Smart Growth America

Improving lives by improving communities

THE FISCAL IMPLICATIONS OF DEVELOPMENT PATTERNS

The City of Tulsa, Oklahoma

August 2017

Prepared for the
The City of Tulsa

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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 related to this topic. Most of these have concluded that "smart growth" – 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 is not entirely consistent). Smart Growth America's *Building Better Budgets*[1] report, published in May 2013, summarizes the results of 17 of these studies.

> *The Cost of Sprawl*, published by the Real Estate Research Corporation in 1974, was the first study to show that providing infrastructure to low-density, sprawling development costs more than for compact, dense developments. Low-density development's greater distances among homes, offices, shops, etc., require more road and pipe infrastructure than would be required to serve the same number of homes and businesses in a more compact development pattern. Looked at another way, one mile of infrastructure costs roughly the same to build no matter where it is, but that mile can serve many times more people in a high-density place than in a low-density place.

Yet these findings are not often included in the typical fiscal impact analysis 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 advanced academic findings into "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.

As part of a U.S. Environmental Protection Agency Technical Assistance Grant, Smart Growth America ("SGA") aims to apply our fiscal impact methodology that accounts for the increased cost efficiencies associated with denser development patterns. This report applies our fiscal impact methodology to the City of Tulsa, Oklahoma.

This analysis considers the fiscal impacts of how Tulsa might accommodate a forecasted 45,606 new persons and jobs over the next 20 years (by 2037).[2] Density matters in terms of what new growth would cost the city.

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[1] https://smartgrowthamerica.org/resources/building-better-budgets-a-national-examination-of-the-fiscal-benefits-of-smart-growth-development/

[2] This figure is both population and employment. We forecast population growth at 22,966 additional persons, and forecast employment growth as 22,640 additional jobs.

We assessed three scenarios, each of which were based on land use alternatives presented in Tulsa's 2010 Comprehensive Plan, as updated in 2016:[3]

1) A Trends Continue scenario, which contains a number of land uses with various specified development densities, that represents low density suburban development moving from the city towards the suburbs.

2) Alternative A: Focus Areas, which uses a new set of land use patterns and development densities as prescribed in Tulsa's Comprehensive Plan, targeted to three specific areas of interest within the city.

3) Alternative B: Includes the same focus areas and land uses as the previous alternative, but with increased density targets within those development areas.

Under the Trends Continued Scenario, the City would face a 20-year cost of $892.6 million to provide additional infrastructure to accommodate the new growth. The most aggressive alternative, Alternative B, costs substantially less, $362.8 million over 20 years. This represents a potential cost savings of $529.9 million.

The cost savings are the result of reduced roadway, sidewalk, water, and sewer system costs serving higher densities and infill development. When we consider the average tax revenues of the new residents and jobs, Alternative B results in a *net fiscal impact* of +$12.05 million per year to the city.

[3] Tulsa Comprehensive Plan – Land Use, 2010. Updated August 2016. pp LU-36-37

The City of Tulsa Projected Growth

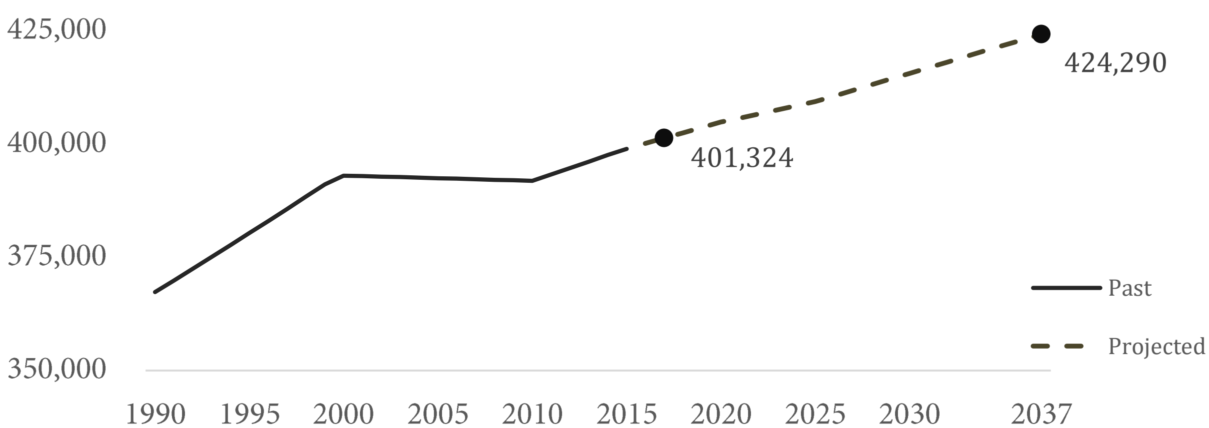
While the population of the City of Tulsa remained relatively stable during the early 2000s, the number of households have been increasing steadily since 2010. We applied population forecasts developed by Smart Growth America based on the total capacity at build out of the three focus areas in Alternative A. This alternative uses targets established for land use categories as defined in the PLANiTULSA comprehensive plan. The total growth that this baseline scenario would yield a 0.25% growth in population annually, or 22,966 over 20 years. The total forecasted growth estimates a 6% increase in population (and a 9% increase in employment).

Figure 1 and Table 1 below illustrate the assumed growth rates we used for this analysis.

With various scenarios projecting possible patterns of growth, this fiscal impact analysis seeks to address the question, "What will it cost to accommodate an additional 45,606 combined persons and jobs?" As our approach suggests, the answer depends on choices the community makes about density.

FIGURE 1

The City of Tulsa, OK Population and Forecast (1990-2037)



Source: SGA projection based on data from 2015 CDC Birth and Death Rates for Tulsa County and migration based on the US Census and 5-year American Community Survey.

