FINAL REPORT

Multimodal Corridor Study for the US 29 and US 33 Development Areas in Greene County

Submitted by

RENAISSANCE PLANNING GROUP

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In cooperation with:

Greene County Planning Commissioners and Staff

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1. EXECUTIVE SUMMARY

The Thomas Jefferson Planning District Commission was awarded a VDOT Multimodal Planning Grant to develop multimodal transportation solutions and land use strategies for Greene County, while addressing regional travel needs on the US 29 and 33 corridors. Through a competitive process, the Renaissance Planning Group was awarded a contract to conduct scenario planning workshops with County residents to determine a preferred future land use scenario and to prepare a modeling analysis of the transportation needs required to achieve this scenario. The five key goals of the Study were to:

- Create safe multimodal transportation options.
- Improve access to and between area businesses.
- Coordinate land use planning and transportation in the Greene County Comprehensive Plan update.
- Identify and prioritize cost-effective public and private transportation recommendations.
- Coordinate with the larger VDOT US 29 Corridor Study.

Four scenario planning questions were posed and addressed at the community workshops: where are we now, where are we going, where do we want to be, and how do we get there?

In response to the first question, Renaissance Planning Group examined existing land use and the corresponding existing transportation system. Most road segments in Greene currently perform under capacity, however US 29 from Ruckersville to the Albemarle County line is already nearing full capacity in the peak hours. Currently there is a lack of connectivity between subdivisions and commercial sites, many of which have a single access point onto a primary arterial. The result is a lack of route choices for local transport.

Second, an analysis of future land use patterns and transportation needs was conducted. For the year 2035 the analysis found that the current land use and trend patterns will result in failing capacities of major sections of US 29 and other major collector roads in 2035. Widening of US 29 in Greene will only temporarily solve the problem. If the proliferation of additional signals continues the capacity improvements that come from widening will be negated.

To address the where we want to be question, a series of workshops with the public were held to create and evaluate alternatives land use and transportation scenarios, and to choose a preferred future scenario. In addition to identifying the preferred land use patter, the participants also sketched in transportation improvements such as ideal new roads, and possible transit features including optimal park-and-ride locations. From the scenario planning workshops, the citizens envisioned a preferred scenario for Greene in 2035 that would:

- Create distinct villages and neighborhoods that are compact, walkable, and mixed use places.
- Offer balance and choice between urban and rural living.
- Minimize impact on farmland, open space and cost on infrastructure.
- Provide a better road system with improved connectivity, parallel roads and walking and biking options where appropriate.

Renaissance Planning Group, County staff and TJPDC staff used the preferred scenario and the public's recommendations to prepare an optimal transportation network analysis. The transportation framework section of this report, along with suggested land use and design guidelines, form the basis for answering the question of how do we get there. The optimized transportation network should:

- Provide a better road system with improved connectivity, parallel roads and walking and biking options where appropriate.
- Manage site access by seeking to limit and separate entrances, intersections, median openings and traffic signals in order to maintain and improve the flow of traffic and enhance public safety.
- Plan for future transit services between several County centers and along the corridors of US 29, US 33 and Route 230, creating an internal loop connecting several destinations within the County.

Time is right to plan and be proactive about shaping the quality of land use and transportation for Greene County. The central recommendation of this plan is for Greene County to strive, together with VDOT, developers and citizens, to create a system of parallel roads, linking new places, which have good internal local street networks. This vision can be achieved using a phased approach, through coordinated planning and cooperation. This will entail incrementally improving corridor access management and, over time, replacing signalized intersections with overpasses in conjunction with the improved parallel and connected network. It includes adopting and implementing an access management strategy, community and land use design recommendations, as well as a thoroughfare plan with street type standards that have improved walking and biking facilities. Some key recommendations from the report include:

- Incorporate recommendations from this multi-modal corridor study into the County's comprehensive plan. Important elements to consider are design guidelines, an access management strategy, a thoroughfare plan, connectivity measures, and the recommended future street types.
- Adjust the 2003 growth area boundary so that it more closely matches the size and location of the new places identified in the preferred land use scenario.
- Incorporate new land use types identified in the preferred scenario into the County's Zoning choices.
- Work with parcel and business owners to identify opportunities for better inter-parcel connectivity, and new road linkages.
- Work with community associations to identify opportunities to connect adjacent neighborhoods.
- Identify opportunities for locations of new streets shown in the thoroughfare plan.
- Plan for right of way acquisition.
- Plan and build parallel corridors that link new growth 'centers' which are places with high internal connectivity and walkable local streets.
- Put in place a phasing strategy that permits near-term signalized intersections to be phased out over time, and where feasible, be replaced by a grid system in conjunction with grade separating Route 29 and the sidestreet.
- Update Greene County's subdivision ordinance so that new subdivisions are required to meet or exceed VDOT's basic connectivity standards.
- Pursue funding and accept developer proffers as opportunities arise.
- Explore other financing options such as special districts, or tax increment financing.
- Coordinate with future VDOT US 29 improvements.

2A. STUDY PURPOSE

Overview

Greene County faces significant development pressures from housing, retail and service growth. This purpose of this study is to develop multimodal transportation solutions and land use strategies specific for Greene County, while addressing regional travel needs on the US 29 and 33 corridors. This study has a similar scenario planning, land use and transportation methodology that was proven to be successful in other regional studies, such as the NW Fluvanna-SW Louisa study. The project has five primary goals and benefits:

1. Improve the existing transportation system along US 29 and US 33 corridors by creating safe multimodal transportation options for drivers, pedestrians, bicyclists, and transit riders, and increased choice for seniors, youth, and the mobility-impaired.
2. Improve access to and between area businesses.
3. Coordinate land use planning and transportation in the Greene County Comprehensive Plan update, using scenario planning to create a multimodal transportation element that will effectively serve the community's land use goals.
4. Identify and prioritize cost-effective public and private transportation projects (both near-term and long-term) for consideration in the Commonwealth Transportation Board (CTB) Six Year Improvement Program and individual County negotiations with developers.
5. Coordinate this study with the larger VDOT US Route 29 Corridor Study.

Results of this study will support and be integrated into the US Route 29 Corridor Study, a concurrent VDOT study. This study has the dual purpose of being well timed to help Greene County update their Comprehensive Plan.

Scenario Planning Process

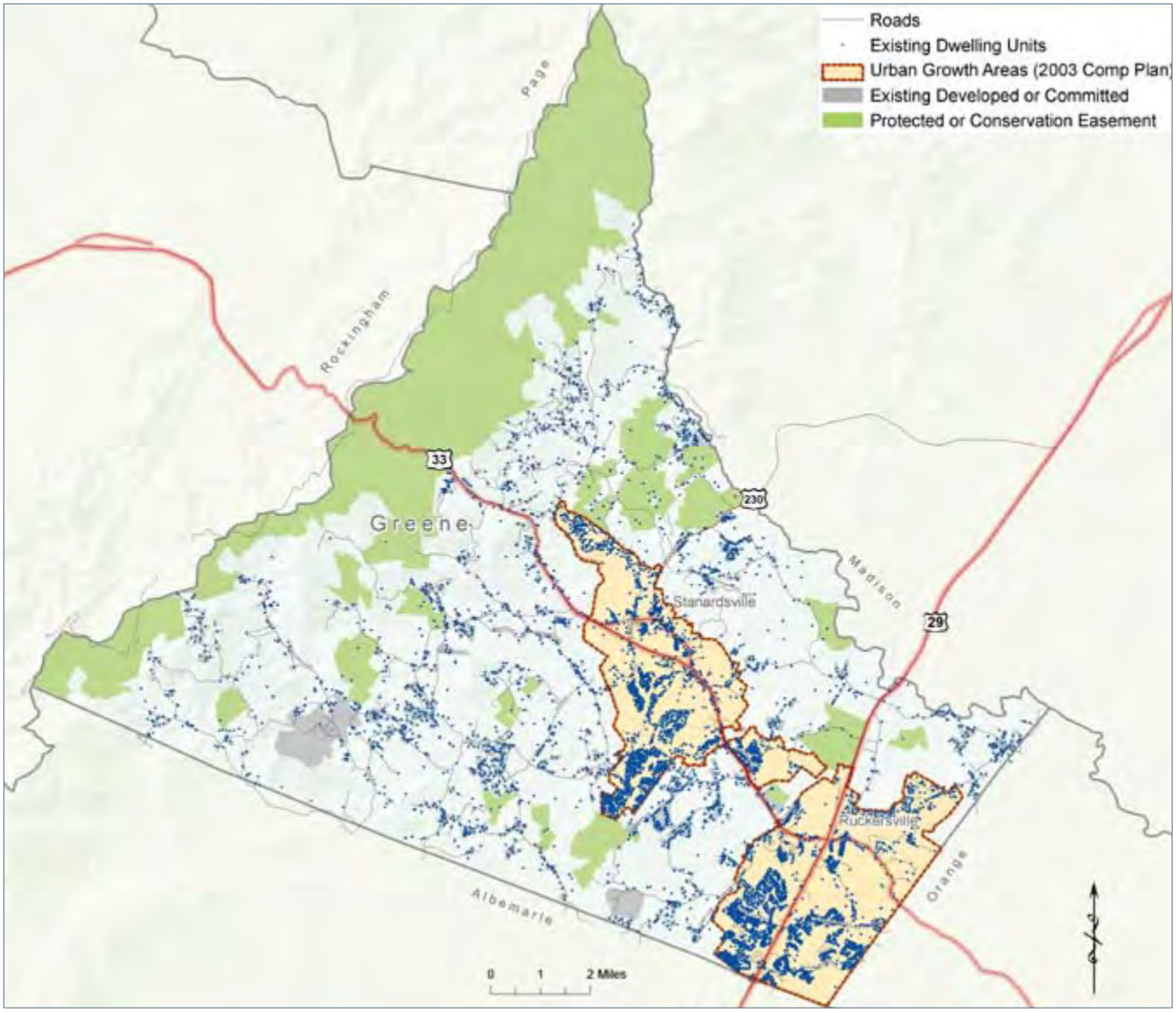
This project was designed around a scenario planning process. Scenario planning is an analytical tool that can help community planning and transportation professionals prepare for what lies ahead. The Federal Highway Administration defines scenario planning as:

> *"A process in which transportation professionals and citizens work together to analyze and shape the long-term future of their communities. Using a variety of tools and techniques, participants assess trends in key factors such as transportation, land use, demographics, health, etc. Participants bring the factors together in alternative future scenarios, each of these reflecting different trend assumptions and tradeoff preferences."* (http://www.fhwa.dot.gov/Planning/scenplan/index.htm).

The specific tools, steps, and methods used for this project's scenario planning process is described in greater detail in section 3. The first step of any scenario planning process is to understand existing conditions and evaluate future trends, which are also described in the sections that follow.

Study Area

The Study Area includes the portion of US 29 from the Albemarle County line to Ruckersville and the portion of US 33 from Ruckersville west to the western boundary of the Town of Stanardsville bypass and the portion of US 33 from Ruckersville east to the Orange County line, along with the surrounding development areas as defined in the Greene County Comprehensive Plan. The 2003 growth area boundaries are shown in the study area map below.

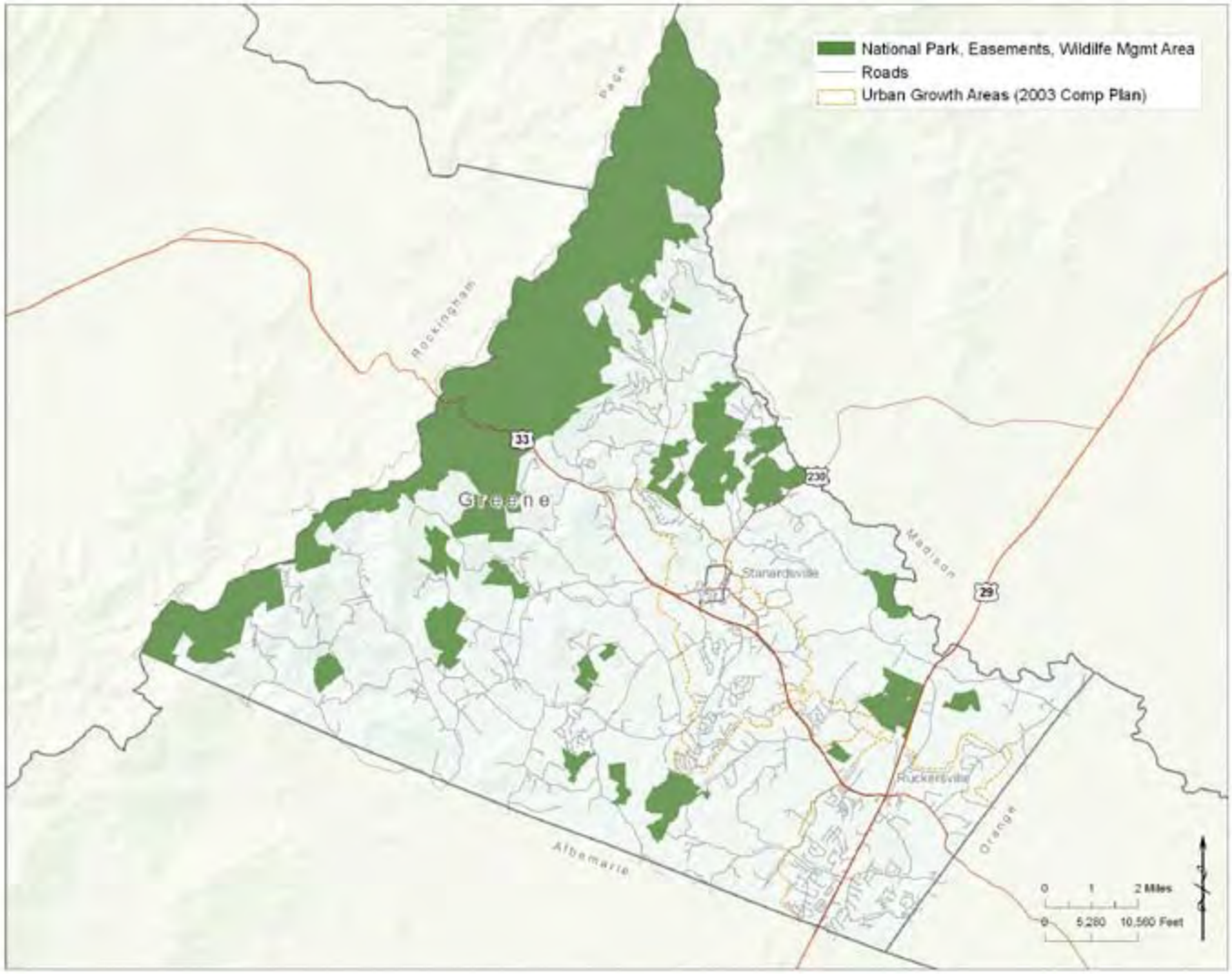


2B. EXISTING CONDITIONS

Protected Land

The purpose of the existing conditions analysis is to evaluate land use in Greene County in preparation for scenario planning. The first step in this process is to identify lands that are committed or undevelopable in any future land use planning scenario. The map below shows lands that are protected, or undevelopable because they are protected by a conservation easement, are wildlife management areas, or are state or federally owned and protected public parks. The conservation easement layers were obtained from the Piedmont Environment Council in October 2008 and are included in the map below.

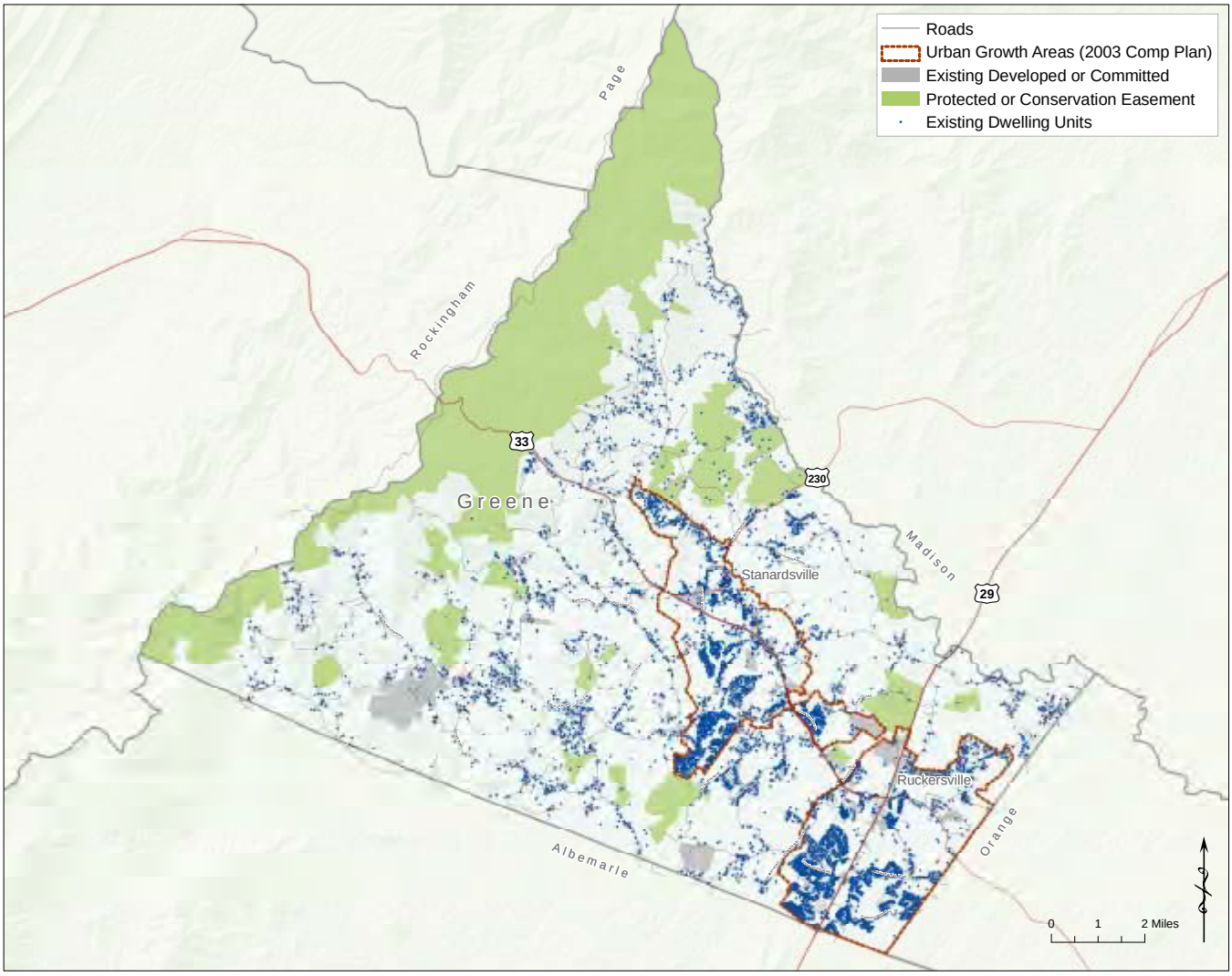
Greene County - Existing Conditions - Committed



Committed Land

Existing residential areas are considered committed in terms of future growth allocation. A primary assumption is that existing residential properties will not be built out in the project time horizon of 2035. It is understood that a residence may exists on a parcel that could possibly be subdivided further given its existing zoning and it size. The map below shows where the 6,615 current dwelling units exist in Greene County. Where there were dwelling units on parcels that could not be subdivided further, these parcels were marked as 'committed' or unlikely to develop or redevelop within the project time horizon.

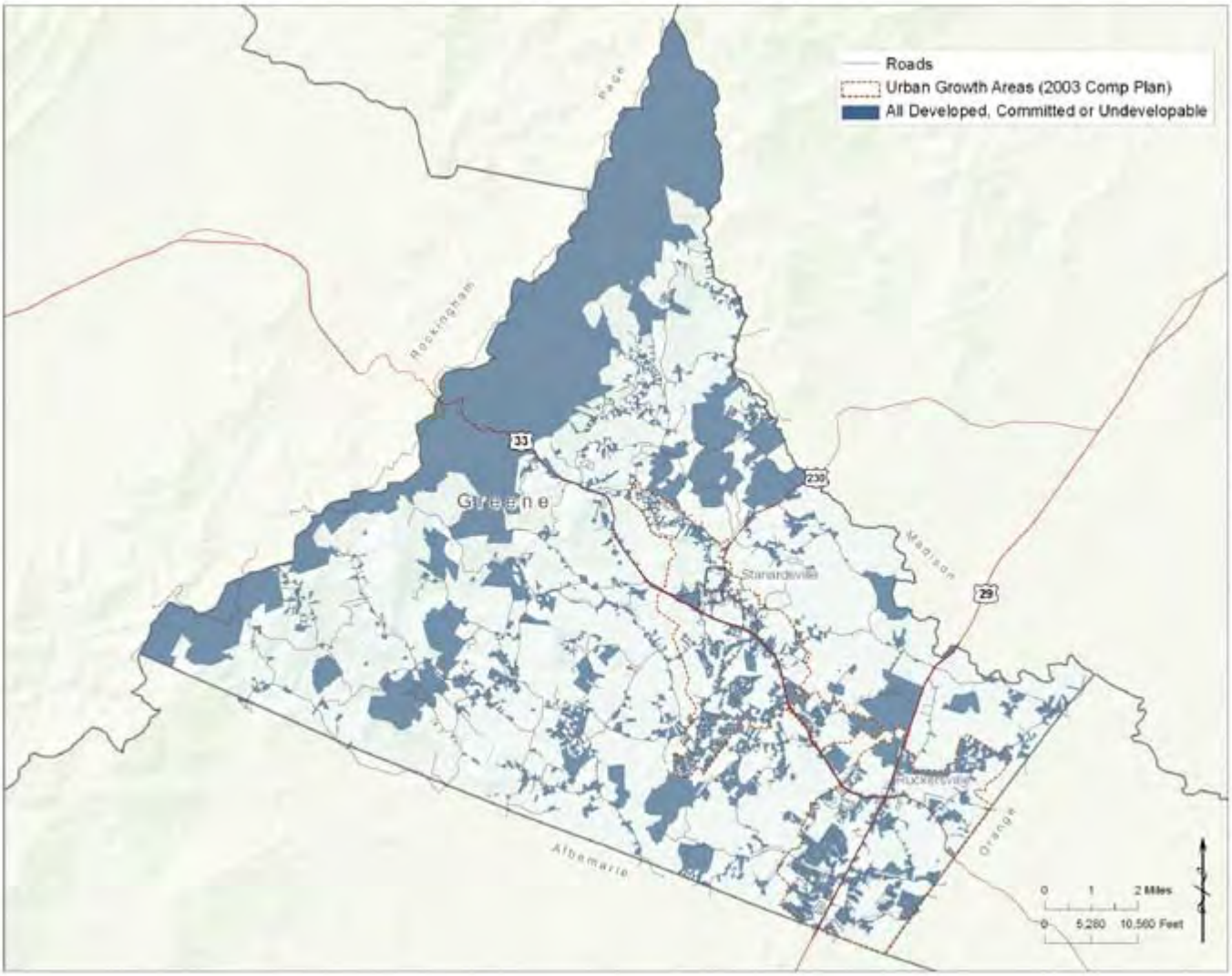
Greene County - Dwelling Units - 2007



Committed or Undevelopable Land Combined

The map below is an aggregate of all committed, developed or undevelopable lands. The County's parcel layer was the primary source of data for this analysis. Schools, churches, civic, parks, federal, state, easements, utilities and rights-of-way were all part of this overall committed/undevelopable evaluation. All the non-blue area on the map below are considered to have some future development potential, and are thus 'in play' as far as scenario planning is concerned.

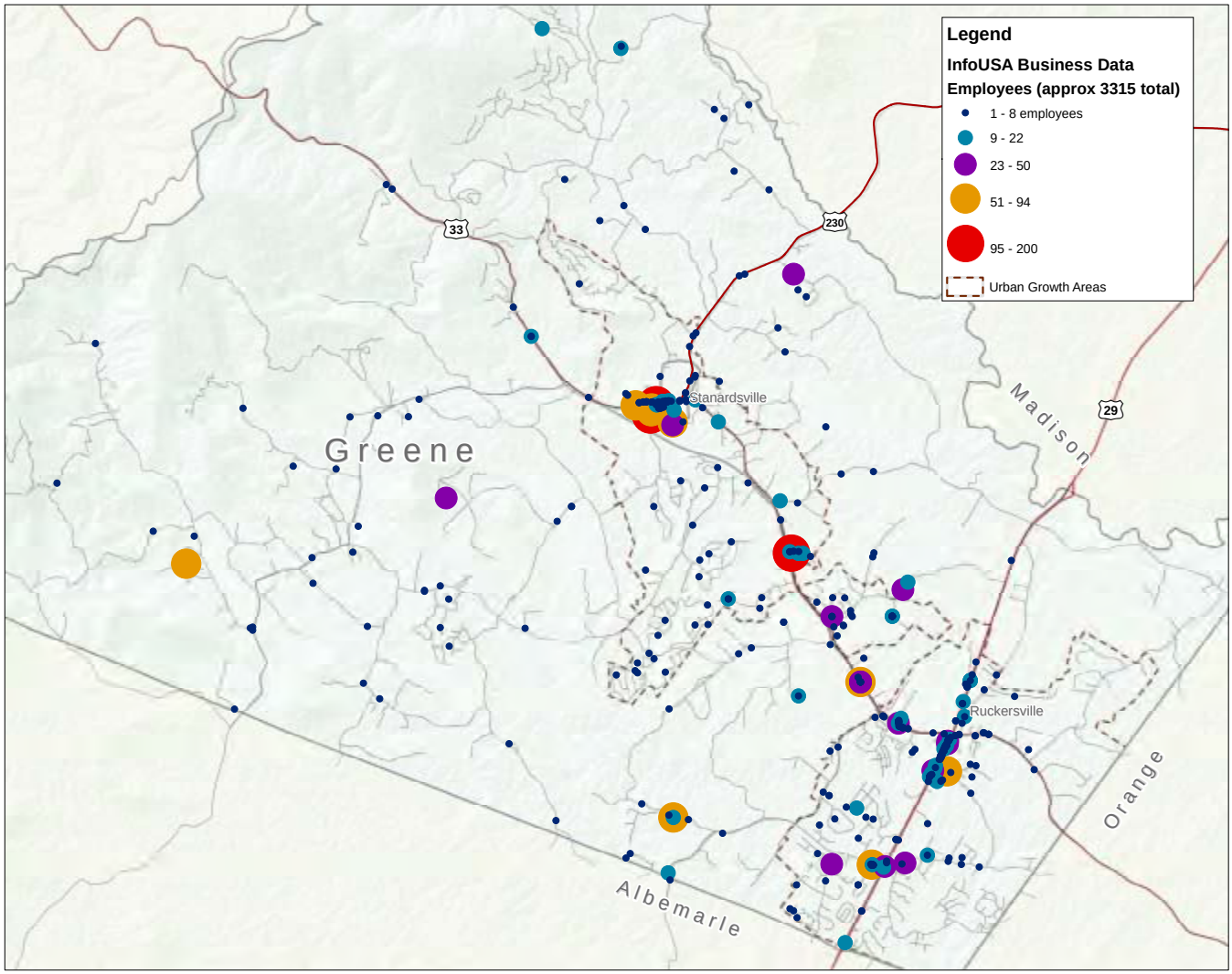
Greene County - Existing Conditions - All Built, Committed, Undevelopable



Existing Employment

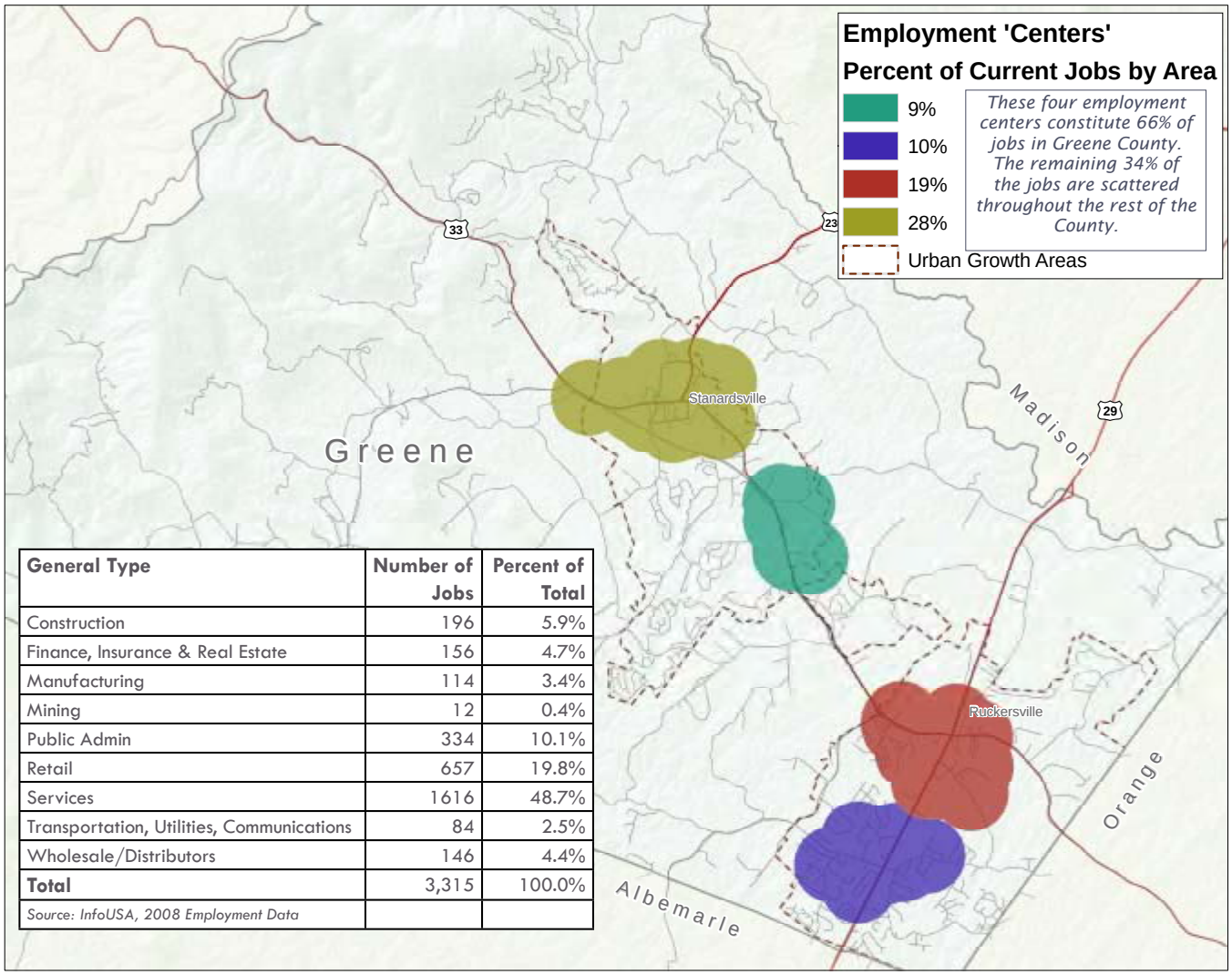
The arrangement of jobs and houses influences the demand on the transportation system. In traffic modeling, dwelling units generally produce trips, while jobs attract trips. It is important, therefore, to understand the location of current (2007) base year employment in Greene. It is furthermore important to spatially locate these jobs so they can be accurately assigned to a traffic analysis zone for purposes of modeling travel demand. Up-to-date, spatially located employment data are not available from state sources such as the Virginia Employment Commission (VEC). A data management company called InfoUSA maintains yearly updated employment data and a data set was obtained for this study. InfoUSA data is used by marketing and analysis firms as well as companies like Google earth for geocoding, or spatially locating, businesses. The map below reflects the employment data set obtained for Greene County, containing data valid through the end of 2007. This information was used to update the base year socio-economic data in the travel demand model.

Greene County - 2008 Employment



Approximately 66% of all employment in Greene County is located in four areas. These areas roughly corresponded to the more developed places, and to places chosen by participants as preferred future growth locations in the scenario planning process (see the section on the preferred scenario). Another noteworthy feature of employment in Greene is that nearly half (48.7%) are service sector jobs, which include local government, utilities, and school employment. These statistics explain why 28% of the County's current employment are located in Stanardsville, the majority of which are made up of schools and local government service employees. The job centers along US 29 are more of the commercial, retail job type, while the Greene industrial park, located along US 33, east of Stanardsville is another hub of employment.

Greene County - 2008 Employment



General Type	Number of Jobs	Percent of Total
Construction	196	5.9%
Finance, Insurance & Real Estate	156	4.7%
Manufacturing	114	3.4%
Mining	12	0.4%
Public Admin	334	10.1%
Retail	657	19.8%
Services	1616	48.7%
Transportation, Utilities, Communications	84	2.5%
Wholesale/Distributors	146	4.4%
Total	3,315	100.0%
Source: InfoUSA, 2008 Employment Data		

2C. GROWTH PROJECTIONS

To plan for the future, a land use and transportation study needs to estimate approximately how many new jobs, houses and people will be living in the study area by 2035. Predicting how much growth will occur in a given area, over a specific period of time is not an easy task. There are many variables that influence growth patterns and rates. Many communities in Virginia use, or reference, population projections made by the Virginia Employment Commission (VEC) projections, which are both based on US Census counts. The population table below is from VEC, with updated US Census figures for 2007 obtained from the Weldon Cooper Center for Public Service/US Census. The 2007 population in Greene is 17,860 which could grow to 29,996 by 2035 according to growth rates and projections based on VEC calculations.

