Smart Growth America
Making Neighborhoods Great Together

THE FISCAL IMPLICATIONS OF DEVELOPMENT PATTERNS

Macon, GA

May 2015

Analysis of Macon, GA

Prepared by Smart Growth America for Macon-Bibb County, GA
May 2015

Background and objectives

The connection between land use development patterns and the costs of providing public infrastructure and services has long been a topic of study, particularly since *The Cost of Sprawl: A detailed analysis* was published in 1974. Since that time, dozens, if not hundreds of studies, have been conducted relating to this topic. Most of these have concluded that "smart growth" (that is, more compact patterns of development) is associated with reduced local government spending on a per capita basis relative to sprawl (recognizing that the definition of each of those terms not entirely consistent). Smart Growth America's *Building Better Budgets* report, published in May 2013, summarizes the results of 17 of these studies.

Yet these findings are not often included in the typical fiscal impact analyses done in connection with new development proposals. There are many reasons for this, but the inconsistent methodologies used in the above-referenced studies, as well as the time-consuming data collection efforts they involve, have likely slowed the filtering of these academic findings into the "practice." Instead, most, (though not all) fiscal impact analyses rely on a simple average cost approach, which implicitly assumes that each new resident or job will add the same amount of public costs, regardless of whether they live and work in a sprawling, low-density development, or a high-density walkable urban one.

In connection with a grant from the Department of Housing and Urban Development, Smart Growth America ("SGA") aims to develop a fiscal impact methodology that not only accounts for the increased cost efficiencies associated with denser development patterns, but can also be easily adapted and used by local practitioners across the country. Macon-Bibb County generously agreed to become a case study community in the development of this methodology.

Scenarios

Macon-Bibb County asked SGA to generally analyze the net fiscal impact of future growth focused on downtown infill versus continued greenfield development in suburban locations. To conduct this analysis, SGA developed four hypothetical development scenarios: two in downtown and two in the suburbs.

There are two suburban scenarios. The conventional development scenario (which we refer to as "Low Density Greenfield") is based on a product mix that is typical for such a development. For the residential component, it assumes 1,000 single-family detached units. Note that this is a different program than the other scenarios, in that there are no multifamily units or townhouses. The commercial component, however, includes the same amount of commercial space as the other scenarios. The high density suburban scenario (Which we refer to as "High Density Greenfield") assumes a development program identical to the downtown infill scenarios but on a greenfield location and at a lower density than downtown (but still high density in a suburban context).

Both the downtown development scenarios ("Downtown Infill" and "Downtown Infill with Value Premium") posit the same program: 800 multifamily units, 200 townhouses, 300,000 square feet of office, and 200,000 square feet of commercial space. The difference is on the revenue side: While the first assumes values currently typical for the county as a whole, the second incorporates a 20 percent assessed value premium, as often appears in walkable urban places.

The purpose of these four scenarios is to illustrate the range of possible fiscal impacts associated with new development, depending upon whether it is more or less compact, and whether it occurs on greenfield sites (needing new infrastructure) or in locations within or proximate to existing development (utilizing existing infrastructure). Table 1, below, summarizes the quantity of development in each scenario:

TABLE 1

Quantity of development in four scenarios

Unit type	Low Density Greenfield	High Density Greenfield	Downtown Infill	Downtown Infill with Value Premium
Single-family detached	1,000	0	0	0
Single-family attached	0	200	200	200
Multifamily units	0	800	800	800
Total units	**1,000**	**1,000**	**1,000**	**1,000**
Total gross acres	688	140	77	77
Net residential density	2.0	16.4	21.8	21.8
Commercial sq. feet	500,000	500,000	500,000	500,000