TABLE 1

DETAIL OF SGA POPULATION AND EMPLOYMENT FORECASTS

	2017	2027	2037	Change 2017 to 2037
Population	401,324	411,887	424,290	22,966
Employment	251,551	261,964	274,191	22,640

Source: SGA projection based on data from 2015 CDC Birth and Death Rates for Tulsa County and migration based on the US Census and 5-year American Community Survey.

Development Scenarios

SGA worked together the City of Tulsa to develop alternative development scenarios. This analysis assesses three potential development scenarios to accommodate the additional 45,606 population and employment.

City of Tulsa Key Stats

5.92 pop + emp / acre
AVERAGE DENSITY OF PEOPLE & JOBS

2.34 persons / household
AVERAGE HOUSEHOLD SIZE

257 pop + emp / acre
HIGHEST OBSERVED DENSITY LEVEL

Our baseline scenario, which we call "Trends Continue," reflects a pattern of development away from the city towards the suburbs that existed around during the time prior to the adoption of the comprehensive plan in 2010. Alternatives A & B contrast the fiscal implications of focused development - as prescribed more fully in Tulsa's Comprehensive Plan - with the Trends Continue scenario. We defined the scenarios as follows:

1. The Trends Continue scenario assumes that new development would continue at the lower suburban and auto-oriented densities, which would equate to a total land area of 3,320 acres needed to accommodate future growth.

2. Alternative A: Focus Areas is a scenario that represents accommodating new growth by focusing development downtown and within dense walkable developments. The land use patterns in this scenario would require about 1,056 acres to accommodate future growth.

3. Alternative B represents the same land uses from Alternative A, however the density levels for each use have been increased to higher target levels within the described from Alternative A. (See Appendix B.) This increase would reduce the needed area to about 855 acres.

We then used geographic information systems (GIS) analysis to divide Tulsa into equal 40-acre cells, and to identify the total number of people and jobs located within each cell based on U.S. Census data.[4]

Based on the GIS analysis, and accounting for undeveloped areas such as parks and water bodies, the existing average density across the entire City of Tulsa is 5.92 persons and jobs per acre.[5] Higher densities were observed within isolated areas of the City of Tulsa, such as downtown, where density levels reached about 76 to 257 population and jobs per acre. The

[4] The GIS analysis was conducted using ESRI ArcGIS. For population density calculations, areas not within the City's municipal borders were omitted. Population was divided into 40-acre cells from Census Block data using an aerial-weighted average calculation. Major water features and open space were omitted from the aerial weight calculation.
[5] Throughout this analysis we define density "population and jobs per acre" as the sum of population and employment per acre.

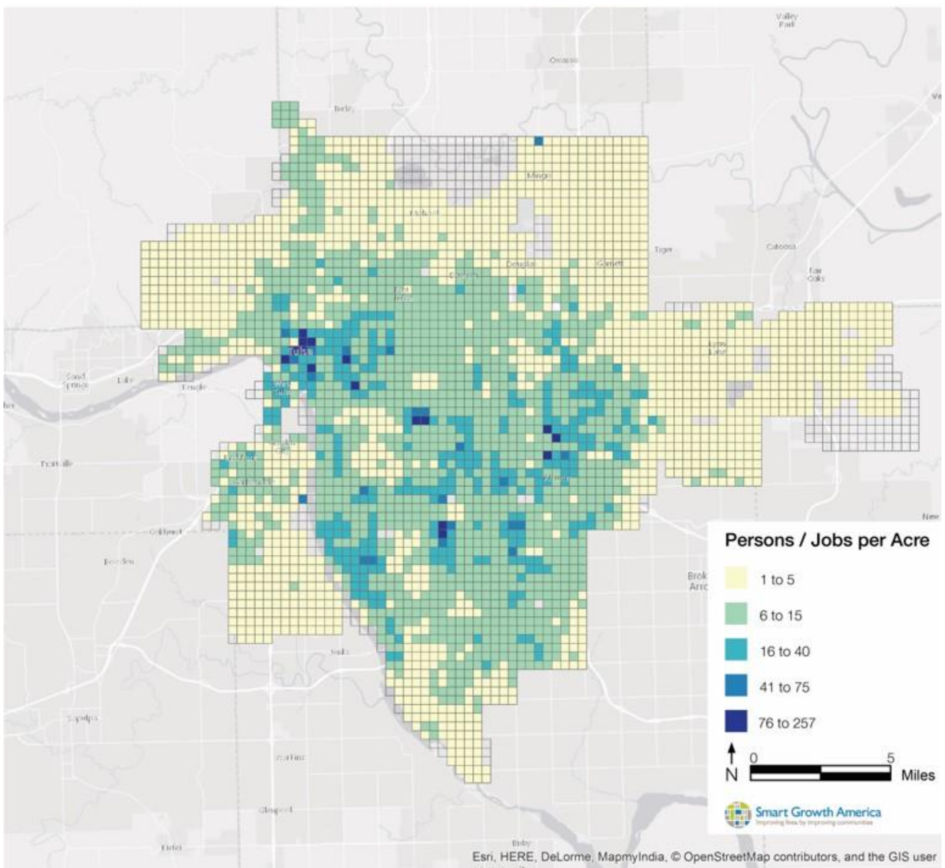
average density level is much lower primarily due to low-density suburban and auto-oriented development within the City limits.

Figure 2 illustrates the densities across the various analysis cells in the City of Tulsa. As seen, the highest housing densities used for Alternative A exist in the dense development of Tulsa's downtown. Overall the highest densities observed within an entire 40-acre grid cell were downtown at 257 persons and jobs per acre.