Population

Year	Greene County	(% Change)	Virginia	(% Change)
2000	15,244		7,079,030	
2007	17,860	17.2%	7,712,091	8.9%
2010	19,269	7.9%	8,010,342	3.9%
2020	23,088	19.8%	8,917,575	11.3%
2030	27,231	17.9%	9,825,288	10.2%
2035	29,996	10.2%	10,377,049	5.6%

Annual growth rate for 2000-2030	Greene	Virginia
	1.96%	1.10%

(Source: 1990-2030 U.S. Census Bureau, Virginia Employment Commission, Community Profile, Greene County. Note population counts for 2000-2007 represent the latest U.S. Census counts from the Weldon Cooper Center for Public Service. Estimates for 2035 calculated by applying annual growth rates.)

VEC does not provide county level employment forecasts, but instead provides regional employment projections. The Piedmont Workforce Network Region (see map below for the size of these regions) is expected to grow on average 1.86% per year. The table below shows the VEC 14 year employment projections for the region.

Regional Employment Projections, 2004-2014

	2004	2014	Annual Growth Rate
All occupations	153,544	184,529	1.86%

(Source: Virginia Employment Commission. Projections data is for Piedmont Workforce Network (LWIA VI). No data available for Greene County.) Note, this study assumed a higher job growth rate than region, and chose a rate equivalent to the population growth rate.

Greene County currently has 3,315 jobs, and 17,860 people, which is a jobs/person ratio of 5.38. This ratio indicates that Greene currently has a profile of a 'bedroom' community, one where there are more people than jobs. Commuter patterns substantiate this bedroom community profile. The majority (approximately 64% according to the 2000 US Census) of Greene County workforce commutes to job locations in the Charlottesville/Albemarle region. Adopting an employment growth rate of 1.86% per year for the study purposes would only widen this jobs/persons ratio, while Greene County planning staff, Planning Commissioners, and focus group participants all expressed that this housing and jobs ratio could become more balanced overtime. For purposes of this study a rate of 1.96% was applied to base year (2007) existing employment, and the employment control totals used for this study are shown below. For comparison, the average annual growth rate for the state of Virginia is 1.10%.

Greene County Employment Projections

	2007	2035	*New*
All occupations	3,315	5,693	2,378

Source: InfoUSA Survey of Businesses and Employees as of October 2008. 2035 estimates based on applying same growth trend as the Population projections, 1.96%)

Average household size in Greene County is 2.7 persons per household. This figure is based on US 2000 Census counts and was validated by further GIS analysis updating the socio-economic data behind the travel demand model. It is important to stress that these growth projections are adopted for planning purposes only, and were adopted from widely used sources as well as educated analysis. Scenario planning for the future requires these estimates. Part of the scenario planning exercise conducted by participants involves choosing where and how these new houses, jobs and people will be arranged and relate to existing development. For example, in what kind of places will the new 12,136 new people by 2035 live, what will their communities look like, how will people travel, where will they work, shop, or recreate? How will the combination of existing and new communities function? In order to compare alternative scenarios a given increment of jobs, people and households are chosen for the project horizon. These control totals, the projected increment from 2007-2035, are shown in the table below.

Project Totals		Total growth by	New between 2007 and 2035
Projections	**2007**	**2035**	**Increment**
People	17,860	29,996	12,136
Households	6,615	11,109	4,495
Jobs	3,315	5,693	2,378
PP/Job	5.39	5.27	

(Sources: 'People' is from the US Census, the 30 year growth projection is 1.96% annual. 'Households' figures for 2007 and 2035 were derived by dividing the population by average household size of 2.7 (US 2000 census). 'Jobs' is from the InfoUSA Survey of Businesses and Employees 2007. 2035 estimates based on applying same growth trend as the Population projections, 1.96% which is higher than the VEC regional average of 1.86%)

Percent 2007 Dwelling Units inside 2003 growth area	70%
Percent 2007 Dwelling Units outside 2003 growth area	30%

2D. LAND USE TREND ANALYSIS

Scenario planning requires a baseline against which to compare alternative futures. This baseline is the trend analysis. The basic methodology in creating this baseline trend analysis follows these steps:

1. How Many

- Estimate future people, houses, jobs by 2035 (see prior section)

2. Where growth can or cannot occur

- Identify existing development (see prior section)
- Evaluate committed (off limits) lands (see prior section)
- Determine developable land (see prior section)

3. Allocate future growth

- Examine current density or intensity specified by the zoning policies.
- Study existing patterns and known (rezoned, platted, but unbuilt) development, and 'populate' these locations first.
- Allocate to high proximity locations (roads, water, sanitary infrastructure) until future control totals are met.

The graphic below illustrates this process. The remainder of this section provides greater detail on the steps above that were not covered in earlier portions of this report, namely the evaluation and allocation of trend growth.

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AVAILABLE LAND + REZONED/SUBDIVIDED + HIGH PROXIMITY LAND + ZONING DENSITIES = TREND

Evaluating Density and Intensity of Existing Zoning

Working closely with County staff and the project team, the existing zoning policies in Greene County were evaluated to identify typical dwelling units per acre and floor-to-area ratio trends. Floor-to-area ratio, or FAR, is the ratio of building square footage to the area of the parcel. It is a means to measure the ratio of building square feet per acre. The Institute of Transportation Engineering (ITE) trip generation manual provides conversion factors for commercial square feet of building to generate trips. Thus by knowing the FAR of a parcel, one can determine the number of jobs per acre. The final result of this analysis allows us to know how many new people or jobs can be expected under the current policies.

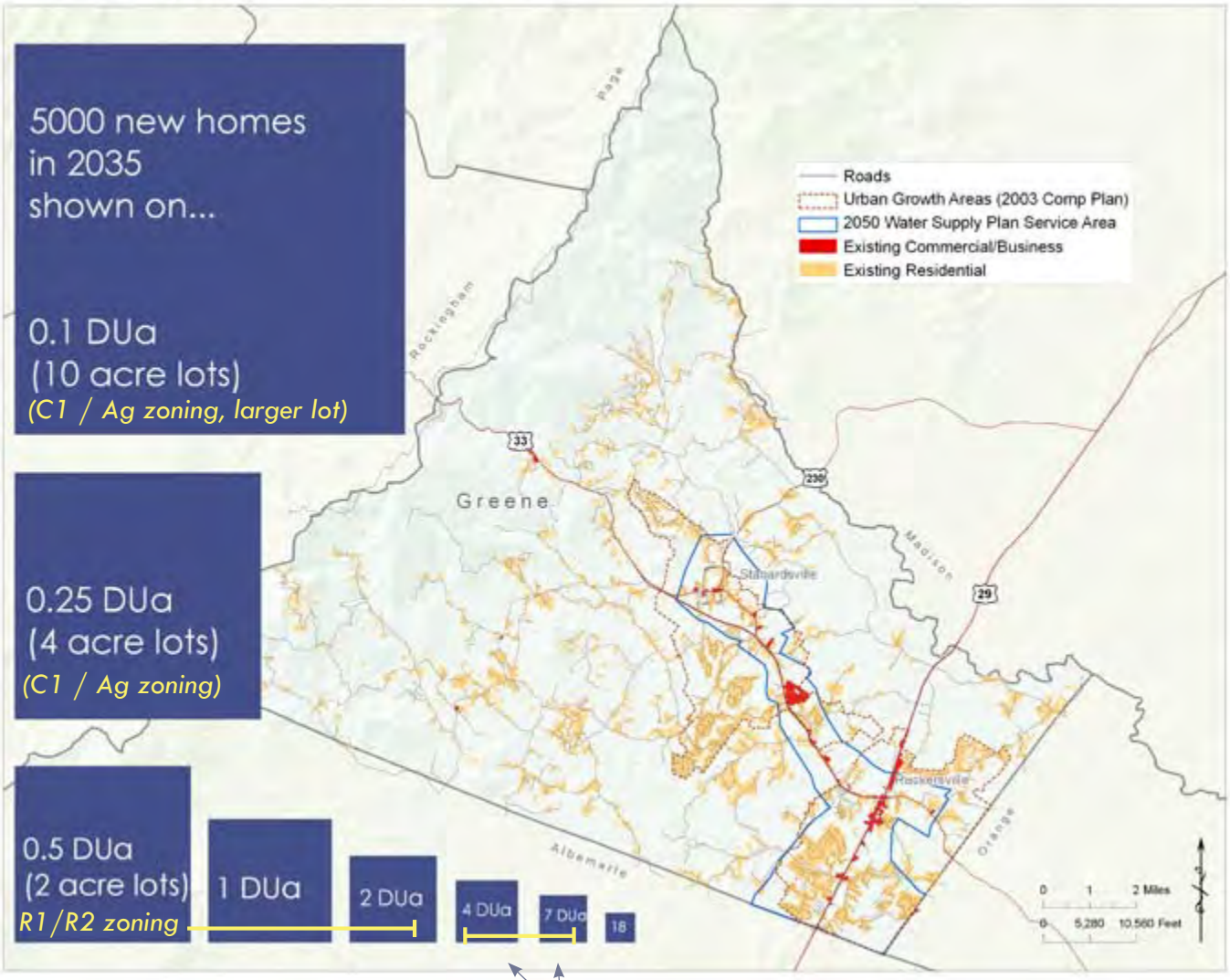
It is important to note that even though a particular zoning category specifies a particular density or intensity, there are factors at play which may prevent that development type from becoming built to the full potential. To get a more realistic picture of development intensity by zoning, GIS was used to analyze existing development. The results of this analysis are in the table below. The figures are the net densities used in the GIS analysis using CorPlan, a software application designed by Renaissance to conduct land use allocations for scenario planning and transportation modeling studies.

Existing Zoning	Description	Density/Intensity	
		DU/Acre	FAR
Residential			
R-1 High	Single Family Residential District -Small Lot	1.50	
R-1 Low	Single Family Residential District -Medium Lot	0.90	
R-2	Residential District - Small Lot	1.80	
R-3 (Sville)	Stanardsville Downtown Residential	3.00	
SR	Senior Residential	5.50	
Commercial			
B-1	Restricted Business		0.20
B-2	General Business		0.20
B-3	Highway/High Intensity Business		0.20
Industrial			
M-1	Limited Industrial		0.30
M-2	General Industrial		0.20
Planned Development			
PUD	Planned Unit Development	4.00	0.15
Residential			
C-1	Conservation District - Medium Lot	0.15	
A-1 High	Agricultural District -Small Lot	0.50	
A-1 Med	Agricultural District - Medium Lot	0.30	
A-1 Low	Agricultural District - Large Lot	0.25	
Other			
RC-1	Stanardsville Downtown District		
SNP	Shenandoah National Park		

Density Comparison

The map below was created to help workshop participants in the public process understand the land needed to accommodate 5000 new homes in Greene County, a figure just above the study control total. The blue squares are scaled to the map below so they match the area of land needed to accommodate 5000 new homes if built at different levels of intensity. For example, if 5000 new homes were built on 10 acre lots it would require the amount of land shown in the largest blue square. The same 5000 homes could all fit in the smallest blue square if all new homes were built at 18 dwellings per acre. In reality there is a mixture of lot sizes and zoning types, but this illustration helps to understand both extremes, and helps make the case for planning for more diverse land use choices.

Greene County - Residential Density Comparison

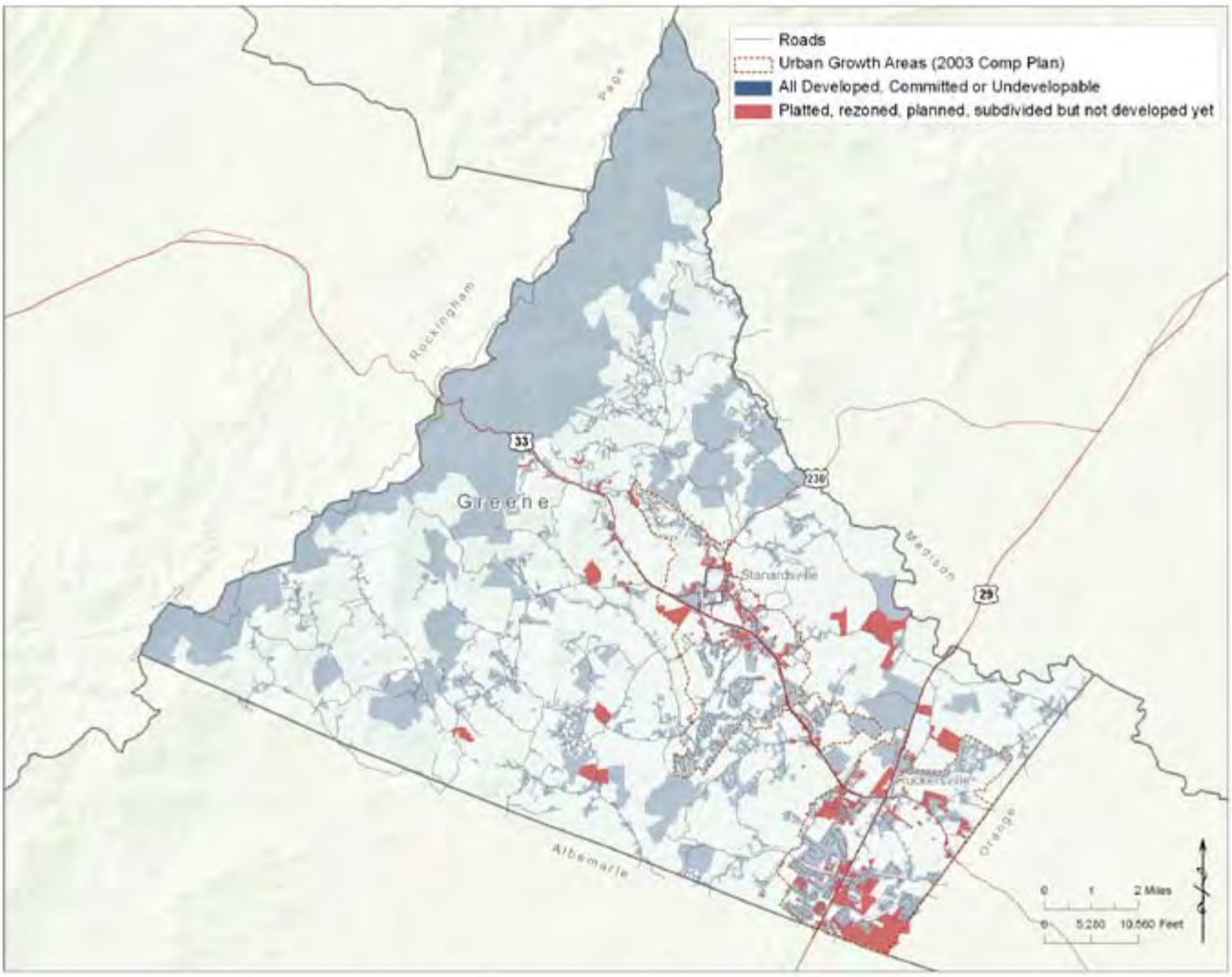


Senior Residential and R3 Stanardsville type zoning, are at densities that begin to support transit service (5-6+).

Planned Development

The next phase of creating a trend scenario is to identify where land has already been rezoned, replatted, or subdivided. The red areas on the map below show parcels that as of October 2008 met one of these criteria. Some of these areas have not yet been developed, nor may ever be developed. In a scenario planning process it is important to know where planned, or 'pipeline' development is likely to occur, and also understand that some of these areas may not necessarily develop as rezoned. A perfect example of this is the Rapidan Center along US 29 where land has been rezoned, and graded but where nothing has yet been built. It is yet to be determined what form or type of new development could occur there. Thus even if planned, or known, development areas are marked on the map below it does not predestine either their creation, nor what character or type of new development could eventually occur there. The identification of planned development was used in populating the trend scenario with future jobs and houses, primarily for purposes of testing how the transportation network would perform in 2035.

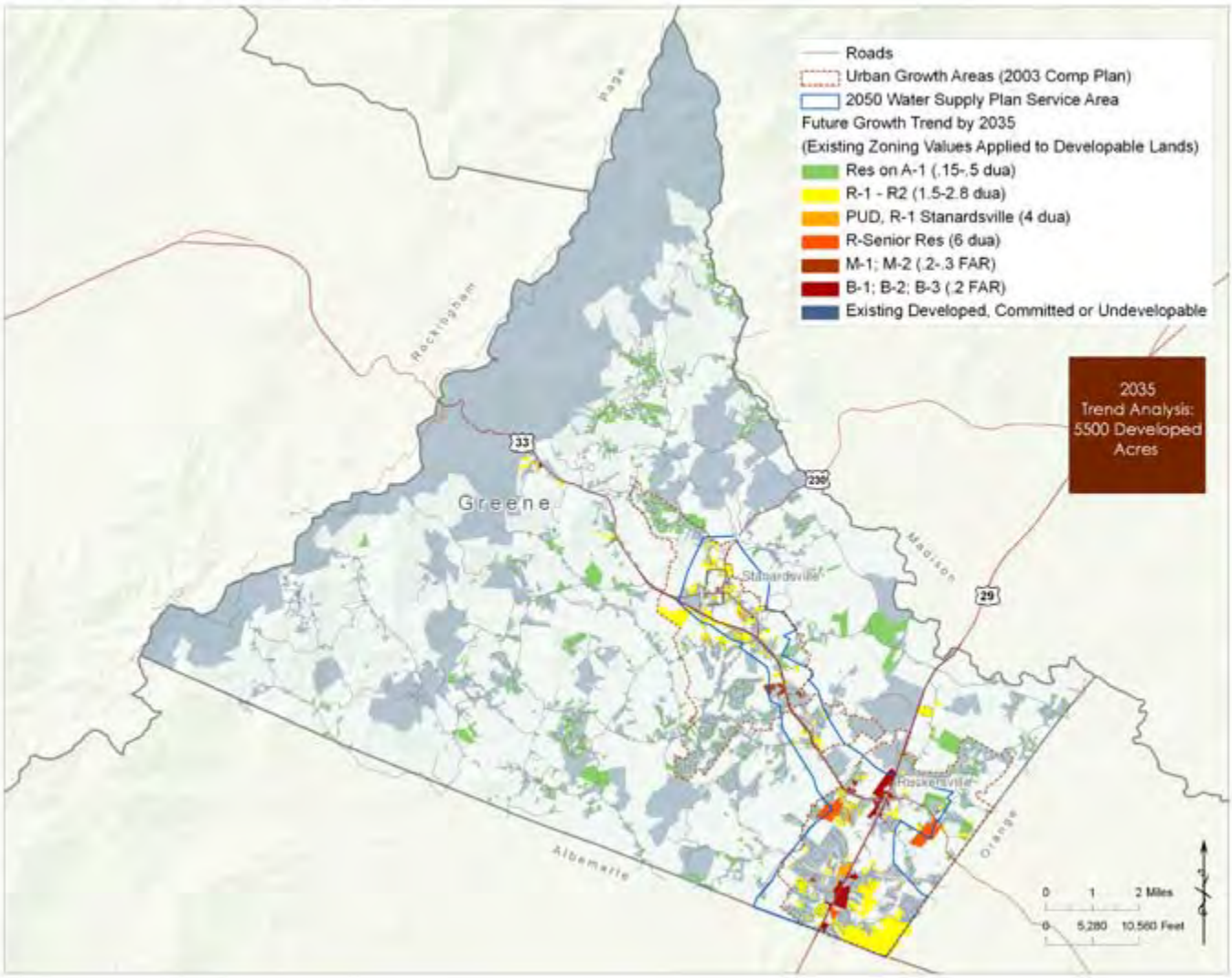
Greene County - Trend Analysis



Trend Analysis

The final step in the trend scenario creation is to populate areas of Greene that are available for development, and which have a higher likelihood of development because they had close proximity to water or sewer services or had good access to primary highways, namely US 29, US 33 and US 230. The map below shows the trend allocation, and how it corresponds to the existing zoning. Approximately 5,500 acres of new land would be needed to accommodate this new growth by 2035, or roughly 12,136 new people, living in 4,495 new homes, and employed in 2,378 new jobs. All the other scenarios used these same increments, or control totals.

Greene County - Trend Analysis



2E. ROAD NETWORK ANALYSIS

US 29 and US 33 are the primary arterials that serve both as regional highways for the Commonwealth as well as primary transportation corridors for local traffic and economic opportunities in Greene County. Both arterials run through the center of the County's growth areas. The focus of this land use and transportation study is to understand the relationship between how land use and the performance of both these arterials as well as the supporting local road network. What happens, or is not happening, off the corridor is just as important as what is happening immediately on the primary corridors. This existing conditions analysis examines the existing road network in Greene County. A traffic demand model was used to test results of the trend scenario land use allocation, described in Section 2D, to evaluate the performance of the road network in 2035.

Functional Class

VDOT has a functional classification for roadways that outlines the intended function and capacity for State primary and secondary roads. Generally road function classes fall into an urban or rural category. Despite recent growth in Greene County's urban growth areas, the area is still characterized as a rural area as far as function al classification is concerned. The first table below describes the characteristics for different rural road type functional classifications. The second table goes into a little more detail about the capacity threshold for each roadtype. US 29 and US 33 (west of US 29) are classified as Other Principal Arterials, a failing capacity would be reached at either 32,200 or 34,200 trips per day depending on the number of signals per that segment. Most all of the secondary streets in Greene are either two lane collectors which fail at capacity 14,600 average annual daily trips (AADT). The map on the following page is a functional classification map, using VDOT data, with the number of lanes labeled.

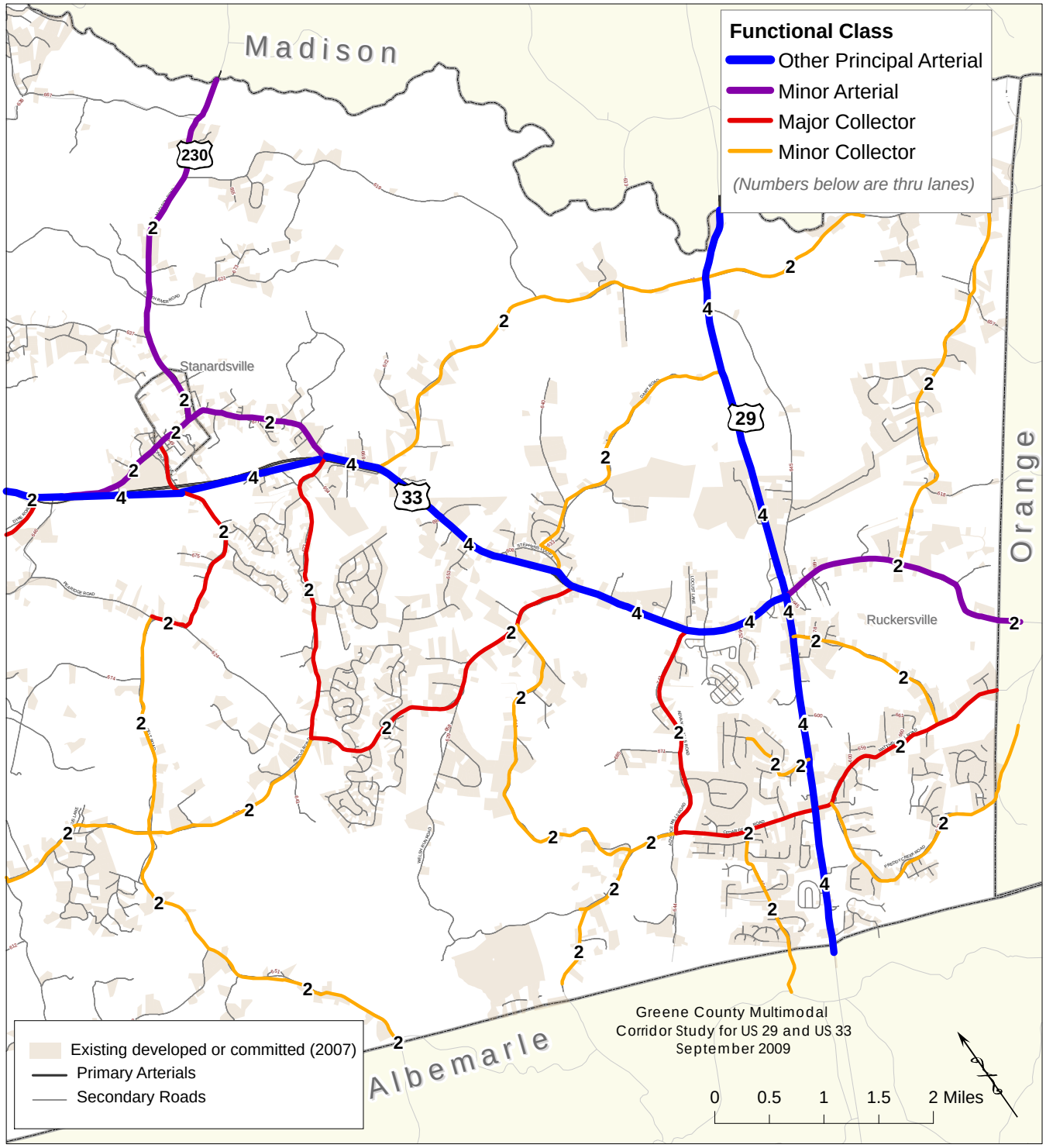
Classification	Location	Characteristics
Principal Arterial	Rural	Trip lengths for statewide or interstate travel. Integrated movement generally without stub connections. Accommodates movement between (virtually) all areas with pop. 50,000. Two design types: freeways and other principal arterials.
Minor Arterial	Rural	Links cities, large towns and other traffic generators attracting traffic over long distances. Intercounty service. Designs should be expected to provide for relatively high speeds and minimum interference to through movements.
Collector	Rural	Serve intercounty travel with travel distances shorter than on arterial system. More moderate speeds. Divided into major and minor system.
Local	Rural	Local roads primarily provide access to adjacent land and the collector network. Travel is over short distances.

Source: Transportation Research Board (TRB) Circular E-C019, Dated December, 2000

VDOT classification		Number of lanes	Signal/ spacing	Divided/ undivided	Capacity at LOS E
1	Rural Interstate	4	n/a	divided	63,000
2	Other Principal Arterial	4	<2 signals/mile	divided	34,200
2	Other Principal Arterial	4	>2 signals/mile	divided	32,200
6	Rural Minor Arterial	2	signalized	undivided	14,900
6	Rural Minor Arterial	4	signalized	divided	31,200
6	Rural Minor Arterial	2	unsignalized	undivided	27,500
6	Rural Minor Arterial	4	unsignalized	divided	58,300
7	Rural Major Collector	2	signalized	undivided	14,600
7	Rural Major Collector	4	signalized	divided	30,900
8	Rural Minor Collector	2	unsignalized	undivided	14,600

LOS is a measure of congestion on a roadway.

Greene County - Thoroughfare Plan - Functional Class (Existing)

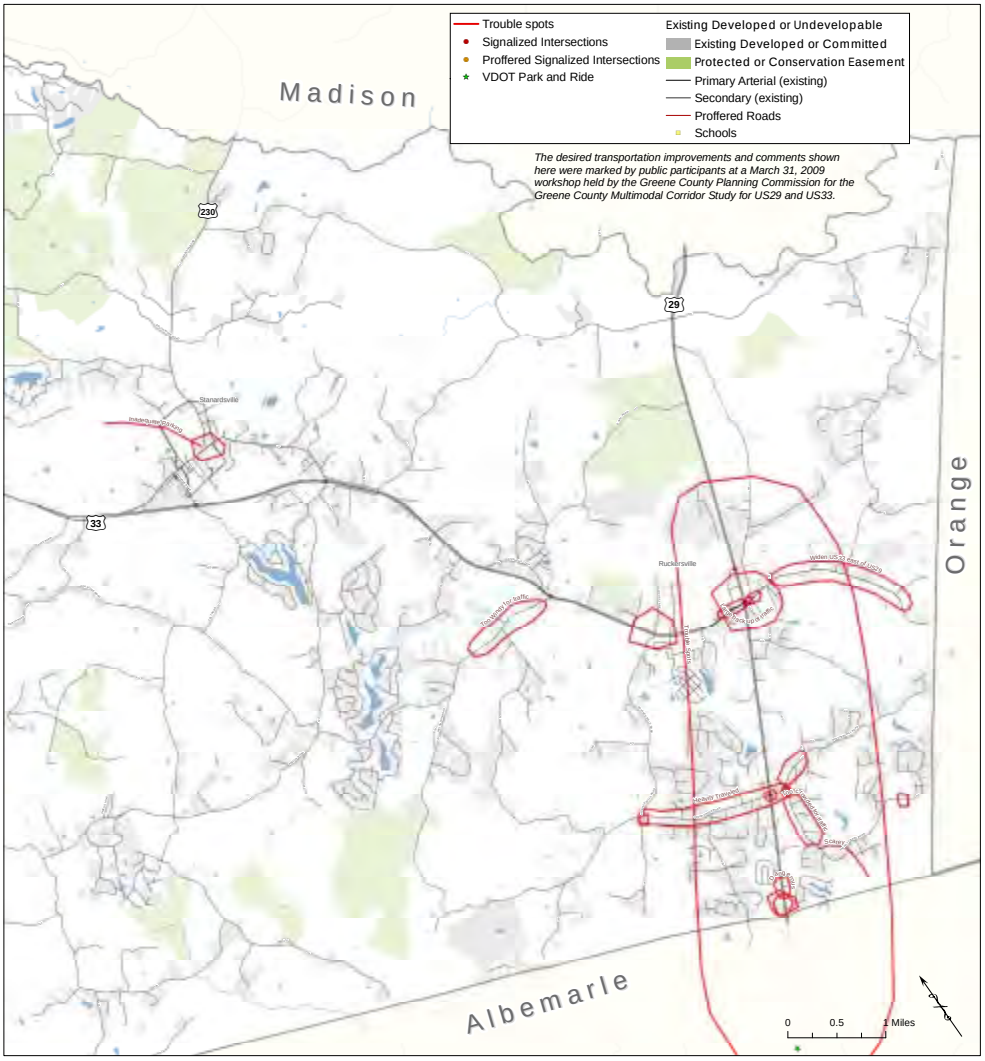


Existing Conditions: Volume to Capacity Ratio Analysis

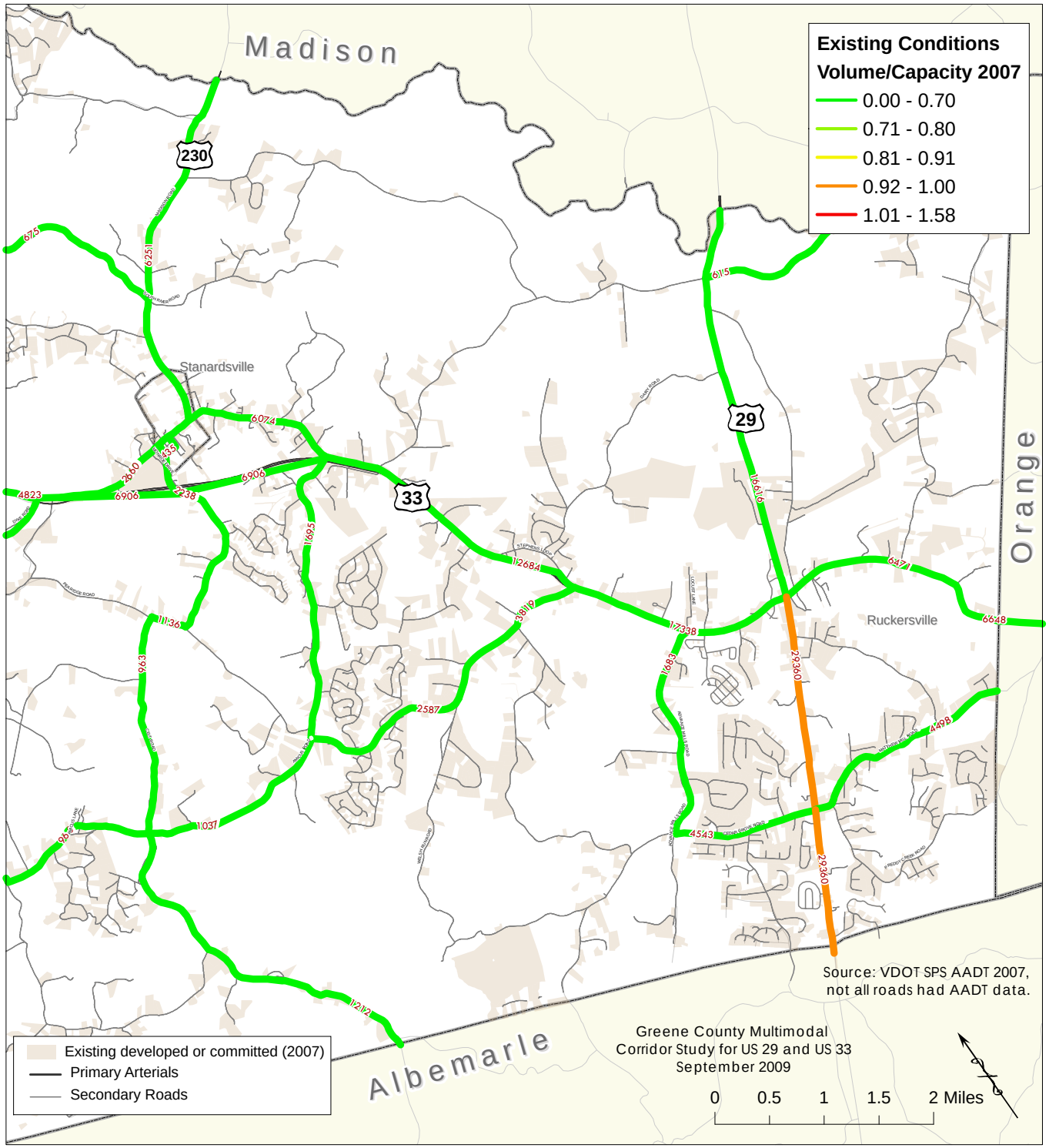
Based on VDOT average annual daily trip counts data available the volumes were compared with the capacity to reach a volume-to-capacity ratio. Volume to Capacity (VC) is a measure of service based on the ratio of traffic volumes to roadway capacity. Capacity is based on the characteristics of a given road. When a VC ratio reaches a value of 1.0 then a roadway segment is considered to be at capacity, and therefore failing. The map on the opposite page shows the VC for current traffic volumes by color. All colors but red as passing. The orange color indicates that a roadway segment is approaching a failing grade, or is .91 or greater. The only significant segment that is approaching failing based on 2007 counts is US 29 from the US 33 intersection to the Albemarle County line. The volumes for each segment are labeled on the map. This does not bode well for the future. Even at modest growth estimates this segment of US 29 will likely be at or over capacity in the near future and certainly by 2035. The future trend analysis substantiates this finding, and is explained in more detail on the following pages.

