
Prevailing Building Height	N/A
Average Dwelling Unit Size	N/A
Average Non-Residential Building Size	N/A
Transportation Choices	Auto, Bicycle, Walking
Typical Block Length	N/A
Setback or Build-To Line	N/A
Open Space Elements	Natural Areas, Greenways
Street Pattern	Curvilinear
Street Connectivity	Low
Parking Provisions	N/A
Typical Street Cross Section	N/A
Water Supply and Usage	N/A
Sewer Treatment and Discharge	N/A

Recreational Open Space (ROS)

COMMUNITY PATTERN – "GREEN" FIELDS

Description of the Recreational Open Space
Land dedicated for active and passive recreational uses. These areas are intended to be publicly accessible. These areas would include municipal and community parks, open air sports complexes and athletic fields.


Recreational Open Space

Land Uses Typically Found in a Recreational Open Space

Primary Land Uses

- state, regional, and municipal parks
- greenways
- athletic fields, golf courses
- sports complexes

Secondary Land Uses

- community, neighborhood, "pocket" parks
- water dependent, recreation activities

Form & Pattern of the Recreational Open Space	
General Development Pattern	Separated Uses
Site Efficiency Factor	N/A
Typical Lot Coverage	N/A
Residential Density	N/A
Non-Residential Intensity	N/A
Prevailing Building Height	N/A
Average Dwelling Unit Size	N/A
Average Non-Residential Building Size	N/A
Transportation Choices	Auto, Bicycle, Walking
Typical Block Length	N/A
Setback or Build-To Line	N/A
Open Space Elements	Natural Areas, Greenways
Street Pattern	Curvilinear
Street Connectivity	Low
Parking Provisions	N/A
Typical Street Cross Section	Rural/Suburban
Water Supply and Usage	N/A
Sewer Treatment and Discharge	N/A

WORKING FARM (WF)

COMMUNITY PATTERN – "GREEN" FIELDS

Description of a Working Farm

Land actively being used for agriculture or forestry activities, including cultivated farmland, timber harvest, livestock and woodlands. These areas may also support the primary residence of the property owner and any out-buildings associated with activities on the working farm.

Working Farm

Land Uses Typically Found in a Working Farm

Primary Land Uses

- Large- and small-scale farming operations
- Cultivated farmland
- Timber harvest
- Livestock
- Woodlands
- Properties under a Voluntary Agricultural District and designated as a bona-fide farm

Secondary Land Uses

- Single-family detached home
- Warehouse/storage
- Light industrial (ancillary to farm activities)
- Agritourism site
- Winery with restaurant and/or retail sales

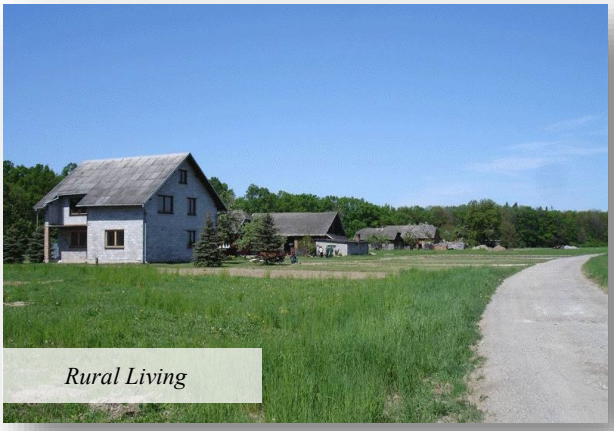
Form and Pattern of the Working Farm	
General Development Pattern	Separated Uses
Site Efficiency Factor	99%
Typical Lot Coverage	1 to 5%
Residential Density	Greater than 3 acres per DU
Non-Residential Intensity	0.05 to 0.10 FAR
Prevailing Building Height	1 Story
Average Dwelling Unit Size	1,500 to 2,000 SF
Average Non-Residential Building Size	N/A
Transportation Choices	Auto
Typical Block Length	N/A
Setback or Build-To Line	Setback requirements
Open Space Elements	Cultivated Farmland, Woodlands
Street Pattern	N/A
Street Connectivity	Low
Parking Provisions	N/A
Typical Street Cross Section	Rural
Water Supply and Usage	Private Well / Varies
Sewer Treatment and Discharge	Septic System / Varies

RURAL LIVING (RL)

COMMUNITY PATTERN - "GREEN" FIELDS

Description of Rural Living

Land characterized by large lots, abundant open space and a high degree of separation between buildings. Large acreage, rural family homes and "hobby farms" are scattered throughout the countryside and often integrated into the landscape. The lot size and distance between dwelling units decrease with greater development densities. Small nodes of commercial activity — gas stations, convenience stores or restaurants — are concentrated at rural crossroads, serving some daily needs of the surrounding rural population.



Rural Living

Land Uses Typically Found a Rural Living

Primary Land Uses

- large estates
- single family dwelling or single lot mobile homes
- small horse or "hobby farms"

Secondary Land Uses

- small scale commercial activity serving some daily needs of the surrounding rural population
- churches
- natural areas

Form & Pattern of the Rural Living	
General Development Pattern	Separated Uses
Site Efficiency Factor	N/A
Typical Lot Coverage	N/A
Residential Density	Greater than 3 acres per DU
Non-Residential Intensity	Low
Prevailing Building Height	35 FT
Average Dwelling Unit Size	2,500 SF
Average Non-Residential Building Size	< 1,000 SF
Transportation Choices	Auto
Typical Block Length	N/A
Setback or Build-To Line	Setback
Open Space Elements	Natural Areas, Greenways
Street Pattern	Curvilinear
Street Connectivity	Low
Parking Provisions	2 per dwelling unit
Typical Street Cross Section	Rural/Suburban
Water Supply and Usage	Private or community well / 250 GPD
Sewer Treatment and Discharge	Private or community system / 250 GPD

LARGE-LOT RESIDENTIAL (LLR)

COMMUNITY PATTERN – Living Spaces

Description of the Large-Lot Residential

Land generally formed as subdivisions, which consist almost entirely of single-family detached homes. Buildings are oriented interior to the site and are typically buffered from surrounding development by transitional uses, topography or vegetative areas. Many neighborhoods 'borrow' open space from adjacent rural or natural settings. Blocks are typically large, and streets rural or suburban in character. In some cases, the neighborhood is served by only one long cul-de-sac.

Large-Lot Residential

Land Uses Typically found in the Large-Lot Residential

Primary Land Uses

- single family residential development

Secondary Land Uses

- home occupations
- duplexes (isolated cases not multiples in a unified development)
- churches
- school
- community center
- pool and amenities
- natural areas
- horse stable

Form & Pattern of the Large-Lot Residential	
General Development Pattern	Separated Uses
Site Efficiency Factor	N/A
Typical Lot Coverage	N/A
Residential Density	1 to 3 acres per DU
Non-Residential Intensity	Low
Prevailing Building Height	35 FT
Average Dwelling Unit Size	2,500 SF
Average Non-Residential Building Size	< 1,000 SF
Transportation Choices	Auto
Typical Block Length	N/A
Setback or Build-To Line	30 feet to 50 FT
Open Space Elements	Natural Areas, Greenways
Street Pattern	Curvilinear
Street Connectivity	Low
Parking Provisions	2 per DU
Typical Street Cross Section	Rural/Suburban
Water Supply and Usage	Private or community well / 250 GPD
Sewer Treatment and Discharge	Private or community system / 250 GPD

SINGLE-FAMILY NEIGHBORHOOD (SFN)

COMMUNITY PATTERN – Living Spaces

Description of the Single-Family Neighborhood

This includes land generally formed as subdivisions or communities, with a relatively uniform housing type and density throughout. They may support a variety of single-family detached residential types, low-density single-family homes to denser formats of smaller single-family detached homes. Homes are oriented interior to the neighborhood and typically buffered from surrounding development by transitional uses or landscaped areas. Single-family neighborhoods are often found in close proximity to suburban commercial, suburban office and suburban mixed-use centers, which help provide the consumers or employees needed to support these businesses.

Single-Family Neighborhood

Land Uses Typically found in the Single-Family Neighborhood

Primary Land Uses

- single-family residential development

Secondary Land Uses

- duplex development
- mobile home
- church
- school
- community center
- park or playground
- natural areas

Form & Pattern in the Single-Family Neighborhood	
General Development Pattern	Separated Uses
Site Efficiency Factor	N/A
Typical Lot Coverage	N/A
Residential Density	½ to 2 acres per DU
Non-Residential Intensity	Medium
Prevailing Building Height	35 FT
Average Dwelling Unit Size	2,500 SF
Average Non-Residential Building Size	< 1,000 SF
Transportation Choices	Auto
Typical Block Length	N/A
Setback or Build-To Line	30 feet to 50 FT
Open Space Elements	Natural Areas, Greenways
Street Pattern	Curvilinear
Street Connectivity	Low
Parking Provisions	2 per dwelling unit
Typical Street Cross Section	Rural/Suburban
Water Supply and Usage	Private or community well / 250 GPD
Sewer Treatment and Discharge	Private or community system / 250 GPD

MOBILE HOME NEIGHBORHOOD (MHN)

COMMUNITY PATTERN – Living Spaces

Description of the Mobile Home Neighborhood

Mobile home neighborhoods are characterized by single-wide and double-wide mobile homes on individual lots, which may be clustered in an area owned and managed by a single entity. These neighborhoods are found throughout the region and often provide an affordable housing option for residents.

Mobile Home Neighborhood

Land Uses Typically found in the Mobile Home Neighborhood

Primary Land Uses

- single-wide mobile home
- double-wide mobile home
- modular home

Secondary Land Uses

- community center
- pool and amenities

Form & Pattern of the Mobile Home Neighborhood	
General Development Pattern	Separated Uses
Site Efficiency Factor	90 to 95%
Typical Lot Coverage	50 to 65%
Residential Density	6 – 12 DU per Acre
Non-Residential Intensity	N/A
Prevailing Building Height	1 Story
Average Dwelling Unit Size	500 to 1,000 SF
Average Non-Residential Building Size	N/A
Transportation Choices	Auto
Typical Block Length	400 – 800 LF
Setback or Build-To Line	Setback Requirements
Open Space Elements	Natural Areas, Greenways
Street Pattern	Curvilinear
Street Connectivity	Low
Parking Provisions	Private Driveway
Typical Street Cross Section	Rural/Suburban
Water Supply and Usage	Private, community well or public 200 GPD per Unit
Sewer Treatment and Discharge	Private or community system 200 GPD per Unit

TOWN HOME COMMUNITY (THC)

COMMUNITY PATTERN – Living Spaces


Town Home Community

Description of the Town Home Community

A Town Home Community is generally developed to provide pockets of greater residential density, often in locations that create a transition between commercial or mixed-use areas and small-lot or large-lot single family neighborhoods. The denser development intensities help provide "rooftops" to support nearby suburban commercial, suburban office or suburban mixed-use centers.

Land Uses Typically found in the Town Home Community

Primary Land Uses

- attached 2 to 3 story dwelling units
- attached single story 2-unit buildings

Secondary Land Uses

- community center
- pool and amenities

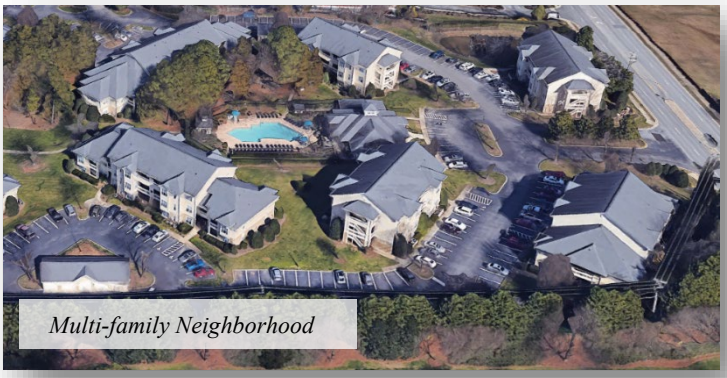
Form & Pattern of the Town Home Community	
General Development Pattern	Separated Uses
Site Efficiency Factor	80 to 90%
Typical Lot Coverage	75 to 100%
Residential Density	6 – 12 DUs per Acre
Non-Residential Intensity	N/A
Prevailing Building Height	2 to 3 Story
Average Dwelling Unit Size	750 to 1,500 SF
Average Non-Residential Building Size	N/A
Transportation Choices	Auto
Typical Block Length	400 – 800 LF
Setback or Build-To Line	Setback Requirements
Open Space Elements	Natural Areas, Greenways
Street Pattern	Curvilinear
Street Connectivity	Low
Parking Provisions	Private Driveway
Typical Street Cross Section	Private Street / Drive
Water Supply and Usage	Private, community well or public 200 GPD per Unit
Sewer Treatment and Discharge	Private or community system 200 GPD per Unit

MULTI-FAMILY NEIGHBORHOOD (MFN)

COMMUNITY PATTERN – Living Spaces

Description of the Multi-family Neighborhood

A Multi-family Neighborhood is generally formed as complexes or communities, with a relatively uniform housing type and density throughout. They support the highest residential density in the suburban landscape and may support condominiums or apartments.



Multi-family Neighborhood

Multi-family neighborhoods are found in close proximity to suburban commercial, suburban office and suburban mixed-use centers, which helps provide the consumers and employees needed to support these centers. Buildings are oriented interior to the site and typically buffered from surrounding development by transitional uses or landscaped areas. Large parking lots and low street connectivity are common in suburban multifamily neighborhoods.

Land Uses Typically found in the Multi-Family Neighborhood

Primary Land Uses

- apartment
- townhome
- condominium
- senior housing

Secondary Land Uses

- church
- community center
- pool and amenities
- natural areas

Form & Pattern of the Multi-family Neighborhood	
General Development Pattern	Separated Uses
Site Efficiency Factor	90 to 95%
Typical Lot Coverage	30 to 60%
Residential Density	6 – 16 Dwelling Units per Acre
Non-Residential Intensity	N/A
Prevailing Building Height	1 to 3 Stories
Average Dwelling Unit Size	800 to 1,500 SF
Average Non-Residential Building Size	N/A
Transportation Choices	Auto
Typical Block Length	600 – 1,200 LF
Setback or Build-To Line	Setback Requirements
Open Space Elements	Greenways, Neighborhood Park
Street Pattern	Modified Grid
Street Connectivity	Medium
Parking Provisions	Surface Lot / On-Street Parking
Typical Street Cross Section	Suburban
Water Supply and Usage	Public 220 GPD per Unit
Sewer Treatment and Discharge	Public 180 GPD per Unit

URBAN NEIGHBORHOOD (UN)

COMMUNITY PATTERN – Living Spaces

Description of the Urban Neighborhood

Urban Neighborhoods support a mix of moderate- to high-density housing options. These neighborhoods are relatively compact and may contain one or more of the following housing types: single family detached (small lots), townhomes, condominiums or apartments.

Urban Neighborhood

Buildings are generally oriented toward the street. The design and scale of development in an urban neighborhood encourages active living with a complete and comprehensive network of walkable streets. Cul-de-sacs are restricted to areas where topography, environmental constraints or existing development makes other street connections prohibitive.

Land Uses Typically found in the Urban Neighborhood

Primary Land Uses

- single-family detached home
- townhome
- duplex
- apartment
- condominium

Secondary Land Uses

- church
- school
- pocket park

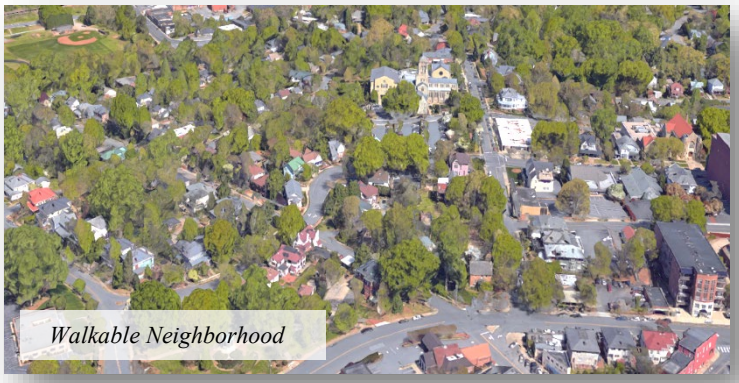
Form & Pattern of the Urban Neighborhood	
General Development Pattern	Mix of Uses
Site Efficiency Factor	80 to 90%
Typical Lot Coverage	30 to 65%
Residential Density	6 – 10 Dwelling Units per Acre
Non-Residential Intensity	N/A
Prevailing Building Height	1 to 3 Stories
Average Dwelling Unit Size	1,000 to 2,000 SF
Average Non-Residential Building Size	N/A
Transportation Choices	Auto
Typical Block Length	300 – 600 LF
Setback or Build-To Line	Setback Requirements
Open Space Elements	Greenways, Neighborhood Park
Street Pattern	Grid
Street Connectivity	High
Parking Provisions	Surface Lot / Private Drive
Typical Street Cross Section	Urban
Water Supply and Usage	Public 220 GPD per Unit
Sewer Treatment and Discharge	Public 180 GPD per Unit

WALKABLE NEIGHBORHOOD (WN)

COMMUNITY PATTERN – Living Spaces

Description of the Walkable Neighborhood

A Walkable Neighborhood offers residents the opportunity to live, shop, work and play in one community. These neighborhoods include a mixture of housing types and residential densities, integrated with goods and services in a walkable community that residents visit on a daily basis. The design and scale of the development encourages active living through a comprehensive and interconnected network of walkable streets. Walkable neighborhoods support multiple modes of transportation.