Key Findings

Net fiscal impact

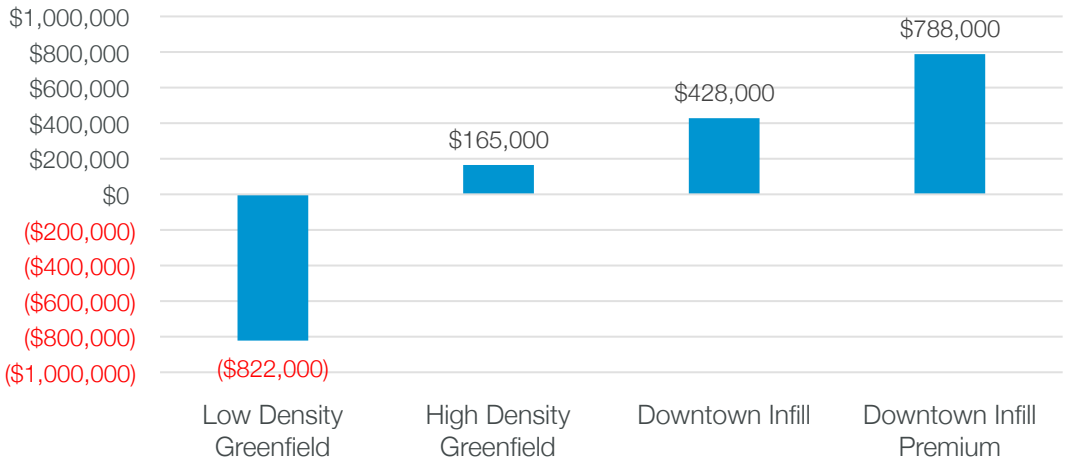
As Figure 1, below, shows, the combined net fiscal impact for the Downtown Infill scenarios is substantially higher than the Low Density Greenfield scenario. This is due to three main factors: First, the multifamily and townhouse units in the Downtown and High Density Greenfield scenarios generate fewer public school students than the single-family detached homes in the Low Density Greenfield Scenario. Second, the High Density Greenfield, and the Downtown Infill scenarios are more compact and therefore require less road and pipe to maintain than the Low Density Greenfield scenario. This is particularly true for the Downtown Infill scenarios, which would not only require less infrastructure if everything was built new, but can rely largely on existing infrastructure in Downtown. The use of existing infrastructure significantly reduces the marginal cost of new development.

The Downtown Infill Premium scenario assumes 20 percent higher values on a per square foot basis for the new development. While this is a speculative assumption, a wide body of research has confirmed that dense, walkable environments enjoy significant value premiums of 20 percent and higher over typical suburban product.[1] These impacts must be considered when making a comparison between infill development and typical suburban development.

FIGURE 1

Annual net fiscal impact at build-out

Macon-Bibb County and School District combined



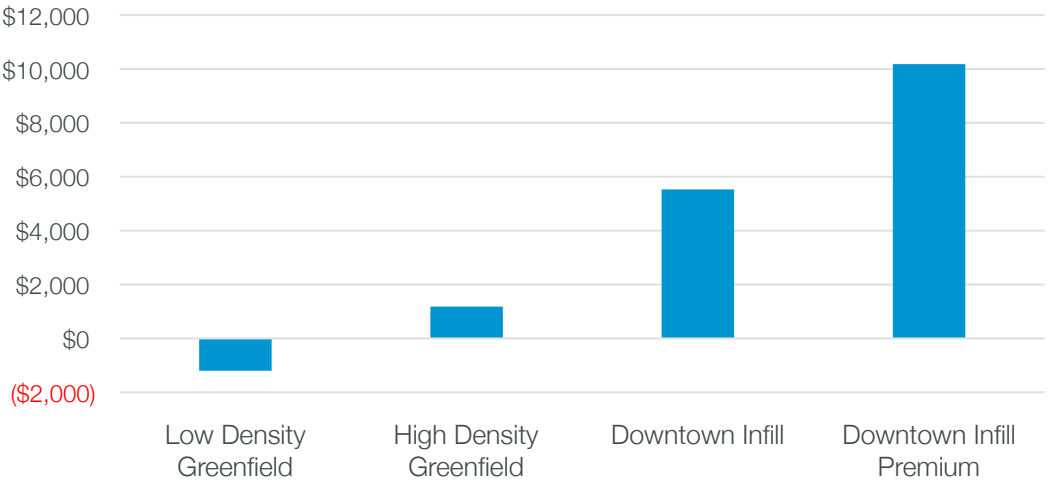
The results are more dramatic on a per acre basis, as Figure 2 on page 4 shows. The Downtown Infill scenarios generate a net fiscal impact per acre that is 4.6 to 6.9 times than the same development program located on a suburban greenfield.