It should be noted that the VC analysis does not evaluate the performance of key intersections, only the segments. Residents at public workshops identified a number of locations where they have experienced poor performance or delays at key intersections. The map on this page is a summary of these 'trouble spots' which identify the same segment of US 29, as well as the intersections at US 33 and US 29, the US 29 and Rt. 607 intersection, and the new development at the Albemarle County line.

Greene County - Transportation Planning Exercise, Public Workshop 3/31/09 - Trouble Spots



Greene County - Existing Conditions 2007 - Volume to Capacity



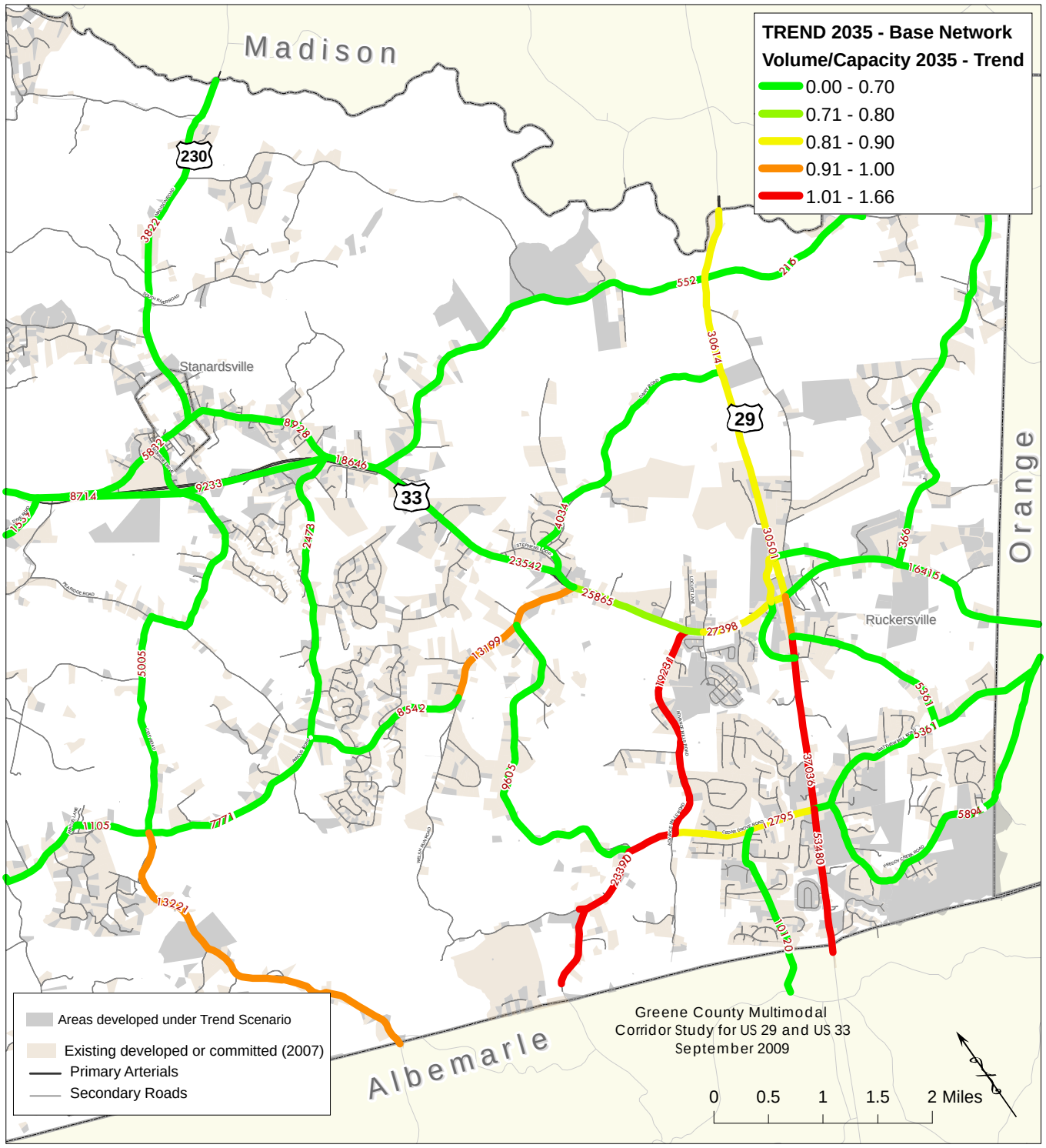
Future Trend Conditions: Volume to Capacity Ratio Analysis

The travel demand model developed for the Eastern Planning Initiative (EPI) and utilized for the NW Fluvanna/SW Louisa study was updated and used to estimate travel demand on alternative transportation networks in the study area. In order to update the existing EPI model for use in the Greene County Multimodal Corridor Study, a number of revisions were conducted. First, the existing traffic analysis zone (TAZ) structure was reviewed and updated as necessary to reflect changes in the County's base future land use forecasts. Next, the existing 2025 highway network was reviewed and updated to include future planned road improvements to the year 2035. Once these revisions were made, the model was run with trend 2035 land use data and checked for reasonableness against VDOT future traffic forecasts. EPI model traffic assignments compared reasonably to VDOT future traffic forecasts.

This trend analysis assumes that land use and transportation patterns of the past 10-20 years continue as they are. The future jobs and households data from the trend analysis was applied to the traffic analysis zones of the traffic model. The map on the following page portrays the results of the travel demand model. Volume to capacity thresholds symbolized in this map show road segments that are failing by 2035. Status quo development patterns are characterized by subdivisions which do not connect to each other and have a heavy reliance to direct access onto US 29 and US 33 for access. This pattern requires the primary arterials in Greene County to function both as local main streets and as fast moving regional highways. When a street is required to perform contradictory functions, performance of both will suffer. Under current patterns local and regional traffic are both heavily reliant on US 29. Local traffic does not have alternate routes or choices for avoiding US 29. Even existing semi-parallel facilities like Advance Mills Road, west of US 29 are shown to have failing volumes in 2035.

Widening of US 29 in Greene will only temporarily solve the problem, and will prove to be expensive and disruptive to the local economy. If the proliferation of future signals continues, even where permitted by access management standards, the capacity improvements that come from widening will be negated. The overarching solution this report endorses is to embrace joint land use and transportation planning effort. This includes an access management strategy, community design recommendations, and a thoroughfare plan that encourages parallel roadways and better connected local street networks in the future.

Greene County - 2035 Trend Road Network Analysis



2F. MULTIMODAL TRANSPORTATION CONDITIONS

Greene County currently is largely a suburban or rural area. Pedestrian facilities are generally only found in or around Stanardsville which has a small village feel (see top right picture). New developments, such as the Four Seasons community (middle right) are being built with pedestrian features such as sidewalks. However, these facilities typically only have internal connectivity. People leaving these developments (see bottom picture) occasionally have to brave crossing high speed arterials to get from one subdivision to the next. The scenario planning workshops clearly identified that as some places develop in Greene, people want to have communities and places where once you arrive there are enjoyable and safe place to walk around. The design guidelines included in this study make recommendations on how to create places that encourage a more enjoyable and safe pedestrian experience.

Rural and suburban communities are still largely dependent on the car for personal transport. Greene County does have a reliable on demand transit service (more on this in the Transportation Framework section recommendations). Residential densities are not currently at the level to support fixed route transit service. However, the preferred land use scenarios endorsed more compact and mixed use development patterns, which if realized may create opportunities in the future for more transit services.

Existing biking facilities such as signage, expanded shoulders, or dedicated bike lanes, are limited. Citizens did express the wish for some places where future bike facilities could be improved.

3A. PROCESS AND SCENARIO DEVELOPMENT

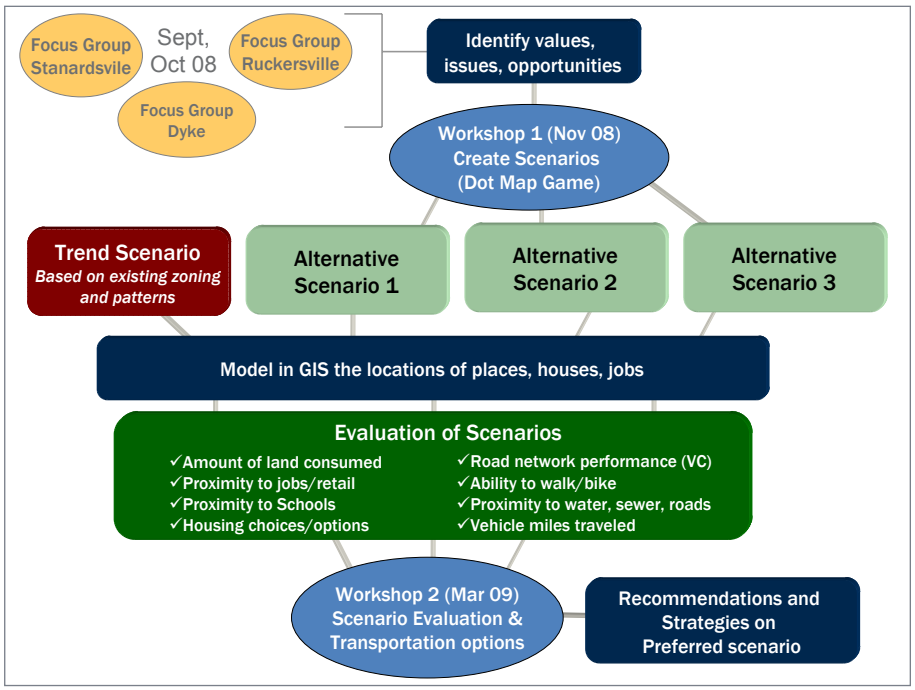
3Ai. PUBLIC INVOLVEMENT OVERVIEW

The general approach used in this study was a tried and tested scenario planning method. Workshops and meetings were structured around a basic four step approach which results in the creation and testing of alternative land use and transportation future scenarios for Greene County.

1. **Where are we now?** Focus group meetings in September and October 2008. Identify issues, opportunities and existing conditions.
2. **Where are we going?** Scenario Planning Workshop – November 15, 2008.
3. **Where do we want to be?** Public Planning Workshop 2 - Scenario Evaluation (March 31, 2009). Pick a preferred scenario and sketch transportation plans to support this.
4. **How do we get there?** Develop multimodal solutions, develop recommendations, draft report, review process, finalize report. (May-July 2009)

The graphic below is a flowchart of the overall project process, elements of which are described further in sections that follow.

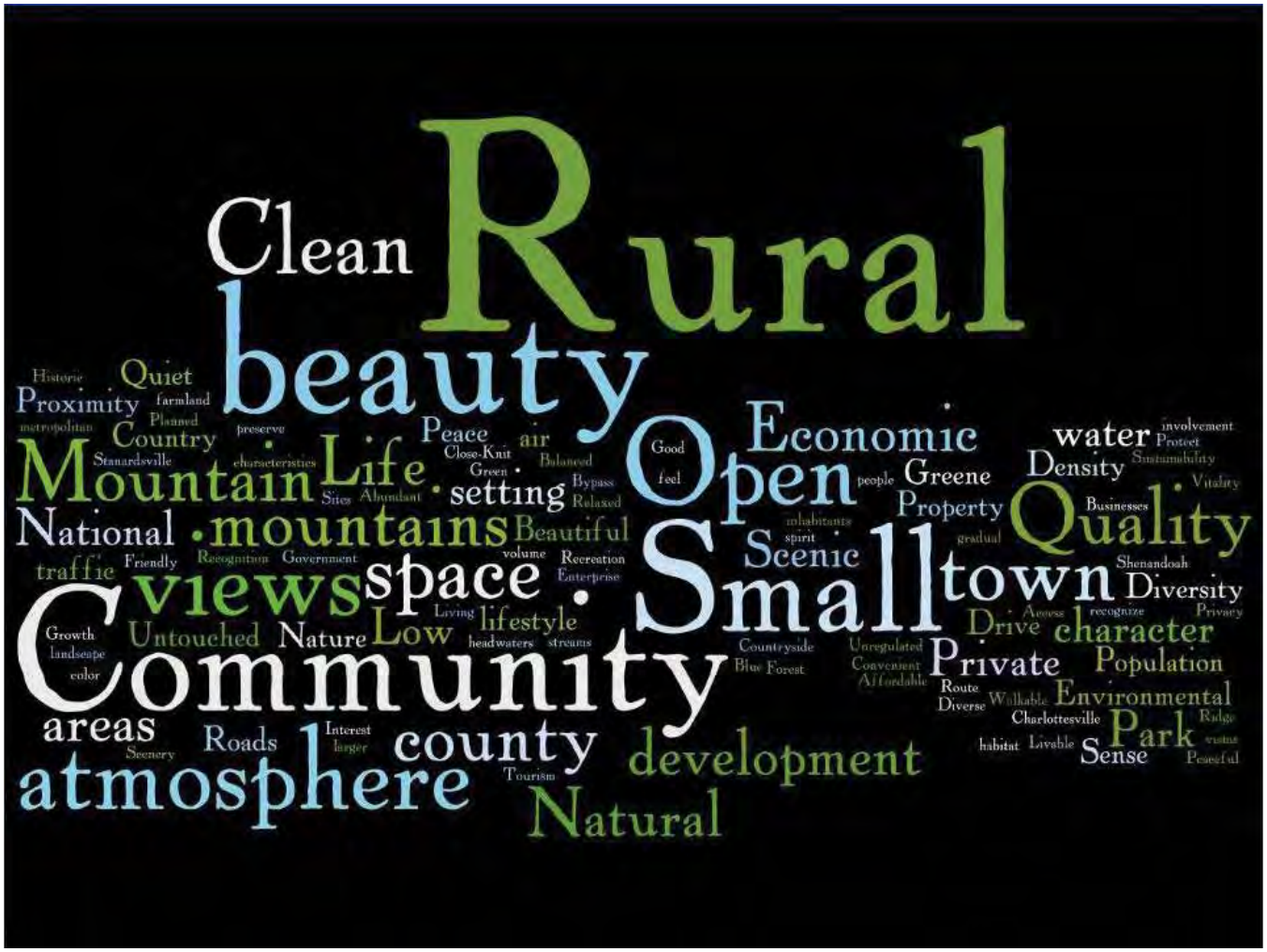
On July 15, 2009 a draft report was presented to the Planning Commission, and published on the project's website hosted by the TJPDC. Public comments were accepted and received. The plan was presented again to the public at an open house on August 20, 2009. The draft report was presented, and favorably received, by the Greene County Board of Supervisors on August 25, 2009. This final September 2009 version incorporates corrections and comments received during the review period.



3Aii. STAKEHOLDER VALUES AND VISION

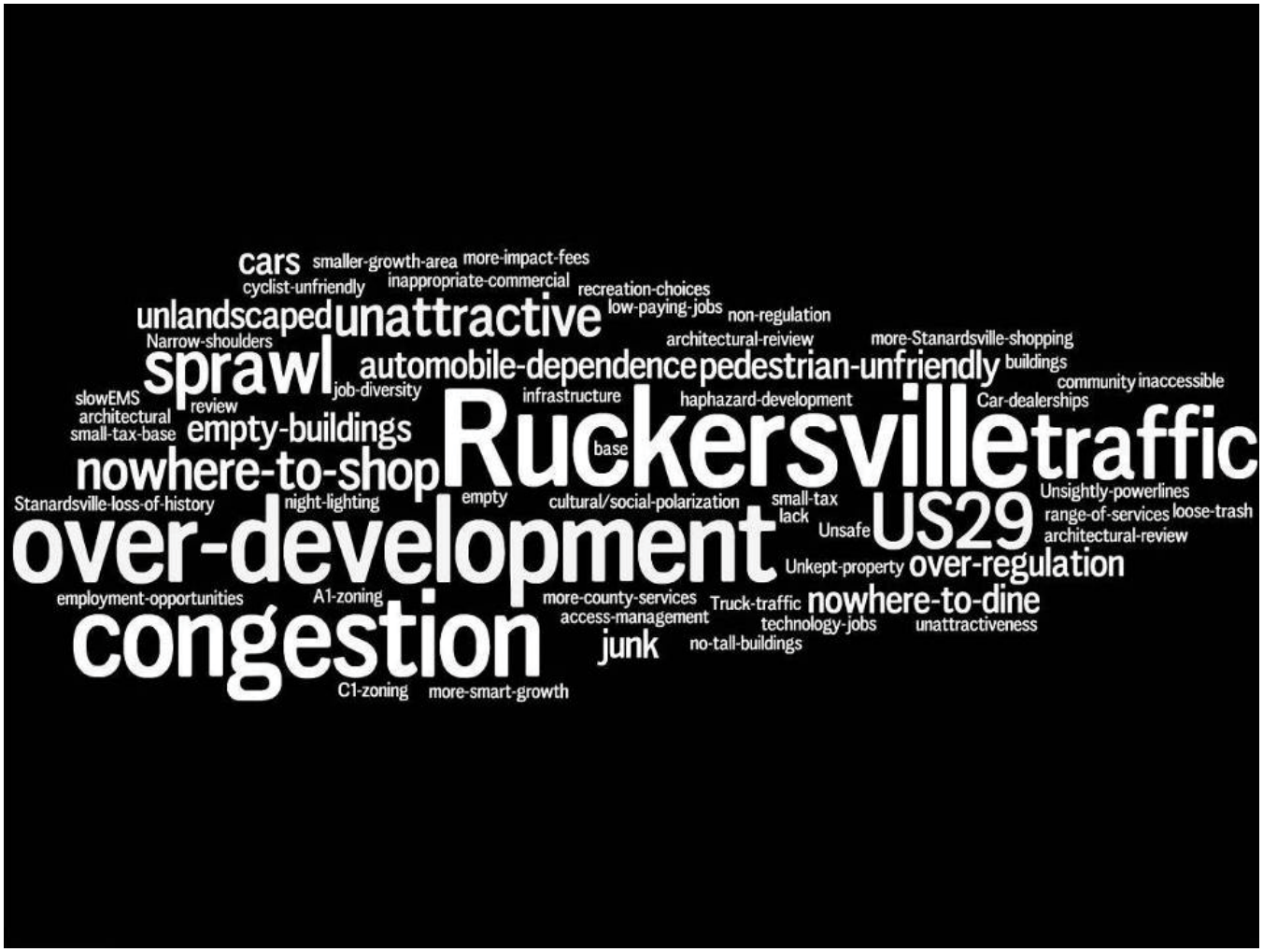
As part of the "where we are now" phase of the project, the consultant team began to analyze existing transportation conditions and existing and planned land uses in August and September of 2008, specifically in preparation for meetings. To obtain baseline values and identifies issues and opportunities a series of Focus Groups were held in Stanardsville, Dyke and Ruckersville – September and October 2008. These were held in conjunction with the Comprehensive Planning Process update but the information gathered proved critical for this study's scenario planning

Things People Like or Value about Living in Greene County



efforts. The full summaries of these meetings are available as part of the Comprehensive Plan Update process. To provide a summary of key findings, two 'word clouds' are shown in this report. The image on the previous page shows words that were identified as elements of Greene County that people liked or valued. The ones in the image below are elements that people either disliked or wanted to see changed or improved in the future. These word clouds were created by an application that counts the frequency of words in a spreadsheet and randomly generates the image. If words appeared more frequently in the summary, they were made larger, giving them greater emphasis.

Things People Dislike or Would like to Change in Greene County



3Aiii. COMMUNITY ELEMENTS

In scenario planning the community elements are, literally and figuratively, the "building blocks" of future communities. A community element is a "snapshot" example of a typical pattern of development within a given region. A single element represents the development and infrastructure characteristics of a 31 acre area, which is equivalent to the area of a circle with a quarter mile diameter. The quarter mile scale is representative of a comfortable walking distance (approximately a 5 minute walk). Community Elements contain the features and land uses that make a place. They also contain the relative social and economic values associated with each, such as number of jobs, houses, and people. They relate to existing zoning, but are more than that since they also contain assumptions about design, density, and diversity.

The Community Elements used for scenario planning in Greene County were initially composed based on analysis of existing zoning. Participants in the focus groups and workshops expressed an interest having possibilities for more compact, mixed used, village/town centers, and walkable neighborhoods in the future. With the exception of old village centers like Stanardsville, these land use options are not commonly found in Greene, or encouraged in the existing zoning. A few new community elements were introduced for the scenario planning exercise. Pages 30-31 contain a summary table listing the features of each Community Elements used in the scenario planning process. The Community Elements were the dots that were allocated during a the dot map exercise, described in Section 3Aiv. The Community Elements form the basis for the design guidelines and street cross-section recommendations outlined in Section 4.


Suburban Residential examples

Employment examples

The aerial diagrams below are examples of areas in Greene County that were surveyed for their Community Element characteristics. The inner circles are approximately 1/4 mile in diameter. A complete set of the community elements is detailed in Appendix A to this report, as well as in the table on the following pages.

HIGHWAY COMMERCIAL

MEDIUM-HIGH DENSITY RESIDENTIAL

EMPLOYMENT CENTER

SUBURBAN SUBDIVISION

COMMUNITY ELEMENTS MATRIX

urban ← COMMUNITY TYPE MATRIX

	Mixed Use Town/ Village Center	Employment Center	Highway Commercial	Medium-Higher Density Residential
SITE DESIGN	**FRONTAGE/SETBACKS (p.)**			
	Commercial/25'-50' Store Front/0'-10' Porch Front/0'-20'	Commercial/25'-50'	Commercial/25'-50' Store Front/0'-10'	Residential Yard/10'-25' Porch Front/0'-20' Store Front/0'-10'
	BUILDING HEIGHT			
	1-4 Stories	1-2 Stories	1-2 Stories	1-2 Stories
	PARKING			
	On-Street Surface Residential Structured	Surface On-street	Surface On-Street	On-street Residential
LAND USE	**MIX OF USES**			
	Single Family Residential Attached Res. Units Multi-family Res. Storefront Retail Restaurant, Office, Civic	Office Light Industrial Health/Medical Large Commercial Restaurant Apts. (2-3 stories)	Large Commercial Storefront Retail Restaurant	Single Family Residential Attached Res. Units Limited Retail Civic
	DENSITY			
	Dwellings/Acre: 3-5 Jobs/Acre: 7-9	Dwellings/Acre: 2-3 Jobs/Acre: 5-9	Dwellings/Acre: 0 Jobs/Acre: 8-9	Dwellings/Acre: 4-10 Jobs/Acre: 0-1 (PUD)
	EQUIVALENT ZONING			
	Does not exist, PUD?	B-1, B-2, M-1	B-1, B-2. B-3	SenRes, PUD, Sville
OPEN SPACE	**OPEN SPACE**			
	Town Square Pocket Park Neighborhood Park	Pocket Park Passive Open Space	Pocket Park Passive Open Space	Pocket Park Neighborhood Park Recreational Park
CONNECTIVITY	**STREET TYPES**			
	Commercial Street Main Street Collector Street Neighborhood Street	Collector Street	Commercial Street Collector Street	Neighborhood Street
	BLOCK LENGTH			
	300-600'	400-600'	400-600'	200-500'
	COMMENTS			
	Vertical and horizontal mixture of uses; compact development; good internal and external circulation	Horizontal mixture of uses with lower FAR; good internal circulation;	Orient new development to new boulevard; provide access to new boulevard	Where opportunity exists, provide connections to adjacent or nearby development

* Suggested enhancements to existing community elements and new enhanced elements are highlighted in green

COMMUNITY ELEMENTS MATRIX

COMMUNITY TYPE MATRIX → rural

	Walkable Residential Neighborhood	Suburban Residential	Rural Residential	Rural Cluster
SITE DESIGN	**FRONTAGE/SETBACKS (p.)**			
	Store Front/0'-10' Residential Yard/10'-25' Porch Front/0'-20'	Residential Yard/10'-25'	Residential Yard/10'-25'	Residential Yard/10'-25' Porch Front/0'-20'
	BUILDING HEIGHT			
	1-3 Stories	1-2 Stories	1-2 Stories	1-2 Stories
	PARKING			
	On-Street Surface Residential	Residential On-street	Residential	Residential
LAND USE	**MIX OF USES**			
	Single Family Residential Attached Res. Units Multi-Family Res. Storefront Retail Restaurant, Office, Civic	Single-Family Residential	Single-Family Residential	Single Family Residential Attached Res. Units
	DENSITY			
	Dwelling Units/Acre: 5-7 Jobs/Acre: 1-2	Dwellings/Acre: 1-3 Jobs/Acre: 0	Dwellings/Acre: 0-1 Jobs/Acre: 0	Dwellings/Acre: 1 Jobs/Acre: 0
	EQUIVALENT ZONING			
	Does not exist	R-1, R-2	A-1, R-1	Does not exist
OPEN SPACE	**OPEN SPACE**			
	Town Square Pocket Park Neighborhood Park	Neighborhood Park Recreational Park Passive Open Space	Farmland Recreational Park Passive Open Space	Farmland Recreational Park Passive Open Space
CONNECTIVITY	**STREET TYPES**			
	Collector Street Neighborhood Street	Neighborhood Street	Rural Road Rural Road with Path	Rural Road Rural Road with Path
	BLOCK LENGTH			
	200-500'	300-600'	N/A	N/A
	COMMENTS			
	Where opportunity exists, provide connections to adjacent or nearby development	Where opportunity exists, provide connections to adjacent or nearby development	Where opportunity exists, provide connections to adjacent or nearby development	

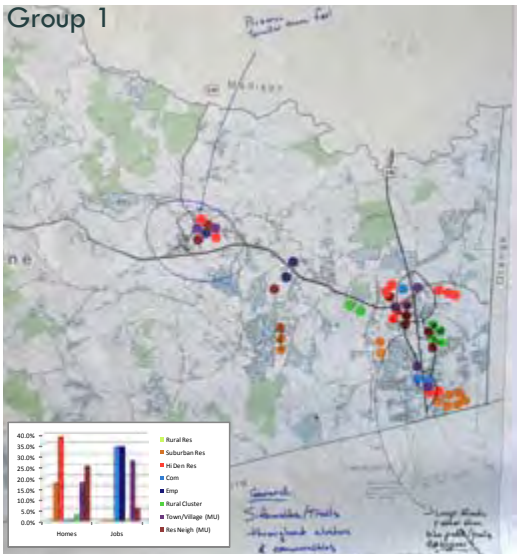
* Suggested enhancements to existing community elements and new enhanced elements are highlighted in green

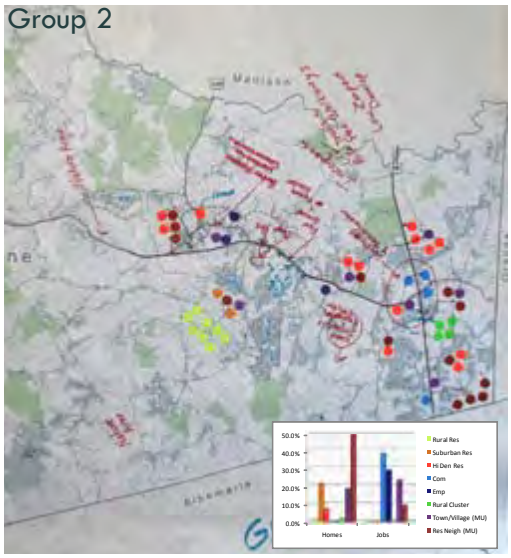
3Aiv. DEVELOPMENT OF SCENARIOS

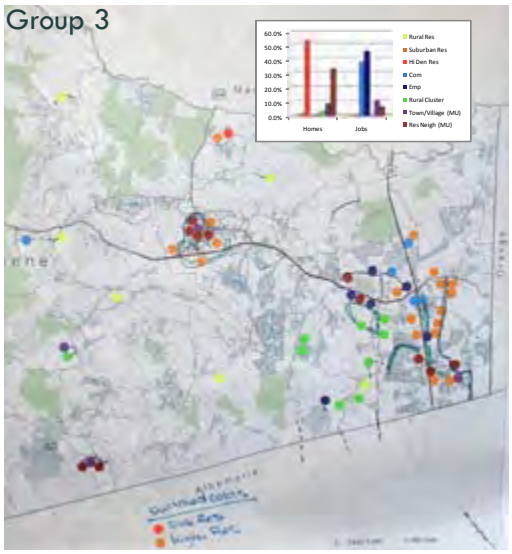
As part of the "Where are we going" phase of the project, a Scenario Planning Workshop was convened on November 15, 2008. At this workshop over 40 participants received presentations on connectivity, existing conditions, existing place types in Greene and potential future place types--the Community Elements discussed earlier. Participants worked in groups to create a future land use and transportation scenarios for the county.

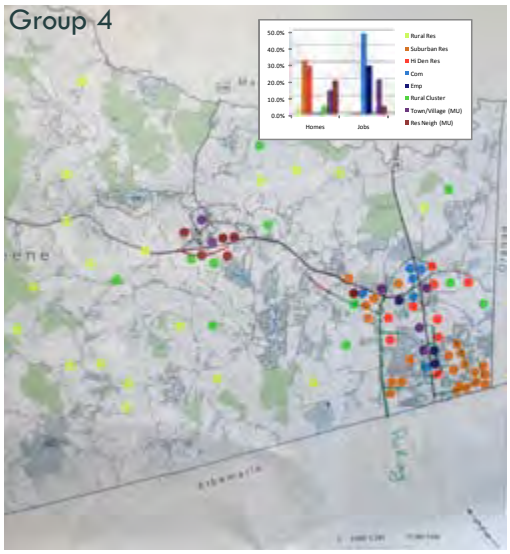
The opposite page contains photographs of the six working groups exercise maps. The 'dots' used represent a certain number of future jobs and houses, as well as potential "place types" for future development. The Community Elements are described in greater detail in Section 3Aiii, and in even greater detail in Appendix A. Both the type and location of the docs plan an important role in trip generation. For example, future jobs and houses placed in closer proximity means opportunities for shorter travel times, and greater potential for biking and walking trips.

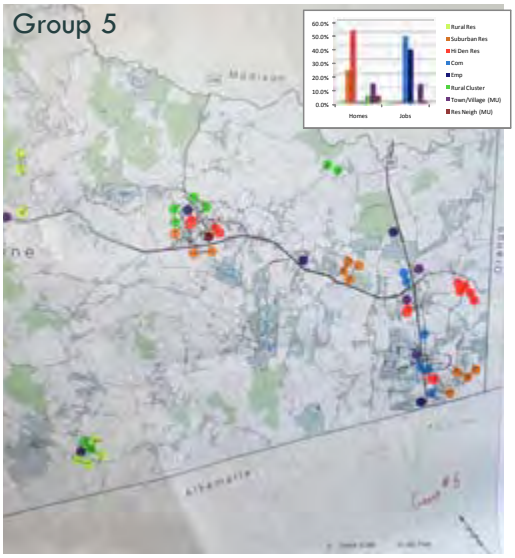
These six working group maps were aggregated into three scenarios that were used for comparison against the trend, or by-right, scenario. The evaluation of these scenarios is described in Section 3Av. The primary purpose of this dot map exercise was to be able think about possible alternative futures for Greene County.