FIGURE 2

The City of Tulsa Population + Employment Density, 2010

Source: Smart Growth America, 2017; U.S. Decennial Census, 2010

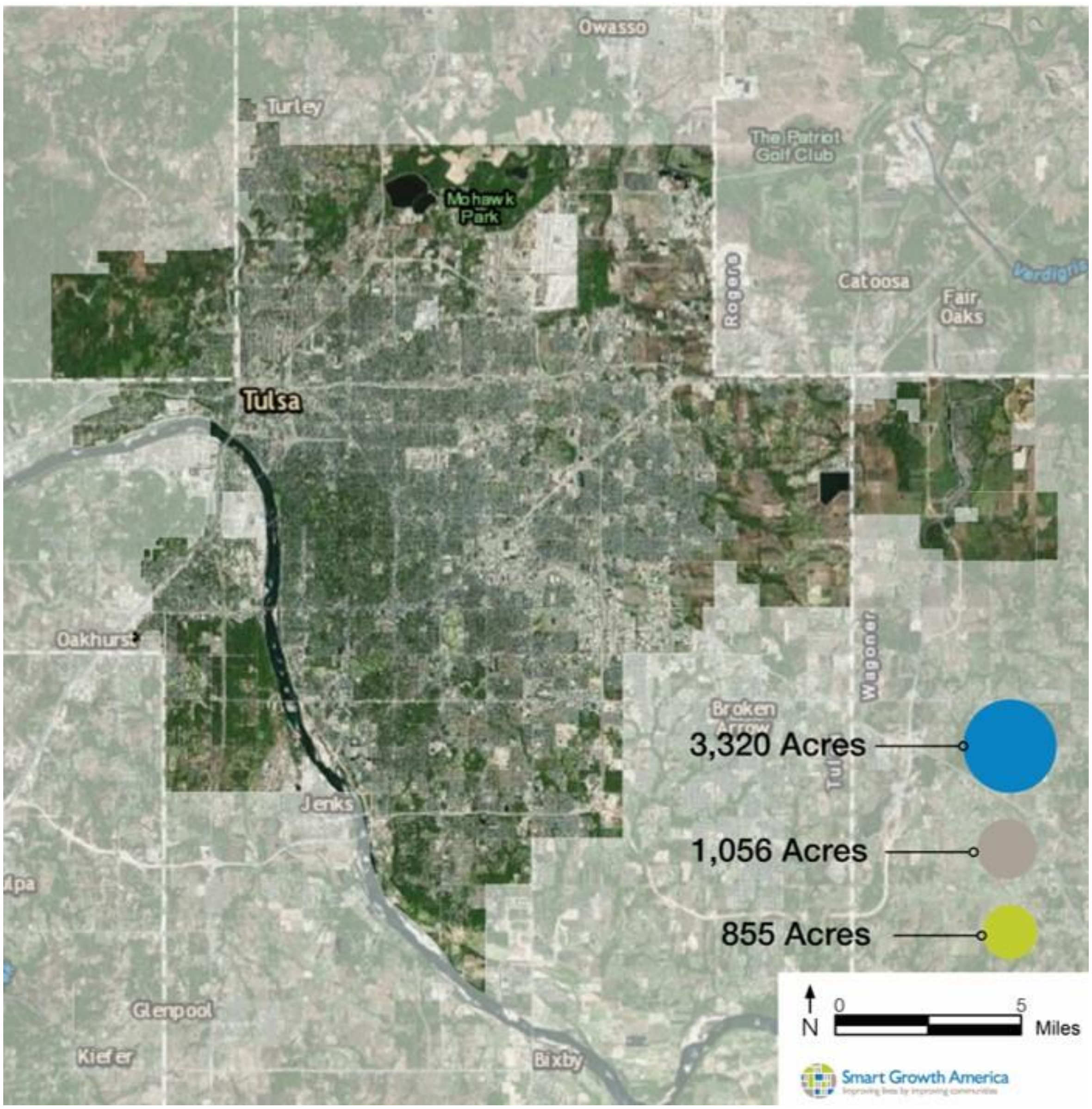


The City of Tulsa, Oklahoma Density Alternatives

Accommodating the new residents and jobs at these density levels would lead to vastly different physical footprints. The Trends Continue Scenario would require 3,320 acres of development; Alternatives A and B would require 1,056 and 855 acres respectively as illustrated in Figure 3.

FIGURE 3

Area Requirements of Analysis Scenarios, The City of Tulsa



Source: Smart Growth America, 2017

Methodology

Infrastructure items considered:

- ROADS
- SIDEWALKS
- WATER LINES
- SEWER LINES

This analysis focuses on four expenditure types for the City of Tulsa: Roads, sidewalks, water lines, and sewer lines. We selected these items based on the available data from the City of Tulsa, and we consider these items for sketch planning purposes. There are many other infrastructure costs, such as police and fire services, schools, and civic infrastructure that are also part of planning for population growth. Focusing on only these four items narrows in on costs that have the strongest relationship to population densities, which can be estimated given the sketch level planning scenarios. **Because this analysis does not use all possible infrastructure items, the costs we present are likely a conservative estimate of what future development would actually cost the City.**

For each expenditure item, the City of Tulsa provided appropriate GIS shapefiles. Using this data, we applied those infrastructure items to the 40-acre cell grid, and this process allowed us to calculate unit density (e.g. “roads per acre”).