Walkable Neighborhood

Land Uses typically found in the Walkable Neighborhood

Primary Land Uses

- single-family detached home
- condominium
- apartment
- townhome
- sit down restaurant
- neighborhood-serving commercial
- professional office
- government building

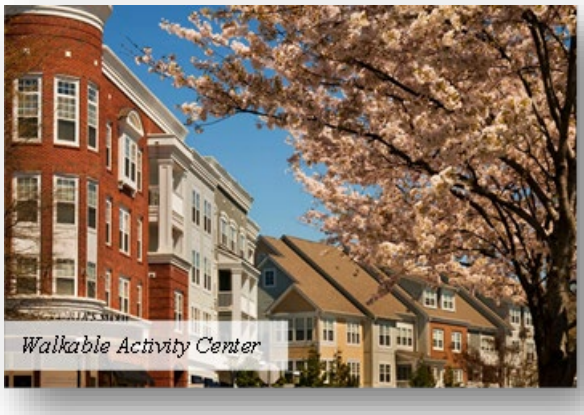
Secondary Land Uses

- church
- school
- pocket park
- community park
- natural areas

Form & Pattern of the Walkable Neighborhood	
General Development Pattern	Mix of Uses
Site Efficiency Factor	80 to 90%
Typical Lot Coverage	35 to 60%
Residential Density	4 – 12 DUs per Acre
Non-Residential Intensity	0.50 – 1.50 FAR
Prevailing Building Height	1 to 4 Stories
Average Dwelling Unit Size	1,000 to 3,000 SF
Average Non-Residential Building Size	8,000 – 50,000 SF
Transportation Choices	Auto, Walking, Bicycle, Transit
Typical Block Length	300 – 1,200 LF
Setback or Build-To Line	Build-To Line
Open Space Elements	Pocket Parks, Public Plazas, Amphitheater
Street Pattern	Grid
Street Connectivity	High
Parking Provisions	Surface Lot / Formal On-Street Parking / Shared Parking Agreements
Typical Street Cross Section	Suburban / Urban
Water Supply and Usage (GPD)	Public - 225 per DU, 0.039 per SF
Sewer Treatment and Discharge (GPD)	Public – 200 per DU, 0.034 per SF

WALKABLE ACTIVITY CENTER (WAC)

COMMUNITY PATTERN – URBAN WALKABLE COMMUNITY



Description of the Walkable Activity Center

A Walkable Activity Center serves broader economic, entertainment and community activities (compared to walkable neighborhoods). Uses and buildings are located on small blocks with streets designed to encourage pedestrian activities. Buildings in the core of a walkable activity center may stand three or more stories. Residential units or office space may be found above storefronts.

Parking is satisfied by using on-street parking, structured parking and shared rear-lot parking strategies. A large-scale walkable activity center may be surrounded by one or more walkable neighborhoods that encourage active living, with a comprehensive and interconnected network of walkable streets.

Land Uses Typically Found in a Walkable Activity Center

Primary Land Uses

- sit down restaurant
- community-serving retail
- professional office
- live/work/shop units
- townhome
- condominium
- apartment
- public plaza
- movie theater

Secondary Land Uses

- farmers market
- pocket park
- day care center
- dry cleaners

Form and Pattern of a Walkable Activity Center	
General Development Pattern	Mix of Uses
Site Efficiency Factor	80 to 90%
Typical Lot Coverage	50 to 75%
Residential Density	10 to 30 DUs per Acre
Non-Residential Intensity	0.50 – 2.0 FAR
Prevailing Building Height	1 to 5 Stories
Average Dwelling Unit Size	800 to 1,500 SF
Average Non-Residential Building Size	10,000 to 50,000 SF
Transportation Choices	Auto, Walking, Bicycle, Transit
Typical Block Length	400 to 1,000 LF
Setback or Build-To Line	Build-To Line Requirements
Open Space Elements	Neighborhood / Pocket Parks / Public Plazas
Street Pattern	Modified Grid
Street Connectivity	High
Parking Provisions	Surface Lot / Structured Parking
Typical Street Cross Section	Urban
Water Supply and Usage (GPD)	Public - 180 per DU, 0.039 per SF
Sewer Treatment and Discharge (GPD)	Public – 150 per DU, 0.034 per SF

TRANSIT ACTIVITY CENTER (TAC)

COMMUNITY PATTERN – URBAN WALKABLE COMMUNITY

Transit Activity Center

Description of a Transit Activity Center

A Transit Activity Center represents the concentration of mixed-use, dense development around a transit center, whether serving bus rapid transit, light rail or commuter rail. Uses and buildings are located on small blocks with streets designed to encourage bicycle and pedestrian activity. High-density development is located primarily within ¼ mile of the transit station, with progressively lower densities spreading out into neighborhoods surrounding the center.

Different transit technologies would spur slightly different development patterns and intensities around transit centers, but their similarities are more important than their differences for the Place Type.

Land Uses Typically found in a Transit Activity Center

Primary Land Uses

- condominium
- apartment
- townhome
- sit down restaurant
- general commercial
- professional office
- live/work/shop units
- government building

Secondary Land Uses

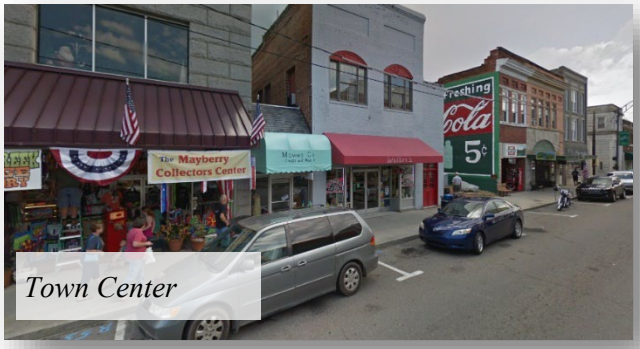
- church
- school
- public plaza
- pocket park
- parking structure

Form & Pattern of the Transit Activity Center	
General Community Pattern	Mix of Uses
Site Efficiency Factor	80 to 90%
Typical Lot Coverage	90 to 100%
Residential Density	8 – 15 DUs per Acre
Non-Residential Intensity	0.50 – 1.50 FAR
Prevailing Building Height	2 to 6 Stories
Average Dwelling Unit Size	800 to 1,500 SF
Average Non-Residential Building Size	5,000 – 25,000 SF
Transportation Choices	Auto, Walking, Bicycle, Transit
Typical Block Length	300 – 1,200 LF
Setback or Build-To Line	Build-To Line Requirement
Open Space Elements	Pocket Parks / Public Plazas
Street Pattern	Grid
Street Connectivity	High
Parking Provisions	Surface Lot / Formal On-Street Parking / Shared Parking Agreements / Parking Deck
Typical Street Cross Section	Urban
Water Supply and Usage (GPD)	Public - 180 per DU, 0.039 per SF
Sewer Treatment and Discharge (GPD)	Public – 150 per DU, 0.034 per SF

TOWN CENTER (TC)

DEVELOPMENT PATTERN – URBAN WALKABLE COMMUNITY

Description of a Town Center A Town Center includes land that satisfies daily economic, entertainment and community needs for surrounding neighborhoods. Uses and buildings are located on small blocks with streets designed to encourage pedestrian activity. Buildings in a town center typically stand two or more stories in height with non-residential uses on the ground floor and residential units above storefronts.



Town Center

Neighborhoods surrounding the commercial core are relatively compact and support moderate- to high-density housing options, including single-family homes (small lots), townhomes, condominiums and apartments.

Land Uses Typically found in a Town Center

Primary Land Uses
- townhome
- apartment
- senior housing
- sit down restaurant
- community-serving commercial
- professional office
- live/work/shop units
- post office
- community facilities

Secondary Land Uses
- day care
- farmers market
- pocket park

Form & Pattern of the Town Center	
General Development Pattern	Mix of Uses
Site Efficiency Factor	80 to 90%
Typical Lot Coverage	90 to 100%
Residential Density	6 – 10 DUs per Acre
Non-Residential Intensity	0.50 – 1.50 FAR
Prevailing Building Height	2 to 4 Stories
Average Dwelling Unit Size	800 to 1,500 SF
Average Non-Residential Building Size	5,000 – 25,000 SF
Transportation Choices	Auto, Walking, Bicycle, Transit (bus)
Typical Block Length	300 – 1,200 LF
Setback or Build-To Line	Build-To Line Requirement
Open Space Elements	Pocket Parks / Public Plazas
Street Pattern	Grid
Street Connectivity	High
Parking Provisions	Surface Lot / Formal On-Street Parking / Shared Parking Agreements
Typical Street Cross Section	Urban
Water Supply and Usage (GPD)	Public - 225 per DU, 0.039 per SF
Sewer Treatment and Discharge (GPD)	Public – 200 per DU, 0.034 per SF

LIGHT INDUSTRIAL CENTER (LI)

COMMUNITY PATTERN – MANUFACTURING AND INDUSTRIAL PROCESSING

Description of a Light Industrial Center

A Light Industrial Center consists of supporting opportunities to concentrate employment on normal workdays. Each center generally supports manufacturing and production uses; including warehousing, light manufacturing, medical research and assembly operations. These areas are found in close proximity to major transportation corridors (i.e., highway or rail) and are generally buffered from surrounding development by transitional uses or landscaped areas that shield the view of structures, loading docks or outdoor storage from adjacent properties.


Light Industrial

Clusters of uses that support or serve one another are often encouraged to locate in the same light industrial center.

Land Uses Typically found in a Light Industrial Center

Primary Land Uses

- light manufacturing and assembly
- processing facilities
- laboratory
- warehouse
- distribution

Secondary Land Uses

- small scale commercial uses
- natural areas

Form & Pattern of the Light Industrial Center	
General Development Pattern	Separated Uses
Site Efficiency Factor	80 to 90%
Typical Lot Coverage	15 to 65%
Residential Density	N/A
Non-Residential Intensity	0.10 – 0.20 FAR
Prevailing Building Height	1 to 2 Stories
Average Dwelling Unit Size	N/A
Average Non-Residential Building Size	10,000 – 50,000 SF
Transportation Choices	Auto, Trucks
Typical Block Length	800 – 1,200 LF
Setback or Build-To Line	Setback Requirements
Open Space Elements	Landscape Buffers
Street Pattern	Curvilinear
Street Connectivity	Low
Parking Provisions	Surface Lot
Typical Street Cross Section	Suburban
Water Supply and Usage (GPD)	0.079 per SF
Sewer Treatment and Discharge (GPD)	0.069 per SF

Heavy Industrial Center (HI)

COMMUNITY PATTERN – MANUFACTURING AND INDUSTRIAL PROCESSING

Description of a Heavy Industrial Center

A Heavy Industrial Center consists of land supporting large-scale manufacturing and production uses; including assembly and processing, regional warehousing and distribution, bulk storage and utilities. These areas are found in close proximity to major transportation corridors (i.e., highway or rail) and are generally buffered from surrounding development by transitional uses or landscape areas that increase in size as development intensity increases.


Heavy Industrial

Heavy industrial centers may require larger sites because activities are not confined entirely to buildings. Conveyer belts, holding tanks, smoke stacks or outdoor storage all may be present. Clusters of uses that support or serve heavy industrial centers generally locate in close proximity.

Land Uses Typically found in a Heavy Industrial Center

Primary Land Uses

- factory
- heavy assembly plant
- construction contractor
- regional warehouse
- regional distribution and trucking
- landfill

Secondary Land Uses

- small scale commercial uses
- natural areas

Form & Pattern of the Heavy Industrial Center	
General Development Pattern	Separated Uses
Site Efficiency Factor	80 to 90%
Typical Lot Coverage	10 to 40%
Residential Density	N/A
Non-Residential Intensity	0.10 – 0.20 FAR
Prevailing Building Height	1 to 2 Stories
Average Dwelling Unit Size	N/A
Average Non-Residential Building Size	20,000 – 300,000 SF
Transportation Choices	Auto, Trucks
Typical Block Length	800 – 1,200 LF
Setback or Build-To Line	Setback Requirements
Open Space Elements	Landscape Buffers
Street Pattern	Curvilinear
Street Connectivity	Low
Parking Provisions	Surface Lot
Typical Street Cross Section	Suburban
Water Supply and Usage (GPD)	0.079 per SF
Sewer Treatment and Discharge (GPD)	0.069 per SF

METROPOLITAN CENTER (MC)

COMMUNITY PATTERN – EMPLOYMENT, GOODS AND SERVICES


Metropolitan Center

Description of a Metropolitan Center

A Metropolitan Center is a major hub for employment, entertainment, civic and cultural activities with a mix of housing types and common open space for active living. As a magnet to surrounding towns and neighborhoods, the metropolitan center becomes an iconic symbol in the region, starting with very tall buildings and a compact street network. The walkable environment and mix of residential and non-residential uses in a metropolitan center support multiple modes of transportation.

Land Uses Typically found in a Metropolitan Center

Primary Land Uses

- condominium or townhome
- apartment
- corporate headquarters
- sit down restaurant
- community-serving commercial
- professional office
- live/work/shop units
- museum
- library
- arena/conference center
- regional transportation hub
- government buildings

Secondary Land Uses

- church
- school
- public plaza
- pocket park
- parking deck

Form & Pattern of the Metropolitan Center	
General Development Pattern	Mix of Uses
Site Efficiency Factor	80 to 90%
Typical Lot Coverage	90 to 100%
Residential Density	10 – 100 DUs per Acre
Non-Residential Intensity	1.0 – 30.0 FAR
Prevailing Building Height	1 to 30 Stories
Average Dwelling Unit Size	800 to 2,000 SF
Average Non-Residential Building Size	10,000 – 200,000 SF
Transportation Choices	Auto, Walking, Bicycle, Transit (bus)
Typical Block Length	300 – 600 LF
Setback or Build-To Line	Build-To Line Requirement
Open Space Elements	Pocket Parks / Public Plazas
Street Pattern	Grid
Street Connectivity	High
Parking Provisions	Surface Lot / Formal On-Street Parking / Shared Parking Agreements
Typical Street Cross Section	Urban
Water Supply and Usage (GPD)	Public - 180 per DU, 0.039 per SF
Sewer Treatment and Discharge (GPD)	Public – 150 per DU, 0.034 per SF

SUBURBAN COMMERCIAL CENTER (SCC)

COMMUNITY PATTERN – EMPLOYMENT, GOODS AND SERVICES

Suburban Commercial

Description of a Suburban Commercial Center

A Suburban Commercial Center consists of land supporting the daily needs of surrounding suburban residential neighborhoods. They typically locate near high volume roads and key intersections and are designed to be accessible primarily by automobile. Buildings are set back from the road behind large surface parking lots with little connectivity between adjacent businesses. Common types of suburban centers in the RTDM portion of the SPGA study area include multi-tenant strip centers, big box stores, small outparcels with a drive-through and large shopping malls.

Land Uses Typically found in a Suburban Commercial Center

Primary Land Uses

- general commercial services
- sit down or fast-food restaurant
- multi-tenant commercial
- big box commercial
- bank
- police station
- hotel
- professional office

Secondary Land Uses

- church
- fire station

Form & Pattern of Suburban Commercial Center	
General Development Pattern	Separate Uses
Site Efficiency Factor	80 to 90%
Typical Lot Coverage	20-40%
Residential Density	N/A
Non-Residential Intensity	0.15 – 0.25 FAR
Prevailing Building Height	1 to 2 Stories
Average Dwelling Unit Size	N/A
Average Non-Residential Building Size	10,000 – 300,000 SF
Transportation Choices	Auto
Typical Block Length	N/A
Setback or Build-To Line	Setback Requirements
Open Space Elements	Natural Areas
Street Pattern	N/A
Street Connectivity	N/A
Parking Provisions	Surface Lot
Typical Street Cross Section	Suburban
Water Supply and Usage (GPD)	Public - 0.039 per SF
Sewer Treatment and Discharge (GPD)	Public – 0.034 per SF

SUBURBAN OFFICE CENTER (SOC)

COMMUNITY PATTERN – EMPLOYMENT, GOODS AND SERVICES


Suburban Office

Description of a Suburban Office Center

A Suburban Office Center consists of land supporting opportunities to concentrate employment on normal workdays. They include both large-scale isolated buildings with numerous employees as well as areas containing multiple office uses that support and serve one another. They are typically buffered from surrounding development by transitional uses or landscaped areas and are often located in close proximity to major highways or thoroughfares.

Land Uses Typically found in a Suburban Office Center

Primary Land Uses

- multi-tenant professional office
- medical office
- corporate office
- call center
- research and development

Secondary Land Uses

- bank
- copy and printing services
- sit down or fast-food restaurant
- flex space
- general government services

Form & Pattern of Suburban Office Center	
General Development Pattern	Separate Uses
Site Efficiency Factor	80 to 90%
Typical Lot Coverage	25 - 60%
Residential Density	N/A
Non-Residential Intensity	0.20 – 1.00 FAR
Prevailing Building Height	1 to 3 Stories
Average Dwelling Unit Size	N/A
Average Non-Residential Building Size	10,000 – 100,000 SF
Transportation Choices	Auto
Typical Block Length	800 to 1,200 LF
Setback or Build-To Line	Setback Requirements
Open Space Elements	Pocket Parks, Landscape Buffers
Street Pattern	Curvilinear
Street Connectivity	Low
Parking Provisions	Surface Lot
Typical Street Cross Section	Suburban
Water Supply and Usage (GPD)	Public - 0.074 per SF
Sewer Treatment and Discharge (GPD)	Public – 0.064 per SF

REGIONAL EMPLOYMENT CENTER (REC)

COMMUNITY PATTERN – EMPLOYMENT, GOODS AND SERVICES

Description of a Regional Employment Center

A Regional Employment Center consists of places that draw people from throughout the study area (and beyond) for employment activities. Development is typically large-scale, including a hierarchy of streets, large sites for a building or group of buildings, supporting amenities and dedicated open space. Centers tend to locate near major transportation corridors and often at the intersection of two major highways or an interstate exit. Uses in a regional employment center vary greatly; however, most complement each other in some manner for increased learning, production or other economies of scale

Regional Employment Center

Land Uses Typically found in a Regional Employment Center

Primary Land Uses

- professional office
- corporate campus
- research and development
- government buildings

Secondary Land Uses

- small retail uses
- restaurants

Form & Pattern of Suburban Office Center	
General Development Pattern	Separate Uses
Site Efficiency Factor	70 to 85%
Typical Lot Coverage	25 - 65%
Residential Density	N/A
Non-Residential Intensity	0.10 – 0.50 FAR
Prevailing Building Height	1 to 10 Stories
Average Dwelling Unit Size	N/A
Average Non-Residential Building Size	50,000 – 500,000 SF
Transportation Choices	Auto, Walking and Transit
Typical Block Length	800 to 3,000 LF
Setback or Build-To Line	Setback Requirements
Open Space Elements	Pocket Parks, Greenways
Street Pattern	Curvilinear
Street Connectivity	Low
Parking Provisions	Surface Lot, Parking Deck
Typical Street Cross Section	Suburban/Rural
Water Supply and Usage (GPD)	Public - 0.074 per SF
Sewer Treatment and Discharge (GPD)	Public – 0.064 per SF

HEALTH CARE CAMPUS (HCC)

COMMUNITY PATTERN – EDUCATION, MEDICAL AND INSTITUTIONAL

Description of a Health Care Campus

A Health Care Campus consists of a concentration of various medical and medical-related uses, such as primary care, outpatient surgery, birthing centers and other specialty services. They are relatively large in scale, and may include a hospital, teaching facilities, research and rehabilitation centers and private medical office buildings.