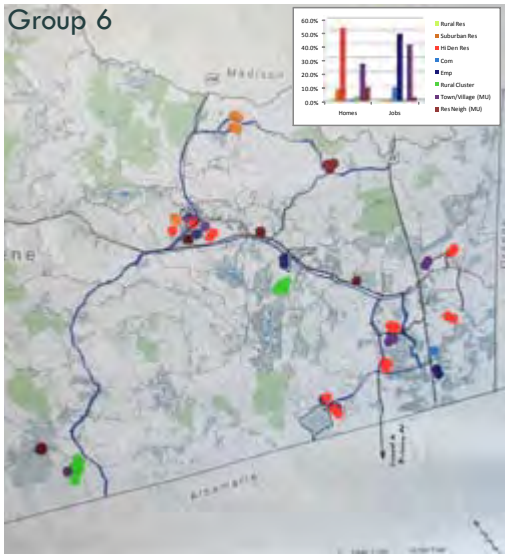

Group 1
Madison
Rural Res
Suburban Res
Hi Den Res
Com
Emp
Rural Cluster
Town/Village (MU)
Res Neigh (MU)
Homes
Jobs


Group 2
Madison
Albemarle
Rural Res
Suburban Res
Hi Den Res
Com
Emp
Rural Cluster
Town/Village (MU)
Res Neigh (MU)
Homes
Jobs


Group 3
Rural Res
Suburban Res
Hi Den Res
Com
Emp
Rural Cluster
Town/Village (MU)
Res Neigh (MU)
Homes
Jobs


Group 4
Rural Res
Suburban Res
Hi Den Res
Com
Emp
Rural Cluster
Town/Village (MU)
Res Neigh (MU)
Homes
Jobs
Albemarle

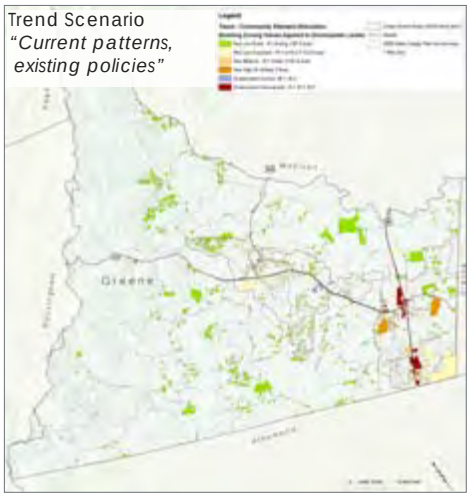

Group 5
Madison
Rural Res
Suburban Res
Hi Den Res
Com
Emp
Rural Cluster
Town/Village (MU)
Res Neigh (MU)
Homes
Jobs
Albemarle

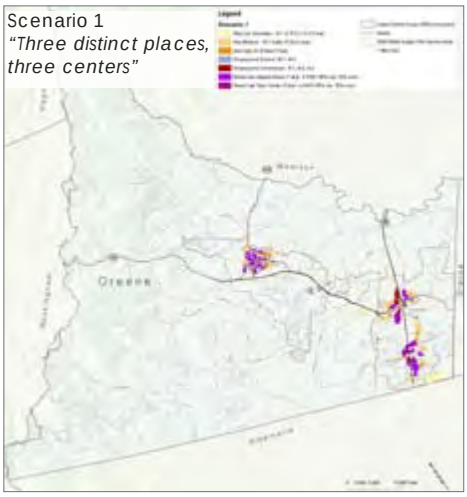

Group 6
Madison
Rural Res
Suburban Res
Hi Den Res
Com
Emp
Rural Cluster
Town/Village (MU)
Res Neigh (MU)
Homes
Jobs
Albemarle

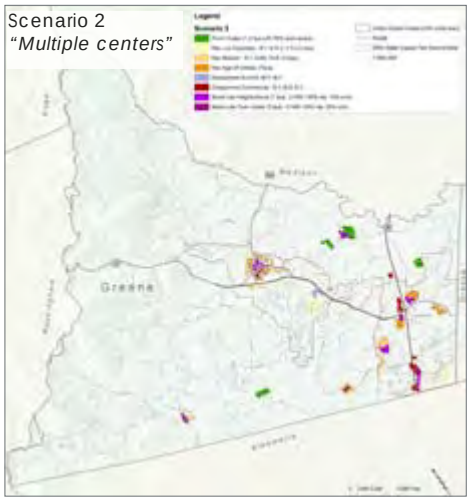
3Av. SCENARIO EVALUATION

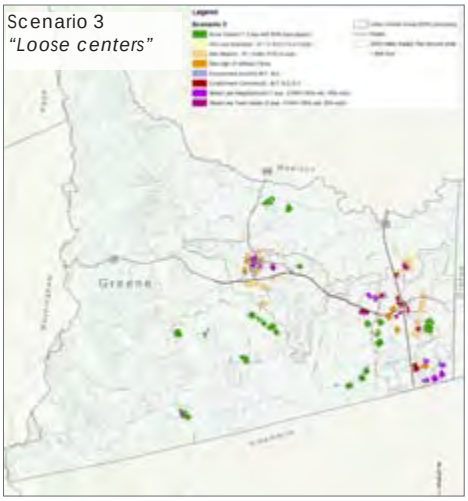
As previously mentioned, the dots used for the scenario planning exercise represented place types in the community, and were composed by locating Community Elements. From the November 2008 dot map (see page 33) three scenario themes were aggregated for the purposes of simplifying the evaluation process. A number of groups in November had identified common patterns. The three themes are shown and summarized below, and are shown in comparison to the trend scenario (see Section 2 for more information on how the trend scenario was developed).

On March 31, 2009 the Greene County Planning Commission hosted the second public workshop. The purpose of the meeting was to evaluate the alternative land use and transportation scenarios and identify preferences for a desirable future scenario. These three scenarios, plus a current trend "by-right" scenario were evaluated and compared against each other. Over thirty participants worked with Planning Commissioners, who served as small group facilitators, to rank and discuss what they liked or disliked about the four scenarios (see images and summary points for each below). Groups then selected the scenario they most preferred, noting what they would change to make it their true favorite. At the end of the workshop the four working groups reported their findings, the results of which constituted elements of a preferred vision for Greene County in 2035.









Trend Scenario – Most Dispersed
(5,516 acres developed)

- Follows current land use patterns and policies with highway/ strip commercial, suburban residential.
- More dispersed patterns.
- Subdivisions are not interconnected, connect directly to primary arterial roads.
- Not much growth or development attention in or around Stanardsville area.
- Connectivity, biking, walking facilities are limited.

Scenario 1 – Three Distinct Places
(1,565 acres developed)

- Mixed-use growth balanced around three high-density, walkable places.
- Develop parallel road network, improve local street network in new development
- Place medium-density residential growth in gaps left by previous residential developments
- Grow Stanardsville, but preserve small town feel.
- Improve roadway connectivity
- Increase sidewalks and trails throughout existing and proposed communities

Scenario 2 – Multiple Centers
(1,761 acres developed)

- Place growth in and around multiple centers throughout the county.
- Develop parallel road network, improve local street network in new development
- Outer growth occurs in clusters, with village centers.
- Keep most rural residential development small-scale, rural cluster
- Keep highway commercial but improve on what exists.
- Grow Stanardsville but preserve small town feel.
- Improve roadway connectivity, biking and walking facilities within new and existing developments.

Scenario 3 – Loose Centers
(1,916 acres developed)

- Distribute development throughout growth area, creating loose centers.-Similar to scenario 2 but more dispersed.
- Develop parallel road network, improve local street network in new development
- Some new development is more compact than existing suburban trend.
- Has highway commercial growth but improves upon what already exists.

Elements of a Preferred Vision for Greene County

The following paragraphs summarize the working group's main themes of a preferred land use and transportation vision for Greene County. The table below summarizes the ratings and showed the elements of Scenarios 1 and 2 emerged with clear preferences. The general workshop themes are consistent with values and preferences expressed in previous workshops and focus groups. The groups then discussed why they ranked the scenarios the way they did. The results of their evaluation exercise can be summarized as follows:

- **Create distinct villages and neighborhoods that are compact, walkable, and mixed use places.** Scenarios 1 and 2 emerged as the evening's two preferred scenarios. These scenarios were the most compact of the four, focusing on creating distinct new places with better street connectivity, walkability and a mixture of housing types, employment and uses. On a scale of 1 to 5, with 1 being least and 5 being most preferred, Scenario 1 averaged 3.93 points and Scenario 2 averaged 3.75. The final scenario was created by combining the best elements of Scenarios 1 and 2, taking into account the feedback received.
- **Business-as-usual is not desirable.** The trend scenario received the lowest ranking and the most critical commentary from all groups. The trend, or "by-right" scenario is a reflection of current lower density, primarily suburban land use patterns. The current road network has poor connectivity and relies heavily on primary arterials. This was clearly the least favorite scenario, as participants expressed their voice for an alternative future.
- **Offer balance and choice.** While participants clearly voted to endorse more compact and mixed land use choices in their future, they also expressed a wish to maintain a balance between urban and rural living choices. There was a clear desire to ensure that as some areas become more urbanized, that they develop with care and consideration of the rural, small town atmosphere and quality of life that makes Greene so valued by its citizens today. There was strong emphasis on balance and allowing choice, while minimizing impact on farmland, open space and cost on infrastructure.
- **Provide a better road system with improved connectivity, parallel roads and walking and biking options where appropriate.** Both Scenarios 1 and 2 are based on a better connected system of local streets and parallel collector roads to give local traffic alternatives to relying primarily on US 29 and US 33 for travel.

Table 1: Average ranking, on a scale of 1 to 5, of all groups.

SUMMARY	Policy Trend	Scenario 1 – Three Centers	Scenario 2 – Multiple Centers	Scenario 3 – Loose Centers
Average ranking	1.60	3.93	3.75	2.38

3B. PREFERRED SCENARIO DEVELOPMENT

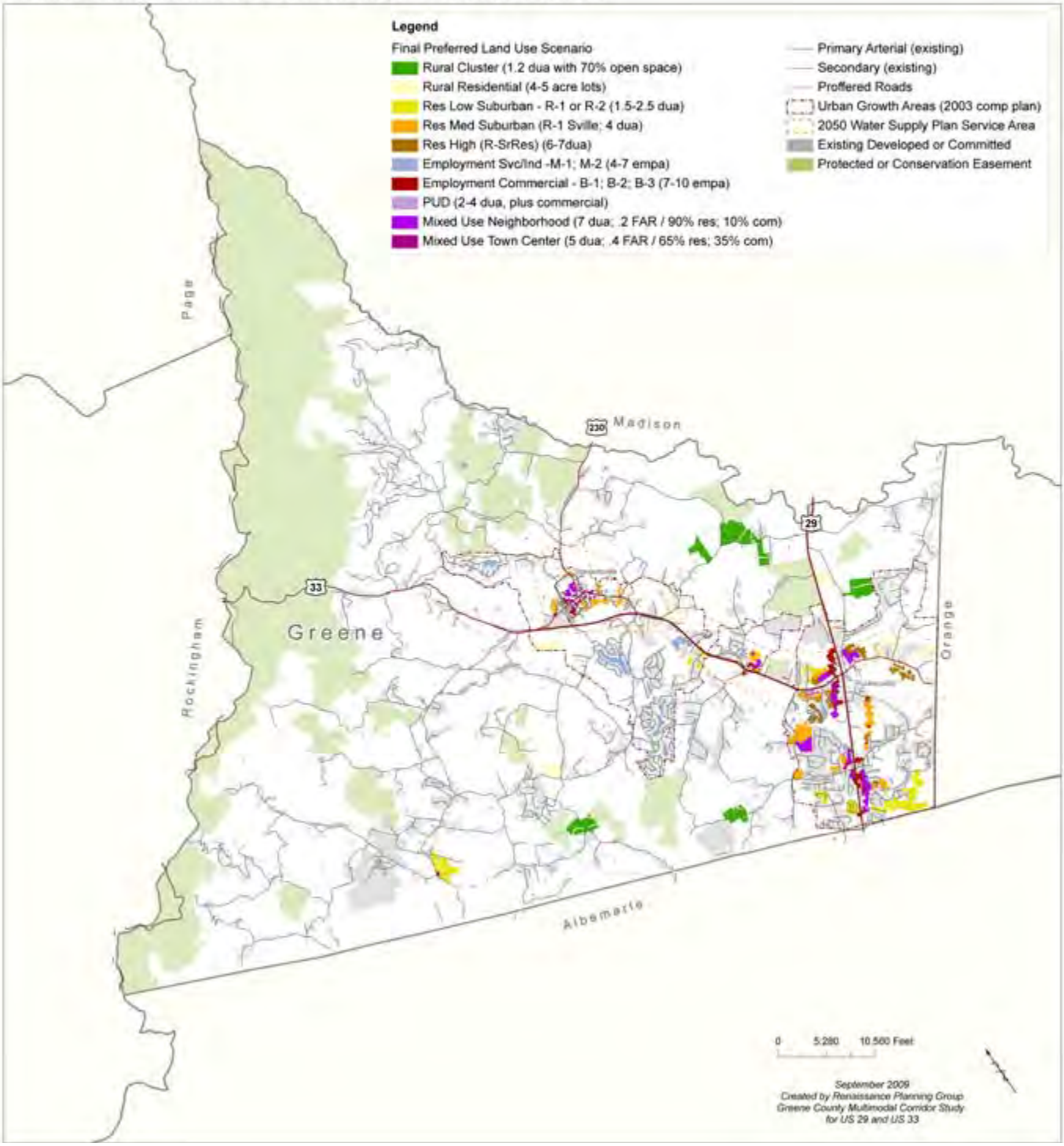
The preferred scenario is a combination of Scenarios 1 and 2, which were the two most preferred scenarios identified at the March 31, 2009 public workshop. These were the most compact scenarios, emphasizing new centers, or places in Stanardsville, Ruckersville, Midway, and a fourth new 'center' at the intersection of Rt. 633 and US 33. Future growth in Stanardsville was scaled back (15% of future houses vs. 33%), but retained an emphasis on growing with a small, walkable village/small town feel, and with a more interconnected local street grid. Some urban-rural balance was accomplished by allocating approximately 10% of future homes to rural areas, notably where land has been already platted, subdivided or rezoned for development. A rural cluster land use option was included as a future choice for rural development (see the Community Element appendix for more detail on this and other place types used).

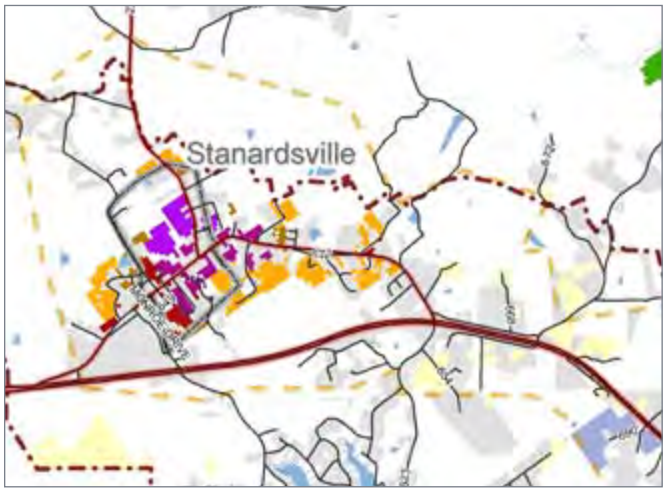
This preferred scenario accomplishes this 'place making,' more compact vision of the future as expressed in public workshops. Ninety percent of new homes in the future would fall within the 2003 growth boundary compared to the seventy percent of the population which is currently accommodated today in this boundary. This preferred scenario encourages future growth in more compact forms, in closer proximity to infrastructure, balances rural and urban living and work options, and reduces projected acreage required by more than half of that projected in the trend scenario.

It should be noted that this preferred land use scenario is just one way that stakeholders in the process have envisioned how future growth could occur. It is not a prediction of what will be, only of what could be, and does not preclude or restrict alternatives. The goal of this preferred vision is to provide a land use backdrop upon which future transportation improvements and systems can be designed. The table below shows how the preferred scenario compared against the other alternatives based on the performance measures used. The maps on the following page are the visual representation of the final preferred land use scenario, including close ups of detailed areas.

Percentage of New Homes and Jobs by Scenario	Within Urban Growth Area (2003)		Within 2050 Water Supply Plan Coverage		Proximity to Existing Sewer lines (half mile)		Proximity to Schools (half mile)		Proximity to Employment Centers (half mile)		Acres developed	
	Homes	Jobs	Homes	Jobs	Homes	Jobs	Homes	Jobs	Homes	Jobs	Acres	% of Trend
Trend	80%	99%	69%	95%	36%	96%	8%	8%	24%	94%	5,516	100%
Scenario 1	96%	100%	91%	94%	81%	99%	12%	23%	88%	98%	1,565	28%
Scenario 2	75%	90%	64%	84%	50%	83%	10%	18%	47%	73%	1,761	32%
Preferred	**90%**	**97%**	**84%**	**97%**	**69%**	**98%**	**7%**	**21%**	**60%**	**89%**	**2,595**	**47%**

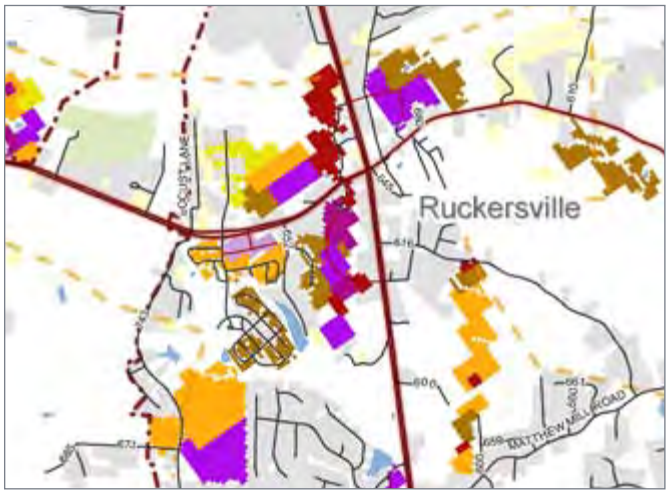
Greene County Multimodal Corridor Study - Preferred Scenario



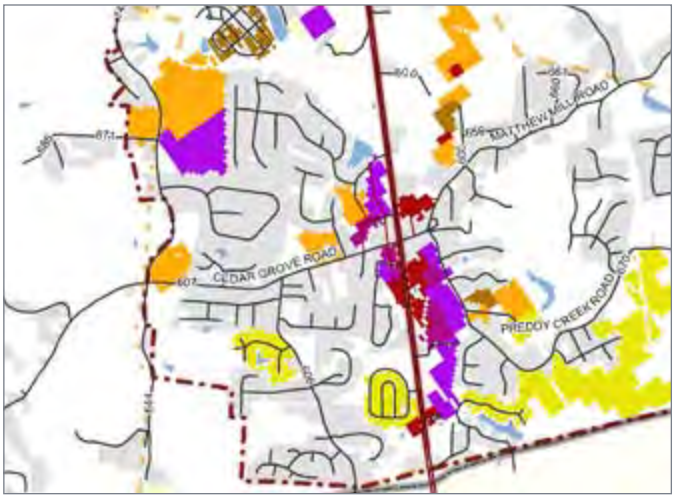


Stanardsville

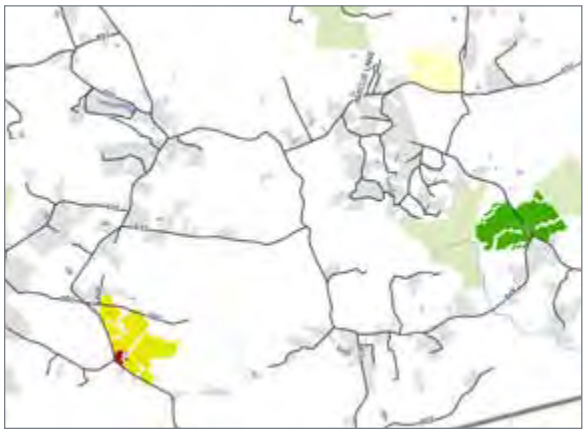
US 33 and Rt. 633 (Stephen's Loop area)



Ruckersville



US 29 and Rt 607 area



Dyke

These details are close-ups from the preferred scenario map on the previous page. It is important to emphasize that the exact locations and types of development represent a combination of preferred elements that emerged from the scenarios developed and evaluated in the study's two workshops. They are not intended to be prescriptive, or precise predictions of a future, but rather one way that Greene County could develop. Section 4 of this report outlines in greater detail a Transportation Framework plan that can help achieve the desired results of the preferred alternative scenario.

4A. TRANSPORTATION FRAMEWORK

Transportation plays a key role in shaping communities. If designed correctly, the transportation system can provide a variety of choices for users, support human scale environments, and help preserve and create memorable places. At the same time, the design of communities has a profound effect on the transportation system: the proper arrangement of land uses, activities and places can make walking, biking and transit viable while reducing demand on the regional roadway network. This integrated approach to transportation and land use planning is reflected in the transportation component of the framework plan.

Current transportation and connectivity patterns in Greene County, especially in the growth areas that surround the US 29 and US 33 principal arterials do not meet current VDOT standards for secondary street acceptance. Traffic modeling results show that major arterials, particularly US 29 from Ruckersville to the Albemarle County line, are at failing levels of service in 2035 if current land use and connectivity patterns continue. Access to US 29 and US 33 provides economic opportunities for Greene County. If a primary arterial is asked to be both a commercial hub and a major regional thoroughfare it is being asked to perform two functions which are at inherent tension with each other. The primary arterials are being asked to function as both a main street and a high speed thoroughfare. As a result of the competing functions, performance and safety are a concern both in the present and particularly for the future.

This study along with the comprehensive plan update, and the larger US 29 Corridor wide study by VDOT, is well timed to make recommendations that can assist Greene County's growth areas to improve connectivity over time. Current land use patterns in the growth areas depend heavily on direct access onto principal arterials. The overall strategy being proposed herein is one that encourages the creation of parallel roadways, better inter-connected local streets and subdivisions, consolidating driveways, better management of access on primary arterials, and improved inter-parcel connectivity. This transportation framework's priority is to increase mobility choices for the citizens of Greene County by planning for alternative and new places and street patterns that complement and add onto existing commercial investments in the growth area.

This transportation framework first addresses general transportation facility guidelines including recommended future street types. It includes a proposed thoroughfare plan showing where desired new parallel roads could better serve the local traffic while providing for new "main streets" to develop overtime. This framework plan also includes an access management strategy with a series of maps that identify areas where access points could be consolidated or better managed as development occurs over time.

4Ai. GENERAL TRANSPORTATION GUIDELINES

DESIGN CONTEXT

An essential, overriding parameter that should be taken into consideration in the design of the transportation system is the surrounding context. Generally speaking, there are three context zones for the study area: urban, rural, and transitions.

URBAN CONTEXT

Within the new 'centers' identified by the preferred land use scenario, the emphasis shifts to pedestrians and a mixture of activities. The character of the street drastically changes and is based on lower operating speeds and a more robust roadside environment including wider sidewalks, landscaping and a diversity of building types.

RURAL CONTEXT

Outside the new places identified in the preferred scenario, the emphasis of the transportation system is on providing vehicular mobility. The design of the transportation network should be based on higher target speeds, larger setbacks and increased sight distance.

TRANSITIONS

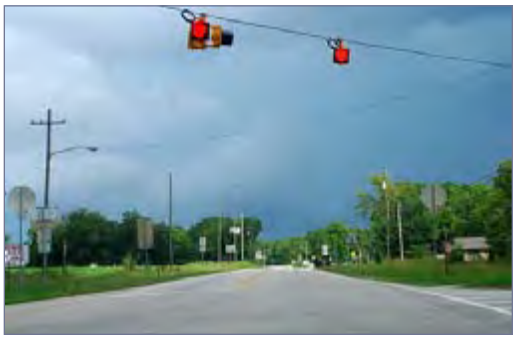
The transitional zone signals a change from a rural context to an urban context. Transitions are designed to send a cue to and that the character of the surrounding environment is changing and there might be a need to reduce automobile speeds. Transitions typically include design treatments to signify a change in context from rural to urban. These may include medians, landscaping and/or pavement treatments. Intersections may also serve as transitions (see the next section).

INTERSECTIONS

Intersections are critical components of the transportation network because they represent the convergence of several different vehicular movements and modes. The majority of safety issues and congestion can be attributed to intersections. There are different intersection types for each of the context zones in the study area.

RURAL INTERSECTIONS

Rural intersections are located outside of the preferred scenario growth areas. As such, the emphasis is on vehicular safety and capacity. Intersections should be designed to accommodate higher approach speeds, including an extended sight distance and deceleration tapers for turn lanes.



URBAN INTERSECTIONS

Within the preferred scenario growth areas, urban intersections should be as compact as possible and anticipate use by different modes, including bicycles and pedestrians. These intersections should avoid unnecessary turn lanes and excessive turning radii. By default, urban intersections should assume that a passenger car is the design vehicle and that turn movements will occur at a crawl speed. Small, compact urban intersections are most feasible when supported by a larger, connected street network. The urban context is designed more for the human-scale to make pedestrians comfortable moving around from location to location without feel compelled to get back in their car.

GATEWAY INTERSECTIONS

Intersections located at the entrance to a preferred scenario growth area may be treated as gateways and represent a good opportunity to create a transition from the rural to urban context. Intersection gateway treatments may include more elaborate signal mast arms with signage, pavement treatments and/or landscaping.

ROUNDABOUTS

Roundabouts should be considered as alternatives to signalized or stop-controlled intersections. In many cases, roundabouts can offer improved safety and capacity, and offer an opportunity for landscape enhancements. Roundabouts make excellent gateway treatments, as they require all entering vehicles to reduce their speed.

4Aii. NETWORKS & CONNECTIVITY

Within a more urban context, or a more compact land use pattern, a good street network and connectivity is absolutely essential. Dense networks create multiple travel paths for all users. They allow for alternative routes for rescue vehicles, increasing civic safety. They distribute traffic more evenly and help prevent large, clogged intersections, instead allowing the creation of compact, walkable intersections and narrow streets that can be treated at a human scale. Traffic is generally slower resulting in fewer auto-pedestrian fatalities. Short blocks create pedestrian-friendly environments.

Network Designed for Accessibility (Savannah, GA)

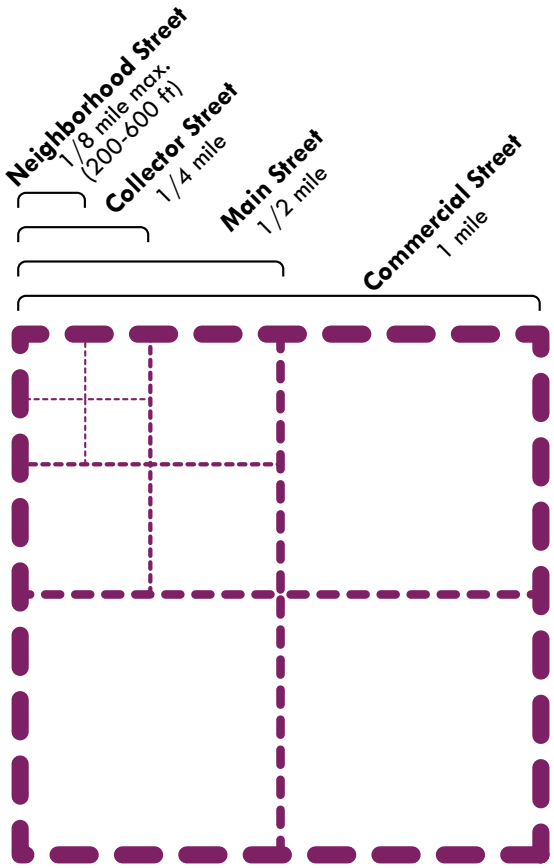
Network Designed for Speed (Suburbia)

Source: Alan Jacobs, "Great Streets"

STREET SPACING & HIERARCHY

At a maximum, local neighborhood streets within the preferred developed areas should be spaced no more than 1/8 of a mile apart. Arterials, which form the backbone of the transportation network and carry most of the regional traffic, should be spaced at approximately one mile. Major and minor collectors, which carry most of the traffic within the target areas, should be spaced at ½ mile and ¼ mile intervals respectively. Local streets should fill in the rest of the network.

It is important to note that this network does not necessarily have to be provided by the public sector. This network could be built as part of private development, and should provide connectivity to the external network.



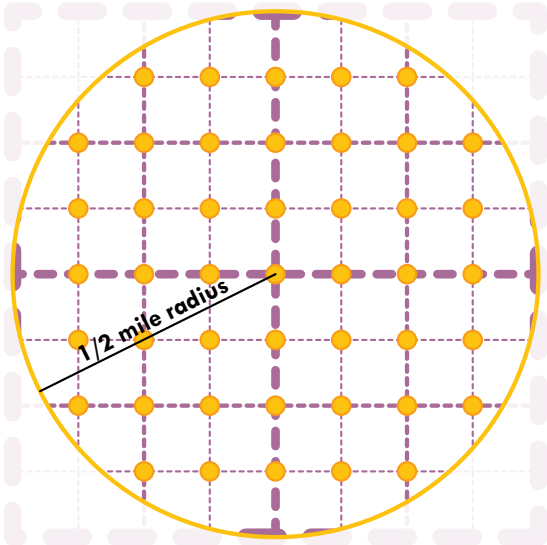
CONNECTIVITY INDEX

The following connectivity standards are text and suggestions outlined in the VDOT publication, "Secondary Street Acceptance Requirements Guidance Document for the Commonwealth Transportation Board's Secondary Street Acceptance Requirements, March 2009" (SSAR).

A number of localities across the nation as well as the states of Virginia and Delaware have implemented "connectivity index" requirements for new street construction. A connectivity index can be used to calculate how well a roadway network provides direct and alternative routes for drivers and pedestrians to reach their destinations. It is a uniform, quantifiable measure of the transportation alternatives provided to travelers.
Computing the index for a given development involves a calculation:

Connectivity Index = Streets Segments ÷ Intersections

The key to successfully calculating the connectivity index is determining exactly what constitutes a "street segment" and an "intersection." The SSAR defines these two terms as follows:



Idealized example of how a grid pattern maximizes connectivity. Often topography or existing development will prevent such rigid grid patterns from forming but, where possible this conceptual pattern can be used as a guide to maximize connectivity and travel choices.

Street Segment (defined)

1. Any roadway, alley, and stub out
2. Any street section between intersections and termini
3. At each connection to an existing road maintained by VDOT, there will be street segments that extend from the intersection of the new road and the existing road. Each of these sections will count as a street segment in the index calculation.

Intersection (defined)

1. A juncture of three or more street segments.

2. The terminus of a street segment, such as a cul-de-sac or other dead end, will count as an intersection. The end of a stub out does not count as an intersection.

3. A stub out's connection with a road, with no direct lot access along the stub out, and that is intended for connection to an existing or future adjacent development does not count as an intersection.

4. The connection of a stub out with an internal street will count as an intersection if the stub out street provides access to a lot(s) within the development.

5. External connection of an existing state road does count as an intersection. The street sections at this intersection also count as street segments, as discussed above.

The connectivity index is found by dividing a network addition's street segments by its intersections. An example of this would be a development with fifteen street segments and ten intersections. The subdivision would have a connectivity index of 15/10 or 1.5. The higher the index, the better the connectivity. It is important to remember that the intent of the regulation is for developments to meet the connectivity index through connections to adjacent properties.

Required Multiple Connections

One of the requirements of the SSAR is that all developments will have multiple connections in multiple directions. This requirement is a "standalone" requirement that must be met regardless of the connectivity index requirement that may apply to a particular development.

Connections, in this context, means either joining with an existing street in the VDOT network or the construction of a stub out(s) planned for current or future connection. It is important to note that a proposed network addition with only one ingress and egress point, with no stub out for future connection, and that meets the applicable connectivity index will not be accepted into the state system as it does not meet the overall connectivity standards contained in the SSAR.

Connectivity Standards – Area Types and Network Additions

The SSAR identifies three area types: Compact, Suburban, and Rural. Most streets within a phase of a development or an entire development will be considered for acceptance into the State system as a group, or "network addition." Streets under certain circumstances may still be accepted as individual streets.

Currently most of the growth areas of Greene would fall into the Suburban Standard section, however if more compact growth patterns as envisioned in the preferred scenario occur, the Compact Standard may become more appropriate.

Compact Standard – Network Additions

Network additions within a Compact area of the state must meet the following requirements to be accepted into the secondary street system:

1. Constructed to all applicable standards, such as the Road Design Manual, the Subdivision Street Design Guide, and all other documents incorporated by reference within the SSAR.

2. Provide adequate connections to adjacent roadways, with multiple connections and in multiple directions, and have a connectivity index of at least 1.6

3. Contain a layout design suitable for pedestrian movement within the development and to adjoining properties

Suburban Standard – Network Additions

Network additions within Suburban areas must meet all of the "Compact" requirements, but with a different connectivity index amount. Suburban area type developments must be designed to have a connectivity index of at least 1.4.

Rural Standard – Network Additions

Rural network additions must meet all applicable design requirements and provide multiple connections in varied directions to adjacent properties. Rural area type developments do not need to meet a specific connectivity index amount. This means that at a minimum, Rural area type developments will be required to connect with the existing VDOT network as well as provide a second connection to the existing network or a stub out in a direction different than the other connection.

Connectivity Index and Individual Streets

Newly constructed roads to be accepted into the VDOT system, which meet the "individual street standards" located within the Compact and Suburban area types, are not required to meet a specific connectivity index standards.