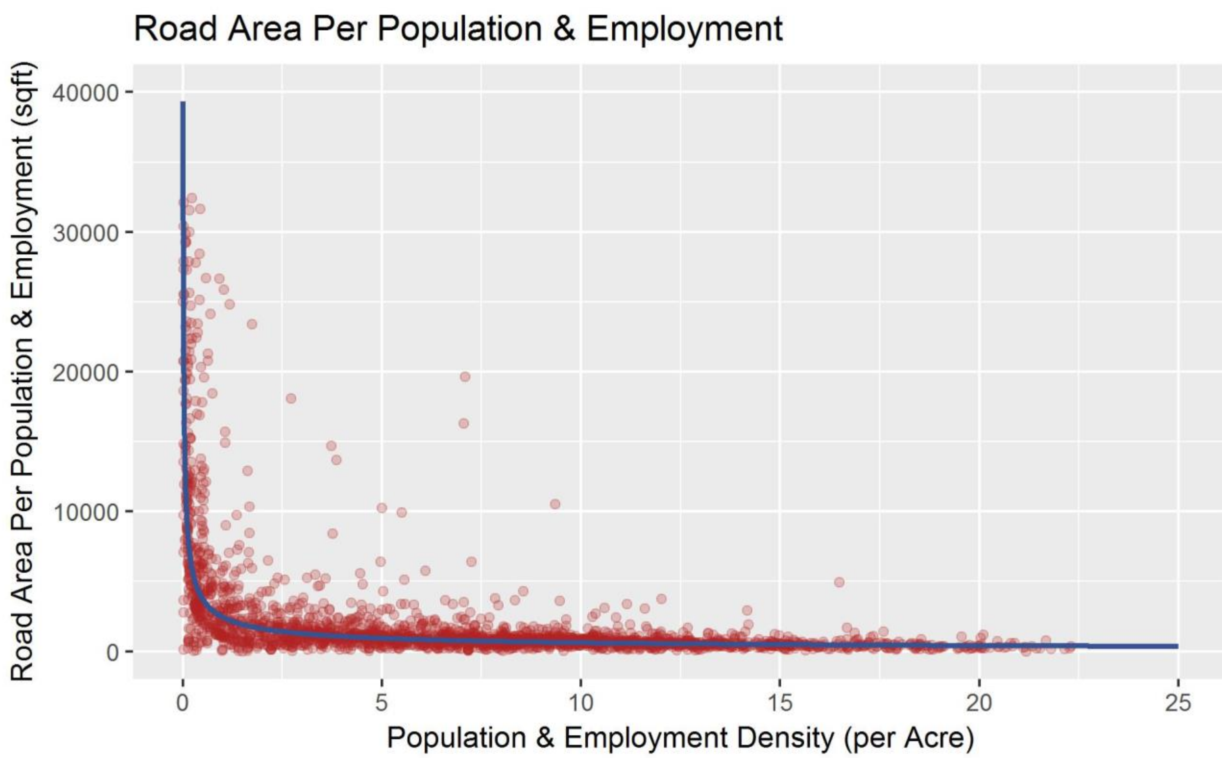
We then applied estimates of units per acre, for each infrastructure item, as the basis of an ordinary least squares (“OLS”) regression analysis. In creating the data set, the unit of analysis was the 40-acre cell. The result is a set of models that estimates unit density (e.g. “roads per acre”) as a function of population and employment density (e.g. “people or jobs per acre”). These models allow one to estimate the amount of infrastructure units needed per population or employment as a function of density. (This operation distinguishes this analysis from “average cost analyses” more commonly used in fiscal impact modeling, as described above on page 3.)

Take Table 2 as an example, which illustrates how “road area per population and employment needed” sharply decreases as a function of population density. At very low levels of population Tulsa requires thousands of square feet of road per population and employment. At higher density this decreases to levels of less than 1,000 and even less than 500 square feet per population and employment because roads can be shared and distributed among more people and jobs.

This scatter plot is the basis of the regression analysis. We created unique models for each infrastructure item, with each item exhibiting a similar relationship. The scatter plots, resulting regression outputs, and cost itemization are reported in Appendix A. The development land use mixes and densities from which these outputs were applied for each scenario can be found in Appendix B.

TABLE 2

Road Area per Population + Employment, by Density, City of Tulsa



Source: Smart Growth America, 2017

Each model estimates the quantity needed per capita, and then the total quantity of infrastructure needed. Using those total quantities, we used item-specific cost factors, each of which were developed based on SGA research and coordination with the City of Tulsa.

The final step in this analysis was to add two additional costs: the costs of financing, and operations and maintenance costs. Infrastructure items are long-term capital investments, and governments typically issue bonds to pay for these investments. This analysis assumes that the financing cost to the City would be 2.2 percent interest over 20-years (a typical cost of long-term municipal bonds in 2017). Finally, the analysis adds an operations and maintenance cost of 5 percent.[6]

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[6] Five percent operations and maintenance costs is consistent with engineering cost estimates in other communities that Smart Growth America has interviewed. It is also consistent with contingency allowances for capital cost estimation. This is in the range of assumptions commonly used in transportation cost estimating. See: http://www.samtrans.com/Assets/_Planning/BRT/Operating+and+Maintenance+Costs.pdf

Results

There are two key results from this analysis. The first are the total 20-year costs, which are the total costs that our fiscal impact model estimated. For a sense of scale we report the results on a per-year basis (Table 3).

The second result is what we call *net fiscal impact* (Table 4). The net fiscal impact takes the total 20-year cost, and compares it against potential revenues of new households and commercial activity. Here, we use an average revenue based on the City's 2017 budget of $1,253 in revenue per person and $960 in sales tax revenue generated per employee. The three scenarios all plan for the same level of growth, therefore they each would generate the same revenues. The only change among the scenarios is on the cost side. When we compare the revenues against the costs, the difference is the net fiscal impact. A negative net fiscal impact indicates that the City would lose money in accommodating the new growth; a positive net fiscal impact indicates that the City would actually make net revenues.

The results of this analysis (Table 3) show that the Trends Continue scenario would cost the City $892.6 million over 20 years. This equates to $33.2 million per year, equivalent to 45 percent of the City's 2017 proposed total budget.[7] Applying the estimated potential tax revenues from new population and employment growth yields a 20-year net fiscal impact of -$381.6 million, or -$7.67 million per year (Table 4).

Alternative A assumes higher densities per acre and increased mixed-use development within the city core (See Appendix B.) This development pattern would reduce the 20-year costs to $478.0 million ($17.8 million per year). The net fiscal impact is positive (per this conservative analysis): a 20-year net fiscal impact of +$33.0 million (nearly +$7.76 million per year). This scenario would put the City "in the black" and make more estimated revenues than it would pay in infrastructure costs.