1 http://blog.walkscore.com/wp-content/uploads/2009/08/WalkingTheWalk_CEOsforCities.pdf; http://www.u.arizona.edu/~gpivo/Walkability%20Paper%208_4%20draft.pdf; http://www.brookings.edu/~/media/Research/Files/Papers/2012/5/25%20walkable%20places%20leinberger/25%20walkable%20places%20leinberger.pdf

FIGURE 2

Annual net fiscal impact per acre at build-out

Macon-Bibb County and School District combined



These results highlight the high opportunity cost of sprawl on public finances. The Downtown Infill scenarios would generate more net fiscal impact for both the County and the School District, while consuming far less land. In this case, infill development could avoid the need to develop up to 688 acres of land. This land, even if it remained vacant would generate property tax revenues, but more importantly, it could accommodate future growth and development, an opportunity that would be foreclosed under the low density scenario.[2] Because the value of the "saved" acreage is not reflected in the absolute totals, the net fiscal impact per acre is the more informative comparison between the programs.

Table 2 on page 5 presents a summary of the results by scenario. The results reflect the estimated annual net fiscal impact, at build-out, of each scenario. The net fiscal impact is defined as the projected revenues minus the projected operating costs and certain annualized capital costs.[3] All results are presented in current dollars.

2 The retained land could of course be put to a public purpose, such as new parks. In such a case, it might come off the tax rolls; nonetheless, it clearly has economic value, which might be approximated by considering the cost that would be incurred to purchase it for that purpose.

3 The model does not currently account for all public capital costs. Only capital costs associated with fire protection, road resurfacing, pipe reconstruction, and school construction are included. Capital costs not accounted for are assumed not to vary directly with density. Future versions of this model will attempt to develop a more comprehensive accounting of all capital costs associated with new development, depending on data availability.

TABLE 2

Revenues, expenditures, and net fiscal impacts, by scenario

Revenues

	Macon-Bibb County			Bibb County School District		
Scenario	**Total**	**Per Capita**	**Per Acre**	**Total**	**Per Capita**	**Per Acre**
Low Density	$3,299,000	$714	$4,800	$4,325,000	$940	$6,300
High Density Greenfield	$2,161,000	$628	$15,500	$1,961,000	$570	$14,100
Downtown Infill	$2,162,000	$629	$27,900	$1,961,000	$570	$25,300
Downtown Infill Premium	$2,325,000	$676	$30,000	$2,158,000	$630	$27,900

Expenditures

	Macon-Bibb County			Bibb County School District		
Scenario	**Total**	**Per Capita**	**Per Acre**	**Total**	**Per Capita**	**Per Acre**
Low Density	$3,587,000	$776	$5,200	$4,860,000	$1,050	$7,100
High Density Greenfield	$2,271,000	$660	$16,300	$1,686,000	$490	$12,100
Downtown Infill	$2,057,000	$598	$26,600	$1,638,000	$480	$21,200
Downtown Infill Premium	$2,057,000	$598	$26,600	$1,638,000	$480	$21,200

Net fiscal impact

	Macon-Bibb County			Bibb County School District		
Scenario	**Total**	**Per Capita**	**Per Acre**	**Total**	**Per Capita**	**Per Acre**
Low Density	($287,000)	($60)	($420)	($535,000)	($120)	($780)
High Density Greenfield	($110,000)	($30)	($790)	$275,000	$80	$1,970
Downtown Infill	$105,000	$30	$1,350	$323,000	$90	$4,180
Downtown Infill Premium	$268,000	$80	$3,460	$520,000	$150	$6,720

Conservatism of the estimates

SGA was not able to model certain other cost drivers that may be density-related, due in part to a lack of sufficient data. Solid waste and recycling pickup, for example, is almost certainly less efficient in low density environments because of the greater distance, and therefore time and fuel between pickups. Similarly, school transportation costs should be expected to rise as students' residences are more dispersed, and school buses are required to travel farther. Because of the

inability to obtain route information from the school system, SGA was only able to model savings associated with increasing the number of students in the walk zone. Police protection may also become less expensive in dense, walkable environments because of a need for fewer patrol cars and vehicle fuel and maintenance costs. The effective modeling of this relationship remains a task for future research.