Health Care Campus

Buildings are typically oriented in a campus setting, with large buildings connected via walkways, structured parking or an internal network of streets for circulation.

Land Uses Typically found in a Health Care Campus

Primary Land Uses

- primary care buildings
- emergency services
- research centers
- birthing center
- rehabilitation center
- surface parking lot

Secondary Land Uses

- teaching facilities
- private medical office buildings
- parking deck

Form & Pattern of Health Care Campus	
General Development Pattern	Mixed Uses
Site Efficiency Factor	80 to 90%
Typical Lot Coverage	40 - 60%
Residential Density	N/A
Non-Residential Intensity	0.25 – 2.00 FAR
Prevailing Building Height	1 to 8 Stories
Average Dwelling Unit Size	N/A
Average Non-Residential Building Size	10,000 – 1,000,000 SF
Transportation Choices	Auto
Typical Block Length	N/A
Setback or Build-To Line	Setback Requirements
Open Space Elements	Neighborhood Parks, Pocket Parks, Plazas, Greenways and Stream Corridors
Street Pattern	Grid
Street Connectivity	High
Parking Provisions	Surface Lot, Parking Deck
Typical Street Cross Section	Suburban/Urban
Water Supply and Usage (GPD)	Public - 0.058 per SF
Sewer Treatment and Discharge (GPD)	Public – 0.050 per SF

EDUCATIONAL CAMPUS K-12 (EC)

COMMUNITY PATTERN – EDUCATION, MEDICAL AND INSTITUTIONAL

Description of an Educational Campus K-12

An Educational Campus K-12 is a public, private or charter school that serves students in kindergarten through twelfth grade (including elementary, middle and high schools). These campuses will generally include playgrounds, a gym, and athletic fields. Day care centers and nurseries are not considered part of an educational campus.

Educational Campus K-12

Land Uses Typically found in an Educational Campus K-12

Primary Land Uses

- elementary schools
- middle schools
- high schools

Secondary Uses

- surface parking

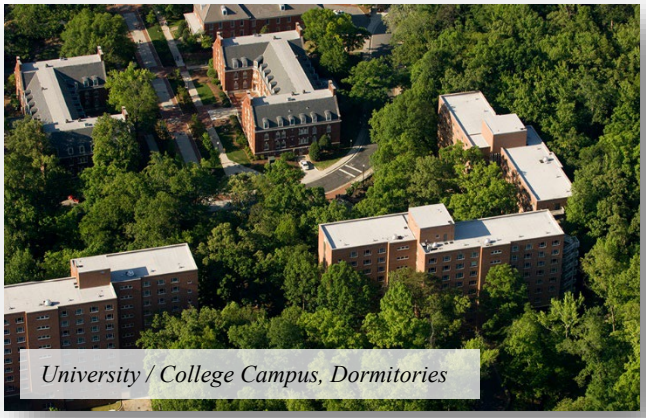
Form & Pattern of Educational Campus K-12	
General Development Pattern	Separate Uses
Site Efficiency Factor	80 to 90%
Typical Lot Coverage	40 - 60%
Residential Density	N/A
Non-Residential Intensity	0.25 – 2.00 FAR
Prevailing Building Height	1 to 2 Stories
Average Dwelling Unit Size	N/A
Average Non-Residential Building Size	10,000 – 1,000,000 SF
Transportation Choices	Auto, Walking. Transit
Typical Block Length	N/A
Setback or Build-To Line	Setback Requirements
Open Space Elements	Landscape Buffers
Street Pattern	N/A
Street Connectivity	N/A
Parking Provisions	Surface Lot
Typical Street Cross Section	Suburban/Urban/Rural
Water Supply and Usage (GPD)	Public - 0.058 per SF
Sewer Treatment and Discharge (GPD)	Public – 0.050 per SF

UNIVERSITY OR COLLEGE CAMPUS, DORMITORIES (UCD)

COMMUNITY PATTERN – EDUCATION, MEDICAL AND INSTITUTIONAL

Description of a University or College Campus, Dormitories

University and College Campus Dormitories consists of the area of a university or college campus that includes residence halls (group quarters) occupied by students of the institution. Buildings are often oriented around a highly walkable network of internal streets and pedestrian pathways, which support several modes of transportation.



University / College Campus, Dormitories

Land Uses Typically found in a University or College Campus, Dormitories

Primary Land Uses

- resident halls
- recreation center
- open space / public plazas

Secondary Land Uses

- supporting retail & restaurants
- residential neighborhood
- parking deck
- surface parking lot

Form & Pattern of University or College Campus, Dormitories	
General Development Pattern	Separate Uses
Site Efficiency Factor	75% to 85%
Typical Lot Coverage	40 - 70%
Residential Density	25 to 100 DU's/Acre
Non-Residential Intensity	0.5 – 3.00 FAR
Prevailing Building Height	1 to 15 Stories
Average Dwelling Unit Size	800 to 1,500 SF
Average Non-Residential Building Size	10,000 – 50,000 SF
Transportation Choices	Auto, Walking. Transit
Typical Block Length	N/A
Setback or Build-To Line	Setback Requirements
Open Space Elements	Open Space Elements, Natural Areas, Plazas, Recreation Fields, Greenways, Stream Corridors
Street Pattern	Grid
Street Connectivity	High
Parking Provisions	Surface Lot
Typical Street Cross Section	N/A
Water Supply and Usage (GPD)	Public - 0.058 per SF
Sewer Treatment and Discharge (GPD)	Public – 0.050 per SF

UNIVERSITY OR COLLEGE CAMPUS, ACADEMIC BUILDINGS (UC)

COMMUNITY PATTERN – EDUCATION, MEDICAL AND INSTITUTIONAL

Description of a University or College Campus, Academic Building (UC)

University or College Campus academic buildings consist of the area of a university or college campus that includes all of the academic buildings and other ancillary employment uses needed to support an institution for higher education. Buildings are often oriented around a highly-walkable network of internal streets and pedestrian pathways, which support several modes of transportation. Structured parking or large surface lots, dedicated areas for public gathering and distinctive architecture also represent a typical university campus.

University/College Campus, Academic

Building uses and intensities on campus vary widely based on the school's mission and available space, topography, etc.

Land Uses Typically found in a University or College Campus, Academic Buildings

Primary Land Uses

- academic buildings
- athletic buildings
- open space / public plazas

Secondary Land Uses

- private research and development buildings
- supporting retail & restaurants
- parking deck
- surface parking lot

Form & Pattern of University or College Campus, Academic Buildings	
General Development Pattern	Separate Uses
Site Efficiency Factor	75% to 85%
Typical Lot Coverage	40 - 70%
Residential Density	N/A
Non-Residential Intensity	0.5 – 3.00 FAR
Prevailing Building Height	1 to 5 Stories
Average Dwelling Unit Size	N/A
Average Non-Residential Building Size	10,000 – 300,000 SF
Transportation Choices	Auto, Walking. Transit
Typical Block Length	N/A
Setback or Build-To Line	Setback Requirements
Open Space Elements	Open Space Elements, Natural Areas, Plazas, Recreation Fields, Greenways, Stream Corridors
Street Pattern	Grid
Street Connectivity	High
Parking Provisions	Surface Lot
Typical Street Cross Section	N/A
Water Supply and Usage (GPD)	Public - 0.058 per SF
Sewer Treatment and Discharge (GPD)	Public – 0.050 per SF

GENERAL AVIATION AIRPORTS (GAA)

COMMUNITY PATTERN – EDUCATION, MEDICAL AND INSTITUTIONAL

Description of General Aviation Airports

General Aviation Airports consists of land that supports commercial or general aviation air traffic into and out of the RTDM portion of the SPGA study area (excluding the Piedmont Triad International Airport). Each airport may include one or more runways, terminals, taxiways, jet fuel and storage facilities, or paved aircraft parking areas. Complimentary uses (e.g., rental car facilities, hotels, restaurants, long-term parking lots) may surround an airport. Restrictions on use, building or structure placement, and maximum height are enforced in designated runway airspace protection areas.

General Aviation Airports

Land Uses Typically found in a General Aviation Airports

Primary Land Uses

- airport activities (e.g., commercial terminal, control tower, freight facilities, etc.)
- flight school
- warehouse
- aviation-related maintenance and repair
- shipping

Secondary Land Uses

- light industrial
- heavy industrial
- professional office
- hotel
- general commercial parking decks
- surface parking lots
-

Form & Pattern of a General Aviation Airport	
General Development Pattern	Separate Uses
Site Efficiency Factor	70% to 80%
Typical Lot Coverage	10 - 15%
Residential Density	N/A
Non-Residential Intensity	0.05 – 0.100 FAR
Prevailing Building Height	1 Stories
Average Dwelling Unit Size	N/A
Average Non-Residential Building Size	3,000 – 100,000 SF
Transportation Choices	Auto, Airplanes
Typical Block Length	300 to 600 LF
Setback or Build-To Line	Setback Requirements
Open Space Elements	Natural Areas
Street Pattern	Grid
Street Connectivity	High
Parking Provisions	Surface Lot
Typical Street Cross Section	N/A
Water Supply and Usage (GPD)	Public - 0.058 per SF
Sewer Treatment and Discharge (GPD)	Public – 0.050 per SF

COMMERCIAL SERVICE AIRPORTS (CSA)

COMMUNITY PATTERN – EDUCATION, MEDICAL AND INSTITUTIONAL

Description of a Commercial Service Airport

Piedmont Triad International Airport is the only commercial service airport in the region. It consists of land that supports commercial and general aviation air traffic into and out of Piedmont Triad International Airport; including multiple runways, terminals, taxiways, jet fuel and storage facilities, and paved aircraft parking areas. Complimentary uses (e.g., rental car facilities, hotels, restaurants, long-term parking lots, etc.) also surround the airport. Restrictions on use, building or structure placement, and maximum height are enforced in designated runway airspace protection areas.

Commercial Service Airports

Land Uses Typically found in a Commercial Service Airport

Primary Land Uses

- airport activities (e.g., commercial terminal, control tower, freight facilities, etc.)
- flight school
- warehouse
- aviation-related maintenance and repair
- shipping

Secondary Land Uses

- light and heavy industrial
- professional office
- hotel
- general commercial
- parking decks and surface parking lots

Form & Pattern of a Commercial Service Airport	
General Development Pattern	Separate Uses
Site Efficiency Factor	70% to 80%
Typical Lot Coverage	10 - 15%
Residential Density	N/A
Non-Residential Intensity	0.05 – 0.100 FAR
Prevailing Building Height	1 Stories
Average Dwelling Unit Size	N/A
Average Non-Residential Building Size	10,000 – 1,000,000 SF
Transportation Choices	Auto, Airplanes
Typical Block Length	300 to 600 LF
Setback or Build-To Line	Setback Requirements
Open Space Elements	Natural Areas
Street Pattern	Grid
Street Connectivity	High
Parking Provisions	Surface Lot
Typical Street Cross Section	N/A
Water Supply and Usage (GPD)	Public - 0.058 per SF
Sewer Treatment and Discharge (GPD)	Public – 0.050 per SF

CIVIC AND INSTITUTIONAL (CIV)

COMMUNITY PATTERN – EDUCATION, MEDICAL AND INSTITUTIONAL

Description of a Civic and Institutional District

Civic and Institutional facilities are focal points in the region. They typically include a building or complex of buildings that serve public purpose, including a library, school, public works complex, or town government. Visual qualities of the building and its surrounding grounds often make civic and institutional facilities a landmark within the region.

Primary Land Uses

- government buildings
- library
- school
- prison
- church
- museum

Secondary Land Uses

- public works building
- church
- community center
- waster or wastewater treatment plant

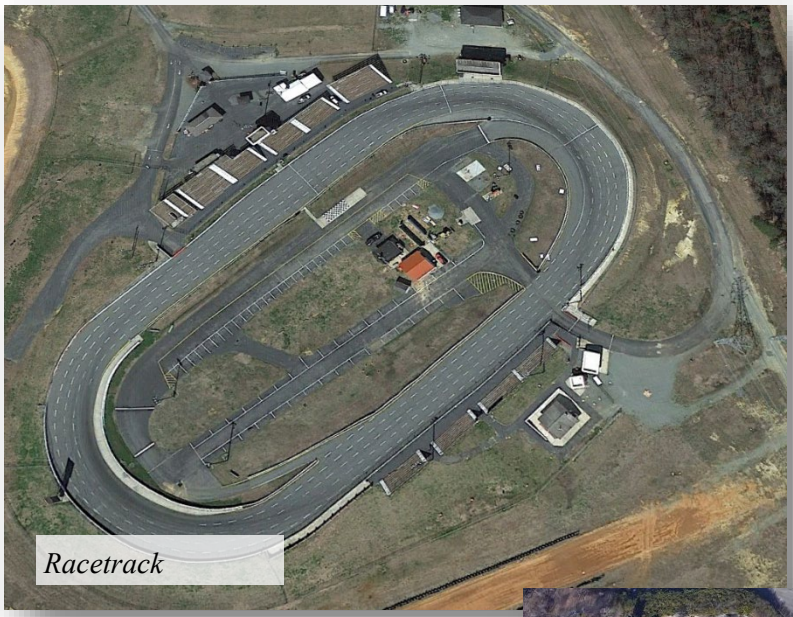
Form & Pattern of a Public and Institutional	
General Development Pattern	Separate Uses
Site Efficiency Factor	85% to 90%
Typical Lot Coverage	30 - 50%
Residential Density	10-30 DUs per Acre
Non-Residential Intensity	0.05 – 0.100 FAR
Prevailing Building Height	1 to 3 Stories
Average Dwelling Unit Size	N/A
Average Non-Residential Building Size	10,000 – 50,000 SF
Transportation Choices	Auto, Walking
Typical Block Length	NA
Setback or Build-To Line	Setback Requirements
Open Space Elements	Natural Areas / Pocket Parks / Landscape Buffers
Street Pattern	Grid
Street Connectivity	Varies
Parking Provisions	Surface Lot
Typical Street Cross Section	N/A
Water Supply and Usage (GPD)	Public - 0.058 per SF
Sewer Treatment and Discharge (GPD)	Public - 0.050 per SF

SPECIAL DISTRICTS (SD)

COMMUNITY PATTERN – EDUCATION, MEDICAL AND INSTITUTIONAL

Description of a Special District

Special Districts contain uses that do not meet general definitions or the intent of other Place Type categories used for the RTDM portion of the SPGA study area. Examples include a regional racetrack, amusement park, etc. that are unique and often defined by their own planning and design standards. Another example would be a large-scale use that requires a Special Use Permit.



Racetrack

Waterpark

Build-Out Potential Analysis

Build-out potential in CV quantifies the type, location and intensity of development for a theoretical condition where all land available in the RTDM portion of the SPGA study area is developed. Specific information for calculating build-out potential for grid cells (used for dwelling unit and employee allocation categories) or traffic analysis zones (used for student or group quarters population allocation categories) is summarized below.

DWELLING UNITS & EMPLOYEES

Build-out potential calculations for dwelling units and employees would simulate a theoretical condition where all grid cells in the RTDM portion of the SPGA study area assigned 'undeveloped' or 'redevelopment' status are (re)developed consistent with assigned Place Types and development lookup table values. Internal scripts in the software would start with buildable area and apply rules for land use mix, density, or intensity from the *General Development Lookup Table* to approximate a maximum number of new dwelling units or maximum non-residential square feet for the grid cells. A factor would be applied to convert maximum allowable non-residential square feet to total employees for the growth allocation process (see employee space ratio discussion on page 41).

Build-out potential statistics would be summarized using eight development categories (single-family residential, multi-family residential, retail high, retail other, industrial, service, office and education) and three horizon periods. Available supply for successive horizon periods would be calculated by subtracting current period allocation statistics from the same horizon period supply statistics (e.g., 2020 available supply – 2020 allocation = 2030 available supply).

Build-out statistics would be summarized by control total category, county location and horizon period for the growth allocation process consistent with control total categories and periods in the *Growth Control Totals Lookup Table for Dwelling Units & Employees*. This information would be used to represent 'available supply' for the growth allocation scripts in CV.

STUDENT CATEGORIES

For the 2022 base year update, the number of students and school employees will be collected externally and included in the SE data at the TAZ level. However, existing and new school locations should be tagged with a Place Type and Development Status.

New school locations in the RTDM portion of the SPGA study area would be limited to those identified by public school districts or private education providers, which represent very limited data for a thirty-year planning horizon. Capacity assumptions for existing school facilities in future years would also be limited because conditions are extremely variable for a thirty-year planning horizon: changing school attendance boundaries, changing federal or state minimum classroom size requirements, school board funding decisions, etc.

The *Piedmont Triad CV Model* would use simple rules for simulating theoretical build-out conditions for schools in the study area. All traffic analysis zones in the RTDM portion of the SPGA study area with students identified for the base year condition would be assumed to grow in the future to meet new demand either through school classroom expansion (portable classrooms or building additions) or new school construction in the same traffic analysis zone. A factor of 30% would be applied to base year student data in the TAZs to calculate 'available supply' for future year students.