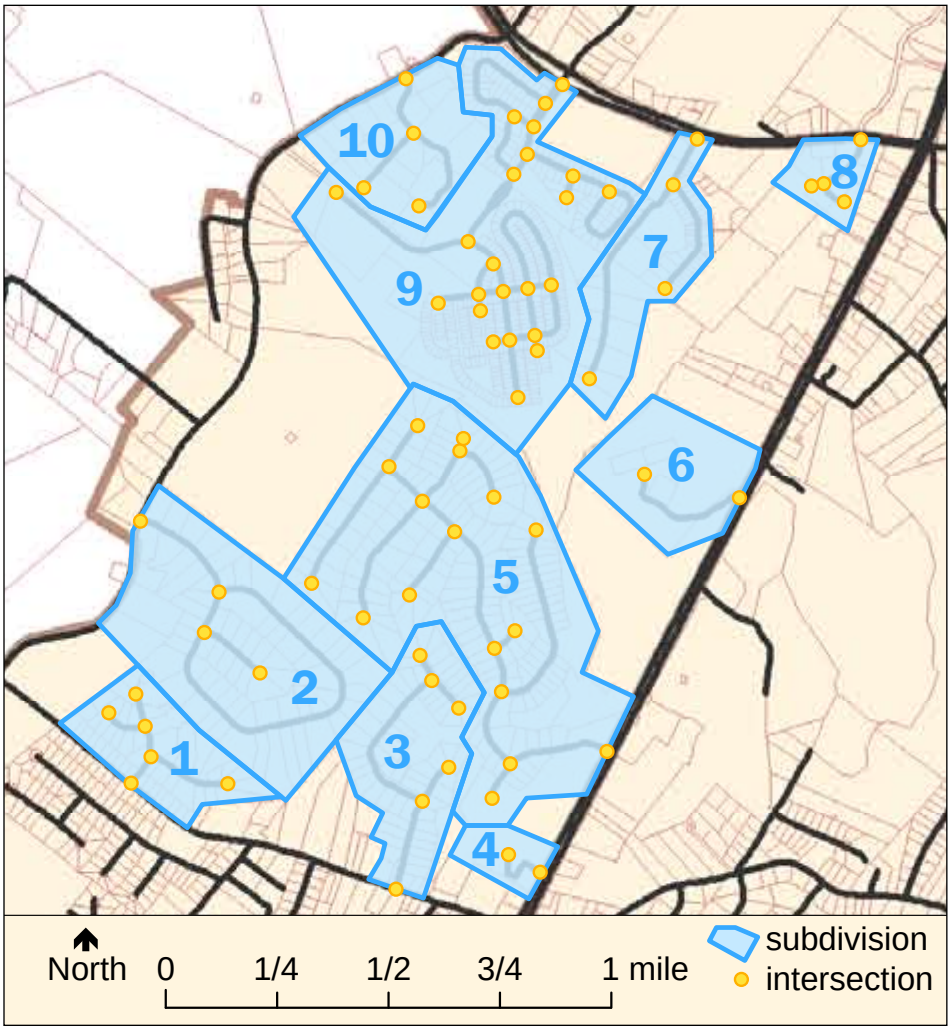
Existing Connectivity Evaluation

To examine how some of the current subdivision patterns in Greene County measure up to the SSAR connectivity standards, an analysis was performed on 10 subdivisions shown in the map on the next page, none of which meet the current SSAR connectivity standards.

The purpose of this illustration is to demonstrate that current subdivision patterns in developing areas of Greene County are forming with poor connectivity and would not meet the current 2009 SSAR standards.

When possible and with appropriate support of affected neighborhoods, opportunities to connect existing neighborhoods to each other should be identified and implemented. The added connectivity helps to reduce the number of local trips on the adjacent collectors and arterials, and also provides opportunities to reduce trip lengths which decreases the overall vehicle miles traveled in a given area. This strategy also helps to afford the opportunity for walking and biking between destinations in adjacent neighborhoods.

Future development should attempt to comply with, and when possible exceed, SSAR standards for connectivity, if the intent is for VDOT to eventually accept these streets into their system and maintain them. The beneficiaries of improved connectivity are all local residents. Improved connectivity results in more choice, safer streets, and ultimately greater access to both residential and commercial properties.



Connectivity Analysis of 10 Greene County Subdivisions (suburban standard is >1.4)					
#	streets	inter-sections	connectivity	connectivity index compliance	multiple connections compliance
1	7	6	1.2	Below standard	Fails
2	6	4	1.5	Adequate	Fails
3	7	6	1.2	Below standard	Fails
4	3	2	1.5	Adequate	Fails
5	18	17	1.1	Below standard	Fails
6	3	2	1.5	Adequate	Fails
7	5	4	1.25	Below standard	Fails
8	5	4	1.25	Below standard	Fails
9	31	23	1.3	Below standard	Fails
10	5	4	1.25	Below standard	Fails

4Aiii. NETWORK IMPROVEMENTS AND EXAMPLE ILLUSTRATIONS

PARALLEL ROADS AND IMPROVED LOCAL CONNECTIONS

The future traffic demand on the transportation network was examined for each of the land use scenarios analyzed, including the trend scenario. Each of the scenarios affected the US 29 and US 33 corridors differently, though the common theme was that additional parallel roadways in conjunction with improved connectivity would be needed to relieve US 29 in the future. The parallel road system and additional road network will provide opportunities to better manage access onto US 29, while providing access to future development. Without the improvements to the network, US 29 would need to be widened to at least six lanes (three in each direction). Even at six lanes the level of service would be poor given the number of access points and signalized intersections that are expected to be in place. With additional north / south parallel roadways, improved access management along US 29, and additional connectivity the capacity and traffic operations along US 29 can be improved in the future. The following two sections provide illustrations of how road improvements could occur in both a Ruckersville and a Stanardsville context.

IMPROVED NETWORK AT RUCKERSVILLE

US 29 is a corridor of regional significance and the primary north/south arterial through Greene County. In the near to mid future, the number of traffic signals and direct connections onto US 29 are expected to increase. The intersection of US 29 and US 33 has experienced additional congestion and delay and this trend will continue into the future as the local trips and through volumes continue to escalate.

The trend scenario, which would be characterized as minimal parallel connectivity and additional direct commercial access onto US 29, will result in traffic volumes approaching 50,000 vehicles a day on US 29 through the study area. This would require 6 and perhaps 8 lanes of through traffic on US 29 to maintain acceptable levels of congestion and delay through the corridor. The strategy of providing additional parallel corridors and network connectivity will result in significantly lower volumes on US 29. Thus unless an improved street network is constructed, key intersections along US 29 will require extensive widening, roadway safety will be of greater concern, and congestion will increase considerably.

Existing conditions on US 29, just over 1/2 a mile south of the intersection with US 33, approximately where the existing Bank of America is located, and where a proffered road is already planned.

The preferred solution to accommodating the expected new development and background through-traffic, while preserving capacity and improving safety along US 29, is to provide an improved network of roadways that will help to separate local traffic from longer distance through trips. A schematic level illustration of this concept is shown in the following illustrations.

The concept includes providing parallel corridors that can accommodate the local traffic while serving the expected future land uses. This network of interconnected streets and parallel (to US 29) corridors, in conjunction with carefully managed access through restriction of new access points onto US 29, functions together to alleviate congestion and the need to widen US 29 in the future.

The illustrations that follow show how the intersections with US 29 can be incrementally reconfigured, using an improved grid of streets, to minimize delay and congestion on US 29. The concept is to put in place a box grid of access streets that serve the same function as a "clover leaf" interchange would. The through movements along both US 29 and the side streets would eventually be separated from each other through use of an overpass. To access the side street from mainline US 29, motorists would use right turn movements from US 29 to access the side street grid. For access onto US 29 the motorist would use the grid to travel to the access point and make a right turn out onto US 29. This alleviates the need for large interchanges and preserves the capacity and throughput of US 29 through the study area.

Ruckersville Illustrations - Sample Phasing of an Intersection

First 0-10 YEARS:

A proffered road is built near the existing full access median break near the current Bank of America site. A new potential signal is put in here as it meets the proper distance from the US 33 and US 29 signal, however it makes other full access points just to the north become non-compliant with VDOT access management standards. Over time this full access entrance will need to be converted to a right-in, right-out entrance. This strategy works because over time it aims to build a 'box' style interchange, using the new access roads. It is important for the public to know that the new signal is not intended to be permanent. Over time, as the new access roads are built and the right-of-way acquired, this signal will be removed and an overpass constructed for the side street. It is particularly important for businesses and developers to understand this long term concept, so they can plan in advance for access management, the consolidation of driveways, consider the orientation of new buildings appropriately, and put in inter-parcel connection as new development occurs. The subsequent illustrations show this evolution.

Non-compliant full access point is converted to a partial, right-in/right-out point.

New Parallel Roadways

Consolidated driveways with improved access on side roads

Limited median breaks on US 29

10-20 years:
The yellow areas above show the new 'box' interchange beginning to take form. New buildings begin to share driveways and orient themselves towards other new development occurring off the US 29 corridor. Non-compliant full access entrances are converted to partial access entrances over time, while entrances are consolidated and inter-parcel connectivity improves as new development occurs. The important aspect of this phase is the building of the new access streets that will lay the groundwork for the signal to be replaced by grade separation as shown below.

- Existing Buildings
- New Buildings
- Medians/Parks
- New Roads or Transportation Facilities
- Potential for New Development

New Bridge/overpass, with pedestrian sidewalk.

New Development/ Town Center. These have new commercial "main streets" begin to form, creating new centers of activity and economic activity.

There is increased acreage available for new communities to take shape, new homes, parks, and businesses could potentially locate here.

20+ years:
The groundwork was previously laid for grade separating the side street over US 29, acquiring right-of-way as new development occurred over time Such an overpass could be built with sidewalks to allow for pedestrians to cross US 29 more safely than either the present time, or even with a future signal. New main streets are created as new activity/ town centers emerge off of US 29. These streets are designed as 'complete streets' with biking and walking features, as detailed in the proposed street cross sections of this study. With the complete 'box' interchange in place, access to US 29 is accomplished through the partial access points north and south.

IMPROVED NETWORK AT STANARDSVILLE

Stakeholders at all the meetings clearly expressed a voice for more compact, walkable, place-centered development. The Stanardsville area was an existing community that could grow into one of these new centers. As part of the preferred growth scenario, additional density and development was identified for Stanardsville. The form and context of the development would be to grow but to retain a small village center character and feel. The preferred land use scenario allocated approximately 700 new homes, or approximately 1,900 new persons to the greater Stanardsville area. This represents about 15% of the future growth projections of 4,495 new homes and 12,136 new persons projected by 2035. The preferred scenario allocated approximately 690 new jobs in Stanardsville, or approximately 29% of the future projection of 2,378 new jobs in 2035 for the whole County.

To accommodate the increased density and development, a grid system of roads should be constructed. This improved roadway network would function to allow adequate travel capacity while providing for a safe, convenient walkable environment. Currently, there is relatively little roadway network, especially the local or neighborhood street type that would provide for increased walkability and connectivity. In the future an improved grid system should be constructed to accommodate the new growth and provide improved opportunities for walking and bicycling using the parallel network of streets. The illustrations on the following pages show the existing conditions in Stanardsville followed by phasing diagrams that demonstrate how the town could look and function in the future. The improved grid will provide system capacity for additional vehicles and will also provide an environment that is walkable, while preserving the small town context and character. These phased illustrations show how Stanardsville could grow into a more residential, walkable place, adding in some new commercial, retail and civic uses while keeping the small, rural village appeal so many value today.

Stanardsville Illustrations - Growing with an Improved Local Street Network

Stanardsville (0-5 YEARS)

Stanardsville (5-10 YEARS)

Commercial
Mixed-Use
Civic/Institutional
Residential
Existing Buildings
Hydrology
Parks/Greenways

Stanardsville (20+ YEARS)

Commercial
Mixed-Use
Civic/Institutional
Residential
Existing Buildings
Hydrology
Parks/Greenways

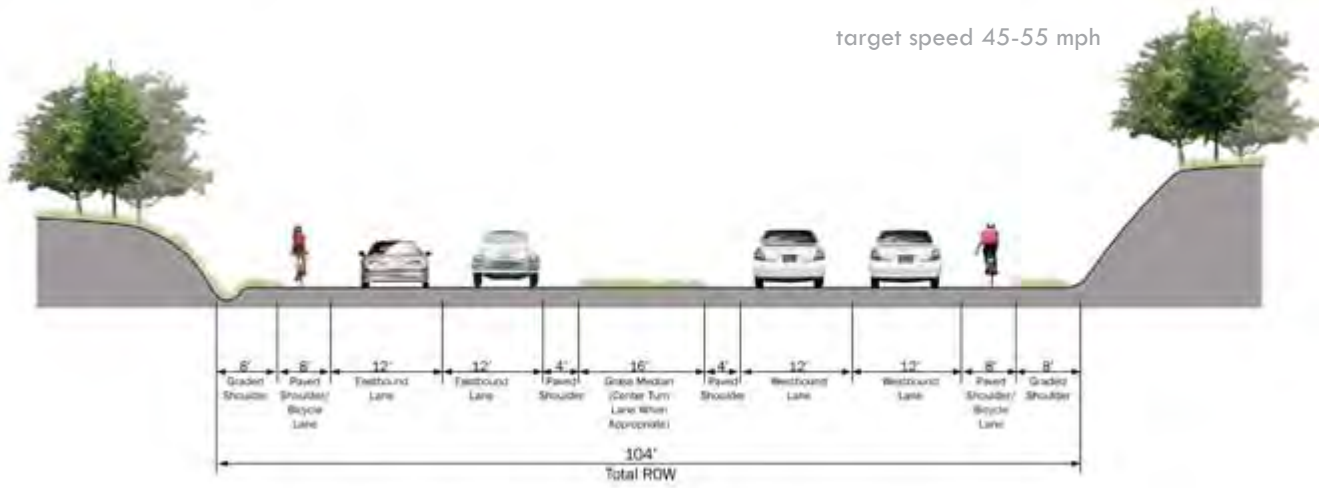
4Aiv. RECOMMENDED STREET TYPES

Effective street design should reinforce the distinct differences between rural and urban contexts within the study area. The street design types presented here are prototypes intended to demonstrate the correct design parameters appropriate for the surrounding context, and should be considered whenever building a new street or improving an existing one. The street types below make recommendations that would improve both biking and walking, and are a major multimodal component of this plan. The Community Elements matrix (pages 30-31) and the Appendix A both reference which recommended street types from this section would be most appropriate for the context of the corresponding land use.

RURAL ROADS: Parkway, Rural Road, and Rural Road with Shared-Use Path

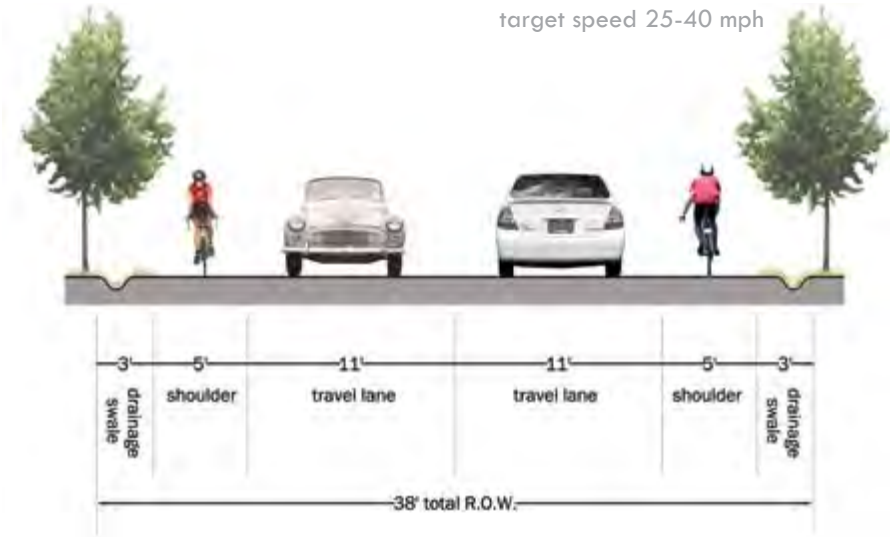
PARKWAY

A parkway moves larger volumes of traffic long distances between concentrated centers. Parkways are characterized by their rural qualities, and are often bordered by open tracts of farmland, preservation areas, or otherwise undeveloped land. Because of the large distance between major intersections, Parkways are able to maintain relatively high target speeds. If the 6-8 foot dedicated bicycle lanes shown below are not feasible for new Parkway type roads, simply widening shoulders by 2-3 feet will provide bikers along these parkways additional safety, allowing cars to pass without moving into an adjacent lane. Where Parkways approach more intensely developed walkable centers, their cross-section should transition into that of a Commercial Street.



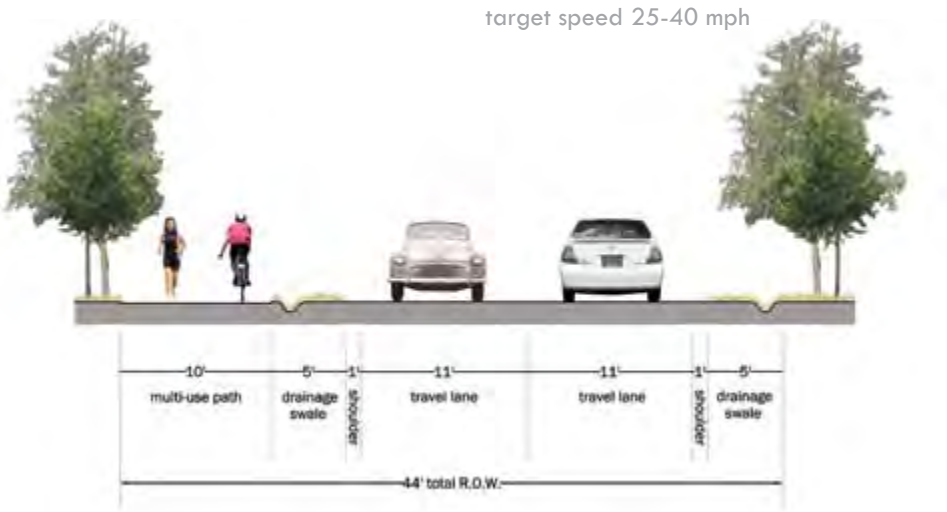
RURAL ROAD

A rural road is similar to a parkway in its mobility orientation, but is intended for lower volumes of traffic and/or where topography and other elements of the natural landscape limit the amount of right-of-way. A rural road is lined with soft shoulders and has open drainage. Roads may be lined with existing trees and natural vegetation and take on the profile of the surrounding landscape. Necessary facilities must also be considered and sensitively integrated with the landscape. A paved shoulder provides bikers along these rural roads additional safety, allowing cars to pass without moving into an opposing lane.



RURAL ROAD WITH SHARED-USE PATH

A rural road with a shared-use path incorporates a dedicated path to the side of the roadway for bicyclists, pedestrians, and recreational uses. The shared-use path is separated from the roadway by an open drainage swale. At points, the path can split a considerable distance from the roadway to incorporate drainage, significant natural features, and the greater network of paths and greenways. Rural roads are encouraged to incorporate shared-use paths wherever there is available ROW.



URBAN ROADS: Commercial, Main, Collector, and Neighborhood/Local Streets

COMMERCIAL STREET

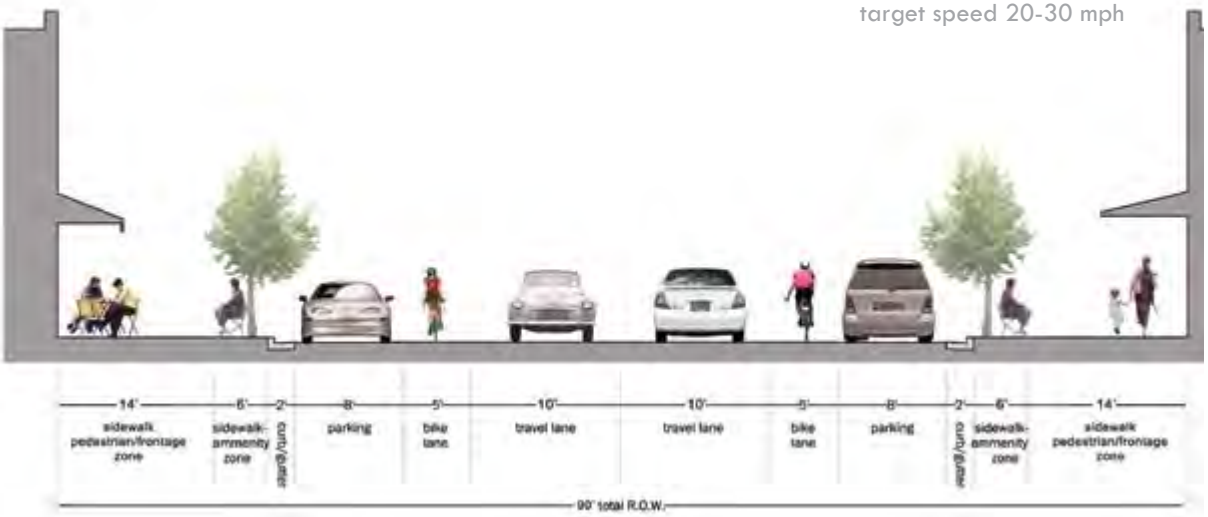
A Commercial Street provides short distance, medium speed connections through pedestrian-oriented areas. Commercial Streets often include medians and at significant points, such as a gateway, medians may be widened for special landscape treatments. In general areas, medians may be planted formally with trees or landscaped informally, depending on context. Bicycle lanes and street trees are appropriate, and emphasize the balance between cars, cyclists, and pedestrians. Commercial Streets have curb and gutter drainage.

target speed 25-35 mph

MAIN STREET

A Main Street is a low-speed, pedestrian-oriented street operating within a high density mixed-use area. Main Streets traditionally serve as a focal point for surrounding areas. The narrow street width, on-street parking, street trees, and small setbacks create spatial enclosure. Sidewalk bulb-outs may be used to minimize pedestrian crossing distances. Individual street trees are typically planted in planting wells. Main Streets have a raised curb and closed drainage. The pedestrian realm is buffered from automobiles by both on street parking, as well as landscaping and street furniture.

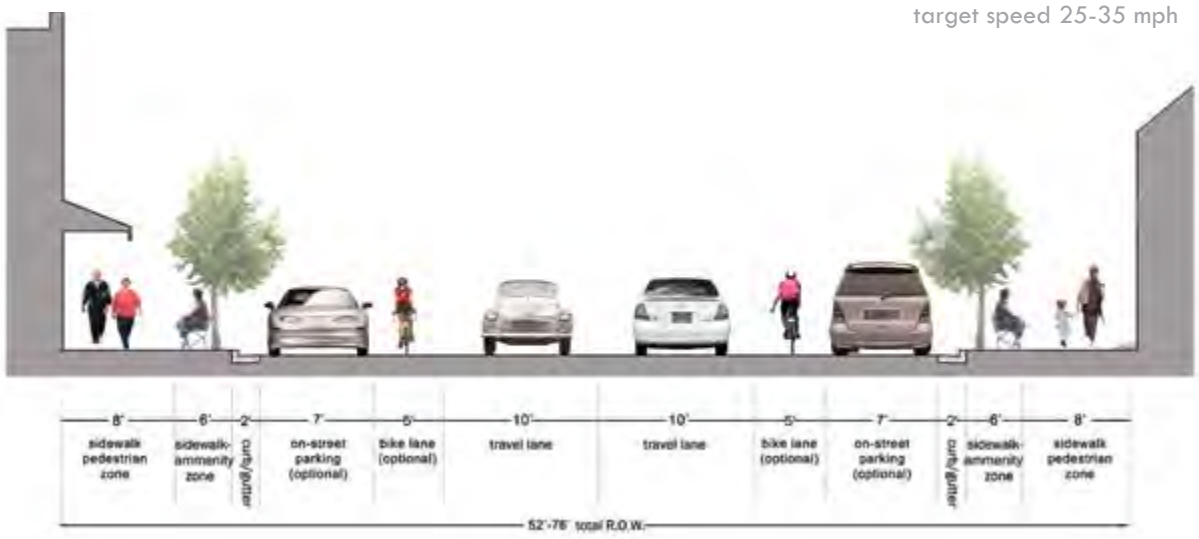
target speed 20-30 mph



COLLECTOR STREET

A collector street can be found within mixed-use centers or can connect mixed-use centers to surrounding neighborhoods. These lower-speed thoroughfares are intended for less-intense surroundings than main streets. The pedestrian realm is buffered from automobiles by both on street parking, as well as landscaping and street furniture.

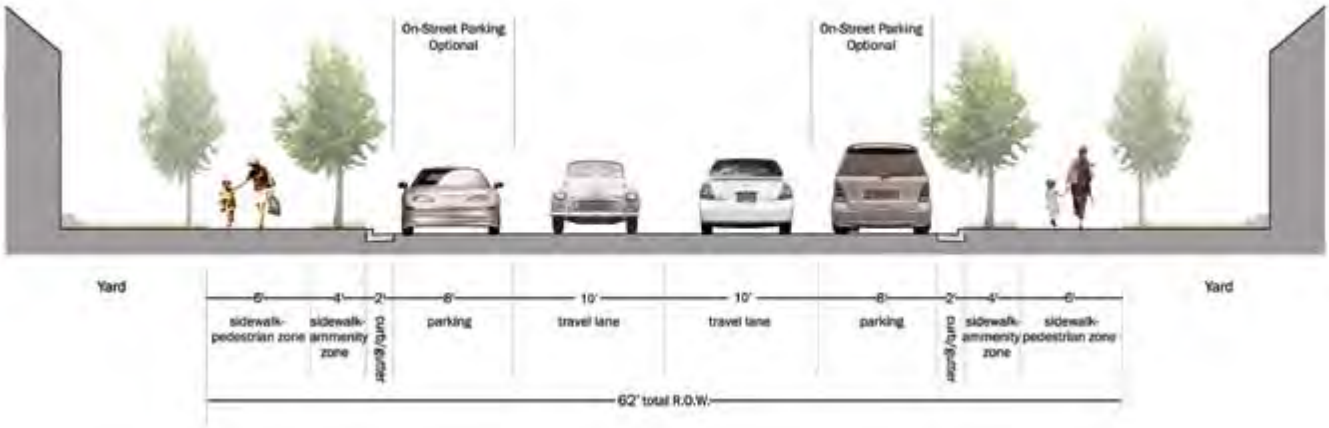
target speed 25-35 mph



NEIGHBORHOOD/LOCAL STREET

Neighborhood streets may typically include sidewalks, street trees, and residential on-street parking. Small building setbacks, such as dooryard or stoop fronts, contribute to the street's spatial enclosure. Neighborhood Streets have curb and gutter drainage.

target speed 20-30 mph



4Av. THOROUGHFARE PLAN

Overview

The purpose of this thoroughfare plan is to provide the guidance necessary to improve the overall connectivity and performance of the transportation network in Greene County's urban areas through 2035, and set the framework for changes beyond 2035. This section compliments the Access Management Strategy section which addresses the issue of access points along the US 29 and US 33. This section addresses the issue of future new or improved roadways linkages that will improve connectivity. The underlying premise in this thoroughfare plan is to develop a street network that supports the land use vision expressed in the preferred scenario developed through public workshops. The following table summarizes some specific challenges identified during the process and summarizes recommendations that are made throughout this plan to address them.

Challenges	Recommendations and Solutions
Lack of alternate routes and transportation choices for local traffic other than primary arterials.	• Plan and build parallel corridors that link new growth 'centers' which are places with high internal connectivity and walkable local streets. • Provide a better road system with improved connectivity, parallel roads and walking and biking options where appropriate. • Plan for future transit services between several County centers and along the corridors of US 29, US 33 and Route 230, creating an internal loop connecting several destinations within the County.
The proliferation of traffic signals decrease capacity along US 29 and US 33.	• Put in place a phasing strategy that permits near-term signalized intersections to be phased out over time, and where feasible, be replaced by a grid system in conjunction with grade separating Route 29 and the sidestreet. This strategy is illustrated on pages 48-49 which is an example for the Ruckersville area. This strategy could apply to other growth or challenge spot areas.
Excessive access entrances along major arterials are safety and functionality concerns.	• Manage site access by seeking to limit and separate entrances, intersections, median openings and traffic signals in order to maintain and improve the flow of traffic and enhance public safety. (See Access Management Strategy, pg. 64)
Typically streets are not being built in context, and do not maximize walking or biking opportunities.	• Design guidelines for desired street cross sections, and where they correspond to new place types and zoning, are included as part of this report. (See Recommended Street types, pg 53+ , Design Guidelines, pg 80+, and Appendix A, pg 92+)
Existing subdivisions do not meet connectivity measures in VDOT's Secondary Street Acceptance Standards (SSAR).	• Update Greene County's subdivision ordinance so that new subdivisions are required to meet or exceed VDOT's basic connectivity standards.

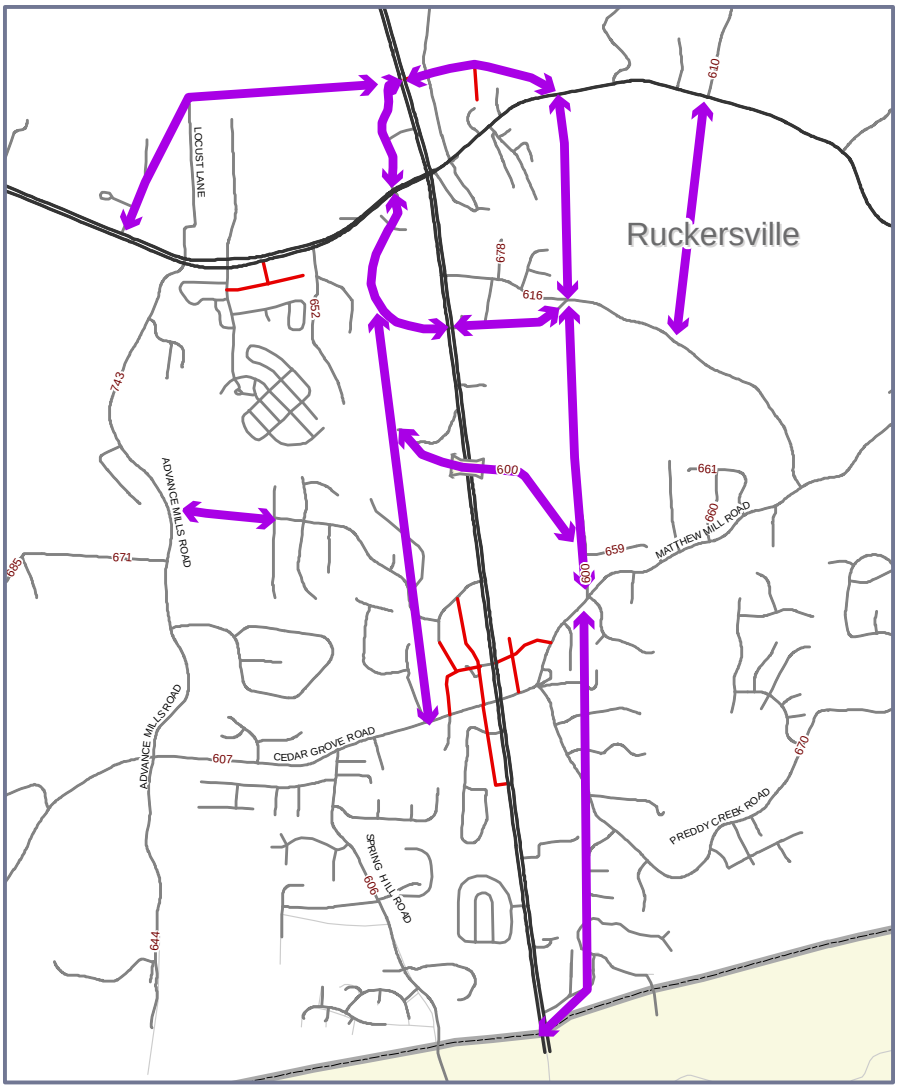
Challenges	Recommendations and Solutions
Lack of coordinated land use and transportation planning, and lack of connectivity in and between existing development (both residential and commercial).	• Work with parcel and business owners to identify opportunities for better inter-parcel connectivity, and new road linkages. • Work with community associations to identify opportunities to connect adjacent neighborhoods. • Adjust the 2003 growth area boundary so that it more closely matches the size and location of the new places identified in the preferred land use scenario (see Section 3B, pg 36+). • Incorporate recommendations from this multi-modal corridor study into the County's comprehensive plan. Important elements to consider are design guidelines, an access management strategy, a thoroughfare plan, connectivity measures, and the recommended future street types. • Identify opportunities for locations of new streets shown in the thoroughfare plan. (See pgs 57-63) • Plan for right of way acquisition. • Incorporate new land use types identified in the preferred scenario into the County's Zoning choices.
Funding	• Pursue funding and accept developer proffers as opportunities arise. • Explore other financing options such as special districts, or tax increment financing. • Coordinate with future VDOT US 29 improvements. The US 29 Corridor Study underway by VDOT encourages similar strategies that are recommended in this Transportation Framework plan. Future funding opportunities may be possible for off-corridor improvements (such as access streets and grade separated intersections) if they ensure on-corridor performance.

Preferred Scenario Model Results

The central recommendation of this thoroughfare plan is to for Greene County to strive, together with VDOT, developers and citizens, to create a system of parallel roads, linking new places, which have good internal local street networks. To measure of effectiveness of this strategy, new road linkages were inserted into the traffic demand model network. The graphic to the right shows the new connections modeled. The VC map on the following page shows that the addition of these new secondary streets improve the capacity of US 29 in the future.