Alternative B uses a higher density pattern than the conservative targets set by the city in Alternative A. We estimate 20-year costs for this development pattern at $362.8 million ($13.5 million per year). The 20-year net fiscal impact is +$148.2 million (+$12.05 million per year).

The alternatives set forth in Tulsa's Comprehensive Plan, which call for increased mixed land uses, higher densities, and dense development near its downtown are important because the additional costs of infrastructure are offset by potential revenues. At lower density levels (such as in the Trends Continued Scenario) the City would likely have a *negative* fiscal impact. Following the scenarios promoted by the comprehensive plan, that focus on targeted areas and work to reverse the trend of low density development, would help the city to generate a *positive* net fiscal impact from future growth.

[7] The City of Tulsa Proposed Budget, 2017

TABLE 3

Results – The City of Tulsa Development Costs in Summary

(Millions $)	*Trends Continue Scenario (Baseline)*	*Alternative A*	*Alternative B*
Capital Costs – 20 years	$688.3	$368.6	$279.7
Amortized Costs (20 years at 2.2% rate)	$858.2	$459.6	$348.8
Maintenance Costs – 20 years	$34.4	$18.4	$14.0
Total Costs – 20 years	$892.6	$478.0	$362.8
Total Costs per Year	$33.2 (+4.5% to budget)	$17.8 (+2.4% to budget)	$13.5 (+1.8% to budget)

Source: Smart Growth America, 2017

TABLE 4

Results – The City of Tulsa Development Net Fiscal Impact

(Millions $)	*Trends Continue Scenario (Baseline)*	*Alternative A*	*Alternative B*
Total Costs – 20 Years	$892.6	$478.0	$362.8
Est. Tax Revenue - 20 Years	$511.0	$511.0	$511.0
Net Fiscal Impact – 20 Years	-$381.6	+$33.0	+$148.2
Total Costs – Annual	$33.2	$17.8	$13.5
Est. Tax Revenue – Annual	$25.6	$25.6	$25.6
Net Fiscal Impact – Annual	-$7.67	+$7.76	+$12.05

Source: Smart Growth America, 2017

Another way of looking at costs is to consider the marginal costs per new resident or employee. This measure tells us, on the average, how much each new household costs Tulsa in terms of infrastructure. Under the Trends Continue scenario, each new unit would cost the city $978 per year. This compares to $524 annually per population and employment under Alternative A; and $398 annually per unit in Alternative B (Table 5).

TABLE 5

Results – The City of Tulsa Development Costs per Capita (Marginal Costs)

	Trends Continue Scenario (Baseline)	*Alternative A*	*Alternative B*
Total 20-year Costs per Additional Pop + Emp	$19,573	$10,482	$7,955
Annual Costs per Additional Pop + Emp	$978	$524	$398

Source: Smart Growth America, 2017

The bottom row of Table 5 simply compares the annual and total 20-year costs associated with the development of each new person or job under each scenario. One way of interpreting these numbers is to think of them in terms of how much either would have to pay the City to "break even" in terms of infrastructure. The Trends Continue scenario would cost the City $978 annually for each resident or employee; $524 annually for each under Alternative A; and $398 annually under Alternative B.

Alternative A and Alternative B represent noteworthy points for a revenue analysis, and it brings us back to what we observe for net fiscal impacts. Recall that the net fiscal impact calculations used the 2017 budget average revenues on average of $1,140 per person or employee.

The marginal cost results differ from the net fiscal impact because they do not consider the fact that new residents do not arrive all at once, and the net fiscal impact calculations do. When the revenues trickle in year-over-year, Alternative A shows a modest positive net fiscal impact (+$7.76 million annually), and Alternative B has an increased positive net fiscal impact (+$12.05 million annually).

This analysis tells us that ***development at existing average density levels would cost Tulsa more money – just for these infrastructure items – than the city would likely receive in additional revenues***. The costs are amplified when we consider the comprehensive set of infrastructure items. However, this is a simplified analysis for sketch planning purposes.

The net fiscal impact results underscore the notion that the new growth would create a cost to Tulsa if future development continues trends of low density development toward the suburbs. Those additional costs would have to be made up somewhere. For example, under the Trends Continue scenario, the city would have to generate $3,385 annually from each new household for the household to pay its own marginal costs. Hypothetically, Tulsa could tax these new households $3,385 per year, but we know that is unlikely. What is more likely is that the costs would be distributed among the existing residents and businesses. The city could also depend on external funds or state funds to pay for the costs, but the point remains that these revenues would have to be generated from somewhere.

Finally, we convert the costs into “cost savings” relative to the Trends Continue scenario (Table 6). Using this point of view, Alternative A and Alternative B offer significant potential savings to Tulsa compared to the baseline. Alternative A would save the city $414.6 million over 20 years ($15.4 million per year), while Alternative B would save the city $529.9 million over 20 years ($19.7 million per year).

TABLE 6

Results – The City of Tulsa Development Cost Savings

(Millions $)	*Trends Continue Scenario (Baseline)*	*Alternative A*	*Alternative B*
Total 20-year savings	-	$414.6	$529.9
Savings per year	-	$15.4	$19.7

Source: Smart Growth America, 2017

Conclusion

This analysis considers how the City of Tulsa might accommodate 45,606 additional residents and jobs over the next 20 years (by 2037). The type of density matters in terms of what it would cost the city to provide services to the additional households.

Tulsa could accommodate new growth at average densities and development patterns that continue current trends and do so at a cost of infrastructure provision of $892.6 million over twenty years, or a net fiscal impact of -$381.6 million after considering potential tax revenues of new residents.

An alternative scenario (Alternative A), which uses higher densities, similar to those already observed in the City across a 40-acre grid cell, would cost $478.0 million over the same period, or a 20-year savings $414.6 million. The 20-year net fiscal impact is +$33.0 million.

A third scenario (Alternative B), uses higher densities in the selected sub-developments. This scenario would cost $362.8 million over the same 20-year period, or a 20-year savings of $529.9 million. At this point the City is “in the black,” with a 20-year net fiscal impact of +$148.2 million.