Build-out potential statistics would be summarized using six student categories (students K-12, full-time equivalent university/college students, full-time university/college students, part-time

university/college students, total full-time enrolled students, and total part-time enrolled students) and three horizon periods. Available supply for successive horizon periods would be calculated by subtracting current period allocation statistics from the same horizon period supply statistics (e.g., 2020 available supply – 2020 allocation = 2030 available supply).

Build-out statistics would be summarized by control total category, county location and horizon period for the growth allocation process consistent with control total categories and periods in the *Growth Control Totals Lookup Table for Students & Group Quarters Population*. This information would be used to represent 'available supply' for the growth allocation scripts in CV.

CURRENTLY THE RTDM ASSUMES THE GRPOUP QUARTERS POPULATION REMAINS CONSTANT OVER TIME.

GROUP QUARTERS POPULATION CATEGORY

New group quarter's locations in the RTDM portion of the SPGA study area would be limited to those identified by service providers, which represent very limited data for a thirty-year planning horizon. Capacity assumptions for existing group quarters facilities in future years would also be limited because conditions are extremely variable for a thirty-year planning horizon: market-driven decisions to expand existing facilities, changing federal or state size and space utilization requirements, government budget decision, etc.

The *Piedmont Triad CV Model* would use simple rules for simulating theoretical build out conditions for group quarters in the study area. All traffic analysis zones in the RTDM portion of the SPGA study area with group quarters population identified for the base year condition would be assumed to grow in the future to meet new demand either through facility expansion or new facility construction in the same traffic analysis zone. A factor of 30% would be applied to base year group quarters population data in the TAZs to calculate 'available supply' for future year group quarters population.

Build-out potential statistics for group quarters population would be summarized for three horizon periods. Available supply for successive horizon periods would be calculated by subtracting current period allocation statistics from the same horizon period supply statistics (e.g., 2020 available supply – 2020 allocation = 2030 available supply).

Build-out statistics would be summarized by control total category, county location and horizon period for the growth allocation process consistent with control total categories and periods in the *Growth Control Totals Lookup Table for Students & Group Quarters Population*. This information would be used to represent 'available supply' for the growth allocation scripts in CV.

Land Suitability Analysis

Land suitability analysis (LSA) in a GIS environment measures the appropriateness of an area for a specific condition or use. For the RTDM portion of the SPGA study area, it is used to identify locations attractive for growth based on known physical features or policies unique to the area. Physical features in and immediately surrounding the RTDM portion of the SPGA study area would be layered over grid cells in CV, and calculations performed to determine either percent overlap or proximity of features to individual grid cells. A normalized scale (between 0 and 100) is used to rank the grid cells from least to most suitable for future development. Factors in the LSA will have a positive or negative correlation to desirability scores.

The land suitability analysis calculations for the *Piedmont Triad CV Model* will be repeated four times to anticipate changing conditions during the thirty-year planning horizon. Specifically, the model would acknowledge new or emerging growth activity centers that could attract future growth over time and/or expanding service areas and infrastructure that could increase the desirability to grow in certain patterns and intensities over time. Horizon years assumed for the land suitability analysis would include base year plus three future years.

The land suitability factors used in the *Piedmont Triad CV Model* are listed below and include a detailed description. The factors are uniform across the region, but the geography of some factors is set by each MPO or jurisdiction. A summary is provided in Table 3.

Development Activity Centers
Community Activity Centers – These are neighborhood focal points with development of a moderate intensity. These centers include attractions with a local draw—uses like local bar/restaurant(s), small shops/offices. There should be noticeably denser housing adjacent to or within a Community Activity Center than found a short distance farther away. This is a point layer and considered a positive factor for attracting development.

Regional Activity Centers – These may be universities/colleges, hospitals, business/employment centers and large shopping centers with a regional draw. These centers are characterized by an abundance and variety of housing, employment and educational opportunities as well as services and entertainments. This is a point layer and considered a positive factor for attracting development.

Both Community and Regional Activity Centers are determined in relation to the community or region they serve. I.E.. a regional activity center for a predominantly rural region (Stokes/Surry/Yadkin) will not have the abundance of development a regional activity center for an urbanized region (Forsyth/Guilford) would.

Municipal Centers – A focal point for development in most cities and towns. Usually, the place is traditionally considered the center point of a municipality. In these centers, denser infrastructure (first built pre-automobile) is still in place and in use. In small municipalities this center is the crossroads that originally made it an activity center/meeting point for the surrounding population. In larger municipalities this center may be the same sort of spot or a town square or government building. This older infrastructure is a backbone for both old and new development and the more expanded examples will form a grid of streets, water lines and sewer lines. This is a point layer and considered a positive factor for attracting development.

Urban Centers – These centers are business districts which have operated as multicounty centers of commerce for many years. Urban Centers can be defined as areas with the highest floor-area density in a city; where commerce, entertainment and living spaces exist in a mixed-use/integrated form. In the Piedmont Triad, the cities of Burlington, Greensboro, High Point and Winston-Salem have areas which fit this definition of urban centers. This is a polygon layer and considered a positive factor for attracting development.

Transportation
Growth Corridors – Locally identified roadway segments which have been and are particularly attractive for development. This attraction is due to both past and current land use policy along these corridors. This factor may be along a portion of any roadway type (residential streets and rural interstate segments unlikely), is a line layer and is considered a positive factor for attracting development.

Interchanges – All points of access from or onto an interstate or other limited-access freeway. This is a point layer and considered a positive factor for attracting development when accompanied by sewer service. This layer does not include points of access from one limited-access freeway directly to another limited access freeway.

Transit Emphasis Corridors – Transit Emphasis Corridors (TEC) are becoming more important to development as trends toward urban living continue. These corridors exist where an emphasis on transit provision provides the access needed for efficient mixed-use development to function well. These service corridors are designed for 15-minute or greater frequency. Proximity to the corridor (line) determines how positive the impact on development.

Local Fixed Routes – Local fixed routes are identified to recognize transit service at greater than 15-minute frequencies. A ¼ mile buffer polygon is used to distinguish their impact from a TEC and represents a positive impact.

Regional Commuter Rideshed – The regional commuter express system has a ride shed identified that reflects how people access the system. System access is primarily thorough a transfer from another system or via a park and ride lot. The rideshed provides varying degrees of "draw" that a park and ride lot has based on its location. It is a polygon with a positive influence on parcels that overlap it.

Development Infrastructure

Water Service Area – The service area for water. This is a polygon layer and considered a positive factor for attracting development.

Sewer Service Area – The service area for sewer. This is a polygon layer and considered a positive factor for attracting development.

Environmental Features

Protected Floodplain – The 100-year flood risk area. This is a polygon layer and considered a deterrent to development.

Critical Water Supply Watershed – These are areas of the region subject to watershed protection rules which are labeled by DEQ as critical (class varies from WS-II to WS-IV). This is a polygon layer and considered a deterrent to development.

Table 2: Regional Land Suitability Factors

LSA Factor	Geography	Measurement	Correlation	Identification
Community Activity Centers	Point	Proximity	Positive	Local
Regional Activity Centers	Point	Proximity	Positive	Local
Municipal Centers	Point	Proximity	Positive	Local
Urban Centers	Polygon	Overlap	Positive	Local
Growth Corridors	Line	Proximity	Positive	Local
Interchanges	Point	Proximity	Positive	Uniform
Transit Emphasis Corridors	Line	Proximity	Positive	Local
Local Fixed Routes	Polygon	Overlap	Positive	Local
Regional Commuter Rideshed	Polygon	Overlap	Positive	Local
Water Service Area	Polygon	Overlap	Positive	Local
Sewer Service Area	Polygon	Overlap	Positive	Local
Protected Floodplain	Polygon	Overlap	Negative	Uniform
Critical Water Supply Watershed	Polygon	Overlap	Negative	Uniform

Factors are weighted, using a scale of 0 – not important to 10 – most important, to put significance on one factor compared to others in the calculations. The impact of a LSA Factor's geography is illustrated in Appendix F. Focus group meetings are used to set the weighted values during the evaluation and discussion of regional growth scenarios.

Growth Allocation

Growth forecasted for the RTDM portion of the SPGA study area would be allocated to grid cells (for dwelling unit and employee allocation categories) and traffic analysis zones (for student and group quarters population allocation categories) using the Allocator 5 Wizard in CV. The tool would help determine where growth is likely to occur using a supply-and-demand approach and a series of probability-based algorithms internal to the software. The allocation wizard would also use a "randomness" factor (available settings range from 0 = strict order, follow LSA scores only to 10 = totally random, ignore LSA scores completely).

Information from previous steps in the modeling process — build-out potential analysis, land suitability analysis for multiple horizon years, and growth control totals — would be fed directly into the wizard for completing the allocation processes. Control totals for the thirty-year planning horizon (reported in ten-year increments) would rely on socio-economic data prepared by others. Control totals would be constrained by county boundary (growth could not be assigned to other counties) for the growth allocation processes.

Specific information for assigning future year growth to grid cells and traffic analysis zones in the RTDM portion of the SPGA study area is summarized below.

Dwelling Units & Employees

Data would be summarized for eight development categories (single-family residential, multi-family residential, retail high, retail other, industrial, service, office and education) and three horizon periods.

Students

Data would be summarized for six student categories (students K-12, full-time equivalent university/college students, full-time university/college students, part-time university/college students, total full-time enrolled students, and total part-time enrolled students) and three horizon periods.

Group Quarters Population

Data for group quarters population will be summarized for three horizon periods.

Growth Control Totals

County-level control totals for a thirty-year planning horizon have been provided by metropolitan planning organizations in the region using traditional processes. Each organization would certify the data sets for updating their independent metropolitan transportation plans and comprehensive transportation plans.

Data would be summarized for sixteen growth control categories consistent with the horizon year needs of the *Piedmont Triad CV Model* (future allocation tool component) and the *Piedmont Triad Regional Travel Demand Model*:

- Single-Family Residential Dwelling Units
- Multifamily Residential Dwelling Units
- Retail Employees (Highway)
- Retail Employees (Other)
- Industrial Employees
- Service Employees
- Office Employees
- Education Employees (K-12)
- University/College Employees
- Students (K-12)
- University/College Students (FTE)
- University/College Students (Full-Time)
- University/College Students (Part-Time)
- Total Enrolled Students (Full-Time)
- Total Enrolled Students (Part-Time)
- Group Quarters Population

Household Category Ratios

The *Piedmont Triad CV Model* would calculate residential build out potential (supply) for single family and multi-family dwelling unit categories. Future year growth forecasts from the metropolitan planning organizations would provide only total households for the thirty-year planning horizon (reported in ten-year increments).

Household category assumptions used in CV would approximate the ratio of single-family dwelling units (single-family detached or town home) to multi-family dwelling units (condominium or apartment) for the growth allocation process. Ratios developed for the conversion should use county-level data published in the US Census Bureau, American Community Survey, Five Year Estimates (Table B25024).

Household Size Assumptions

The *Piedmont Triad CV Model* would calculate residential build out potential (supply) and residential growth allocation (demand) for single-family and multi-family dwelling unit categories. The Model also needs population for developing a complete socio-economic data set.

Household size assumptions would be used in CV to convert dwelling units to population during the data output reporting process. Ratios developed for the conversion should use county-level data published in the US Census Bureau, American Community Survey, Five Year Estimates (Tables B25033 and S2504).

Employee Space Ratios

Employee space ratios are used in CV to convert build out potential for non-residential development (square feet) to available supply (employees) for the growth allocation process. Ratios used for the conversion should rely on information published in the Institute of Transportation Engineers *Trip Generation Manual*.

Growth Control Totals Lookup Table: Dwelling Units & Employees

The growth control totals lookup table for dwelling units and employees would be used to store county-level control totals for three interim horizon periods. Dwelling unit data would be reported for single family and multi-family residential categories. Data for employees would be reported for retail (high), retail (other), industrial, service, office and education categories.

Growth Control Totals Lookup Table: Students & Group Quarters Population

The growth control totals lookup table for students and group quarters population would be used to store county-level control totals for three interim horizon periods. Student data would be reported for students (K-12), university/college students (FTE), university/college students (full-time), university/college students (part-time), total enrolled students (full-time), and total enrolled students (part-time). Group quarters population data would be kept in a single category.

Allocation Categories Lookup Table

The allocation categories lookup table is a data set referenced in the "land uses" window of the Allocator 5 wizard in CV. It would assign a numerical identifier to each growth allocation category (residential, employee, student, and group quarters) that streamlines internal scripts and calculations in the software.

Model Calibration

A significant amount of time should be reserved in the model build process to calibrate the CV model and validate the data used to create them. These activities would be critical to developing the new model architecture, data protocols, and key assumptions for building the *Piedmont Triad CV Model*; instilling confidence in the analysis tools and reaching greater consensus among metropolitan planning organizations and local governments in the RTDM portion of the SPGA study area for the results.

A summary of key calibration/validation activities for building the *Piedmont Triad CV Model* is provided below.

Project Steering Committee

A project steering committee would provide direct oversight and counsel for building the model and collecting data identified to run it. Those on the steering committee should represent a broad base of interests, viewpoints and concerns in the RTDM portion of the SPGA study area.

Technical Advisory Committee

A subset of the project steering committee and invited guests should make up a technical advisory committee for the *Piedmont Triad CV Model*. Their charge would be to discuss very specific data needs, key assumptions and model logic important for building parts of the future year allocation tool in CV.

Topics discussed in technical advisory committee meetings could include: employee space ratios, regional control total categories, land suitability analysis data and horizon periods, a crosswalk (classification matrix) for matching RTDM control total categories with SPGA Place Type categories, household size assumptions, and household type percentage split assumptions (single-family vs. multi-family by county).

Sub-Region Coordination Meetings

Sub-region coordination meetings should be held throughout the RTDM portion of the SPGA study area to present initial data and collect comments for moving forward. Participants should include planning directors, other planning staff, MPO representatives, utility service providers and MPO technical committee members. Initial data maps should be presented at each meeting and comments recorded for revising data sets. A comment period should remain open for two weeks following each event.

[Highlight items above are required by the RTDM but are not currently set-up in SPGA.]

Site Validation Studies

Site validation studies should be completed to confirm the values used in the general development lookup table for Place Types and jurisdictions represented in the RTDM portion of the SPGA study area. Using existing development data, the project team should complete site analyses for the Place Type categories (three sample sites each) present in the individual jurisdictions. Data should be collected for buildable area, density and floor area ratio.

[Highlight items above are required by the RTDM but are not currently set-up in SPGA.]

Information from the validation studies should be shared with local governments during sub-region coordination meetings and used to adjust lookup table values for conditions unique to each Place Type and jurisdiction.

Internal Quality Control

The project team should use regular coordination calls, emails, web meetings and on-site coordination meetings to build and calibrate the *Piedmont Triad CV Model* and validate the data used to create it. Key quality control issues addressed by the team could include: data quality and availability, model architecture, model input data and values, rates and calculations (especially for the land suitability analysis, build-out potential and growth allocation processes), beta model results, and reporting geographies.

[Highlight items above are required by the RTDM but are not currently set-up in SPGA.]

Partnering Strategy

SPGA Development Team

A model development team for the *Piedmont Triad CV Model* (SPGA) — includes staffs from city and county planning departments, GIS departments, the RTDM Model Team and the four MPOs. This includes the Core Area as identified above. These individuals work 'in the trenches' to build the model in a way that supports a variety of applications and scales for analysis and reporting primarily for the creation of socio-economic data for updating the base year of the travel demand model.

Since it is custodian of the travel demand model PART serves as the official model custodian for the Piedmont Triad CV model. PART coordinates the work of the model development team, reviews work of other team members, completes quality control checks, and aligns the team's work within the overall scenario planning initiative identified for the Piedmont Triad Region. Refer to Appendix A for SPGA Development Team Structure.

Future SPGA development occurs in partnership with the Piedmont Triad Regional Council (PTRC). RTDM is uniquely positioned to assist with the CV Model development for the expanded area. Development of the model for this area will allow for additional scenario model exercises beyond the primary application with the travel demand model.

Model Development and Users Group

A *Piedmont Triad CV Model* users group works with the project team to offer advice or recommend improvements to safeguard the technical process and data used to create the scenario planning tools. This group will be trained to use the CV software and be able to drive the models and data sets available to local governments for their use.

Project Steering Committee

The project steering committee for the *Piedmont Triad CV Model* provides direct oversight and counsel for building the model and collecting data identified to run it. The steering committee represents a broad base of interests, viewpoints and concerns in the SPGA study area. It primarily consists of planning and transportation directors, long range planning staffs and MPO representatives.

User Group

The user group for the *Piedmont Triad CV Model* consists primarily of GIS staffs and planners that process data updates and run scenarios. They are responsible for developing process for data collection and have high level of understand how to run scenarios with the model.

RTDM Team

The RTDM Team consists of NCDOT Planning Division staff, MPO representatives and PART staff. The team is responsible for the overview of the RTDM enhancements and maintenance. The team's focus will be the development of the SE Data as an output from the Regional CV Model.

Model Staff

The Model Staff consists of PART's Planning Department. PART's transportation planner's primary function is the development and understanding of the CV Model. They staff the Project Steering Committee and User Group. Their responsibility ends when the CV model is asked to generate the SE data for the RTDM.

[THE HIGHLIGHTED ITEMS BELOW HAVE NOT BEEN IMPLEMENTED]

RTDM Communication Strategy Group
The project team will meet regularly with staff and officials responsible for the *Piedmont Triad Regional Travel Demand Model* to ensure the communication strategy selected for converting CV output data to TransCAD socio-economic input data is complete, comprehensive and efficient.

Focus Group Meetings

Each local CV project team should establish three focus groups to build their customized data set. Each is important for collecting data, validating assumptions, and calibrating results for the Model. These groups should also be activated for regional scenario workshops and major updates to the SPGA. A brief description of each focus group and their input to the project follows.

Business & Development Interests
A focus group with business and development interests should be used to capture the effect of market conditions or business site selection criteria for making one area more attractive to develop over others in the region. Participants would rank 'growth drivers' in order of importance and answer general questions about 'hot spots' in the region for future growth. General interests represented by the group should include business development, finance, developers, real estate, and business leaders.

Local Utility Service Providers
A focus group with local utility service providers should be used to capture the influence of infrastructure for making some areas more attractive to develop over others in the region. General interests represented by the group should include water and sewer service providers.