In addition, while SGA assumed a 20 percent premium for the valuation of the new infill development in Downtown, the addition of new development Downtown may also increase the value of existing properties in Downtown, because it makes the entire place more vital and active. These potential impacts have not been factored into the results.

Thus, the estimations may understate, possibly to a significant degree, the net fiscal impacts attainable with future growth focused on more compact, downtown development.

Methodology

Revenues

Property tax
SGA developed assumptions regarding average property values based on a review of assessment records in Macon-Bibb County. Table 3 below summarizes these assumptions by scenario.

TABLE 3
Property tax assumptions, by scenario

Product Type	Low Density Greenfield	High Density Greenfield	Downtown Infill	Downtown Infill with Premium
Single-family detached	$200,000 per unit	N/A	N/A	N/A
Townhouse	N/A	$110,000 per unit	$110,000 per unit	$132,000 per unit
Multifamily rental apartment	N/A	$60,000 per unit	$60,000 per unit	$68,000 per unit
Multifamily for-sale condominium		$75,000 per unit	$75,000 per unit	$90,000 per unit
Office	$117 per sq. foot	$117 per sq. foot	$117 per sq. foot	$140 per sq. foot
Retail	$121 per sq. foot	$121 per sq. foot	$121 per sq. foot	$145 per sq. foot

In each scenario, the assumed assessed values were multiplied by the appropriate tax rates for Macon-Bibb County and the Bibb County School District. For purposes of this analysis, SGA used the planned fiscal year 2016 tax rate for Macon-Bibb County, which is consistent across both the City of Macon and the rest of Bibb County.

Sales tax

The analysis assumes sales tax generation from two sources: the new residents of the given development scenario and the new retail in the development program. Resident household incomes were estimated based on the average home value and/or rent of the proposed developments. The percentage of that income spent on retail goods was estimated using data from the national Consumer Expenditure Survey. Finally, SGA estimated that 80 percent of each new household's retail expenditures would occur in Macon-Bibb and therefore be subject to sales tax.

For the new retail development, SGA assumed an average sales volume of $250 per square foot, and that 25 percent of these sales would be new to the County, and therefore generate new sales taxes. A precise determination of this percentage is rarely possible in advance of the new retail's delivery, and the actual percentage of new sales could vary significantly from this estimate. (Any variation, however, should be consistent across scenarios modeled, and therefore not qualitatively affect the conclusions.)

Miscellaneous revenues

Residents and employees of the development were assumed to generate revenues related to licenses, permits, fees, and certain other miscellaneous sources at the same rate as current residents and employees. These revenues were assumed to not vary by density.

Density-related expenditures

SGA divided the expenditures associated with new development into two basic categories. The first includes those that are likely to be affected by the density of the development while the second includes all other expenditures. For purposes of this analysis, SGA has treated expenditures on the maintenance of roads and pipes, including water, sewer, and storm sewer, as well as fire protection and school transportation as density-related. This represents approximately 20 percent of the total operating expenditures by Macon-Bibb County and 4 percent of the Bibb County School District. Other expenditure categories, in particular solid waste pickup, and police protection are likely also affected by the density of development but the available information was not sufficient for SGA to credibly analyze the relationship for all categories.