In short, accommodating growth at higher density levels and a greater mix of uses would save Tulsa money in the form of reduced roadway, sidewalk, water lines and sewer system infrastructure costs. Accommodating development at the density levels proposed under Alternative A or Alternative B would result in a *positive* net fiscal impact to the City.

This is a set of hypothetical scenarios for the City of Tulsa, with assumed population forecasts. However, it highlights the financial consequences of land-use decisions over the long term and the potential of Tulsa’s comprehensive plan to create a positive fiscal impact. The costs of low-density, sprawling development add up to significant amounts over time. Planners and policymakers in the region will want to take note, before another 50 years of development makes the problem even worse. Smarter growth, with more compact development patterns, would reduce long-term costs.

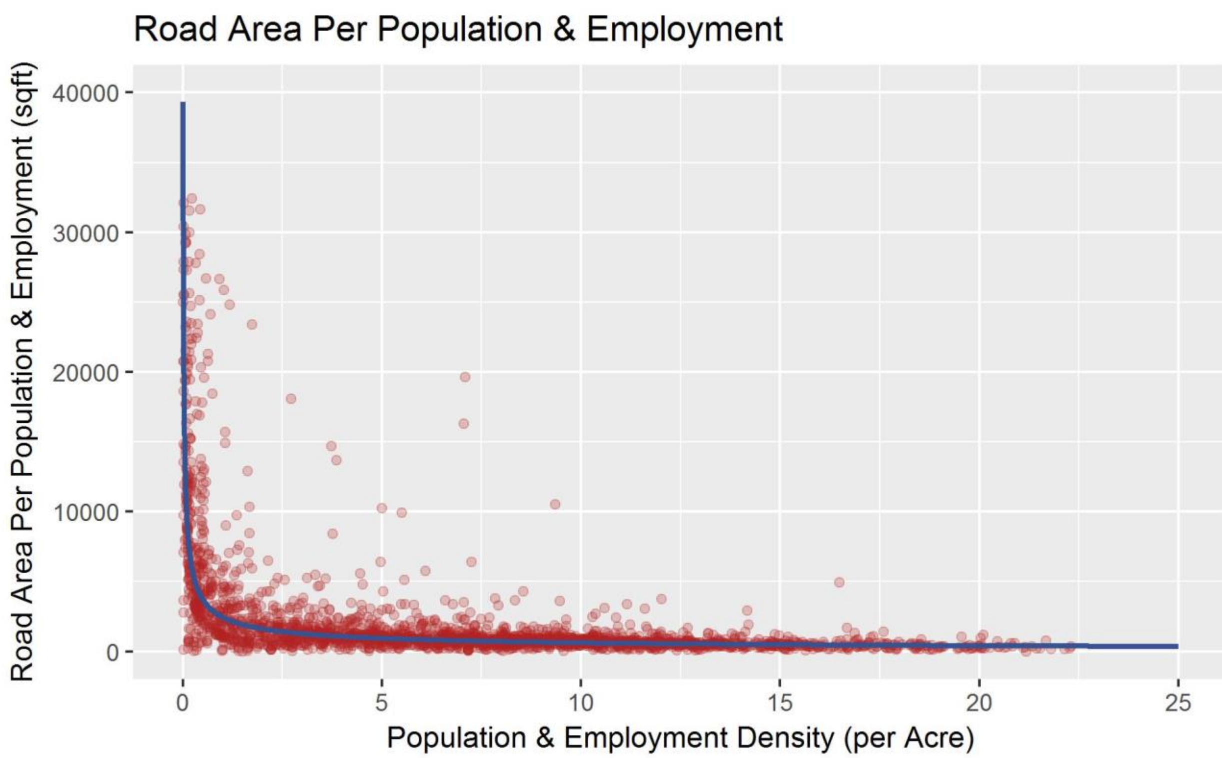
A few caveats to this analysis are warranted. First, because the population forecast assumes projections of an increase of 6 percent over 20 years and a 9 percent increase of employment over that period of time, the magnitude of the numbers can vary. This is also the case with the development scenarios, which are hypothetical scenarios for density levels for the new growth. An analysis of a specific scenario or development pattern, especially with a defined geography would allow for assessment of other factors such as the costs of fixed services like schools, fire, police, waste management, and transit.

Finally, SGA conducted this analysis for the City of Tulsa using data particular to that community. These factors and magnitudes differ from community to community, representing the various policy and spending decisions that differ across the country. Infrastructure provision, especially on a per-capita basis, can vary widely from one place to another, even at similar density levels. Thus, it is best to understand these cost estimating models as best suitable for the City of Tulsa. The parameter estimates themselves are not suitable for application to other communities, although the trends of higher density requiring fewer people per capita do hold.

This analysis should be used as a guideline for the City of Tulsa to consider the fact that context-sensitive higher density levels are not only beneficial from a land use, social equity, and environmental standpoint, they also make financial sense. As portrayed, the City stands to save an additional $529.9 million by building at dense levels already present in the City; these levels of density are easily congruent with the character of the community. Continuing to build at low-density levels would yield heavy capital costs for major infrastructure items. These costs can be mitigated with a "smart growth" approach to new development.