Chief Planning Officials
A focus group with chief planning officials should be used to understand the effect of local land use policies and ordinances for estimating development potential in the region. Cities, towns, and counties in the region should be included in the focus group.

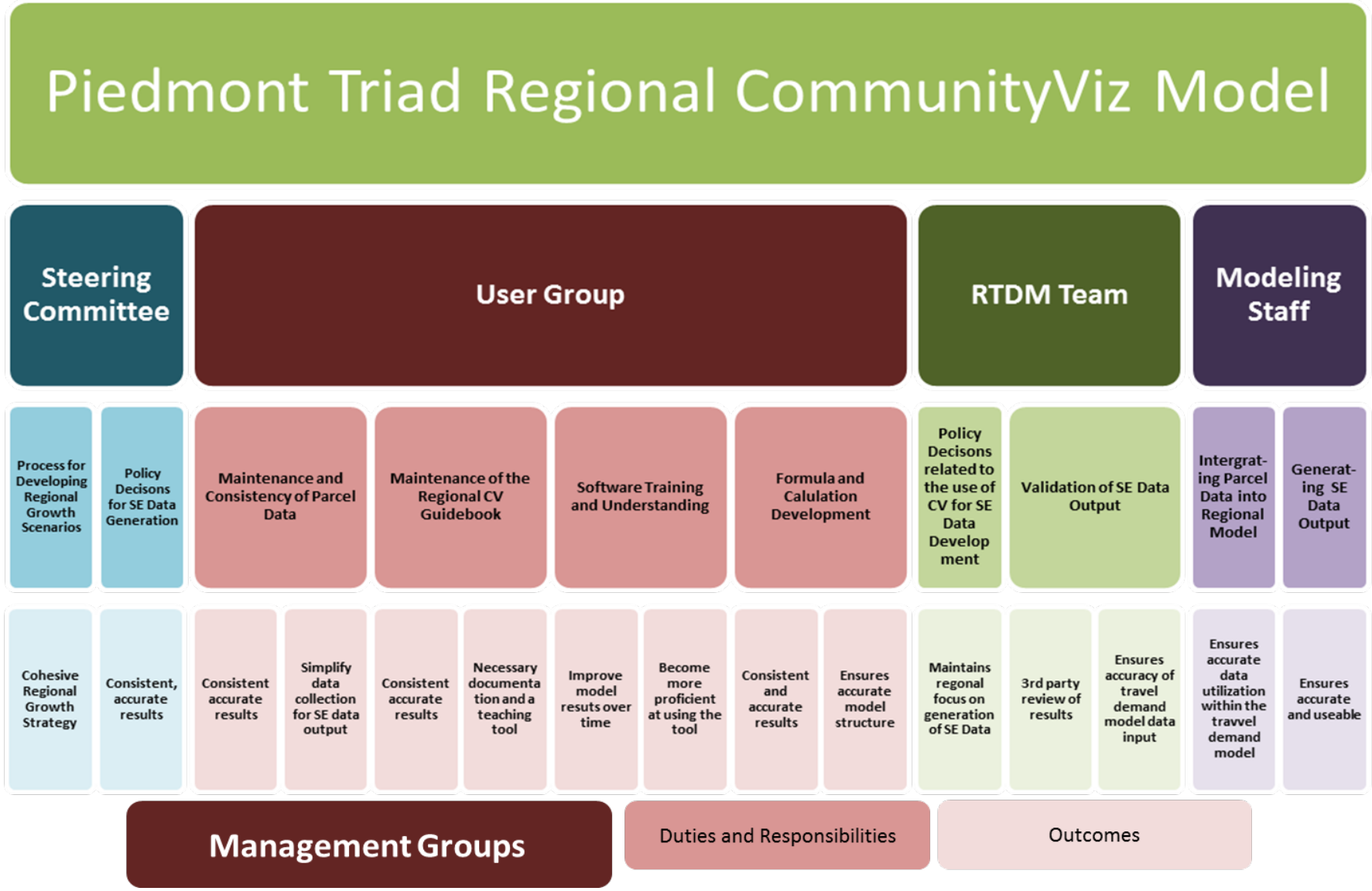
Regional Coordination Meetings

A series of regional meetings will be scheduled at set milestones in the planning process to share results and findings with local governments for their feedback. The meetings should help calibrate Place Type and development status assignments used in the *Piedmont Triad CV Model* and validate default values assumed for the general development lookup tables. Key assumptions and initial results from CV — carrying capacity, build-out potential, land suitability, and growth allocation — should also be presented to local governments for calibrating the Model.

Policymaker Briefings

The project team will provide regular briefings to MPO and RPO technical committees and policymakers to keep them involved during the model build process and its applications. These meetings will summarize key issues for a *Piedmont Triad CV Model* so committee members could provide their input prior to finalizing the data and tools. Through these efforts, committee members will have a greater understanding of how the process evolves, which will be essential for endorsing Model results in the future.

Appendix A: SPGA Development Team Structure

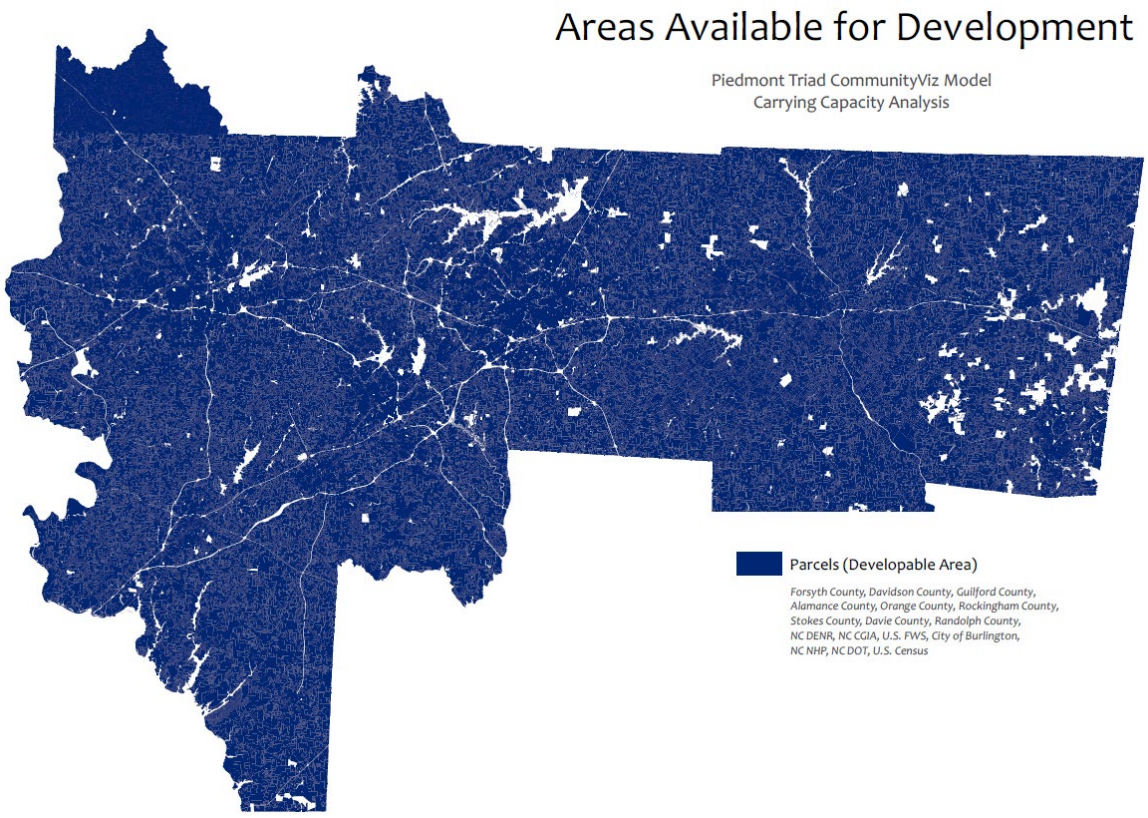


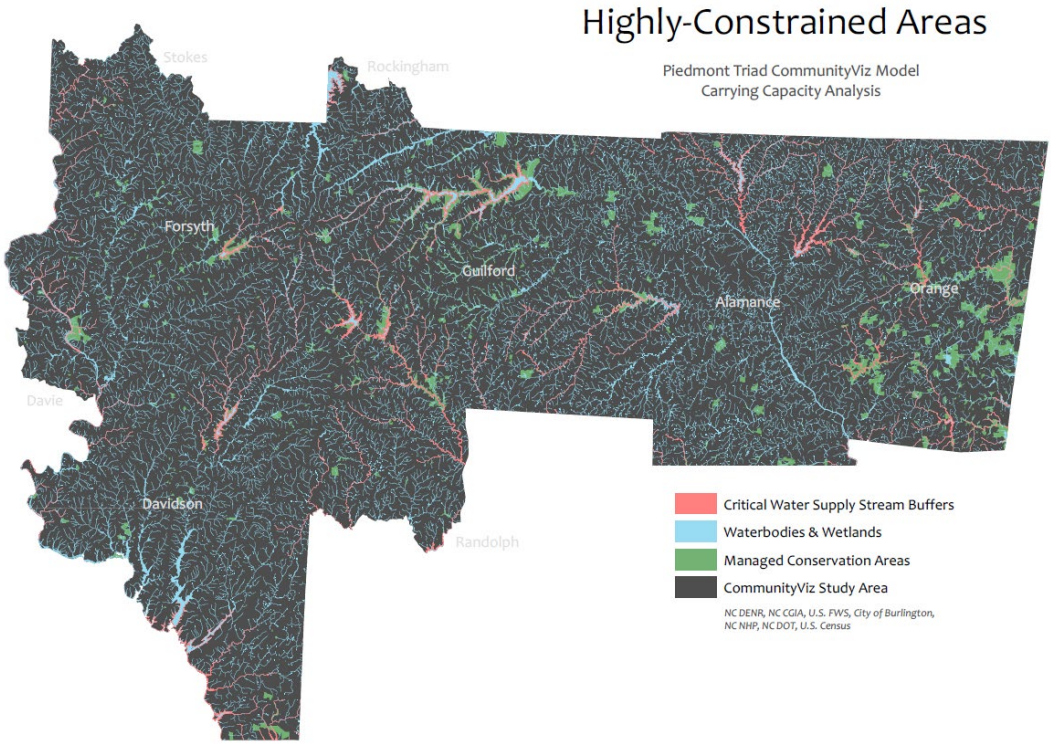
Appendix B: GIS Data Needs

Category	CommunityViz Module	Item	Model Process	Local Use Using CV	SE Data Participating Tagging and Assumptions	Not Participating Tagging and	Type	Source	Update Frequency
BASE MAP DATA	Reporting	City-County Labels		PART	PART	PART	Point	NC One Map	6 months
BASE MAP DATA	Reporting	Interstate Shields		PART	PART	PART	Point	NC One Map	6 months
BASE MAP DATA	Reporting	US and NC Highway Shields		PART	PART	PART	Point	NC One Map	6 months
BASE MAP DATA	Reporting	PTRM Area Boundary		PART	PART	PART	Polygon	PART	6 months
BASE MAP DATA	Reporting	Interstates		PART	PART	PART	Polyline	NC One Map	6 months
BASE MAP DATA	Reporting	County Boundaries		PART	PART	PART	Polygon	NC One Map	6 months
REFERENCE DATA	Reporting	Zoning Maps		Local	Local	PART	Polygon	Jurisdicational	6 months
REFERENCE DATA	Reporting	Future Land Use Maps		Local	Local	PART	Polygon	Jurisdicational	3 years
REFERENCE DATA	Reporting	Points of Interest		Local	Local	PART	Point	Jurisdicational	6 months
REFERENCE DATA	Reporting	Building Footprints		Local	Local	PART	Polygon	Jurisdicational	6 months
REFERENCE DATA	Reporting	Aerial Photigraphy		PART	PART	PART	Raster		6 months
ANALYSIS DATA	All Modules	Graduated Grid Cells		PART	PART	PART	Polygon	PART	3 years
ANALYSIS DATA	All Modules	Traffic Analysis Zones		PART	PART	PART	Polygon	PART	3 years
ANALYSIS DATA	Carrying Capacity	**Carrying Capacity**		Local	Local	PART	Process	Data Output	3 years
ANALYSIS DATA	Carrying Capacity	Wetlands		PART	PART	PART	Polygon	NC One Map	6 months
ANALYSIS DATA	Carrying Capacity	Major Water Bodies		PART	PART	PART	Polygon	NC One Map	6 months
ANALYSIS DATA	Carrying Capacity	Stream Buffers		PART	PART	PART	Polygon	NC One Map	6 months
ANALYSIS DATA	Carrying Capacity	Permanent Conservation Areas		PART	PART	PART	Polygon	NC One Map	6 months
ANALYSIS DATA	Carrying Capacity	Existing Rights-of-Way		PART	PART	PART	Polygon	NC One Map	6 months
ANALYSIS DATA	Carrying Capacity	Addresses		PART	PART	PART	Point	County GIS	6 months
ANALYSIS DATA	Carrying Capacity	Not Available for Development		PART	PART	PART	Calculation	UG	3 years
ANALYSIS DATA	Carrying Capacity	Available for Development		PART	PART	PART	Calculation	UG	3 years
ANALYSIS DATA	Carrying Capacity	Development Constraints layer		PART	PART	PART	Map	CV	N/A
ANALYSIS DATA	Build Out Potential	**Build Out Potential**		Local	Local	PART	Process	Data Output	3 years
ANALYSIS DATA	Build Out Potential	Grid Cells		PART	PART	PART	Polyline	PART	6 months
ANALYSIS DATA	Build Out Potential	Parcels		PART	PART	PART	Polyline	PART	6 months
ANALYSIS DATA	Build Out Potential	Development Status Assignments		Local	Local	MPO or PART	Parcel Tag	Jurisdicational	6 months
ANALYSIS DATA	Build Out Potential	Place Type Assignments		Local	Local	MPO or PART	Parcel Tag	Jurisdicational	6 months
ANALYSIS DATA	Build Out Potential	Committed Development		Local	Local	MPO or PART	Parcel Tag	Jurisdicational	6 months
ANALYSIS DATA	Build Out Potential	Development Lookup Table (H/B/D)		Local	Local	PART	Numerical	Jurisdicational	3 years
ANALYSIS DATA	Build Out Potential	H/B/D Thresholds by Place Type		Local	Local	PART	Numerical	Jurisdicational	3 years
ANALYSIS DATA	Build Out Potential	Watershed Boundaries		PART	PART	PART	Polyline	NC One Map	6 months
ANALYSIS DATA	Build Out Potential	Jurisdiction		PART	PART	PART	Polyline	NC One Map	6 months
ANALYSIS DATA	Build Out Potential	Traffic Analysis Zones		PART	PART	PART	Polyline	PART	6 months
ANALYSIS DATA	Build Out Potential	Watershed Max Lot Coverage		PART	PART	PART	Assumption	SC	3 years
ANALYSIS DATA	Build Out Potential	Site Efficiency Factor		PART	PART	PART	Assumption	SC	3 years
ANALYSIS DATA	Build Out Potential	Parcel Buildable Area		PART	PART	PART	Calculation	UG	3 years
ANALYSIS DATA	Build Out Potential	Existing Development Inventory		PART	PART	PART	Calculation	UG	3 years
ANALYSIS DATA	Build Out Potential	Future Yr. Development - Existing		PART	PART	PART	Calculation	UG	3 years
ANALYSIS DATA	Build Out Potential	Traffic Analysis Zones		PART	PART	PART	Calculation	UG	3 years
ANALYSIS DATA	Build Out Potential	Model Lookup Table		Local	Local	MPO or PART	Numerical	Jurisdicational	3 years
ANALYSIS DATA	Land Suitability Analysis	**Land Suitability Analysis**		Local	Local	PART	Process	Data Output	3 years
ANALYSIS DATA	Land Suitability Analysis	Major Roads		Local	Local	MPO or PART	Polyline	SC	3 years
ANALYSIS DATA	Land Suitability Analysis	Interchange Locations		Local	Local	MPO or PART	Point	SC	3 years
ANALYSIS DATA	Land Suitability Analysis	Major Intersections		Local	Local	MPO or PART	Point	SC	3 years
ANALYSIS DATA	Land Suitability Analysis	Metropolitan Centers		Local	Local	MPO or PART	Polygon	SC	3 years
ANALYSIS DATA	Land Suitability Analysis	Water/Sewer Service Areas		Local	Local	MPO or PART	Polygon	SC	3 years
ANALYSIS DATA	Land Suitability Analysis	Major Activity Centers		Local	Local	MPO or PART	Point	SC	3 years
ANALYSIS DATA	Land Suitability Analysis	Town Centers		Local	Local	MPO or PART	Point	SC	3 years
ANALYSIS DATA	Land Suitability Analysis	Flood Hazard Areas		Local	Local	MPO or PART	Polygon	SC	3 years
ANALYSIS DATA	Land Suitability Analysis	Watershed Protection Areas		Local	Local	MPO or PART	Polygon	SC	3 years
ANALYSIS DATA	Land Suitability Analysis	Assign Weighting to LSA Variables		Local	Local	MPO or PART	Numerical	Jurisdicational	3 years
ANALYSIS DATA	Land Suitability Analysis	Calaulcate LSA Score		Local	Local	PART	Calculation	UG	3 years
ANALYSIS DATA	Land Suitability Analysis	Land Suitability Composite Map		PART	PART	PART	Map	CV	3 years
ANALYSIS DATA	Growth Allocation	**Growth Allocation**		PART	PART	PART	Process	Data Output	3 years
ANALYSIS DATA	Growth Allocation	Control Totals by Category		PART	PART	PART	Numerical	SC	3 years
ANALYSIS DATA	Growth Allocation	P/HH & Employee Space Ratios		Local	Local	PART	Numerical	SC	3 years
REFERENCE DATA	Reporting	Study Area Boundary		PART	PART	PART	Polygon	PART	6 months
REFERENCE DATA	Reporting	Planning Jurisdiction Boundaries		PART	PART	PART	Polygon	PART	6 months
REFERENCE DATA	Reporting	Traffic Analysis Zones		PART	PART	PART	Polygon	PART	6 months
REFERENCE DATA	Reporting	Growth Allocation Composite Map		PART	PART	PART	Map	CV	3 years