Roads

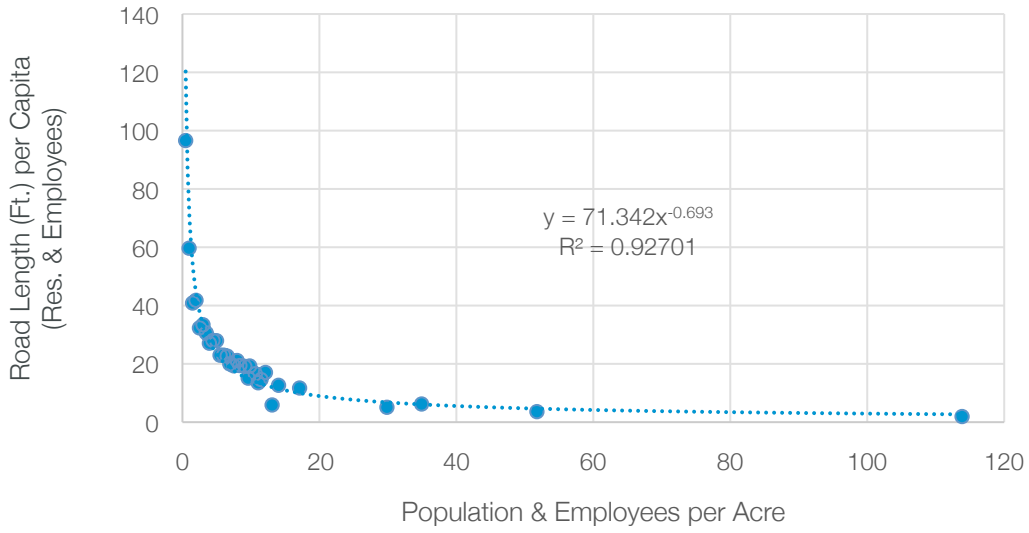
SGA analysis shows that there is a strong inverse relationship between road length and area per capita, and the density of development in Macon-Bibb County. Using GIS, a grid of equal-sized cells was drawn across Macon-Bibb County and the number of residents and employees determined, as well as the road length and area in each cell. From these data points, a formula was derived estimating both the road length and area needed per capita, at any reasonable density, assuming that the new development conforms to historical experience in the area. Figure 3 on page 8 is a scatterplot with road length per capita on the y axis and the density (measured in terms of residents and employees per acre) on the x axis, along with a regression formula describing the relationship between the two factors.[4] As Figure 3 clearly illustrates, there are significant improvements in efficiency when moving from typical suburban densities of 4-5 people and employees per acre to approximately 40 persons and employees per acre. Thereafter,

4 Note that each point may not represent one cell. Instead, values for all cells within certain density categories have been averaged and presented as one point.

the quantity of roads per capita decreases only slightly as density increases. (While the chart below depicts road length only, SGA found a similarly strong relationship between road area and population/employment density.)

FIGURE 3

Quantity of roads per capita



The capital costs for new roads is assumed to be paid by the developer; however, the City must maintain all roads. Macon-Bibb County estimated that roads generally cost $2.42 per square foot to resurface and must be resurfaced every 20 years depending on usage. The cost of resurfacing is annualized by dividing the estimated resurfacing cost by the expected lifetime of 20 years. In addition, the model assumes that the new roads would generate the same average costs per square foot in terms of pothole repair and snow removal as all other roads in Macon-Bibb. Note that this model does not currently estimate the additional demand placed on off-site roads, which may also incur maintenance costs.

Water and sewer mains

The maintenance of water and sewer mains is performed by the County utility, which collects fees based on the quantity of water provided and wastewater processed. In a typical fiscal impact analysis, costs and revenues associated with public utilities are ignored because it is assumed that the utility adjusts its rates to cover all costs, such that any expenses associated with a new development would be covered by the revenue it would generate.

Nonetheless, the density of development does affect the costs to the utility. All else being equal, a development that requires an average of 100 feet of pipe between residences will cost more to maintain than a development with only 20 feet of pipe between residences. To account for this fact, SGA has developed a methodology that compares the ratio of pipe maintenance costs to the projected water and wastewater revenue generated by the development, to the same ratio for the City as a whole. If the ratio of maintenance costs to revenue generated is lower in the development than in the City as a whole, then the project is assumed to generate a positive cash flow to the City and vice versa.

Sewer and water mains typically follow the length of the street, and SGA found that to be largely the case in Macon-Bibb County. Therefore, SGA employed the same methodology used for road length to estimate the length of pipe needed in the development under each scenario. Water and wastewater use projections were made on a per-resident and per-employee basis using third party estimates.[5]

Pipe maintenance costs were based on the annualized cost of reconstruction, assuming a cost of $35 per linear foot for water pipes, and $75 per linear foot for sewer, and a lifetime of 50 years, based on data provided by Macon-Bibb County.[6]