Appendix A – Technical Output

Roads

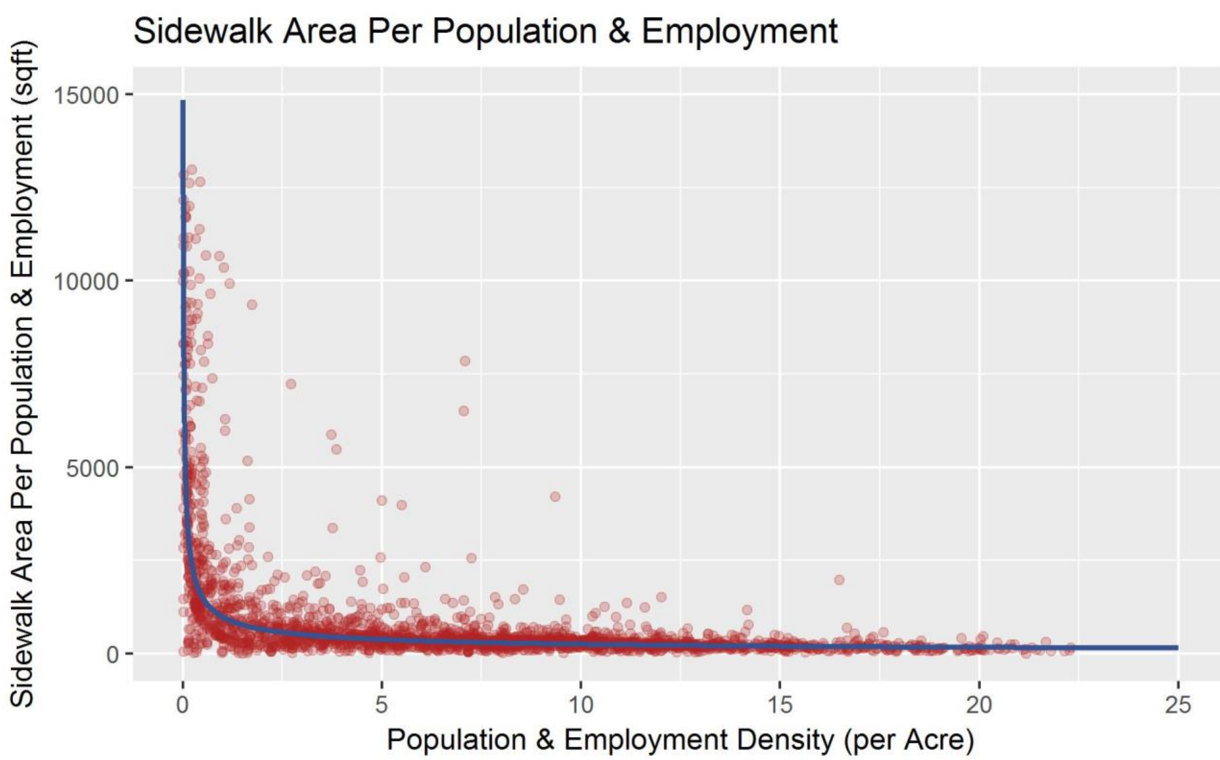


	Baseline	Alternative A	Alternative B
Unit Cost ($ / sq. ft.)	$30	$30	$30
Est. Road Area per Pop+ Emp (sq. ft.)	427	228	172
Est. Road Area Needed (sq. ft.)	19,494,494	10,378,740	7,859,031
Est. Cost of Road Needed ($)	$584,834,808	$311,362,204	$235,770,943

Road Area Per Capita by Pop + Emp Density

Dependent variable:	log(Road_Per_Capita)		
Mean:			34.67
Standard Deviation:			43.91
OLS:			
=7.804+ -0.603*ln(population per acre)			
log(PopDensity)			-0.603
Standard Deviation:			-0.011
	t = -52.773		
		p = 0.000***	
Constant			7.804
Standard Deviation			-0.022
	t = 349.623		
	p = 0.000***		
Observations			2413
R^2			0.536
Adjusted R^2			0.536
Residual Std. Error	0.770 (df = 2411)		
Sum Squared Residuals			1430.3
F Statistic	2,785.009*** (df = 1; 2411)		
Akaike criterion			-1257.91
Log-likelihood			-2359.55
Note:			*p**p***p<0.01