	Legend	Reporting or Base Map
		All Modules
		Major Process Category
		Model Input Data
		Model Assumption
		Dynamic Attribute Calculation
		Resoure Map

Appendix C: Carrying Capacity Maps





Appendix D: Regional Development Lookup Table

Piedmont Triad Regional CommunityViz Development Look Up Table

As of May 11, 2021

	Development Density		Residential / Non-residential Split			Residential Mix			Employment Categories (based on the Travel Demand Model)							
Place Type	Residential Density (DU's / acre)	# of Stories	Residenti	Non-residential	Tota	Single-fam	Multi-fam	Tot	Office	Servic	Highway Retail	Retail - Other	Industri	Education K-12	Universi	Total
Preserved Open Space	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Recreational Open Space	0	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Working Farm	0.07	0	50%	50%	100%	100%	0%	100%	0%	10%	0%	10%	80%	0%	0%	100%
Rural Living	0.2	2	80%	20%	100%	100%	0%	100%	0%	25%	50%	0%	25%	0%	0%	100%
Large-lot Residential	0.5	2	100%	0%	100%	100%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%
Single-family Neighborhood	1	2	90%	10%	100%	100%	0%	100%	0%	50%	0%	50%	0%	0%	0%	100%
Mobile Home Neighborhood	6	1	100%	0%	100%	100%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%
Townhome Community	9	2	100%	0%	100%	0%	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%
Multi-family Neighborhood	12	3	100%	0%	100%	0%	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%
Urban Neighborhood	6	2	100%	0%	100%	50%	50%	100%	0%	0%	0%	0%	0%	0%	0%	0%
Walkable Neighborhood	10	2	75%	25%	100%	50%	50%	100%	25%	25%	15%	35%	0%	0%	0%	100%
Walkable Activity Center	20	3	25%	75%	100%	0%	100%	100%	25%	25%	15%	35%	0%	0%	0%	100%
Transit Activity Center	15	4	50%	50%	100%	0%	100%	100%	25%	25%	15%	35%	0%	0%	0%	100%
Town Center	10	3	20%	80%	100%	20%	80%	100%	25%	25%	15%	35%	0%	0%	0%	100%
Heavy Industrial	0	1	0%	100%	100%	0%	0%	0%	5%	0%	0%	0%	95%	0%	0%	100%
Light Industrial	0	1	0%	100%	100%	0%	0%	0%	5%	5%	5%	0%	85%	0%	0%	100%
Metropolitan Center	50	15	20%	80%	100%	0%	100%	100%	40%	20%	20%	20%	0%	0%	0%	100%
Suburban Commercial Center	0	1	0%	100%	100%	0%	0%	0%	10%	20%	30%	40%	0%	0%	0%	100%
Suburban Office Center	0	3	0%	100%	100%	0%	0%	0%	85%	10%	5%	0%	0%	0%	0%	100%
Regional Employment Center	0	6	0%	100%	100%	0%	0%	0%	65%	5%	10%	0%	20%	0%	0%	100%
Health Care Campus	0	4	0%	100%	100%	0%	0%	0%	20%	70%	5%	5%	0%	0%	0%	100%
Educational Campus K-12	0	1	0%	100%	100%	0%	0%	0%	5%	1%	0%	0%	0%	94%	0%	100%
University/College Dormitories	0	8	100%	0%	100%	0%	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%
University/College Campus	0	3	25%	75%	100%	50%	50%	100%	10%	5%	4%	1%	0%	0%	80%	100%
Commercial Service Airport	0	1	0%	100%	100%	0%	0%	0%	5%	75%	5%	5%	10%	0%	0%	100%
General Aviation Airport	0	1	0%	100%	100%	0%	0%	0%	5%	75%	0%	0%	20%	0%	0%	100%
Civic and Institutional	0	3	0%	100%	100%	0%	0%	0%	28%	70%	1%	1%	0%	0%	0%	100%

Appendix E: Parcel Development Status and Place Type Tagging Portal

CV Parcel Reviewer

Welcome and thank you for your participation in the CV Reviewer. The following steps below will guide you through making edits to parcel data and make you aware of a few nuances that could potentially throw you off.

If you do not have the application open, you can use this link to open it:

Guilford County - all jurisdictions
Davidson County - all jurisdictions
Forsyth County – all jurisdictions
Alamance County – all jurisdictions
Orange County – all jurisdictions

****Update 3/16/2020 – If you want to review any additional parcels, please use the link above and the following instructions. Previous revisions have been preserved so you are able to see what edits have already been made.****

****Due to requests from other jurisdictions, the EDITOR and EDIT DATE fields have been removed so please ignore those fields in the images when following along with the instructions. A layer that shows the parcel boundaries has also been added. ****

Before we get started, I'll explain a few basics. Initially, the map is displayed with the layer *CV 'County' Parcels Place Type* turned on which is the layer you will be editing. A second layer called *CV 'County' Parcels Property Lines* is also turned on. *CV 'County' Parcels Place Type* is symbolized based on Place Type and the fields you will be editing are:

> 'STATUS' which you will mark either 'Reviewed' or 'Follow-up needed',
> 'REVISED PLACE TYPE' where you will change the Place Type if necessary,
> 'REVISED DEVELOPMENT STATUS' where you will change the development status if necessary.

The last two fields will be changed only if you feel that 'PLACE TYPE' and 'DEVELOPMENT STATUS' do not accurately reflect the parcel. By clicking the 'Layer list' icon in the top right corner of the application (See Image 1 below), you can access the other two layers which are included for reference. The layers contain the same data as *CV 'County' Parcels Place Type*, but are symbolized by Development Status and Review Status. These two layers are not editable.

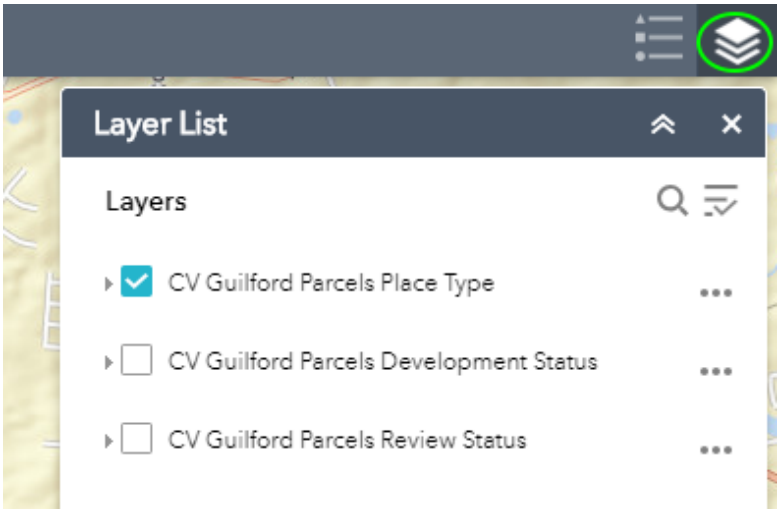


Image 1

You may also use the 'Basemap Gallery' icon to change the basemap (See Image 2 below). For example, it may be easier to identify what's on the parcel using satellite imagery instead of a Streets basemap.

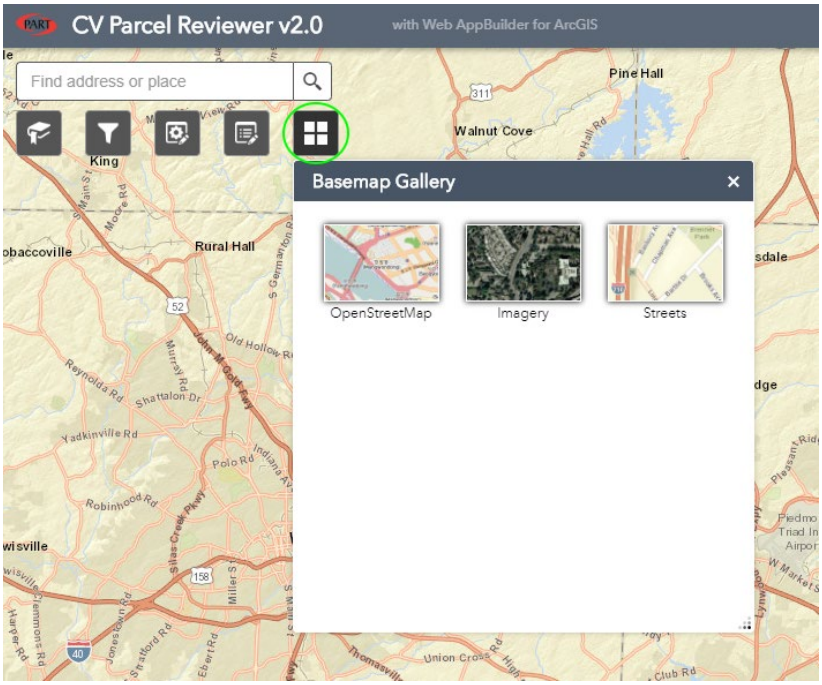


Image 2

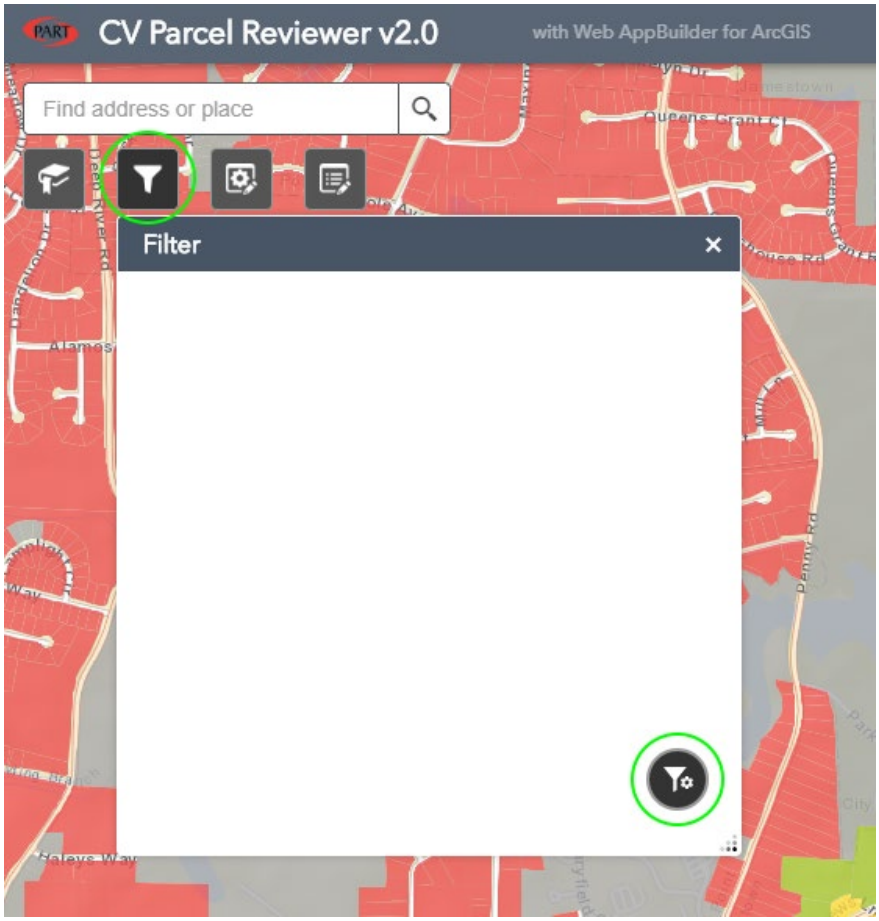
Let's get started!

To begin, open the ‘Bookmarks’ tool from the toolbar (See Image 3 below). Select an area and the map will automatically zoom there.

Image 3

From here, we will set a custom filter to view only parcels in your jurisdiction. You do this by clicking the filter icon from the toolbar. In the lower right corner of the pop-up, click the icon for ‘Create Custom Filter’ (See Image 4 below).

Image 4



Now select the *CV ‘County’ Parcels Place Type* layer from the drop down and click ‘Add expression’. Select ‘JURISDICTION (String)’ from the fields list. Leave the ‘is’ operator in the next drop-down menu. Select the ‘Set input type’ icon, it looks like a cog, and change the value to ‘Unique’. This will populate the final drop-down list with all possible values from that field. Select your jurisdiction (See Images 5 & 6 below). The map will automatically update to reflect the filter.

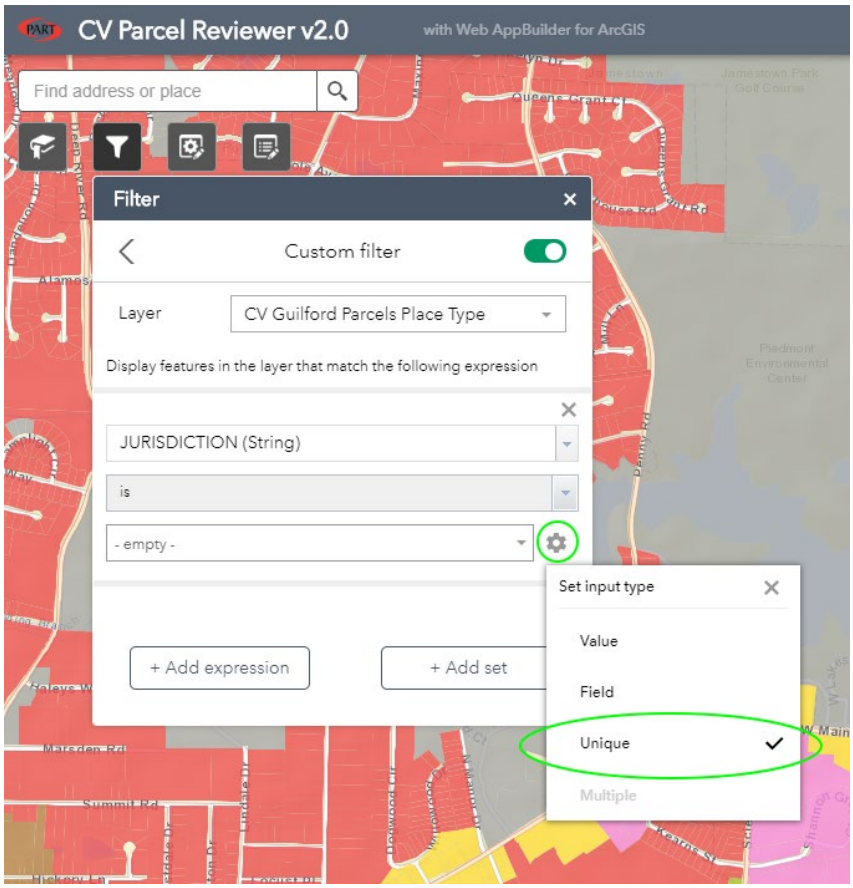


Image 5

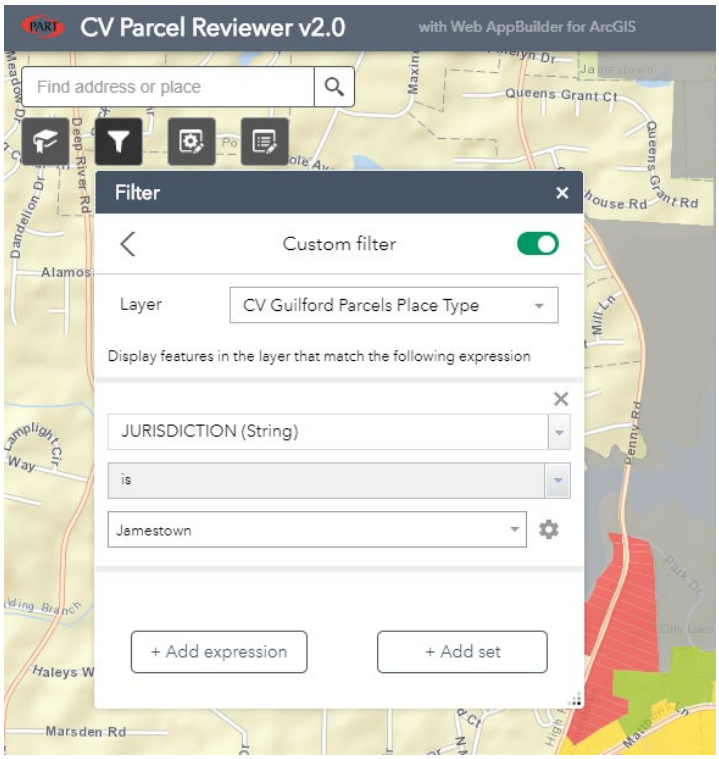


Image 6

The toggle switch in the top right of the filter pop-up will turn the filter on and off. Make sure it is set in the ‘on’ position so you are only viewing parcels in your jurisdiction (See Image 7 below).

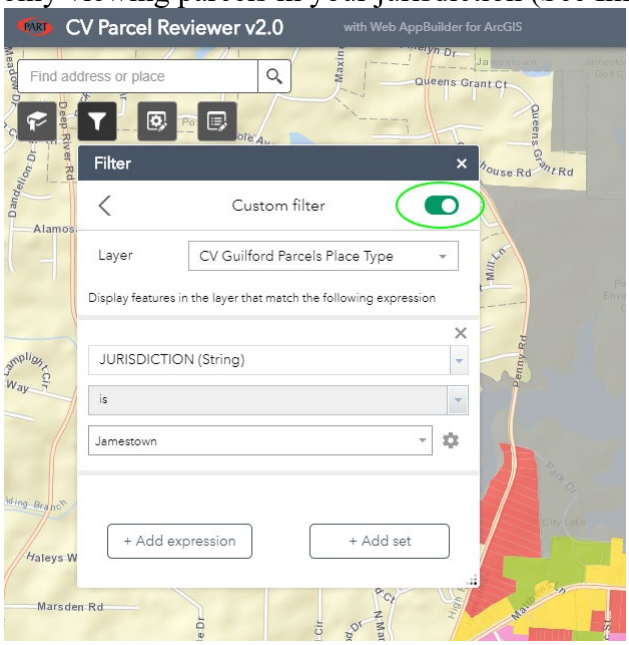


Image 7

Now that you have everything set up, you can begin to make edits. This can be done in two ways. You can use the ‘Batch Attribute Editor’ tool or you can edit parcels individually by clicking the ‘Edit’ icon. These instructions will walk you through how to use both. First, we’ll start with the ‘Batch Attribute Editor’.