Fire/EMS protection

To be effective, fire and EMS services must respond to emergency calls in a short amount of time. The specific response time varies by community, but fire service budgets and capital requirements are typically based on an established standard. This necessarily means that, for any given response-time standard, the efficiency of fire service will be dependent on the density within the "fire service shed" (the geographic area served by a station). If it is developed at a very low density, then the cost of service, including the cost of the station, the ambulances, fire engine/ladders, and their staff will be spread over a few people and employees, and likely a low property tax base. However, only the station costs are fixed. If density increases enough, the additional population will eventually require new fire engines and staff to serve them. To estimate when this need would happen, SGA estimated the average call rate per person in Macon-Bibb County based on publicly available data, and assumed that each fire engine could handle a maximum of 2,500 calls per year. SGA assumed a five-minute response time standard, although the actual average response time in Macon-Bibb is slightly less. Assuming one minute for dispatch, this equates to a four minute travel time for the fire engine. SGA estimated the distance that the fire engine could travel using a formula developed by the RAND institute and in use by ISO, a firm that analyzes the risk associated with public protection services for insurance companies.[7] SGA translated the distance the engine could travel in four minutes into the acreage of the response shed from a hypothetical station at the center of the proposed development.[8] Based on these assumptions, we found that the maximum service capacity for one fire engine and ambulance can be reached even at relatively low densities of approximately six-to-seven residents and employees per acre. Therefore, the incremental operating efficiencies associated with rising density are already more or less maximized, even at low densities.

The capital cost of the station, however, is more fixed. Though additional bays may need to be added as the population of the response shed increases, much of the station would remain the same. These costs can then be "spread out" over more people and a larger property tax base as density increases. Based on information provided by Macon-Bibb and additional sources, SGA estimated the cost of constructing a fire station, purchasing the necessary vehicles and equipment,

5 https://www.home-water-works.org/about/calculator

6 SGA has assumed slightly higher costs for water pipes due to larger pipe widths in areas with higher population and employment density. However, the correlation between pipe width and density was found to be very weak in Macon-Bibb, and the impact on costs is minimal.

7 https://firechief.iso.com/FCWWeb/mitigation/ppc/3000/ppc3015.jsp

8 The estimate is based on the assumption that the fire engine response shed is roughly equivalent to the area of a circle with its center at the station, and radius equal to the distance the fire engine can travel in 4 minutes, after discounting the distance for connectivity issues. SGA estimated the appropriate discount by comparing the actual areas of various response sheds, using the street network, to the area in a whole circle.

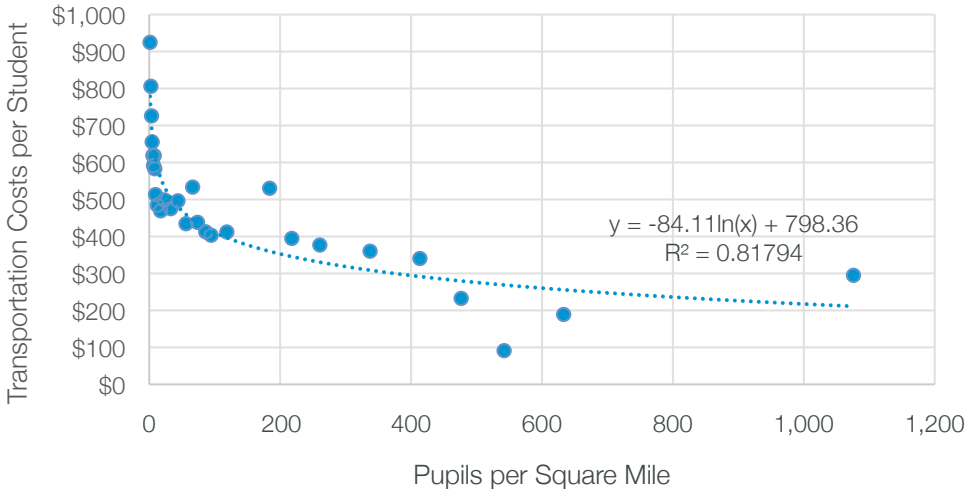
and operating the vehicles on a per capita basis, assuming that the entire County were built at the density of the scenario.[9] This per capita cost is then multiplied by the number of residents and employees in the development in each scenario.