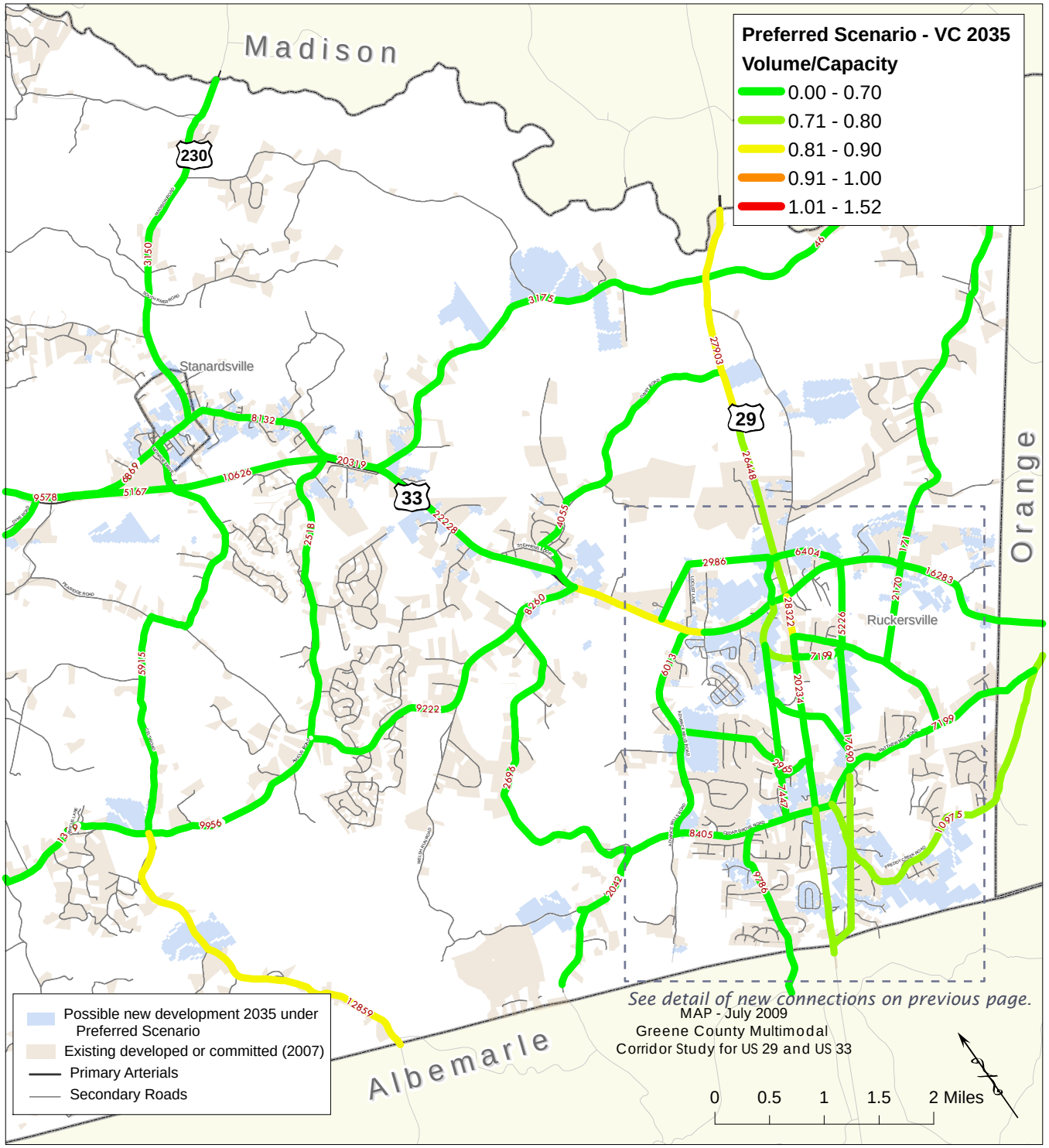
This vision can only be achieved using a phased approach. This will entail incrementally improving corridor access management and, over time, replacing signalized intersections with overpasses in conjunction with the improved parallel and connected network using the concepts shown in Section 4Aiii. The illustrations of the phased box intersection in the Ruckersville growth area show how this can be achieved. The same concept can be applied to other congested intersections, such as US 29 and Rt. 607 (Midway). The basic premise of this strategy is that local traffic and regional traffic are separated, and new communities are built with less direct access onto US 29. Using this approach, more land is opened up for commercial development with new main streets and local street networks built off the corridor in new places identified in the preferred land use scenario.

The graphic on the following page illustrates projected traffic volumes and resulting VC for the preferred scenario and recommended roadway network.



Future secondary connections modeled. See the map on the following page for area of coverage.

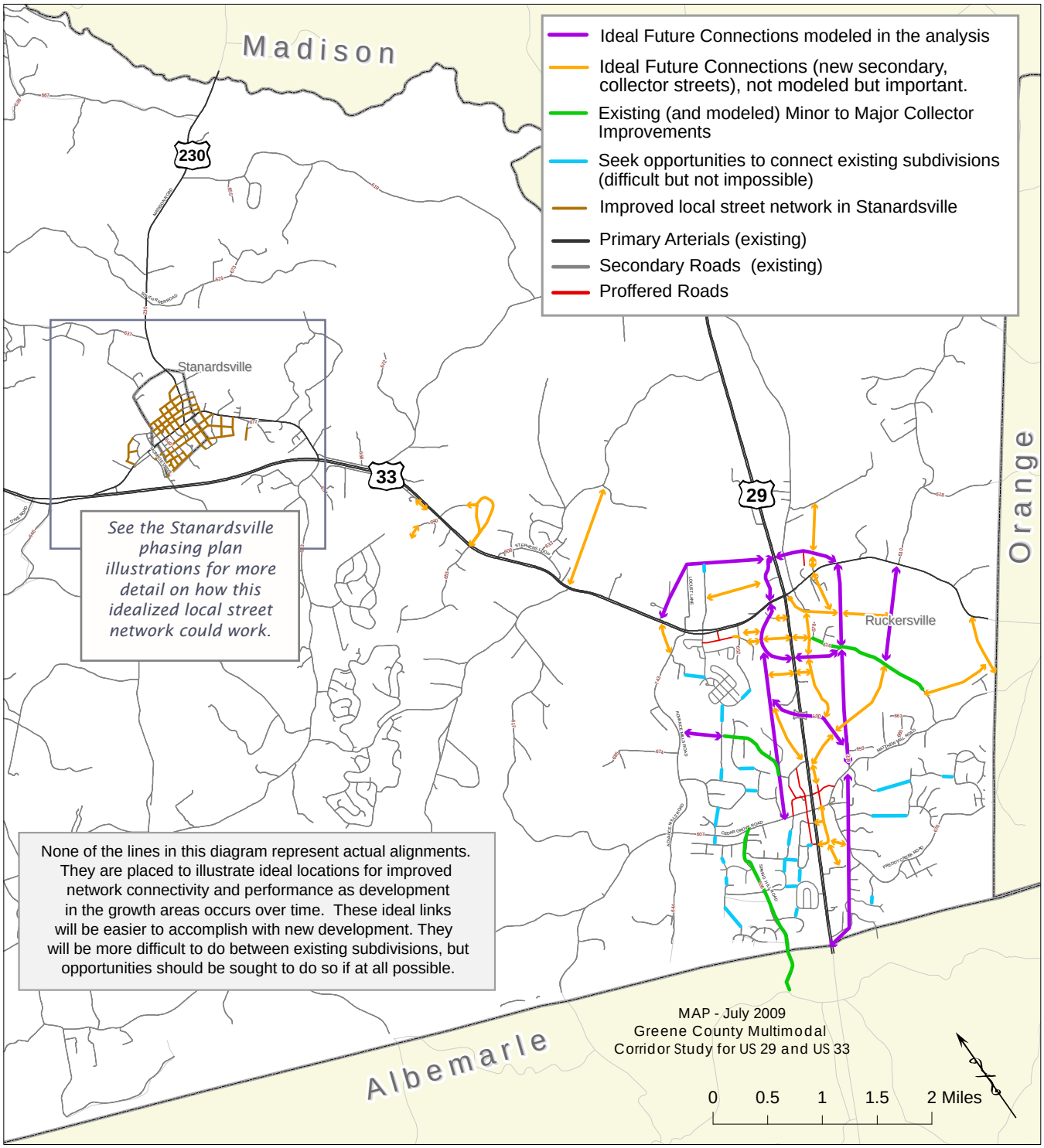
Greene County - 2035 Preferred Scenario and Optimized Network Analysis



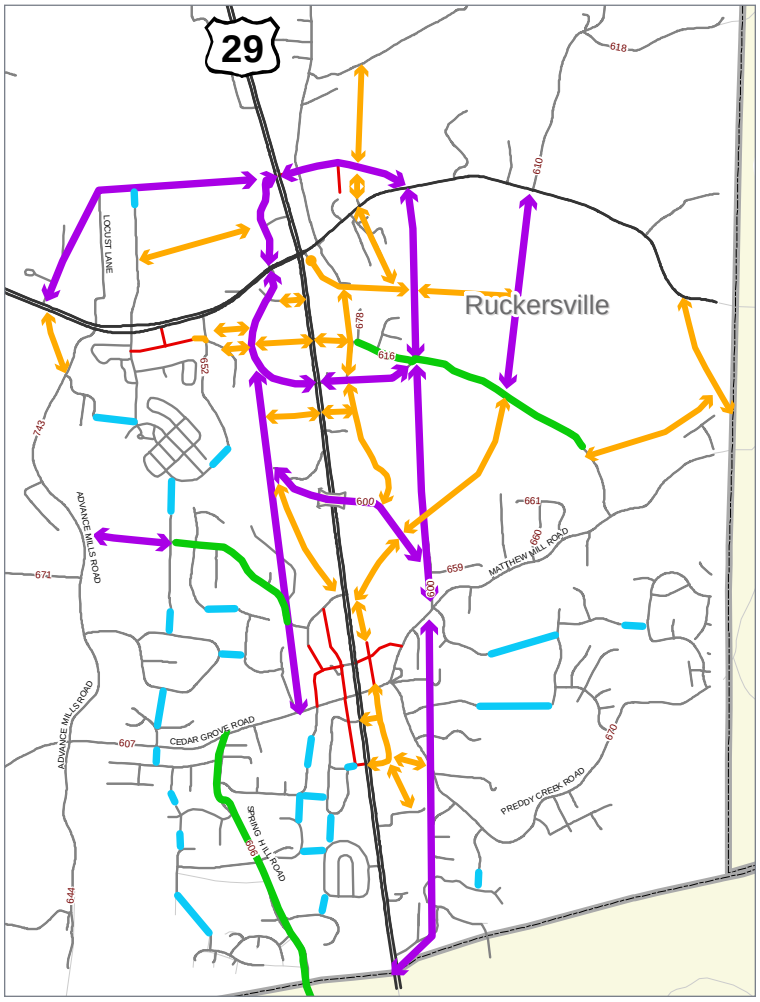
Idealized Future Network

The map on the following page identifies a series of connections, or improvements to existing streets, necessary to reduce congestion and provide the system capacity necessary through year 2035 and beyond. The purple links are new roads added to the traffic demand model that resulted in improvements to the network's overall performance. The green links are improvements to existing streets that will be necessary as part of the overall thoroughfare plan. The yellow lines represent other 'desirable'' connections. These yellow lines were not modeled but were identified in workshops and through analysis as opportune places to increase overall connectivity and travel choices in the growth areas of Greene County. The blue links address where existing subdivisions with poor connectivity could be joined. Establishing these connections is perhaps very difficult and would require retrofitting or purchasing lots. However, the blue lines shown primarily to illustrate how connectivity could be improved. The brown street grid shown for local streets in Stanardsville would be for slow traffic, walkable neighborhood streets as described in the Neighborhood street cross section guidelines, with a Main Street serving as the commercial core. The conceptual plans for Stanardsville were based on this proposed, idealized street grid pattern. These older street grid patterns replicate urban design style with high connectivity associated with town and villages that were designed prior to our current heavy reliance on cars for personal transport. They often result in the most walkable, enjoyable, or human scaled places to visit and live.

Greene County - 2035 Thoroughfare Plan - Idealized Future Network



The map details on this page are close up from the Idealized Future Network map on the previous page.



- Ideal Future Connections modeled in the analysis
- Ideal Future Connections (new secondary, collector streets), not modeled but important.
- Existing (and modeled) Minor to Major Collector Improvements
- Seek opportunities to connect existing subdivisions (difficult but not impossible)
- Improved local street network in Stanardsville
- Primary Arterials (existing)
- Secondary Roads (existing)
- Proffered Roads

None of the lines in this diagram represent actual alignments. They are placed to illustrate ideal locations for improved network connectivity and performance as development in the growth areas occurs over time. These ideal links will be easier to accomplish with new development. They will be more difficult to do between existing subdivisions, but opportunities should be sought to do so if at all possible.

4Avi. ACCESS MANAGEMENT STRATEGY

The following section contains text from a draft document called "Managing Access to Principal Arterials" authored by VDOT. This paper was drafted as part of the VDOT US 29 Corridor Study, to supplement existing VDOT access management standards (see www.virginiadot.org/accessmgt). The intention of this paper is to provide guidance to help communities and VDOT work together to protect the transportation and commercial investments that both the Commonwealth and localities have made in their communities. This study outlines a strategy for Greene County's comprehensive plan update that provides guidance so that communities can grow and develop over time with appropriate measure to both protect their commercial interests while protecting the overall transportation goals of the Commonwealth's primary arterial corridors.

Background

Roads are a critical public resource and constitute a major investment of the public's money. In an era of shrinking highway construction budgets and rising costs, greater recognition is being placed on maximizing the performance of Virginia's existing highway network to reduce the need for new roads and road widening projects. In response to this challenge, the 2007 General Assembly unanimously approved a bill introduced by Governor Kaine to authorize the Virginian Department of Transportation (VDOT) to adopt access management regulations and standards.

What is Access Management?

Access management is a comprehensive approach for controlling the location, spacing, design and operation of entrances, street intersections, median openings, and traffic signals. Each of these access points (entrances) creates conflict points where vehicles have to stop or slow down, disrupting the flow of traffic. As the number of conflict points increase, so does traffic congestion and traffic crashes affecting the traffic carrying capacity of the road. Interstates have few conflict points because access is restricted to a limited number of interchanges, allowing interstates to convey large volumes of traffic at high speeds for long distances with lower crash rates. Managing access, therefore, seeks to limit and separate entrances, intersections, median openings, and traffic signals in order to maintain and improve the flow of traffic and enhance public safety. The benefits include:

- Less traffic congestion.
- Lower fuel consumption and air pollution.
- Fewer and less severe traffic crashes.
- More efficient movement of people and goods that promotes economic development by expanding the market area and labor market for businesses.
- Preserving highway traffic carrying capacity to avoid having to widen them or build new ones.

Functional Classification of Highways

Travel involves movement through a network of roads. To achieve safe and efficient traffic circulation within the network, highways are classified according to the importance of their function to move traffic versus provide access to adjoining property. Access to roads should be managed so they perform the function they were built to serve.

Interstates - offer the highest level of mobility and are intended to carry the greatest amount of traffic at the highest speeds. Accordingly, they provide no direct access to property, allowing access only at interchanges.
Principal Arterials - provide the next highest level of mobility and convey large amounts of traffic over relatively long distances. Direct property access may be provided but require careful management to preserve arterial mobility and avoid creating unsafe and congested traffic operations.
Minor Arterials – interconnect with and augment the principal arterial system, distributing traffic to smaller geographical areas.
Collectors - provide traffic circulation within residential and business areas. They distribute trips from the arterials through these areas to the motorist's destination and conversely collect traffic to channel it to the arterial system. Trips are shorter distance local trips at lower speeds, so they can safely provide a higher amount of property access.
Local streets - provide the lowest level of mobility and are intended to offer direct access to abutting land.

The reason so many principal arterials are congested and have high traffic crash counts is because multiple entrances, intersections, and traffic signals have been allowed to serve development, affecting the arterial's primary function to move traffic.

In order to prevent this from happening, it is necessary to limit the number of such connections and to safely space them from each other. Maintaining the functional integrity of the highway network over time preserves its overall travel capacity and safety. This in turn maximizes the expenditure of highway related taxes.

Development of Virginia's Access Management Program

During 2007, access management regulations and standards were drafted by a VDOT committee representing a broad range of disciplines. The documents were reviewed and refined by an advisory committee composed of representatives from local government, development, environmental, and transportation engineering organizations. Several hundred comments received during the public comment period were evaluated and used to revise the regulations and standards, which were approved by VDOT's Commissioner December 2007. Legislation approved by the 2008 General Assembly established a phased approach to implementing the access management program. Due to the critical importance of principal arterials for travel within the Commonwealth, transporting of goods, commuting to work, tourism, and emergency

evacuation, the first phase implementation of the access management regulations and standards were for principal arterials (effective July 1, 2008). Minor arterials, collectors, and local streets were included in the second phase implementation (effective October 1, 2009).

Highway Functional Classification	Legal Speed Limit (mph)	Centerline to Centerline Spacing in Feet		
		Signalized Intersections	Unsignalized Intersections & Full Access Entrances	Partial Access One or Two Way Entrance
Rural Principal Arterial	≤ 30 mph	2,640	1,320	270
	35 to 45 mph	2,640	1,320	440
	≥ 50 mph	2,640	1,760	585

Access Management Regulations and Standards for Principal Arterials

The regulations and standards were designed to balance the right of property owners to reasonable access to the highway with the right of users of the roads to mobility, safety, and efficient expenditure of public funds. Key elements include:

- Spacing standards for intersections, median openings, and driveways.
- Shared entrances.
- Vehicular/pedestrian connections to adjacent properties.
- Locating entrances a safe distance from interchange ramps.
- Traffic signal spacing standards.
- Right-in/right-out entrances.
- Entrance throat depths.
- Encouraging the preparation of highway corridor access management plans.

The principal arterial spacing standards in Appendix F of VDOT's Road Design Manual are based on urban vs. rural highways, the speed limit, and type of entrance.

Two Issues That Are Not Addressed by the Access Management Regulations

Virginia now has regulations and standards to better control access to principal arterials. However, their effectiveness is limited by a site-by-site approach to the approval of connections to the highway. As vacant parcels are developed, the owner has to try to fit proposed entrances and traffic signals within the pattern of existing ones. If the access management spacing standards cannot be met, the regulations require restrictions on the type of entrance that can be approved, such as right-in/right-out entrances, or the denial

of a traffic signal. Depending on the situation, the developer may seek an exception from the spacing standards. In addition, as parcels are subdivided, new property owners expect access to the highway. In high growth areas, the subdivision of land leads to the potential for more and more new entrances. The cumulative impact of strip development along principal arterials results in a deterioration of their function, creating unsafe and congested traffic operations.

The challenges of managing access tend to be greatest on principal arterials where demand for individual property access conflicts with the public's demand for through traffic movement with minimal travel delay. Preventing the proliferation of new entrances is a key strategy to meet this challenge. This can be accomplished by requiring lots created from the subdivision of a parcel to access the highway using an internalized street circulation system.

Top:
23 entrances,
28 parcels

Bottom:
10 entrances,
29 parcels

Ideally, as development is proposed through further subdivision of parcels, the encouraged condition would be to configure the new lots in a manner that creates a vehicular circulation system so as to access the highway via the designated entrance. This would help to minimize the number of new connections onto the arterial roadway.

US 33 and US 29 Access Management Recommendations

It is important that, as future development occurs, proposed entrances on the principal arterial network be scrutinized for adherence to the entrance spacing standards. On divided highways, crossovers could be closed or relocated according to the one half (½) mile spacing requirements for future signals. Where full access will not be provided, entrances could be designated as right-in/right-out depending on the future land use classification or the size of the property. Identifying and adhering to an access management plan and adhering to access management strategies provides an opportunity to guide future access requests in such a manner as to preserve the Route 29 and US 33 corridor traffic operations into the future.

The project study corridors are classified as Rural Principal Arterial facilities. Recommendations, in accordance with the VDOT Access Management criteria, include the following measures.

- Place traffic signals to achieve the 1/2 mile signal spacing necessary for signal timing to produce maximum traffic flow rates.
- Separate potential entrances from interchange on and off ramps.
- Use minor side streets for property access.
- Close and/or relocate median openings (crossovers) to achieve the VDOT spacing standards.
- Identify suitable locations for future vehicular connections to adjacent properties (where there are no physical constraints to such connections).
- Share entrances.
- Add left turn lanes to existing crossovers.
- Evaluate the potential for frontage roads.

The following series of aerial based color coded graphics illustrate where opportunities exist to improve safety and capacity through access management. The color coding key is as follows:

Orange – Areas where substandard conditions, per the new criteria, currently exist. As future development occurs, modifications to the access should be examined as opportunities arise.

Blue – Areas that comply with current standards and where no new full access points are currently permitted.

Access Management Mapping Methodology

Primary Control Points (CP) are existing or proffered signals from which access point spacing is measured. Minimum signal spacing is 2640' and Full Access or Median Opening minimum spacing is 1320' for speed limits 45 mph and under or 1760' for speed limits greater than 50 mph (see page 66 for Principal Arterial Spacing Standards.) Any full access points or signals that do not comply with these standards are called out on the maps as segments highlighted in orange. For segments that are currently in conformance and are already built out according to current standards, a blue line indicates that no additional full access points are permitted.

Secondary CPs are full access points that, under current conditions, conform with primary or other secondary full access point spacing standards. Secondary CP conformance is always measured outward from the nearest Primary CP or signal. However, the closest conforming access point to a Primary CP may not be the most important point to preserve in the future especially if it is not serving access to one or more roadways. Additionally, Primary CPs may change or new ones may be added in the future. Therefore, these secondary control points locations shown on the maps are highly flexible.

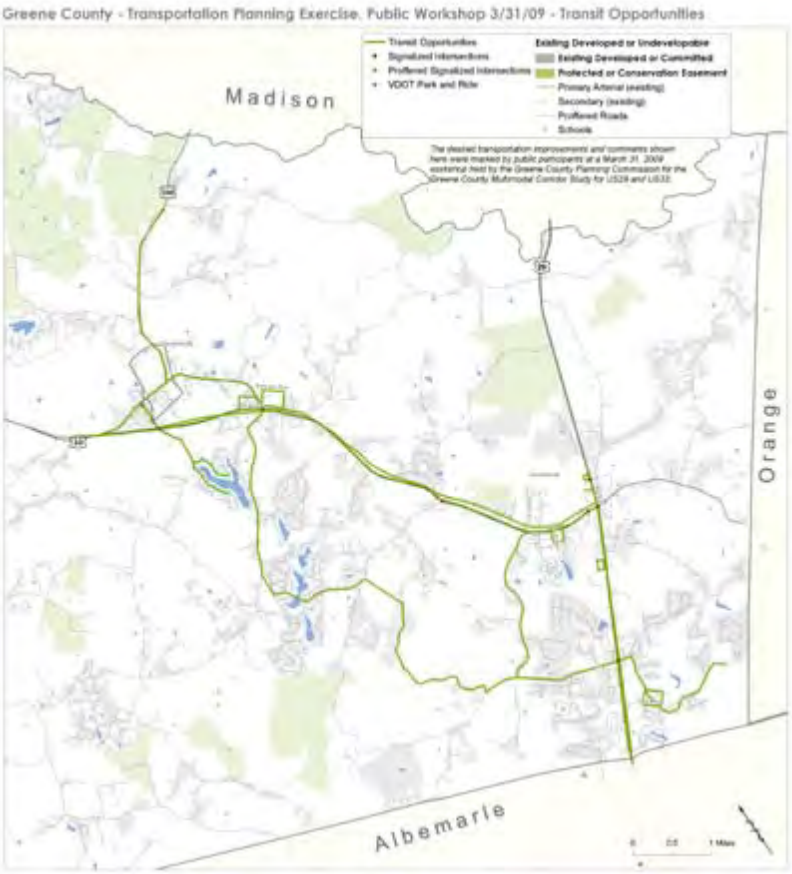
It should be noted that partial access points, right-in/right-out points, are not included in this map series. However, these points should be given careful attention as development occurs in the future. As development occurs places where the spacing of partial access points does not conform with the current access management spacing requirements, consideration should be given to consolidating multiple partial access points and/or providing access from a parallel, adjacent road or service road. This will allow more fluid movement of vehicles along major roadways and improve safety as fewer vehicles are merging into and out of high speed traffic.

4Avii. TRANSIT RECOMMENDATIONS

Greene County operates a successful rural transit program that offers valuable services of mobility to the residents of Greene County. The system is currently operated as a department within the County performing demand response services to all residents. This service provides connections to resources in neighboring jurisdictions, as far as Charlottesville. Transit services generally focus on those with limited mobility options, such as the elderly and disabled residents. But, services are offered to any resident who needs it and based on the system's availability. The current service delivery strategy supports the approach that the most effective operation of transit is to provide rural transit is to ensure there are common destinations within close proximity. While residents are currently picked up in low density locations, having destinations within close proximity of each other will ensure continued program success as the system continues to grow in response to the community's mobility needs.

Internal Transit Loop to serve new centers. As the region grows the demand for Greene County's transit services will increase. Based on public input and analysis of land use growth patterns, there is significant potential for future services between several county centers and along the corridors of US 29, US 33, and Route 230. This approach would create an internal loop connecting several destinations within the County. While these corridors have just begun to support the potential of a rural fixed route service, the idea is not too far into the future. By considering the connections and supportive land use now, the county can increase the success of future services.

Park-and-Ride. Participants at the stakeholder meetings did propose some new locations where they felt park-and-ride lots may be useful. These are shown on the 'transit recommendations' map from that meeting. As another aspect of transit, the County should begin considering optimal locations for park-and-ride lots. In rural areas, such lots serve to encourage car-pooling, but with proper planning, these lots would allow for greater connectivity between jurisdictions and prepare for future regional transit services. By examining the optimal location of park-and-ride lots, the County can better incorporate the need with future complimenting land use developments. As an example, localities have partnered with large commercial developments to create an ad hoc park-and-ride lot, using the large amount of required parking as the park-and-ride location.



Transit recommendations map, March 31, 2009 public workshop. Area details of this map are shown on the following page.

Prepare for Future Fixed Routes/Transit Oriented Development. Finally, the preferred land use scenario endorsed creating new centers, or more compact places with densities which could begin to support fixed route transit in the future. Notably the Town and Village Center places identified in the preferred scenario can encourage transit opportunities in the future. To prepare for the potential of local fixed route and regional services the County should consider defining and implementing clear performance measures that examine service performance from three perspectives; financial, operations and the customer. Some of these measures already exist as part of their annual reporting to the state, but some would be additional and established for more County specific use.

The map detail above shows the transit recommendations around Stanardsville, including two new proposed park-and-ride locations just east of the town, near US 33.

The map detail to the left shows transit recommendations along US 29, with new park-and-ride lots in the south, near midway, as well as near Ruckersville, along US 33. This map detail also shows future transit service on Advance Mills Road, west of US 29.

The map detail below shows the desired internal linkages between Stanardsville and Ruckersville.

All of these map details are transit recommendations made during a public meeting workshop exercise, March 31, 2009.

4Aviii. CHALLENGE AREA STRATEGIES

In addition to the model results which identified congested segments, there were a number areas along US 29 and US 33 that were identified as challenged. This section identifies challenges in 5 specific areas and proposes some solutions.

US 29 at Albemarle County Line

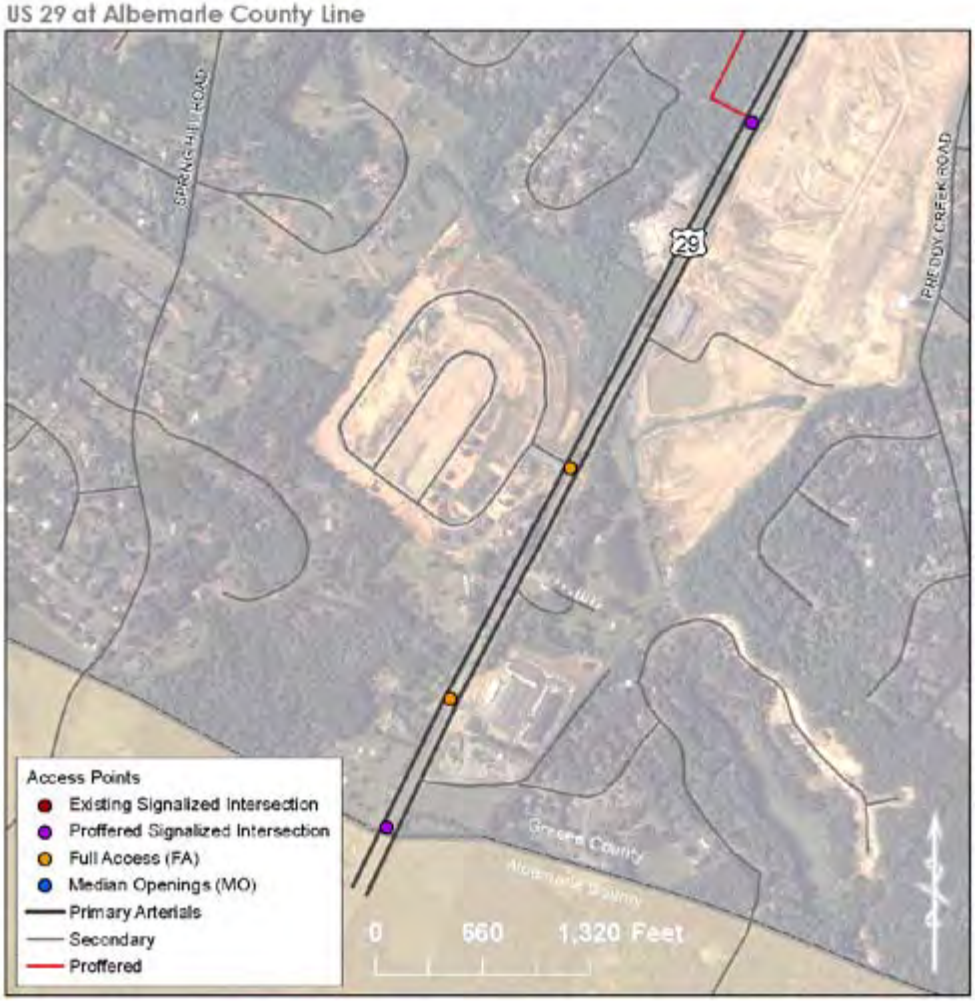
Transportation Challenges:
As development continues north of the Albemarle County line, it is anticipated that traffic volumes will grow along Spring Hill Road, thus their will be a challenge in managing and accommodating traffic along that corridor.

Possible Solutions:
Conduct a corridor location study to identify where a new north/south corridor can be sited along the east side of Route 29. Then work closely with the development community to obtain right-of-way and improvements leading to a fully connected parallel network.

On a larger scale, an important goal for the whole US 29 corridor will be to provide a new connection to Route 29 to serve as a parallel collector along the east side of Route 29.

Conduct a study along Spring Hill Road to identify requirements and needs relative to spot and roadside improvements that will help to accommodate increased traffic volumes.

US 29 at Albemarle County Line

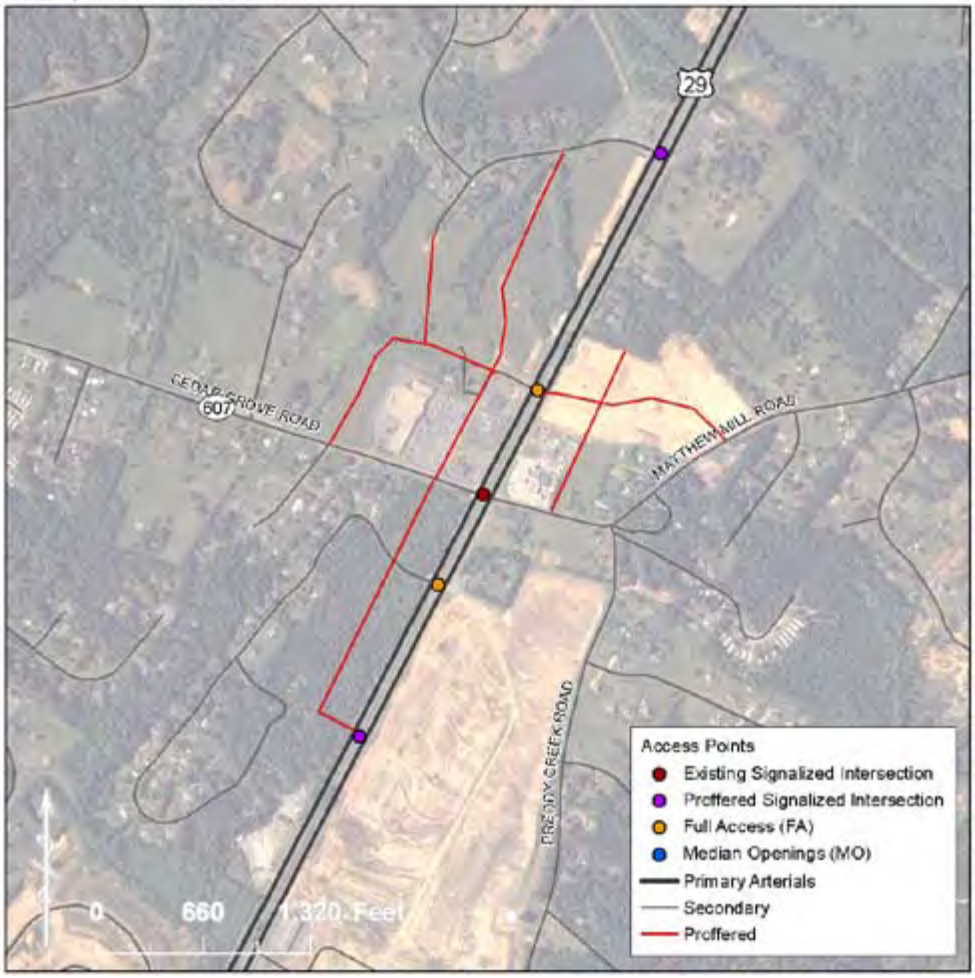


US 29 and Rt 607 Intersection

Transportation Challenges:
Route 607 is a major collector facility providing access to residential development east and west of Route 29. Currently, this intersection experiences traffic operational concerns in terms of delay and queuing in the peak hours. In the future, the challenge will be to mitigate the sidestreet delay and queuing and eventually provide a grade separation of the through movements and either ramp or sidestreet access to/from Route 607. Also in the near term another signalized intersection might be constructed a short distance to the south of this intersection. Signal coordination will be necessary to minimize stops and provide progression through the corridor.