To make edits to several parcels at once, select the ‘Batch Attribute Editor’ tool from the toolbar. A pop-up for the tool will appear and I recommend using ‘Extent’ or ‘Polygon’ to draw the shapes that will select the desired parcels (See Image 8 below)

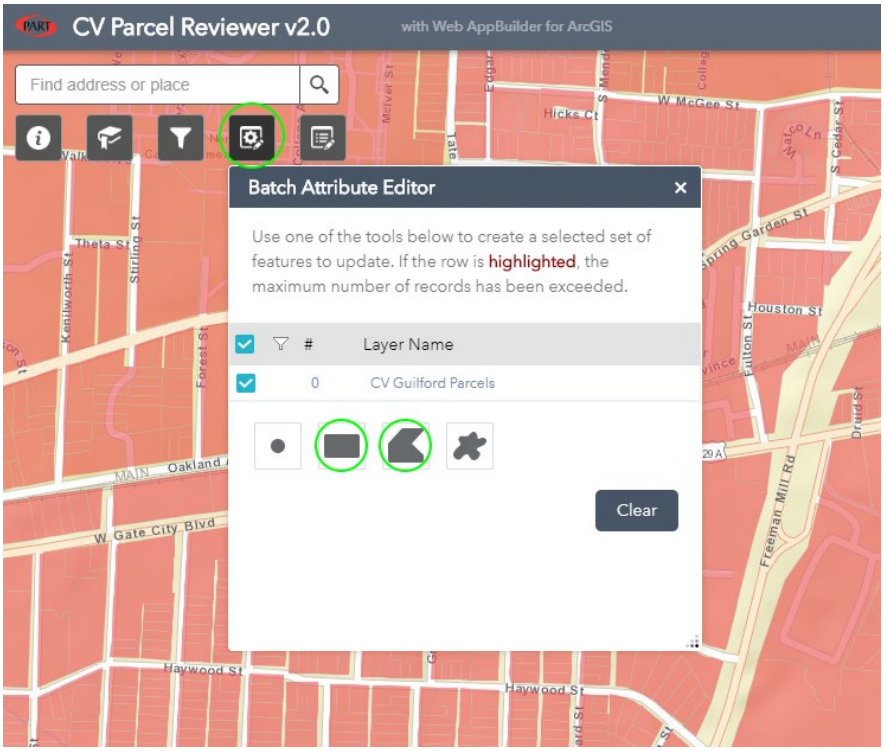


Image 8

The selected parcels will be highlighted and a pop-up for editing will appear next to the parcels (See Image 9 below). **Please ignore the EDITOR and EDIT DATE fields**

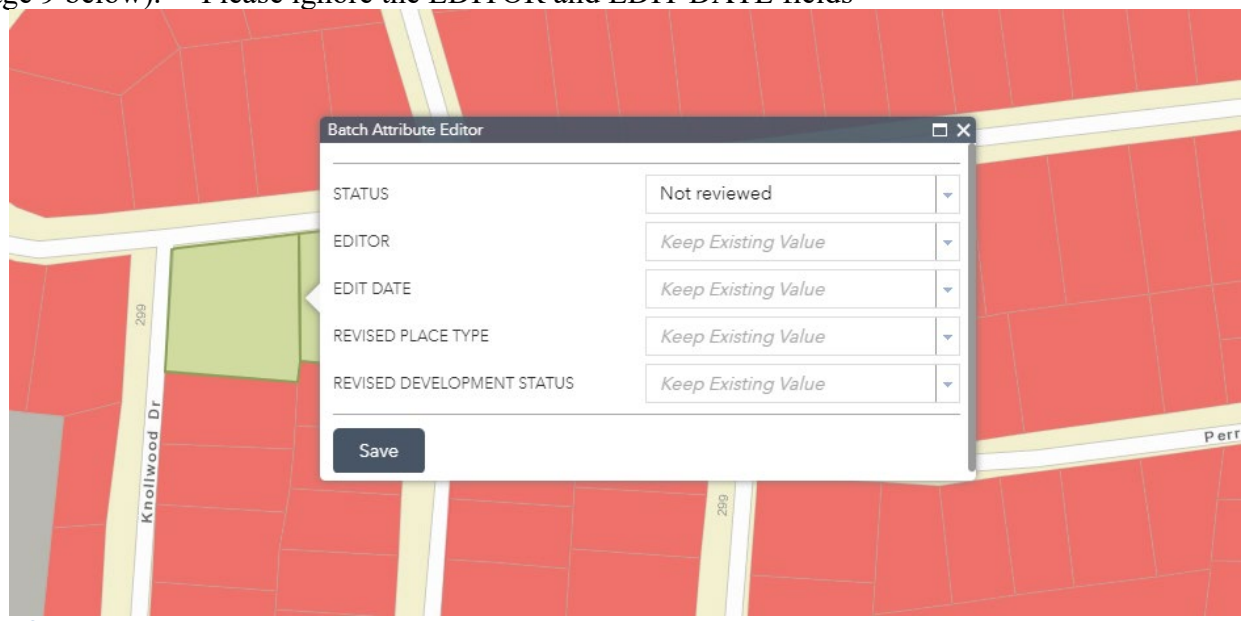


Image 9

You can now make the necessary edits to the selected parcels. When you are finished, press the 'Save' button and close the pop-ups. The parcels are now updated.
Another way you can make edits is by selecting an individual parcel. This is done by clicking the 'Edit' tool from the toolbar and then selecting a parcel on the map (See Images 10 & 11 below). **Please ignore the EDITOR and EDIT DATE fields**

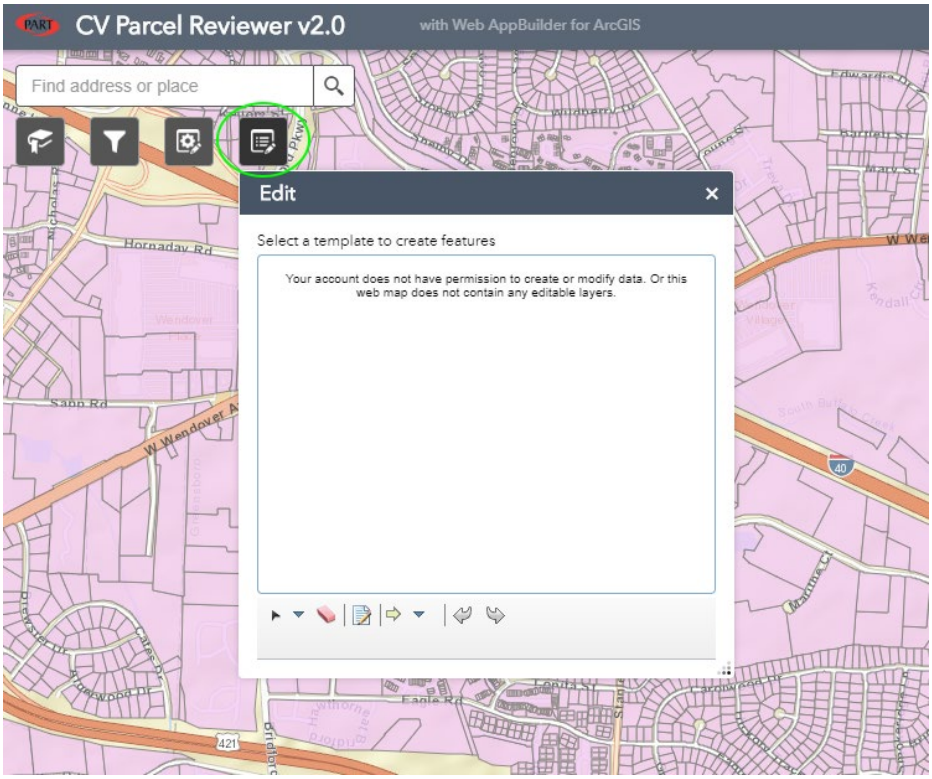


Image 10

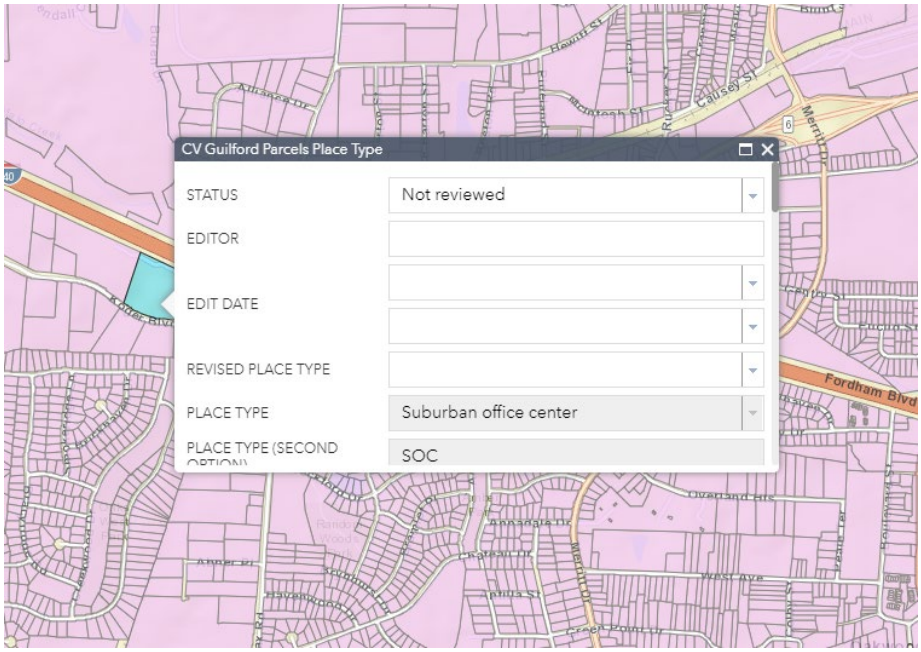


Image 11

A word of caution: Selecting a small parcel when the map is at a small scale might cause multiple parcels to be selected and edits could be made to the wrong parcel. I recommend zooming in to a larger scale to select smaller parcels. However, when in doubt, check the header of the pop-up to see if multiple parcels are selected. If only one parcel is selected, only the header title will be present. (See Images 12 & 13 below).

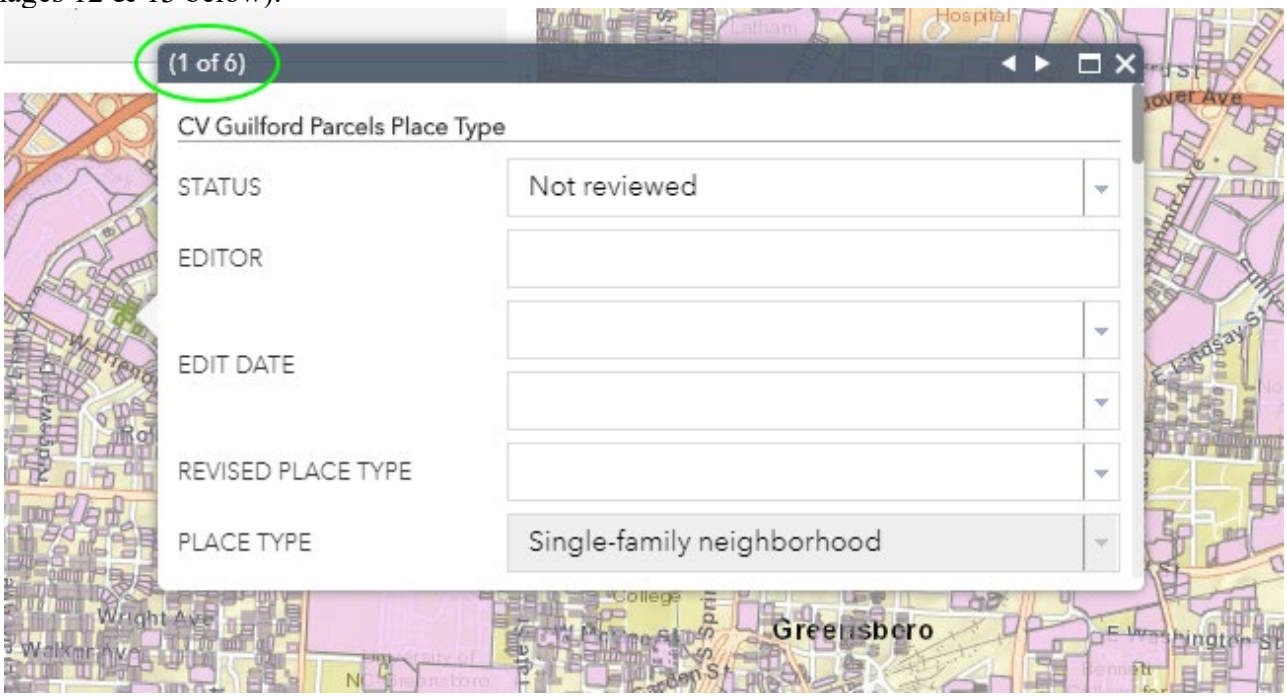


Image 12

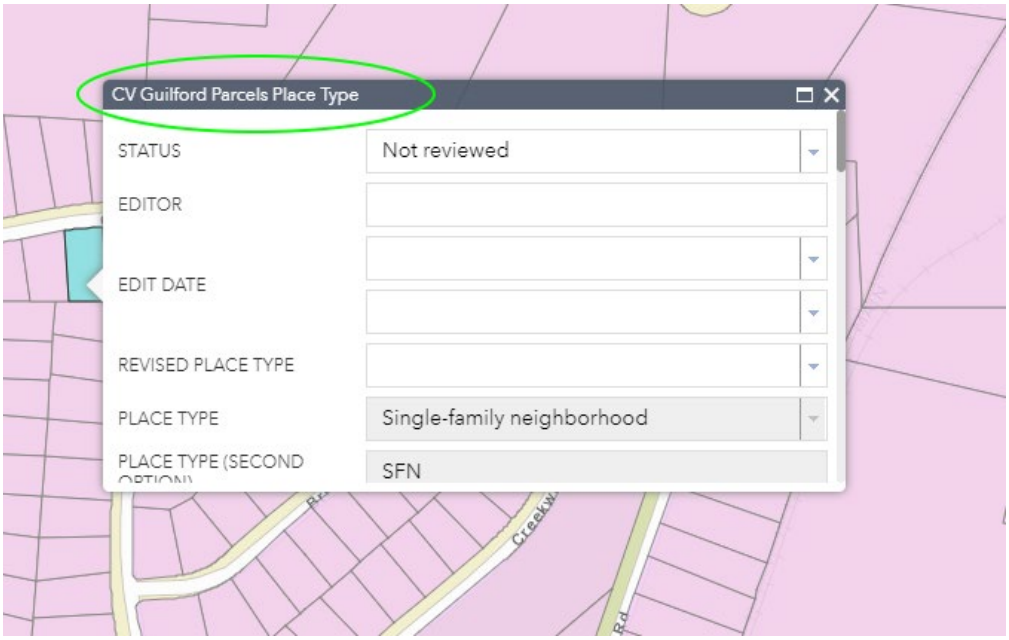
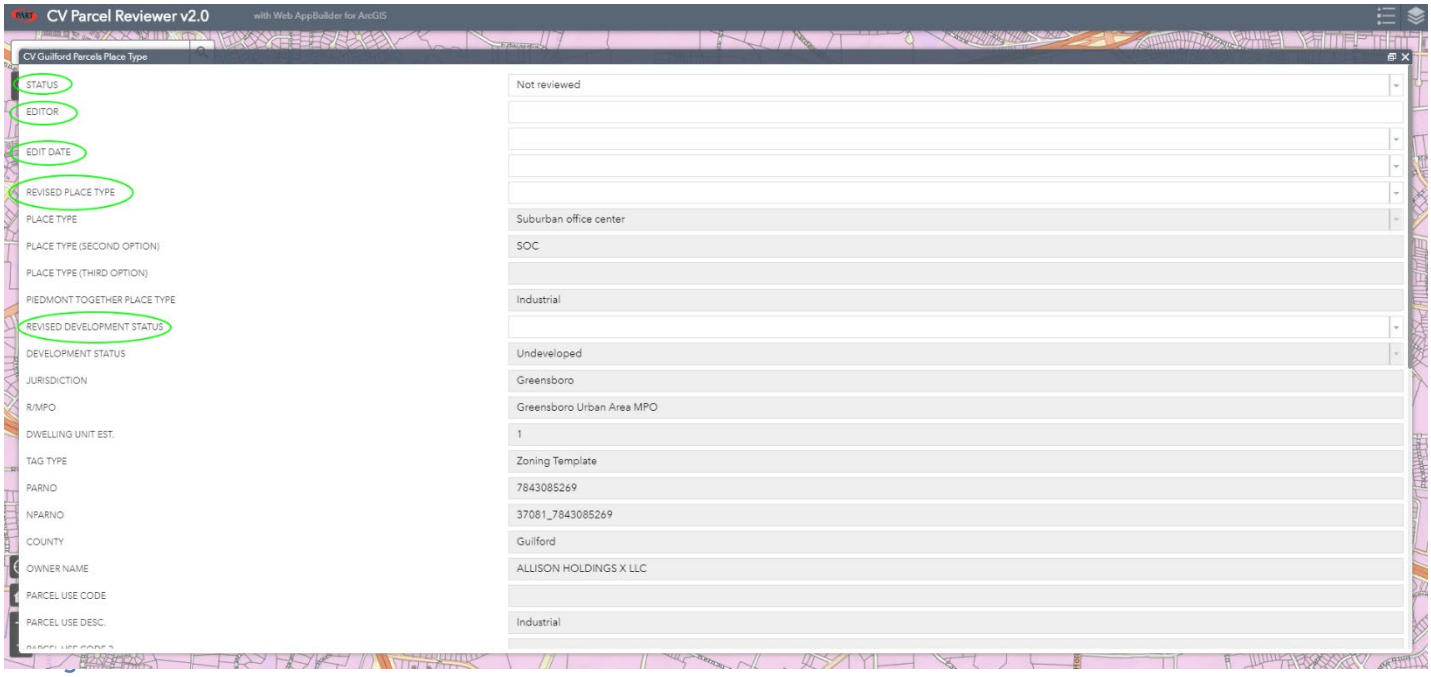


Image 13

I suggest clicking the ‘Maximize’ button in the pop-up so you can see all five attributes that are editable (See Image 14 below). **Please ignore the EDITOR and EDIT DATE fields**

Once you have made your edits, you can close both pop-up windows and your edits will be automatically saved.
Please note that it is not expected that you should review every parcel in your jurisdiction. The idea of



this review is to spot check the Place Types and development status of parcels. The data for the parcels was built using information jurisdictions provided or information from Piedmont Together (2013).