School transportation

All else being equal, school transportation costs should decline in areas of higher density, for two reasons: a) more students will live within the "walk zone" (close enough that they are expected to walk to school), and; b) for those who are bused, school buses should have smaller distances to travel, saving on fuel costs and other operating costs. Data collected by the state of Wisconsin and other states on district transportation costs bears this out – transportation costs per student clearly decline as density increases. Figure 4 below, based on data from the Wisconsin Department of Public Instruction, illustrates the relationship.

FIGURE 4

Transportation costs per student



SGA's model calculates school transportation costs by estimating the number of students that are likely to be within the "walk zone" of any given school, assuming that the area around it is populated at the same gross density as the planned development in each scenario. Based on American Community Survey Public Use Microdata (PUMS) data for Macon-Bibb County, we estimated the number of students that would live in each development scenario and calculated the density of students per acre. The average student density was multiplied by the acreage of the walk zone for each school type (Elementary, Middle, and High). The number of likely students in the walk zone was then compared to the average school size by type for Macon-Bibb County. If the number of students likely to be in the walk zone met or exceeded the typical school capacity, then transportation costs were assumed to be zero. If the number of students within the walk zone was less than the capacity of the school, the remainder were assumed to be eligible for school bus. Based on data provided by the school district, we assumed that 61 percent of bus eligible students would actually use school bus service. Every bused student was assumed to generate

9 Until the response shed is completely built-out, per capita costs would be higher but the intent of this model is to capture the long-term differences in costs associated with different densities, therefore the per capita costs at build-out were used.

annual costs equivalent to the current average expenditure per bused student in the Bibb County school district. This model does not account for bussing due to reasons other than the distance from the school, e.g. integration, magnet schools, etc.

Non-density-related expenditures

For all expenditures deemed not related to density of development, SGA applied the conventional methodology of average costing, whereby expenditure categories are averaged across the number of residents and employees in the jurisdiction. Each new resident and employee is assumed to generate these same costs. The distribution of costs between residents and employees is imprecise, as municipalities typically do not and/or cannot track expenditures at this level of detail. SGA used judgment in this regard, informed by the total proportion of residents to employees in Macon-Bibb. Note, however, that the allocation of these costs can have significant impact on the results, particularly when comparing development scenarios with different ratios of residents to employees. SGA recommends that Macon-Bibb County review these assumptions carefully.

Notes on interpretation

This study is intended to provide an estimate of the different costs and revenues associated with development at different densities. To that end, it compares annual revenues for each scenario at full build-out. It does not account for the time until build-out, which may well vary depending on the scenario. It also is a better calculator of the difference between scenarios, rather than the actual net fiscal impact in any given year of one scenario. This is mainly because major capital costs are annualized to provide an estimate of the overall long-term average costs. In reality, the County may need to spend very little money in the early years on maintaining infrastructure, for example, before eventually making a large balloon payment when infrastructure reaches the end of its lifetime. This model essentially assumes that the County saves up enough each year to make the large payment. Macon-Bibb County's actual practice may differ, of course. In addition, the model does not account for all capital costs that may be generated by new development. For example, the capital cost of new police stations, libraries, and recreation facilities are not currently included in the model. These cost items were assumed to be either independent of density or SGA did not have sufficient data to establish a relationship between density and their costs. Therefore, the inclusion of these costs might reduce the net fiscal impact of each scenario but the difference between scenarios, and the basic conclusions of this analysis, would remain unchanged.

The model also does not specifically account for the capacity of existing infrastructure. This is a deliberate choice, for two reasons. First, the information on school, police, and fire capacity is difficult to obtain. Particularly, with respect to police, and fire, there are often no objective standards on when a new staffing or equipment is required. Second, and perhaps more importantly, it is questionable to attribute the cost of a new station or school entirely to the new development that happens to push facilities beyond their "tipping point." Growth in prior years is equally responsible. For that reason, it is more important to understand the long-term average costs and apply them equally. The key point is that, while such a quantification may be important for a full fiscal impact analysis of prospective development, it would not affect the results here, because any such variation is likely to be the same regardless of the density of the development alternatives. In this analysis, our effort is simply to discern fiscal impacts that vary based on development pattern.

Smart Growth America
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