Possible Solutions:
Short term, the intersection needs to be improved to provide additional laneage on the sidestreet to help mitigate queuing and delay concerns. Once the adjacent signal is constructed signal coordination will become necessary. In the longer term, the intersection should be grade separated using some form of a tight diamond interchange, or the "box" concept as shown in the Ruckersville connectivity section of this document.

US 29 / Rt 607 Intersection



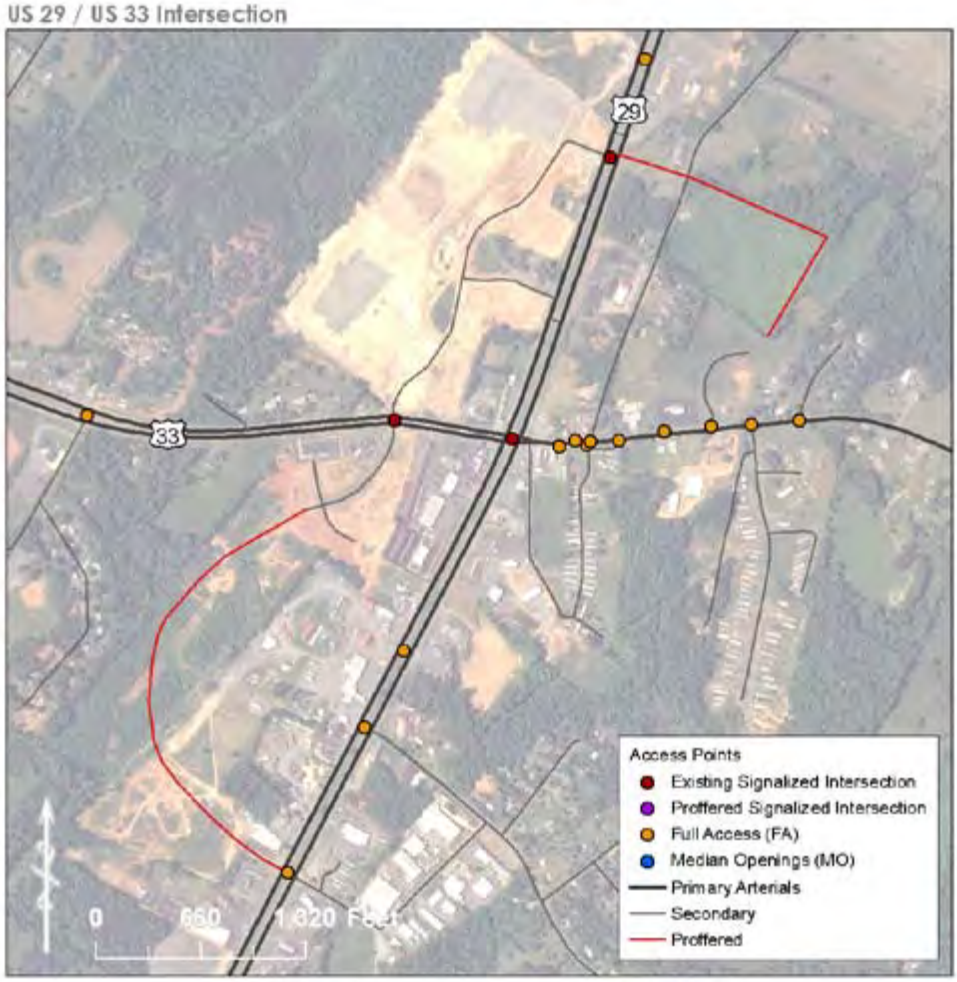
US 29 and US 33 Intersection

Transportation Challenges:
Route 33 is largely a four lane limited access arterial facility west of Route 29. East of Route 29 the Route 33 corridor has two lanes of travel and provides local and regional access between points east and the Route 29 corridor. In the vicinity of the intersection with Route 29 there are numerous access points within the functional area of the intersection. This intersection currently experiences delay, queuing, and safety concerns that will need to be mitigated as additional development and traffic occurs along both corridors. There is another signalized intersection in close proximity along Route 29 to the north of this intersection and then another signal to the west of Route 29 along Route 33 that is in close proximity, less than the currently recommended signal spacing per the VDOT access management guidelines.

Possible Solutions:
In the near term, access management improvements in terms of driveway access point consolidation should occur, especially on the east and north west quadrants of the intersection. Also in the near term the intersection should be monitored for need to add sidestreet capacity to the east side of the intersection. In addition, to minimize stops (which affect the number of rear end crashes), signal coordination should be provided.

In the longer term, the intersection should be grade separated using some form of a tight diamond interchange, or the "box" concept as shown in the Ruckersville connectivity section of this document.

US 29 / US 33 Intersection

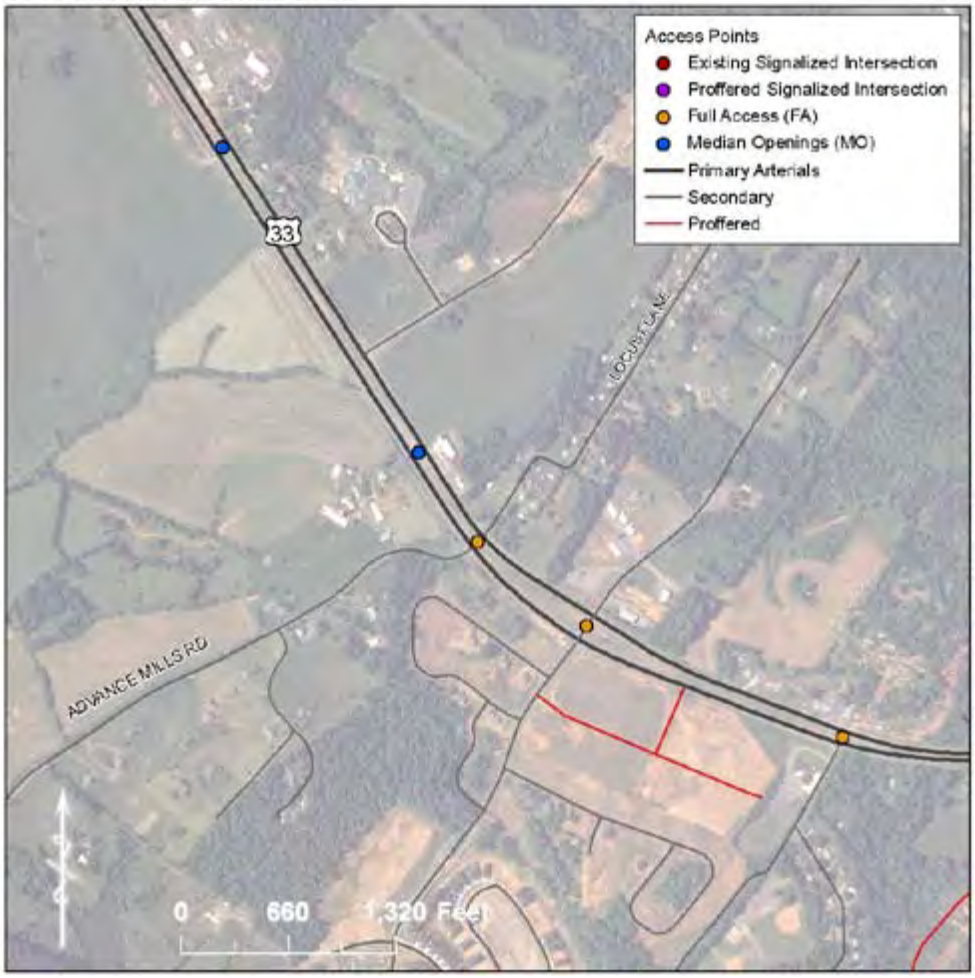


US 33 and Advance Mills Road

Transportation Challenges:
The County has expressed an interest in realigning Advance Mills Road to intersection Route 33 further to the west to make a full "plus" intersection with better access to Greene County Elementary School at Progress Place. This will serve to improve the median crossover and signalization spacing along the corridor, while providing improved access to the County's educational facilities.

Possible Solutions:
In the near term, coordinate with development proposals to identify opportunities to acquire right-of-way and construct some, if not all, of the required pavement to effectively realign Advance mills Road.

US 33 and Advance Mills Road

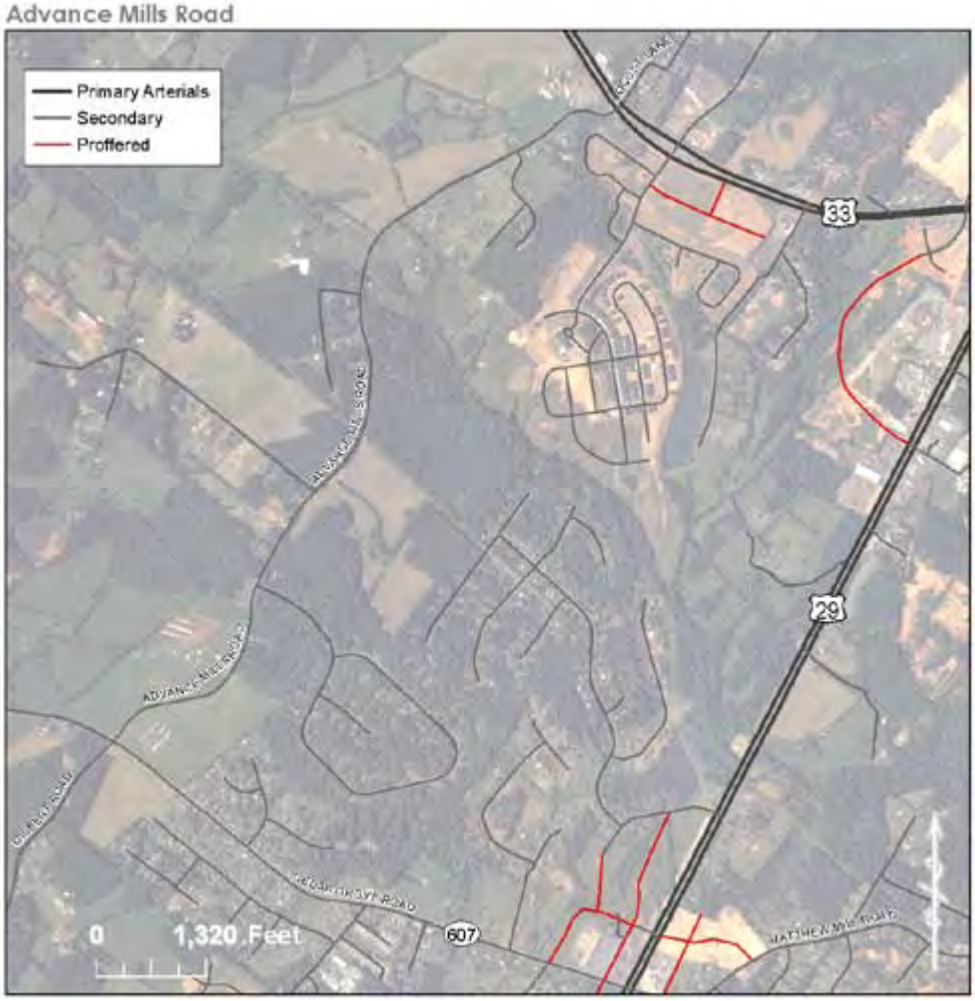


Advance Mills Road

Transportation Challenges:
Advance Mills Road is a typical central Virginia farm to market type rural collector facility. However, in the future it is expected that Advance Mills Road will carry higher volumes of traffic due to its proximity to the growth area and increasing congestion on Route 29. The challenge will be to provide for increased capacity and safety as the volumes continue to grow.

Possible Solutions:
In the near term, seek opportunities to improve the roadside conditions and construct spot improvements to add turn lanes where needed. In the long term, seek opportunities to realign portions or the road to minimize the horizontal and vertical curvature of the road throughout the corridor.

Advance Mills Road



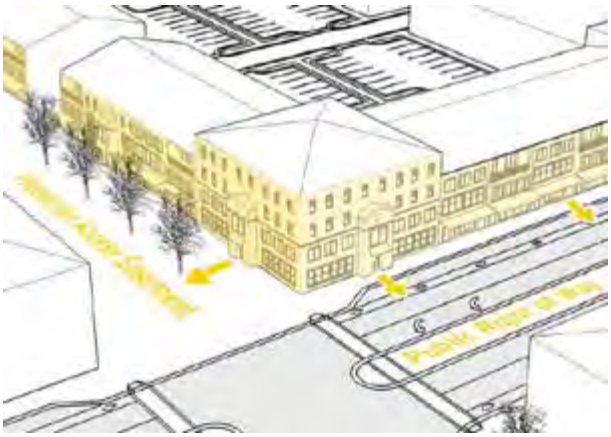
4B. DESIGN GUIDELINES

The following section outlines a series of development principles for considering how future development within the Greene County study area could occur in the future. Although these are arranged under separate headings, it is important to consider these as interrelated pieces, contributing to and reliant on each other for successful place making. New and infill development should strive to realize these principles to ensure walkable places that minimize land consumption, balance pedestrian and vehicular traffic, foster a vibrant mixed-use environment, and protect and enhance the existing qualities of the region.

4Bi. SITE DESIGN

BUILDING ORIENTATION

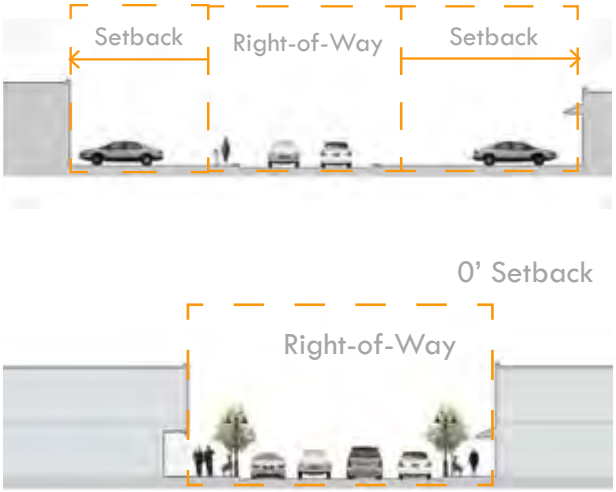
Successful site design depends on proper building orientation to create a presence that is welcoming to pedestrians. By simply reconfiguring a site, building placement can reduce walking distances for customers and make streets more useful for pedestrians, transit users, and bicyclists. Building entries should border main streets and public thoroughfares to foster a vibrant, walkable environment. The primary building entrance should be oriented toward the public street or other principal pedestrian access way, typically the public sidewalk or an interior sidewalk where the majority of pedestrian traffic is expected to be coming from within the site. Additional entrances may be permitted that are oriented towards on-site parking.



Building entrances front directly onto the public right of way and principal pedestrian access way. -

SETBACKS

Setbacks represent the maximum distance between the lot line and building facade on the primary street or primary frontage of the building. A front setback of zero means that a building should be located directly adjacent to public sidewalks to provide direct access between the public sidewalk and buildings. Buildings drawn to the street edge create a defined edge providing "spatial enclosure," an important quality for a pedestrian-friendly streetscape. The side and rear setbacks are less stringent, especially rear setbacks which apply mostly to lots with rear or alley access. Surface parking is allowed in the side and rear setbacks.



Large setbacks add to the distance a pedestrian must travel to access buildings.

FRONTAGE TYPES:

COMMERCIAL FRONT

The commercial front is used for buildings facing onto commercial streets. Because commercial streets tend to be higher-speed thoroughfares, they provide a challenge to walkability and pedestrian comfort. Without the presence of on-street parking, landscaping takes a primary role in defining the pedestrian environment. Street trees and setbacks help to separate the pedestrian realm from vehicular traffic. Despite their setback, buildings should address the street and public spaces, using vertical elements to provide a degree of spatial enclosure. With the deep setback as a buffer, the commercial front can be suitable for higher speed thoroughfares.

Commercial front setbacks: 25' min. - 50' max.

STORE FRONT

A store front is intended to promote retail activity. The front building facade should be at or near the edge of the right-of-way. Higher ground floor heights ensure a civic presence at street level. The ground floor often has large windows, drawing attention inward and allowing pedestrians to window shop. Awnings and signage may cantilever over the right-of-way.

Store front setbacks: 0' min. - 10' max.

PORCH FRONT

A porch front is designed to promote social interaction between pedestrians and residents of individual houses without compromising the privacy of those same residents. The building facade is set back while the porch is adjacent or near to the right-of-way. Porch fronts can either be level with the ground or elevated.

Porch front setbacks: 0' min. - 20' max.

RESIDENTIAL YARD

A residential yard uses a substantial building setback. The front yard created may be fenced or unfenced and should have similar landscaping to adjacent yards.

Residential Yard front setbacks: 10' min. - 25' max.

PARKING: Surface, On-street, Structured, and Residential

SURFACE PARKING

Off-street (on-site) parking located between the sidewalk and buildings creates an inconvenient and potentially unsafe barrier to pedestrian activity. Parking should be located to the rear of the building wherever possible to minimize visual impact. Any off street parking adjacent to the public right-of-way should be screened with landscaping or fencing in such a way that does not create a barrier to adjacent sites or blocks. Long aisles of parking bays should be broken up with landscaped islands, which help to reduce storm water runoff, filter air, provide shade, and maintain property values. Pedestrian access should be designed around the perimeter of on-site parking and between parking aisles, to ensure that pedestrians can safely walk through parking lots without being forced to walk through the parking aisles themselves.

Expansive parking lots which support auto-oriented development are discouraged.

ON-STREET PARKING

On-street parking provides parking spaces within the thoroughfare right-of-way. Spaces are distributed evenly along the street edge, helping to maintain the visual consistency and appeal of the street edge. On street parking contributes to the street environment by helping to buffer pedestrian space from vehicular traffic. Bulb-outs should be used to define parking areas and create a stronger pedestrian environment. On-street parking is encouraged to reduce on-site parking needs, provide convenient front-door parking opportunities, and provide a protective buffer between pedestrians and moving traffic. On-street parallel parking is preferred over angled parking on low speed urban streets. Parallel parking leaves more space for bike lanes and wider sidewalks.

On-street parking can reduce on-site parking needs and provide convenient front door parking opportunities.

STRUCTURED PARKING

Parking structures should be designed to blend into the urban environment by using a scale and façade design to complement surrounding buildings. "Wrapping" a parking structure with buildings can serve to conceal the parking and maintain a pedestrian friendly street wall. If a parking garage will be fronting the street, the façade can be articulated to give the appearance of multiple smaller buildings with variety in massing and architectural design. The exterior floor space on the ground floor of any parking structure should be used for commercial space with parking behind and above. Structured parking allows for an efficient use of space in high density areas.

Parking structures that are integrated into a mixed use, walkable development pattern are encouraged. The images above show parking structures can be designed to articulated to blend with the environment, or are more ascetically appealing.

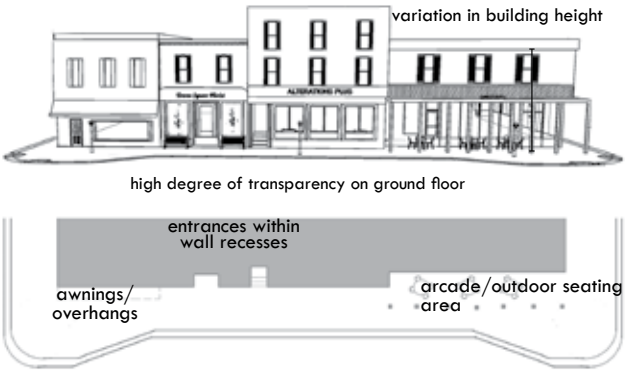
RESIDENTIAL PARKING

Residential parking is a significant component of residential neighborhoods. Frequently, driveways and garages have a dominating presence along residential streets. To enhance the pedestrian-orientation of residential streets and create a stronger connection between homes and the street, it is encouraged to set residential garages and driveways behind and to the side of the front entry of residences. Setting garages back separates the house from the garage, and better balances the relationship between the home and street and vehicles and pedestrians. In higher-density residential areas, residential alleys prove an effective way of providing private driveways and garages without limiting potential density.

4Bii. BUILT FORM

FACADE DESIGN

Large monolithic buildings along a block often present a scale that is overwhelming or uninteresting to the pedestrian. Buildings should be designed to provide visual interest to the pedestrian through massing and articulation in façade design. Massing describes the physical form of a building or group of buildings. Large buildings or adjacent buildings along a block often present a scale that is overwhelming or uninteresting to the pedestrian, limiting the desirability to walk along these blocks. Variations in height, horizontal divisions, window treatments, and facade materials help break up the mass of a building. Awnings, display windows, recessed entryways, arcades, or public art can be used to create a pedestrian-friendly and interesting street wall.



The above images represent an appropriate way to articulate a facade.

ARRANGEMENT

Vertical (multiple floors) or horizontal (adjacent buildings) mixed uses allow developments to internally capture trips by providing multiple opportunities for trip-making within a reasonable walking area, typically ¼ of a mile (or a 5 minute walk) between origins and destinations. Uses that will attract pedestrians, such as retail, service, or entertainment uses, should be encouraged on the ground floor, with office and residential uses above. Concentrating land uses of appropriate intensity and density to generate transit ridership and produce a high level of pedestrian activity should also be encouraged.

The above images shows one way in which vertical mixed use can be implemented to promote proximity, which allows for a variety of daily needs to be met without using a personal vehicle.

TRANSPARENCY

Transparent building façades featuring display windows generate visual interest for the pedestrian and improve security through enhanced visibility. For all buildings fronting public right-of-ways with non-residential uses on the ground floor, a minimum of 60% of the area between 2' and 8' vertically should be transparent, and no more than a 50' stretch of wall should be left blank.

Transparent building frontages generate visual interest to the pedestrian and promotes security.

4Biii. LAND USE

Walkable centers typically include a careful balance of land uses, combining jobs, living, and shopping within close proximity. Mixed use development provides a diverse range of commercial stores, shops, restaurants, and housing within a compact, walkable area. To be successful mixed use development must provide strong connections between different uses, allowing residents, employees, and patrons to naturally overlap and cross between uses. Creating compact and interconnected street networks also allows users to park once and walk between several uses in a single trip and provides a diversity of activities to enjoy at all times of the day.

DIVERSITY

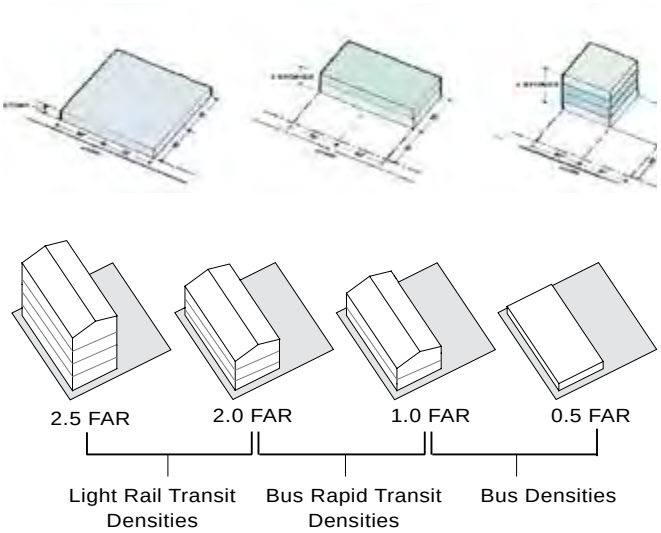
Creating a walkable environment typically includes providing a diverse and careful balance of land uses, including jobs, housing, restaurants and shopping within a compact area. To be successful, mixed use development must utilize both vertical (multiple floors) and horizontal (adjacent buildings) mixed use; include an interconnected street network that enhances the opportunities for pedestrians and cyclists and allows users to park once and walk between several uses in one trip; and provide a balance between activities that occur between the daytime, evening, and weekend hours, fostering a busier, safer, and more exciting environment at all times of the day.

Diverse uses are well-connected and located close to one another to improve options for using multiple modes of transportation.

DENSITY/INTENSITY

Non-residential or mixed-use intensity is typically expressed in terms of Floor-Area-Ratio (FAR) which is the total building floor area divided by the total lot area. The illustration right shows three simple ways in which an FAR of 1.0 (which simply means that if the area of the lot is 100 square feet, then 100 square feet of gross floor area has been built on) the lot might be reached: one story covering the entire lot, two stories covering 50 percent of the lot, or 4 stories covering one quarter of the lot.

Residential density is typically expressed in terms of residential units per acre. Increased densities in strategic locations, such as close to jobs, retail, or another complementary use, have the potential to reduce traffic congestion if constructed with a highly connected street network that also provides facilities and amenities for bicycles and pedestrians.



The above diagram shows general guidelines that should be followed when planning for various transportation modes. Bus transit is supported with FARs of at least 0.5 and preferably over 1.0. Light rail transit is supported with FARs of 2.0 or greater.

4Biv. OPEN SPACE

Carefully planned open space is necessary for the richness of mixed-use centers and the vitality of the public realm. Open space is a broad classification for public spaces ranging from community recreational areas to civic squares. The scale, enclosure, and density of surrounding conditions inform the properties of the open space: formal/informal, active/passive, and open/contained. Formal civic spaces should be located in the center area, serving the area of highest intensity, while recreational facilities, greenways, and neighborhood parks should be strategically placed to serve the core of these mixed-use communities. Many qualities contribute to the appeal of open spaces. Often, environmental and natural features are integrated into open space planning. Wetlands, critical slopes, drainage swales, and vegetation should be conserved as open public space wherever possible. In more compact areas, water retention systems can be rethought and formalized as landscape elements that punctuate design. Attractive civic spaces in the center, such as canals, ponds, and fountains promote gathering, interaction, and comfort. Moveable seating, tables, and elements that are multi-functional (planters that are at seat height) allow people to congregate and personally define spaces. Shade trees, greens, and cooling fountains help create a comfortable setting.

TOWN SQUARE

A town square is the most formal public, open space and is generally less than half the size of a block located at the intersection of important thoroughfares. It is devoted to civic uses and commercial activity and is surrounded by buildings on all sides. Its landscape is composed primarily of durable pavement and formally planted trees. Significant architectural features such as fountains, statues, and other vertical elements help mark the civic prominence of the square. Such features are most successful when planned in accordance with a strong visual axis, allowing the square to be visible from a distance.

POCKET PARK

A pocket park is a small park that often occupies a 'left over' space between buildings. Typically small in scale, pocket parks provide vegetation, shade, and open space within densely built areas. Due to their size, pocket parks predominately serve immediately adjacent buildings. These small, informal breaks in the built fabric provide alternatives to more prominent civic spaces, such as town squares, which require a greater commitment of land area and resources.

NEIGHBORHOOD PARK

A neighborhood park is an open public space serving a residential area. The space may be used for civic gatherings and recreation. Neighborhood parks provide a safe open area free from moving traffic for children and neighborhood residents. Neighborhood parks may be bound by residences or small scale institutional or civic buildings to form a common green. These parks are intended to serve the local area, unlike recreational parks, which serve a larger residential population.

RECREATIONAL PARK

Recreational parks, ranging from three to ten acres, are reserved for civic gatherings and recreation. Often, recreational parks are designed around existing natural features. Its landscape consists primarily of grassy areas, paved or unpaved walks, and shade trees. Formal playing fields may be established to serve community needs. The park should be surrounded by a mix of residential, commercial, and civic buildings. Recreational parks may also serve nearby institutions, such as schools. Parking needs and other necessary facilities must also be considered and sensitively integrated with the landscape.

GREENWAYS

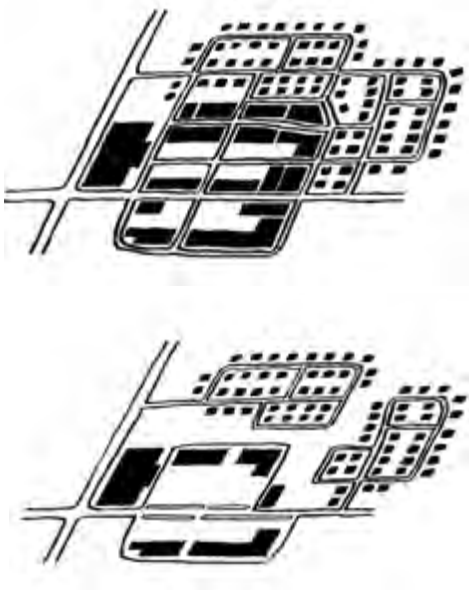
Greenways provide places for recreation and help maintain the scenic quality of landscapes. It is important from a transportation mobility and access perspective that greenways function by connecting places where people want to go: neighborhoods, business centers, shopping areas, schools and parks. Additionally, greenways provide an excellent opportunity for embedded community and neighborhood parks. Greenways also provide opportunities for unique recreational activities such as mountain biking and equestrian trails.

4Bv. CONNECTIVITY

Interconnected transportation networks can provide advantages such as enhanced vehicular and pedestrian access, reduced traffic congestion, and enable emergency vehicles to respond in a more timely manner. Well-connected areas promote pedestrian activity and encourage walking in place of driving for local trips

STREET NETWORK

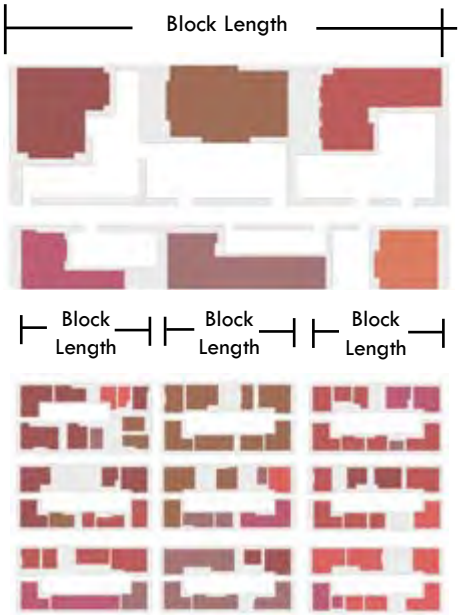
A connected street network disperses traffic flow, and promotes pedestrian and bicycle activity by making connections between destinations accessible and convenient. An interconnected street network also provides the framework for mixed-use development with smaller block sizes and a greater diversity of building types within close proximity. Interconnected street networks can provide advantages such as enhanced vehicular and pedestrian access, reduced traffic congestion, and enable emergency vehicles to respond in a more timely manner. This can be accomplished through short blocks, cross-access easements, bicycle/pedestrian facilities, building orientation, pedestrian sleeves through landscape and other barriers, and related strategies. This interconnected network should extend into adjoining developments and surrounding areas.



The top image represents a well-connected street network, and is encouraged. The bottom image represents poorer connectivity, and is discouraged.

BLOCK LENGTH

Maximum block length standards are used to promote connectivity. Encouraging shorter blocks, creates more intersections and, therefore, shorter travel distances and a greater number of routes between locations. As pedestrians typically will walk only ¼ of a mile for most trips, block lengths no longer than 1/8 of a mile should be encouraged.

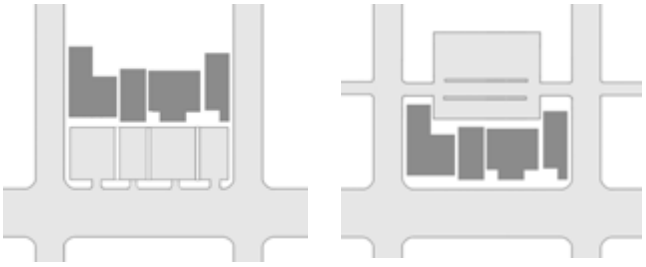


The images above show how a large block (top) can be broken down to better accommodate pedestrians (image bottom).

ACCESS MANAGEMENT (Site level)

Access management is a key component to a functioning street network that accommodates both pedestrians and automobiles. Access management should be used to minimize unnecessary driveway connections and to encourage shared and cross-access between adjacent parcels. Successful access management makes use of one alleyway or entrance to a common parking lot, usually internal to a block or behind a set of buildings. This makes sidewalks safer for pedestrians, reduces traffic delays, and improves the appearance of a street. Shared access strategies help reduce pedestrian & bicyclist conflicts with automobiles and help maintain traffic flow.

Access management on the network level, for US 29 and US 33 is discussed in Section 4Avi.



The images above show how access can be provided while supporting multimodal principles. The image left is discouraged with separate driveways and parking in front. The image right is encouraged with shared/rear access with parking in the back.

SIDEWALKS

External sidewalks should be provided on both sides of all streets, with a minimum of 5' in width for residential areas, and 6' in width for commercial areas. Wider sidewalks should be provided in commercial areas to encourage pedestrian activity, provide comfortable space for high pedestrian volumes, and provide space for on-sidewalk dining or other pedestrian-oriented uses.