Appendix G: Place Type Tagging Guidelines

Distinguishing between POS and ROS

ROS is distinguished from POS by the land being developed for recreational activities. If trees were cleared and/or land was graded, and man-made structures added then ROS. If foot or bike trials required only clearing and simple stream crossing to a natural or conversation area, then POS.

Distinguishing between Living Spaces Place Types

Large Lots, Houses and Mobile Homes
LLR development is:

1. served with septic tank systems and individual or community wells;
2. developed along an existing roadway or lots are serviced by a road network that does not connect to other developments; and
3. don't form a neighborhood or community.

SFN developments are:

1. primarily served with public water and sewer but could be served by septic tanks;
2. consist of internal streets; and
3. lie adjacent to each other with some connectivity.

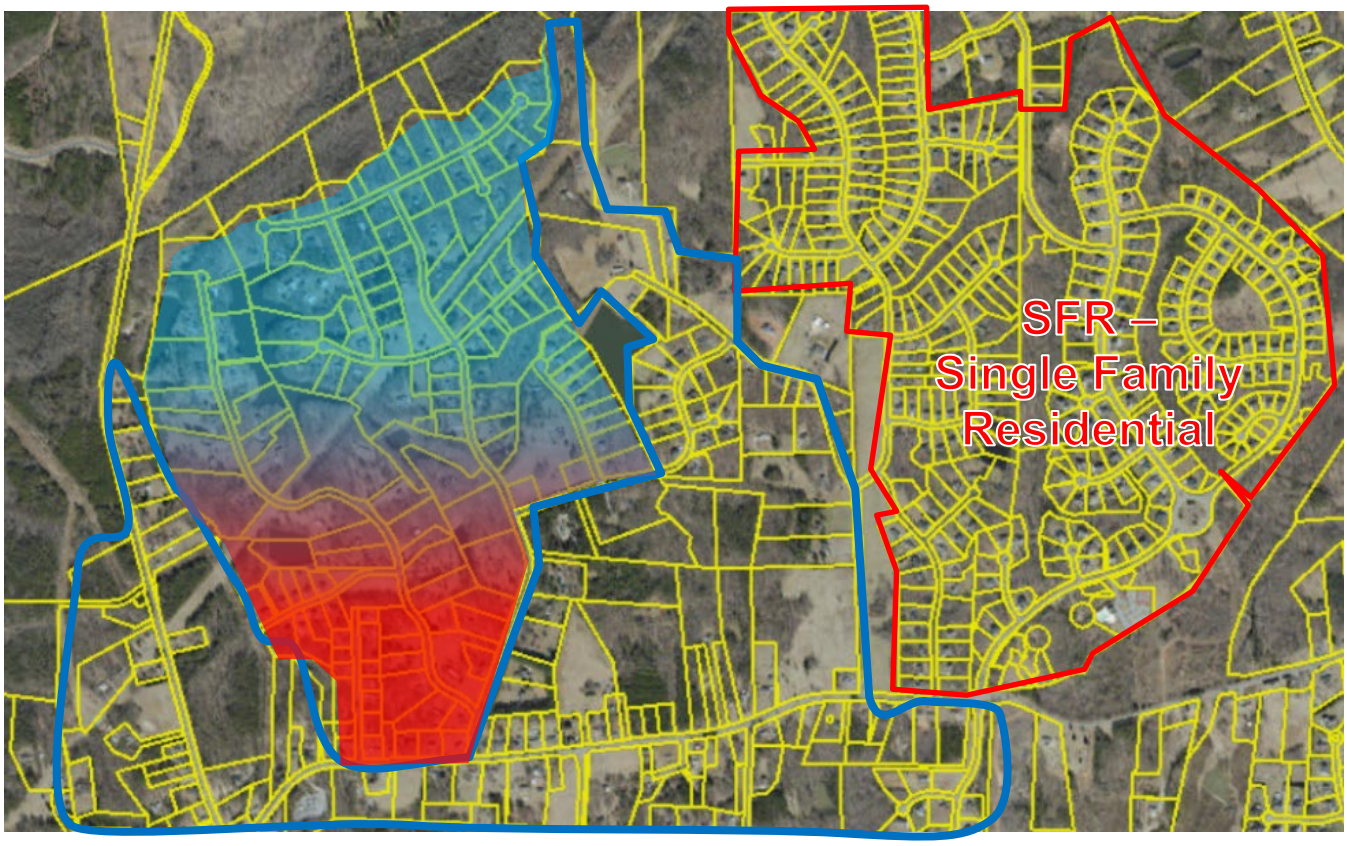
LLR development usually results from the division of a parcel with access coming off the existing road or street. SFN development will always include new streets to provide access to lots and may include amenities such as a pool, sidewalks or walking trails. **Both LLR and SFN can have site built, modular or mobile homes. A LLR with a manufactured home on individual lots is not a Mobile Home Neighborhood (MHN).**

MHN develops are:

1. primarily served with private or community or public water and sewer but could be served by public sewer and water, especially are part of a retrofit;
2. consists of internal private streets;
3. typically consist of individual leased lots or spaces owned and managed by a single entity; and
4. consists exclusively of mobile and modular homes.

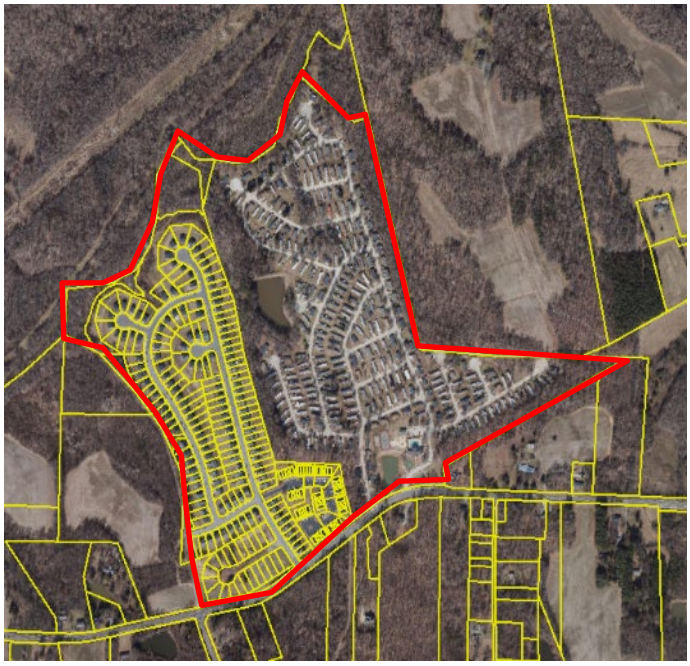
The distinguishing factor between these three residential development patterns comes down to density and land or lot ownership. The land or lot ownership in a MHN is like that of a condominium. The individual owns the condo unit or mobile home but not the ground underneath it. The common area, parking and streets and other amenities are owned and managed by a private company or single entity. Another term for MHN is a mobile home park. Just because a parcel is zoned for mobile homes does not make it a MHN. Lots in private ownership that are 20,000 sf or great occupied by a mobile home are either SFN, LLR or even Rural Living (RL).

A third area could be LLR or a mix of LLR and SFN. It appears that new roads have been built, some are connected, and some are not. Then there are some lots at appear to have been created along an existing road. Plus, some of the lots within what could be the SFN are "large." The parcels in this area could be tagged several different ways.



In the diagram at the top of the next page, LLR and SFN development patterns are outlined in either red or blue.

Lot Ownership is Important



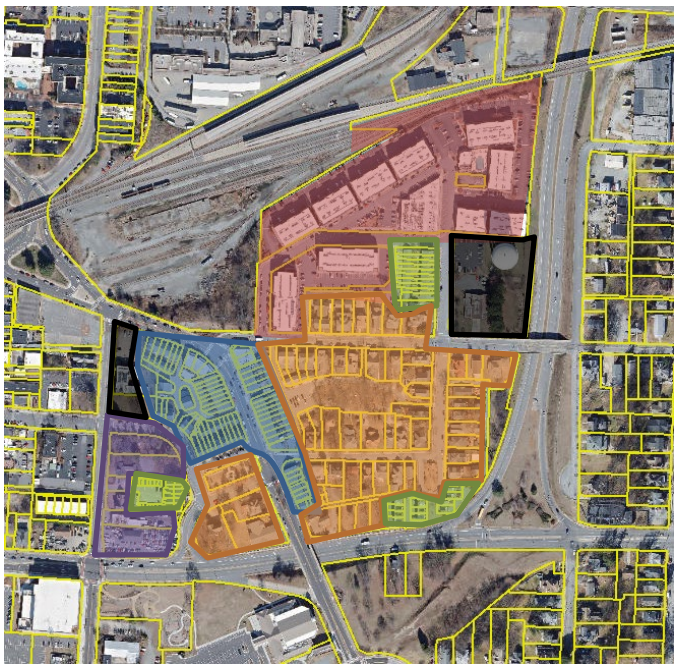
The diagram to the right highlights a single-family detached development with site-built homes, a townhouse development, and mobile home park. All are about the same density. The principle difference is the land/lot ownership structure. The lots in the single-family are about the same size as the leased space for each mobile home. But you easily see that the mobile home park is under one ownership. Even if the single-family development consisted of mobile homes, it should not be tagged as MHN. The townhouse development should be tagged THC due to the lot type of ownership. The single-family detached development should be tagged Urban Neighborhood (UN) because of the density.

a

Question: Could the UN and THC both be tagged Urban Neighborhood or Walkable Neighborhood?
Answer: Urban Neighborhood, yes. Walkable Neighborhood, no

The single-family detached homes and townhouses are integrated into a single community. There are sidewalks in the community, so it is walkable. However, the only destinations are other homes. There are no restaurants, retail locations or services to walk too. So, it does not meet the description of a WN. When tagging existing development another factor is now detailed you want an existing land use plan to look.

In the example below the area depicted is an existing neighborhood. There are sidewalks, detached homes, apartments, townhouses, and non-residential uses. This is clearly a WN and should be tagged as such whether developed, undeveloped or tagged for redevelopment. However, each individual parcel could be tagged based solely on its use as shown on the right.



More Helpful Tagging Hints

Common Areas: All types of residential development to have common areas, recreation facilities, open space owned by a homeowner's association or stormwater detention devices under the ownership of a single entity.

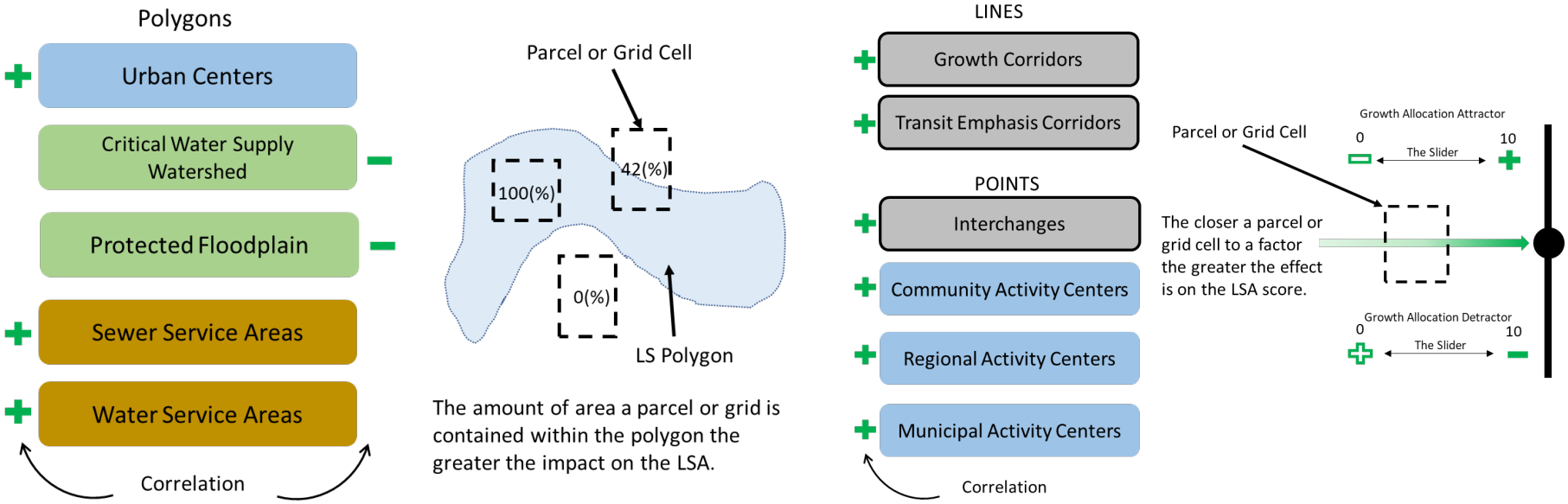
Comparison Chart				
Development Pattern	Density	Lot Size	Lot / Land Ownership	Sewer Service
LLR	0.3 to 1 unit per acre	1 to 3 acres per lot	Individual / Private	Private (septic tank)
SFN	0.5 to 2 units per acre	20,000 sf to 2 acres per lot	Individual / Private	Private (septic tank)
MHN	6 to 12 DU's per acre	7,200 to 3,630 SF per lot	Lots are owned and managed by a single entity	Private/Community
THC	6 to 12 units per acre	Typically, the same size as the unit's footprint	Individual, typical with common area owned by an association	Public
MFN	6 to 16 units per acre	Varies	Building and grounds are owned and managed by a single entity	Public
UN	6 to 10 units per acre	Varies	Typically, parcels are under individual ownership	Public
WN	4 to 12 units per acre	Varies	Varies	Public
Appendix G contains a more detailed breakdown of residential densities across all Place Types.				

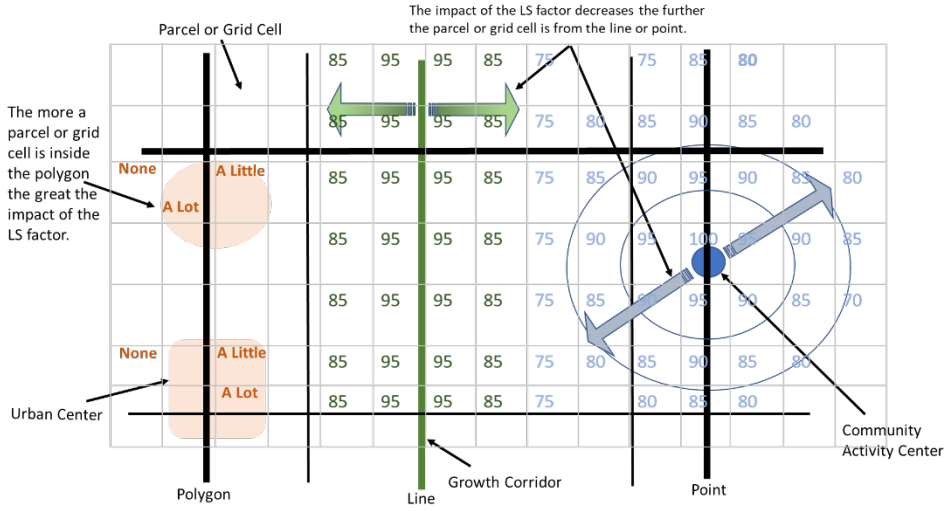
Appendix H: Residential Density by Place Type

The table below is used as a guide for the range of residential densities that can be found in each Place Type.

Residential Densities and Criteria by Place Typ																							
As of December 8, 2020																							
	Lot Size	3 Ac	2 Ac	1 Ac	20K SF	14.5K Sf	10K SF	8.7K SF	7.2K SF	6.2K SF	5.4K SF	4.8K SF											
Place Type	DU's / Ac	0.3	0.5	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	20	30	40	50
Large Lot Residential - LLR			X																				
Single Family Neighborhood - SFN				X																			
Mobile Home Neighborhood - MHN									X														
Town House Community - THC												X											
Multi-family Neighborhood - MFN															X								
Unban Neighborhood - UN									X														
Walkable Neighborhood - WN													X										
Walkable Activity Center - WAC																				X			
Transit Activity Center - TAC																		X					
Town Center - TC													X										
Metropolitan Center - MC																							X
							X = Denotes density value in the Regional Development Look Up Table																	

Appendix I: Land Suitability Factor Impacts


Polygons
Urban Centers
Critical Water Supply Watershed
Protected Floodplain
Sewer Service Areas
Water Service Areas
Correlation
Parcel or Grid Cell
100(%)
42(%)
0(%)
LS Polygon
The amount of area a parcel or grid is contained within the polygon the greater the impact on the LSA.
LINES
Growth Corridors
Transit Emphasis Corridors
POINTS
Interchanges
Community Activity Centers
Regional Activity Centers
Municipal Activity Centers
Correlation
Parcel or Grid Cell
Growth Allocation Attractor
0
10
The Slider
The closer a parcel or grid cell to a factor the greater the effect is on the LSA score.
Growth Allocation Detractor
0
10
The Slider


Parcel or Grid Cell
The impact of the LS factor decreases the further the parcel or grid cell is from the line or point.
The more a parcel or grid cell is inside the polygon the great the impact of the LS factor.
None
A Little
A Lot
Urban Center
Community Activity Center
Polygon
Line
Growth Corridor
Point