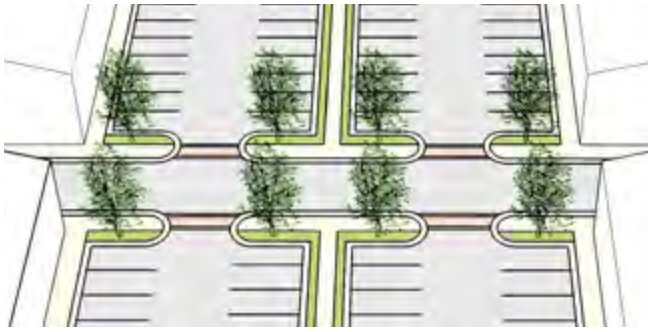
5' sidewalk design
(non-commercial areas)

Typical 10' sidewalk design
(commercial areas)

Enhanced 16' sidewalk Design
(commercial areas)

INTERNAL SIDEWALKS

Internal sidewalks (walkways) are needed within developments to promote pedestrian movement by connecting users from the public sidewalk network, or parking areas, to destinations within a site and adjacent sites. This allows citizens to park once and safely walk between buildings and uses without a car. Walkways should be built between adjacent development sites to connect all primary building entrances, surrounding streets, external sidewalks, adjacent trails, transit stops, parking areas and recreational facilities. Walkways should be at least 6 feet wide and should be clearly marked to ensure visibility between pedestrians and motorists.



Internal and cross-parcel walkways are important components to the overall function and design of pedestrian circulation.

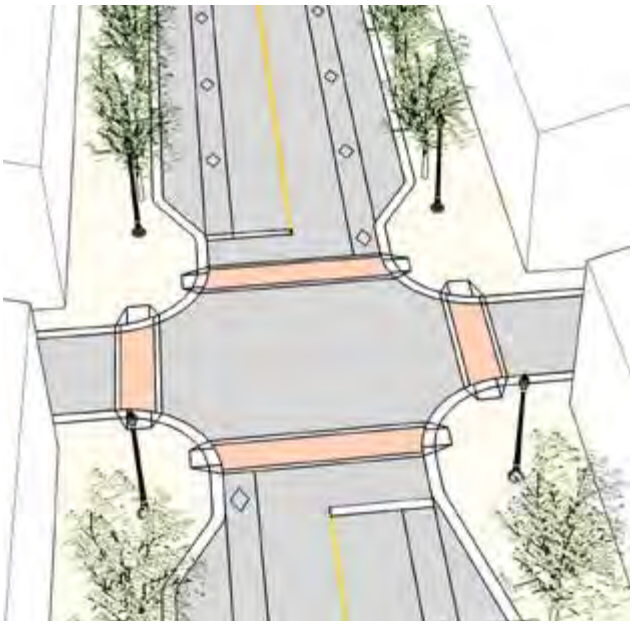
STREETSCAPE DESIGN

The design of the space between the edge of the curb and the front of a building is essential for encouraging pedestrian activity and promoting safety and security. In addition to providing a spatial buffer between vehicles and pedestrians, the streetscape should consist of trees for shade and softening the urban environment, pedestrian-scaled lighting for security and aesthetics, and benches, drinking fountains, or other pedestrian-oriented amenities. Six feet in sidewalk width should always be maintained as an obstacle-free throughway zone with trees, lighting, and other amenities located either in the furnishings zone between the street and sidewalk or frontage zone next to the buildings. Street lighting and signage should be coordinated with landscaping and street furniture/furnishings and allow for easy pedestrian flow on sidewalks. Fixed and movable signage elements should be scaled and proportionate to the building facade. Some general signs, such as banners, can be combined with street lighting and other street furnishings.

Streetscape design features promote pedestrian activity and reinforce a sense of place (above image). Auto-oriented streetscape discourages pedestrian activity (bottom image)

CROSSWALKS

Pedestrian crossings are a critical element of the pedestrian network. Safe and convenient crosswalks make a sidewalk system usable and appealing, encouraging pedestrian activity. Crosswalks should be clearly marked and located carefully in relation to vehicular traffic. Specially paved or painted crosswalks indicate the appropriate route across traffic for pedestrians, assist the visually impaired, and serve as a reminder to motorists. Care should be used so that the surface does not impede wheelchair access or provide a hazard for the visually impaired or elderly. Crosswalks should be aligned with the path of the sidewalk to ensure accessibility. Intersections and crossing areas with heavy traffic or wide crossing distances require crossing signals to aid pedestrians and motorists. Additionally, pedestrian can be used to extend the corner sidewalk at an intersection (see image right). Curb ramps provide ease of use for persons with rolling walkers, strollers, or wheel chairs.



Pedestrian crossings near the Boca Raton Community Hospital (left image) provide safe and convenient crossings. Pedestrian bulbouts (top image) shorten the crossing distance.

ON-STREET BICYCLE LANES

On-street bike lanes should be a minimum of 4' in width, measured from the outside edge of the gutter, or 5' in width when on-street parking is present, measured from the outside edge of the parking lane.

OFF-STREET BICYCLE PATHS

Multi-use trails that allow for bicycle access should be a minimum of 12' in width. Where adjacent to roadways, trails can replace sidewalks. Trails should be paved, with the exception of those in environmentally sensitive areas, where pervious surfaces are recommended, and adhere to the same lighting standards as pedestrian sidewalks. Trails should be clearly marked and easily accessible to pedestrian and bicycle traffic. Center striping should be considered to allow for free-flowing 2-way traffic.

APPENDIX A: Community Elements

MIXED USE TOWN/VILLAGE CENTER

- Mixed Use
- Commercial/Retail
- Civic/Institutional
- Office/Lt Industrial
- Multi-family Housing
- Single-family Housing
- Open Space
- Woodland

CIRCLE RADIUS = 1/4 MILE

Illustrative example of an Village Center

A Mixed-Use/Village Center is a focal point for the larger region. Overall, a Mixed-Use/Village Center is characterized by a higher-intensity and mixture of land uses than surrounding areas, small-scale blocks, an interconnected street network, and a walkable, commercial main street. The Main Street must be low-speed and pedestrian-friendly, creating a walkable environment between small shops, stores, and offices. Well-connected sidewalks, a bicycle network, trees, streetlights, curbs, and sometimes planting strips all comprise this center. Multi-family residences are encouraged within close walking distance to the Main Street, becoming less dense with distance from the core. Has future transit service potential.

There are no current examples of Mixed-Use/Village Centers within the project study area. Places like downtown Stanardsville and new enhanced centers near Ruckersville and Midway (the Rapidan Center)) could develop into a village center over time.

FRONTAGE (p.)
Commercial/25'-50'
Store Front/0'-10'
Porch Front/0'-20'

BUILDING HEIGHT
1-4 Stories

PARKING
On-Street
Surface
Residential
Structured

MIX OF USES
Single Family Residential
Attached Res. Units Multi-family Res.
Storefront Retail
Restaurant, Office, Civic

DENSITY
Dwellings/Acre: 3-5
Jobs/Acre: 7-9

EQUIVALENT ZONING
Does not exist, PUD?

OPEN SPACE
Town Square
Pocket Park
Neighborhood Park

STREET TYPES
Commercial Street
Main Street
Collector Street
Neighborhood Street

BLOCK LENGTH
300-600'

RECOMMENDATIONS/ OTHER
Vertical and horizontal mixture of uses; compact development; good internal and external circulation

*Suggested enhancements
* Existing Design

MIXED USE TOWN/VILLAGE CENTER, continued

SITE DESIGN

BUILDING SETBACKS & FRONTAGE: Minimal setbacks are recommended for Commercial and Main Streets. Buildings drawn close to the street create a defined edge and provide "spatial enclosure," an important quality for a pedestrian-friendly streetscape. Small setbacks also allow building entrances to be placed convenient to pedestrian circulation off of the sidewalk. Residential uses at the edges may have lower building heights and slightly wider setbacks.

PARKING: On-street parking is encouraged on commercial, main, and residential streets. Surface parking should be placed to the rear of buildings, shielded or screened from the sidewalk and Main Street setting. If a need arises in the future, structured parking may become a useful option for providing additional parking, while maintaining the desired community form.

LAND USE

MIXTURE OF USES: The Mixed Use/Village Center has the widest variety of land uses arranged both vertically and horizontally. For example, a building with first floor retail and multi-family above may be situated adjacent to a building with a civic, commercial, office or other use. The diversity of uses creates a center with a vibrant and active streetscape for residents, patrons, and workers to enjoy in the morning, afternoon and into the evening.

DENSITY: Within the study area, the Village Center is the community element with the greatest density. Large areas of surface parking should be minimized to prioritize community form within the center.

BUILT FORM & OPEN SPACE

FACADE DESIGN, ARRANGEMENT, AND TRANSPARENCY: To encourage higher levels of pedestrian activity, built form should enhance the pedestrian experience. Building facades should be broken down with architectural elements, recesses, windows, etc. Ground floor elements should be placed and scaled to the level of the pedestrian such as signs, awnings, lights, and windows. Windows placed at street level allow transparency from the street to the interior, enhancing safety and providing a more interesting pedestrian experience.

CONNECTIVITY

STREET TYPES (see Transportation Framework Plan for street type descriptions:

- Commercial Street
- Main Street
- Collector Street
- Neighborhood Street

BLOCK LENGTH: Block lengths affect the degree of connectivity and access to a given place. Long blocks may discourage pedestrian activity because there may be less direct connections to a given destination. Typically, pedestrians aim to reach their destination within a 5-10 minute walk. The tight street network provides many routes for pedestrians, connects parking lots, and joins the residential and mixed-use areas.

EMPLOYMENT CENTER

- Mixed Use
- Commercial/Retail
- Civic/Institutional
- Office/Lt Industrial
- Multi-family Housing
- Single-family Housing
- Open Space
- Woodland

CIRCLE RADIUS = 1/4 MILE

FRONTAGE/SETBACKS
Commercial/25'-50'
BUILDING HEIGHT
1-2 Stories
PARKING
Surface On-street
MIX OF USES
Office Light Industrial Health/Medical Large Commercial Restaurant Apts. (2-3 stories)
DENSITY
Dwellings/Acre: 2-3 Jobs/Acre: 5-9
EQUIVALENT ZONING
B-1, B-2, M-1
OPEN SPACE
Pocket Park Passive Open Space
STREET TYPES
Collector Street
BLOCK LENGTH
400-600'
COMMENTS
Horizontal mixture of uses with lower FAR; good internal circulation;

*Suggested enhancements
* Existing Design

Illustrative example of an Employment Center

The Employment Center is a place type that contains a significant amount of employment including light industrial or office uses in a park-or campus-like setting. As important destinations, most employment centers require access from major roadways. Buildings are often single-story, single-use with large footprints, vast areas of surface parking and little to no internal circulation system.

Enhancements to the Employment Center may include adding a greater mixture of uses such as restaurants or other daytime amenities for workers. With greater variety provided locally on "campus", more trips could be captured internal to the employment center. Workers could arrive on "campus" and wouldn't need to get back into their car until the end of the workday. Additional improvements may include providing nearby apartment buildings that allow affordable living and working to occur in closer proximity. Finally, sidewalks should be provided to encourage pedestrian circulation internal to the center.

SITE DESIGN

BUILDING SETBACKS & FRONTAGE: Commercial setbacks are appropriate for the Employment Center. Entrances should be provided from the parking lot and from the sidewalk. Buildings located internal to an Employment Center and situated in a "campus-like" arrangement should be drawn closer to the street for optimal pedestrian access between adjacent buildings.

EMPLOYMENT CENTER, continued

PARKING: On-street parking may be present on internal "campus" streets. Surface parking should be placed to the rear of buildings, shielded or screened from the sidewalk and the street. Structured parking may be included in the future as a way of providing sufficient parking without an excessive consumption of land needed for surface lot parking.

LAND USE

MIXTURE OF USES: While primarily an employment center, additional uses should be provided to minimize the need for external daily trips. For example, providing places to eat lunch within the center could capture and reduce daily trips into and out of the center. Also, multi-family residential units located within the center, could provide lower cost housing to workers accessible by bicycle or by foot.

DENSITY: Buildings are often large and single story, thus taking up a large area of land at low densities. If possible, it is recommended that buildings be a minimum of 2 stories to reduce the footprint size. This will allow room for higher densities that may support daily bus transit for commuters.

BUILT FORM & OPEN SPACE

FACADE DESIGN, ARRANGEMENT, AND TRANSPARENCY: Employment buildings have an array of architectural styles from an unadorned factory or industrial building to a highly transparent, articulated office building. The use often determines the degree of facade design. It is recommended that buildings oriented to support pedestrian activity, exhibit facade design and transparency that enhance the pedestrian experience and contribute to a "campus-like" feel.

INTEGRATION OF OPEN SPACES: Open spaces such as plazas or public greens should be incorporated to promote aesthetic beauty and reinforce the sense of place within the Employment Center. Open spaces may be used for gathering, events, or as a place to eat lunch outdoors.

CONNECTIVITY

STREET TYPES (see Transportation Framework Plan for street type descriptions:

- Collector Street

BLOCK LENGTH: Block lengths affect the degree of connectivity and access to a given place. Long blocks may discourage pedestrian activity because there may be less direct connections to a given destination. Typically, pedestrians aim to reach their destination within a 5-10 minute walk. Within the Employment Center, block length may play a more significant role if residential uses are located in or near the campus. A block network may enhance accessibility from home to work and circulation within. Additionally, greenways may be incorporated to provide connections from surrounding areas.

HIGHWAY COMMERCIAL

- Mixed Use
- Commercial/Retail
- Civic/Institutional
- Office/Lt Industrial
- Multi-family Housing
- Single-family Housing
- Open Space
- Woodland

CIRCLE RADIUS = 1/4 MILE

FRONTAGE/SETBACKS
Commercial/25'-50' Store Front/0'-10'
BUILDING HEIGHT
1-2 Stories
PARKING
Surface On-Street (sidestreets)
MIX OF USES
Large Commercial Storefront Retail Restaurant
DENSITY
Dwellings/Acre: 0 Jobs/Acre: 8-9
EQUIVALENT ZONING
B-1, B-2. B-3
OPEN SPACE
Pocket Park Passive Open Space
STREET TYPES
Commercial Street Collector Street
BLOCK LENGTH
400-600'
COMMENTS
Orient new development to new boulevard; provide existing development access to new boulevard

*Suggested enhancements
* Existing Design

Illustrative example of Highway Commercial

Highway Commercial is comprised of a mixture of auto-dependent retail and services accessed from a major roadway. Buildings are generally single story and set back from the road with parking adjacent to the street or sidewalk. Sidewalks and landscaping are occasionally present.

Success for these businesses is partly reliant on having good visibility from the roadway, ample parking, access, and visible signage. However, some of these factors that benefit businesses can have a negative effect on traffic flow. Adjacent and frequent driveways increase the amount of vehicles merging into and out of traffic. Additionally, as development continues to expand along the length of the corridor, traffic demands may begin to exceed roadway capacity, with resulting high levels of congestion.

One possibility for enhancing the Highway Commercial Community Element includes providing additional roadway capacity through parallel boulevards. Expanding the roadway network will allow some new businesses to locate off of major roadways and could provide additional access to existing highway businesses from the rear.

HIGHWAY COMMERCIAL, continued

SITE DESIGN

BUILDING SETBACKS & FRONTAGE: Commercial and Storefront setbacks are appropriate for Highway Commercial development. Smaller setbacks with landscaped buffers are encouraged with parking relegated to the rear. Building entrances should be provided from the parking lot and from the sidewalk for optimal pedestrian circulation.

PARKING: Surface parking is often the predominant form of parking for Highway Commercial Development. Surface parking should be relegated to the rear or side of the building. If located on the side, proper screening should hide parking from the roadway.

LAND USE

MIXTURE OF USES: Highway Commercial is mostly comprised of stores, restaurants, offices, and other commercial uses that are primarily accessed by automobile.

DENSITY: Building density is relatively low for Highway Commercial development. Buildings tend to be 1-2 stories in height, surrounded by surface parking. The form along a Commercial Highway discourages pedestrian activity because buildings are further apart and often sidewalks, if included, are separated from building entrances by parking. It is recommended that to improve pedestrian accessibility, buildings should be situated closer to the sidewalk to improve pedestrian access. Densities may be increased by requiring smaller side setbacks and providing incentives to build taller buildings with smaller footprint sizes.

BUILT FORM & OPEN SPACE

FACADE DESIGN, ARRANGEMENT, AND TRANSPARENCY: Highway Commercial buildings are often designed with "anywhere USA" style facades of chain retail. It is recommended that buildings facades follow a local, vernacular, style of design and materials to create a look and feel unique to the area.

INTEGRATION OF OPEN SPACES: Pocket parks or passive recreational areas are most appropriate along Highway Commercial development.

CONNECTIVITY

STREET TYPES (see Transportation Framework Plan for street type descriptions:

- Commercial Street
- Collector Street

BLOCK LENGTH: Commercial Highways have variable block networks. Boulevards running parallel to commercial highways such as US 29, may provide a greater network of streets with accessibility to properties currently located on Rt. 29. A block network of 400-600' is recommended for this development type.

MEDIUM-HIGHER DENSITY RESIDENTIAL

- Mixed Use
- Commercial/Retail
- Civic/Institutional
- Office/Lt Industrial
- Multi-family Housing
- Single-family Housing
- Open Space
- Woodland

CIRCLE RADIUS = 1/4 MILE

FRONTAGE/SETBACKS
Residential Yard/10'-25'
Porch Front/0'-20'
Storefront/0'-10'
BUILDING HEIGHT
1-2 Stories
PARKING
On-street
Residential
MIX OF USES
Single Family Residential
Attached Res. Units
Limited Retail
Civic
DENSITY
Dwellings/Acre: 4-10
Jobs/Acre: 0-1 (PUD)
EQUIVALENT ZONING
SenRes, PUD, Sville
OPEN SPACE
Pocket Park
Neighborhood Park
Recreational Park
STREET TYPES
Neighborhood Street
BLOCK LENGTH
200-500'
COMMENTS
Where opportunity exists, provide connections to adjacent or nearby development

*Suggested enhancements
* Existing Design

Illustrative example of Medium-Higher Density Residential

The Medium-Higher Density Residential community type is a subdivision where houses or multifamily units of similar form and character are located on small lot sizes and placed in close proximity. Connectivity within this community type includes sidewalks with curb and gutter located interior to the subdivision. However, external connectivity is limited to none, meaning that there is often one or two entrances into the subdivision and no roads connecting directly to adjacent development. Community spaces are sometimes located within walking distance and densities are in the range that begin to support bus service.

Potential enhancements to this place type may include locating a small amount of neighborhood scaled retail or civic uses within walking distance. Smaller block lengths increase connectivity and encourage pedestrian activity. Finally, connectivity between developments is highly encouraged. This helps to lessen traffic impacts on major roadways.

An existing example of the Medium-Higher Density Residential community element is the Four Seasons development, pictured above.

MEDIUM-HIGHER DENSITY RESIDENTIAL, continued

SITE DESIGN

BUILDING SETBACKS & FRONTAGE: Residential development comprises the Medium-higher Density Residential Community Element. Residential Yard and Porch Front setbacks range between 0 and 25' with shorter setbacks recommended for higher-density blocks. When retail or civic uses are included, storefront setbacks are most appropriate.

PARKING: On-street parking is suggested in this development type in areas where residential development is most dense and where neighborhood retail or civic uses are located. Where block sizes are larger, on-street parking may fully give way to residential driveways and garages. Where garages are present, it is important to set them to the side and rear of the residence, so that they do not dominate the residential frontage.

LAND USE

MIXTURE OF USES: While predominately single-family residential, Medium-Higher Density Residential areas should incorporate some degree of mixed residential densities and housing choices. Storefront retail and civic uses may be integrated at a residential scale.

DENSITY: The Medium-Higher Density Residential element is primarily composed of single-family residences. Residential development should strive to maintain a reasonably high density, in turn freeing green space to be retained as a shared amenity.

BUILT FORM & OPEN SPACE

FACADE DESIGN, ARRANGEMENT, AND TRANSPARENCY: Facade design on private residences is generally left up to individual owners or a development's home-owner's association. For any non-residential uses consider the scale and form of adjacent residences to create a compatible facade design.

INTEGRATION OF OPEN SPACES: The shared neighborhood park is the ideal type of open space in this type of development. Located in or near the core, neighborhood parks serve local residents for recreation or gathering within a 5-10 minute walking distance. Ideally, trails would be provided to connect neighborhoods and residences to open spaces.

CONNECTIVITY

STREET TYPES (see Transportation Framework Plan for street type descriptions:

- Neighborhood Street

BLOCK LENGTH: Block size should relate to the size and density of residences. Higher densities allow for smaller block sizes, where lower density areas may have larger scale blocks. Connectivity with adjacent land uses, primarily nearby neighborhoods, is encouraged. Where street connections are not feasible, greenways are recommended.

WALKABLE NEIGHBORHOOD

- Mixed Use
- Commercial/Retail
- Civic/Institutional
- Office/Lt Industrial
- Multi-family Housing
- Single-family Housing
- Open Space
- Woodland

CIRCLE RADIUS = 1/4 MILE

FRONTAGE/SETBACKS
Store Front/0'-10'
Residential Yard/10'-25'
Porch Front/0'-20'
BUILDING HEIGHT
1-3 Stories
PARKING
On-Street
Surface
Residential
MIX OF USES
Single Family Residential
Attached Res. Units
Multi-Family Res.
Storefront Retail
Restaurant, Office, Civic
DENSITY
Dwelling Units/Acre: 5-7
Jobs/Acre: 1-2
EQUIVALENT ZONING
Does not exist
OPEN SPACE
Town Square
Pocket Park
Neighborhood Park
STREET TYPES
Collector Street
Neighborhood Street
BLOCK LENGTH
200-500'
COMMENTS
Where opportunity exists, provide connections to adjacent or nearby development

*Suggested enhancements
* Existing Design

Illustrative example of a Walkable Residential Neighborhood

A walkable neighborhood is a subdivision with a well-connected street grid, closely spaced single family residences and some multi-family residences. Neighborhood commercial stores and local parks are located in walking distance to residences. The streetscape is supportive of pedestrian activity and includes sidewalks, trees, pedestrian-oriented streetlights, curbs, and bike lanes along busier roads. Good external connectivity provides access to adjacent developments off of major roadways. Densities support potential bus service. There are no current examples of the walkable neighborhood within the study area.

SITE DESIGN

BUILDING SETBACKS & FRONTAGE: The greatest density and intensity of uses in the Walkable Residential Neighborhood are located at its center. Setbacks should be minimized at the center where walkability is at its greatest. Small-scale commercial uses form this center and should reinforce the pedestrian network with small setbacks, orientation and facade design. Residences just outside of the core will likely have small setbacks that gradually widen with distance from the center and a decrease in density.

WALKABLE NEIGHBORHOOD, continued

PARKING: On-street parking is encouraged along both commercial and residential streets. Surface parking should be placed to the rear of buildings, shielded from the sidewalk and Main Street setting. Large surface parking lots should be placed within the interior of blocks and arranged to maximize sharing between multiple uses.

LAND USE

MIXTURE OF USES: While predominately residential, Walkable Residential Neighborhoods have a center comprised of neighborhood commercial stores and local parks. This mixed-use quality is important to the vibrance of the center and diversity of the neighborhood.

DENSITY: The greatest density and intensity of uses in the Walkable Residential Neighborhood are at its center where the neighborhood commercial and higher density homes are located. Density decreases with distance from the center and single family detached residential uses are dominant.

BUILT FORM & OPEN SPACE

FACADE DESIGN, ARRANGEMENT, AND TRANSPARENCY: Facade design on private residences is generally left up to individual owners or a development's home-owner's association. For any non-residential uses, outside of the HOA's consideration, create a scale and form compatible with adjacent buildings or residences.

INTEGRATION OF OPEN SPACES: A Town Square or Pocket Park is the most appropriate type of open space for the Walkable Residential Neighborhood. Open space integrated at the Neighborhood's core creates opportunities for public gathering and recreation. Greenways may connect between the center and peripheral areas.

CONNECTIVITY

STREET TYPES (see Transportation Framework Plan for street type descriptions:

- Collector Street
- Neighborhood Street

BLOCK LENGTH:

Smaller block sizes are appropriate for The Walkable Residential Neighborhood to accommodate a limited, but dense collection of small retail uses at its core. Residential block sizes should relate to the lot size and density of residences. Higher density allows for smaller block sizes, where lower density areas may have larger scaled blocks. Connectivity with adjacent land uses, primarily nearby neighborhoods, is encouraged. Where street connections are not feasible, greenways are recommended.

SUBURBAN RESIDENTIAL

- Mixed Use
- Commercial/Retail
- Civic/Institutional
- Office/Lt Industrial
- Multi-family Housing
- Single-family Housing
- Open Space
- Woodland

CIRCLE RADIUS = 1/4 MILE

FRONTAGE/SETBACKS
Residential Yard/10'-25'
BUILDING HEIGHT
1-2 Stories
PARKING
Residential On-street
MIX OF USES
Single-Family Residential
DENSITY
Dwellings/Acre: 1-3 Jobs/Acre: 0
EQUIVALENT ZONING
R-1, R-2
OPEN SPACE
Neighborhood Park Recreational Park Passive Open Space
STREET TYPES
Neighborhood Street
BLOCK LENGTH
300-600'
COMMENTS
Where opportunity exists, provide connections to adjacent or nearby development. New subdivisions should meet or exceed the VDOT SSAR street connectivity measures.

*Suggested enhancements
* Existing Design

Illustrative example of Suburban Residential

The Suburban Residential place type includes detached, single-family residences often located in subdivisions. Internal connectivity is limited by the cul-de-sac pattern of "dead-end" streets and the lack of a continuous sidewalk network. External connectivity is also often limited in suburban residential communities.

Enhancements to the Suburban Residential place type may include connecting cul-de-sacs or providing additional connections at an optimal block length of 300-600'. Internal and external connectivity should be stressed to reduce future roadway impacts.

SUBURBAN RESIDENTIAL, continued

SITE DESIGN

BUILDING SETBACKS & FRONTAGE: The Suburban Residential place type is comprised of single-family residential development. As such, buildings have a reduced scale and greater setbacks in comparison to Medium-Higher Density and Walkable Neighborhoods. Shorter setbacks are recommended for higher density blocks.

PARKING: Residential driveways and garages are the predominant form of parking in this place type. Where garages are present, it is recommended that they are set to the side and rear of the residence, so that they do not dominate the residential frontage. On-street parking may occur where the right-of-way allows.

LAND USE

MIXTURE OF USES: Suburban residential neighborhoods are comprised of single-family residential units. Occasionally, parks and open spaces are interspersed throughout.

DENSITY: The Suburban Residential element is primarily composed of single-family residences. Residential development should strive to maintain a reasonably high density, in turn freeing green space to be retained as a shared amenity.

BUILT FORM & OPEN SPACE

FACADE DESIGN, ARRANGEMENT, AND TRANSPARENCY: Facade design on private residences is generally left up to individual owners or a development's home-owner's association.

INTEGRATION OF OPEN SPACES: Ideally, a shared green space will be incorporated at the Neighborhood's core. Neighborhood parks may vary in scale, but are intended to serve local residents as recreational and gathering space. If possible, integrate greenway trails to link surrounding neighborhoods with open spaces.

CONNECTIVITY

STREET TYPES (see Transportation Framework Plan for street type descriptions:

- Neighborhood Street

BLOCK LENGTH: Residential block sizes should relate to the lot size and density of residences. Higher density allows for smaller block sizes, where lower density areas may have larger scaled blocks. Connectivity with adjacent land uses, primarily nearby neighborhoods, is encouraged. Where street connections are not feasible, greenways are recommended.

RURAL RESIDENTIAL

- Mixed Use
- Commercial/Retail
- Civic/Institutional
- Office/Lt Industrial
- Multi-family Housing
- Single-family Housing
- Open Space
- Woodland

CIRCLE RADIUS = 1/4 MILE

FRONTAGE/SETBACKS
Residential Yard/10'-25'
BUILDING HEIGHT
1-2 Stories
PARKING
Residential
MIX OF USES
Single-Family Residential
DENSITY
Dwellings/Acre: 0-1 Jobs/Acre: 0
EQUIVALENT ZONING
A-1, R-1
OPEN SPACE
Farmland Recreational Park Passive Open Space
STREET TYPES
Rural Road Rural Road with Path
BLOCK LENGTH
N/A
COMMENTS
Where opportunity exists, encourage rural clustering instead of rural residential development

Illustrative example of Rural Residential

*Suggested enhancements
* Existing Design

Rural Residential development is comprised of low density, large-lot, single family residences located along rural roads or within rural subdivisions. No commercial or public activities are located within walking distance and sidewalks or other streetscape amenities are often not included.

Rural cluster development is encouraged over the traditional rural residential large lot to promote conservation of open space. See Cluster Development for additional details.

RURAL RESIDENTIAL, continued

SITE DESIGN

BUILDING SETBACKS & FRONTAGE: Rural Residential development is comprised of low density single-family residences. Frontage type is residential yard and as such, the rural residential development tends to have the greatest setbacks.

PARKING: Residential driveways and garages are the predominant form of parking in this place type. On-street parking may occur where the right-of-way allows. Where garages are present, it is recommended that they are set to the side and rear of the residence, so that they do not dominate the residential frontage.

LAND USE

MIXTURE OF USES: Rural residential neighborhoods are comprised of single-family residential units. Occasionally, parks and open spaces are interspersed throughout.

DENSITY: The Rural Residential element is primarily composed of single-family residences. Residential development should strive to maintain a reasonably high density, in turn freeing green space to be retained as a shared amenity.

BUILT FORM & OPEN SPACE

FACADE DESIGN, ARRANGEMENT, AND TRANSPARENCY: Facade design on private residences is generally left up to individual owners or a development's home-owner's association.

INTEGRATION OF OPEN SPACES:
Neighborhood parks may vary in scale, but are intended to serve local residents as recreational and gathering space. If possible, integrate greenway trails to link surrounding neighborhoods with open spaces.

CONNECTIVITY

STREET TYPES (see Transportation Framework Plan for street type descriptions:

- Rural Road
- Rural Road with path.

BLOCK LENGTH:
Residential block sizes should relate to the lot size and density of residences. Higher density allows for smaller block sizes, where lower density areas may have larger scaled blocks. Connectivity with adjacent land uses, primarily nearby neighborhoods, is encouraged. Where street connections are not feasible, greenways are recommended.

RURAL CLUSTER

- Mixed Use
- Commercial/Retail
- Civic/Institutional
- Office/Lt Industrial
- Multi-family Housing
- Single-family Housing
- Open Space
- Woodland

CIRCLE RADIUS = 1/4 MILE

FRONTAGE/SETBACKS
Residential Yard/10'-25'
Porch Front/0'-20'
BUILDING HEIGHT
1-2 Stories
PARKING
Residential
MIX OF USES
Single Family Residential
Attached Res. Units
DENSITY
Dwellings/Acre: 1
Jobs/Acre: 0
EQUIVALENT ZONING
Does not exist
OPEN SPACE
Farmland
Recreational Park
Passive Open Space
STREET TYPES
Rural Road
Rural Road with Path
BLOCK LENGTH
N/A
COMMENTS

*Suggested enhancements
* Existing Design

Illustrative example of a Rural Cluster

Rural Cluster development is a group of homes located on 1/4 to 1/2 acre lots adjacent to other cluster homes. The vast majority of land (90%) remains rural open space or a working farm. Homes are often located so that views of the surrounding landscape are optimized and unobscured by adjacent residences. Typically access is from one single driveway.

Rural Clusters promote land conservation by allowing the same densities as traditional Rural Development, but organized so that private land use is minimized in favor of collective swaths of land that could sustain agriculture or other uses. The owners of the clustered homes become stewards of the open space and ensure that their viewsheds remain rural and undeveloped.

RURAL CLUSTER, continued

SITE DESIGN

BUILDING SETBACKS & FRONTAGE: The majority of buildings in rural clusters are residential. As such, buildings have a reduced scale and greater setbacks in comparison to other Neighborhood place types. Setback requirements should remain flexible, due to the varying rural quality of rural areas.

PARKING: In a rural setting, formal on-street parking is rarely required or appropriate. For residential parking, it is important to set garages to the side and rear of the residence, so that they do not dominate the residential frontage.

LAND USE

MIXTURE OF USES: While predominantly single-family residential, rural clusters may incorporate a limited amount of multi-family residential, typically positioned at the center of the developed area.

DENSITY: The rural cluster element groups development into a compact area, leaving the remaining land for preservation and common use. In general, development should strive to maintain a reasonably high density, in order to optimize the opportunity for preservation.

BUILT FORM & OPEN SPACE

FACADE DESIGN, ARRANGEMENT, AND TRANSPARENCY: Facade design on private residences is generally left up to individual owners or a development's home-owner's association.

INTEGRATION OF OPEN SPACES: Rural clusters provide a great opportunity for open space preservation, typically at the periphery surrounding the developed area. Neighborhood parks are recommended at the core. If possible, greenway trails may be integrated to link rural neighborhoods with surrounding neighborhoods and open spaces.

CONNECTIVITY

STREET TYPES (see Transportation Framework Plan for street type descriptions:

- Rural Road
- Rural Road with path.

BLOCK LENGTH:
When a rural cluster takes a compact form, block sizes should remain relatively small. However, some situations do not allow for typical, defined blocks, in which case no maximum block size is applicable. In such situations, it is still important to maintain a connected street network.