Sidewalks

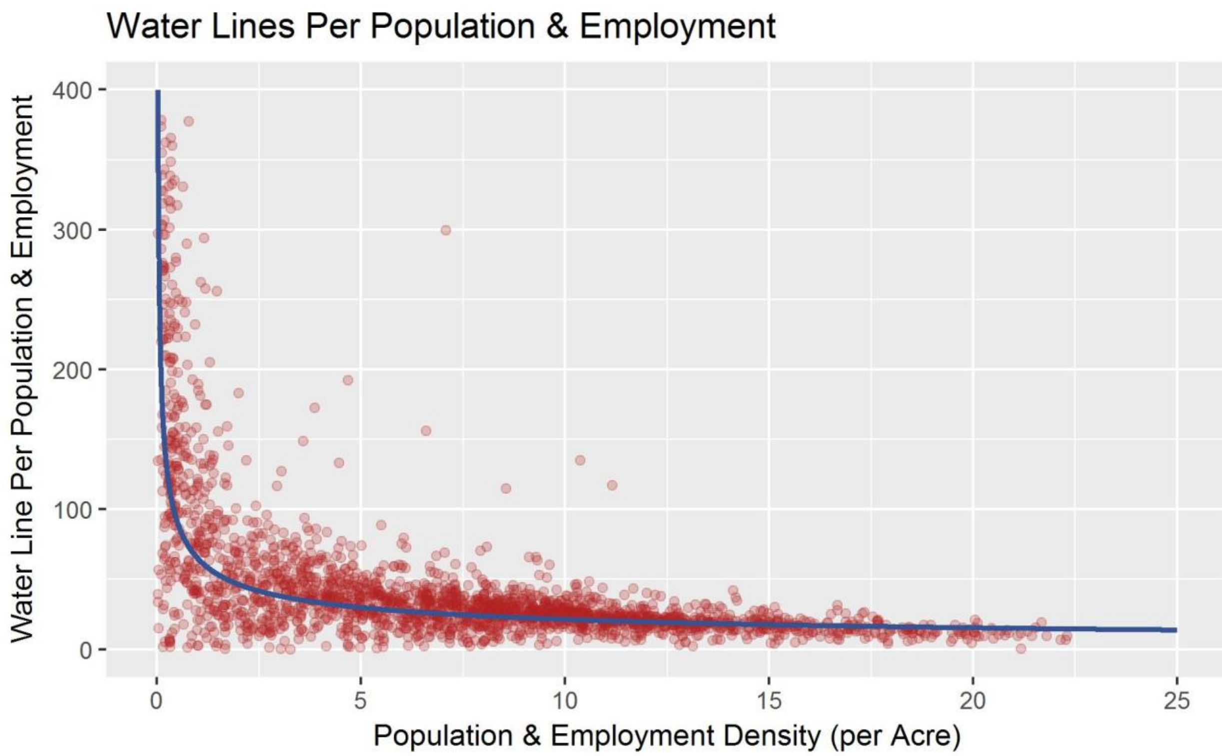


	Baseline	Alternative A	Alternative B
Unit Cost ($ / sq. ft.)	$10	$10	$10
Est. Sidewalk per Pop + Emp (ft.)	171	91	69
Est. Sidewalk Needed (ft.)	7,792,269	4,148,553	3,141,384
Est. Cost of Sidewalk Needed (ft.)	$77,922,687	$41,485,526	$31,413,837

Sidewalk Area Per Capita by Pop + Emp Density

Dependent variable:	log(Sidewalk_Per_Capita)	
Mean:	931.05	
Standard Deviation:	1,749.79	
OLS:		
=6.887+ -0.603*ln(population per acre)		
log(PopDensity)		-0.603
Standard Deviation:		-0.011
	t = -52.772	
	p = 0.000***	
Constant		6.887
Standard Deviation		-0.022
	t = 308.562	
	p = 0.000***	
Observations		2413
R^2		0.536
Adjusted R^2		0.536
Residual Std. Error	0.770 (df = 2411)	
Sum Squared Residuals		1430.3
F Statistic	2,784.844*** (df = 1; 2411)	
Akaike criterion		-1257.91
Log-likelihood		-2792.95
Note:		*p**p***p<0.01

Water Lines

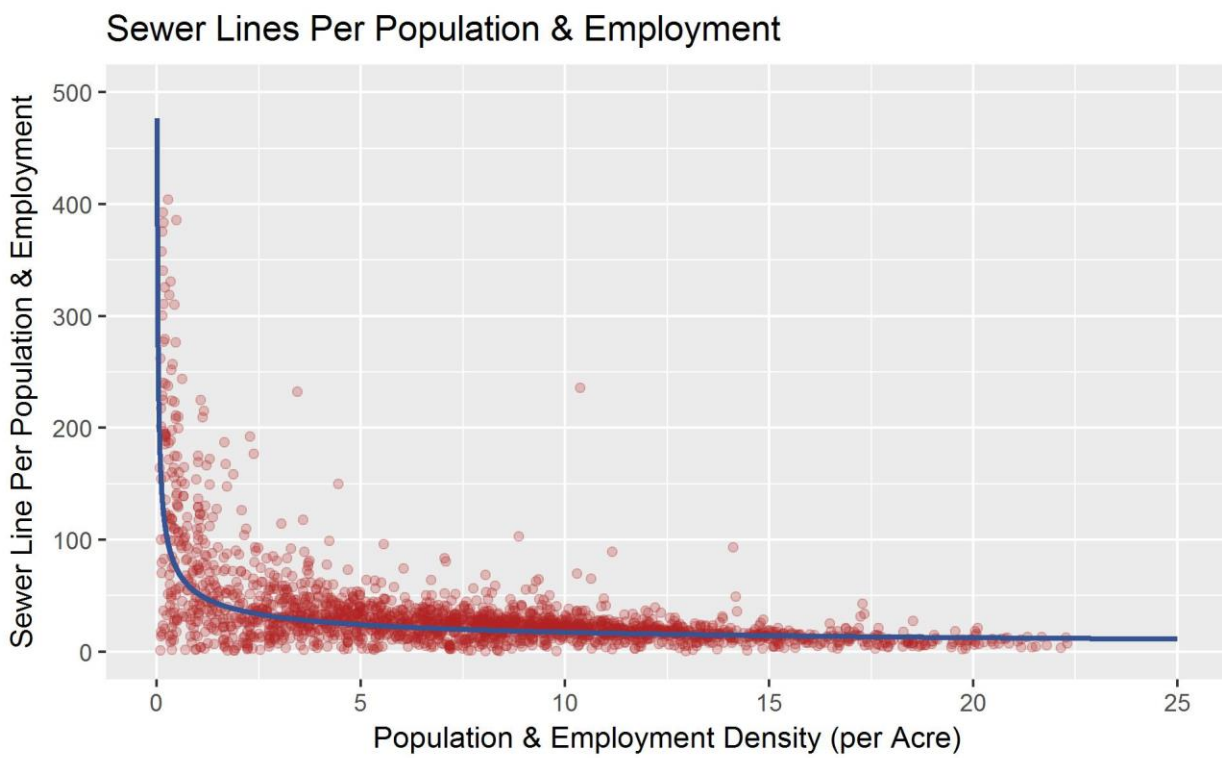


	Baseline	Alternative A	Alternative B
Unit Cost ($ / ft.)	$20	$20	$20
Est. Water Line per Pop + Emp (ft.)	15.50	9.55	7.61
Est. Water Line Needed (ft.)	707,086	435,373	347,131
Est. Cost of Water Line ($)	14,141,716	8,707,464	6,942,616

Water Lines Per Capita by Pop + Emp Density

Dependent variable:	log(WaterLine_Per_Capita)	
Mean:		46.460
Standard Deviation:		55.712
OLS:		
=4.171+ -0.483*ln(population per acre)		
log(PopDensity)		-0.483
Standard Deviation:		-0.012
	t = -39.601	
	p = 0.000***	
Constant		4.171
Standard Deviation		-0.024
	t = 175.667	
	p = 0.000***	
Observations		2296
R^2		0.406
Adjusted R^2		0.406
Residual Std. Error	0.688 (df = 2294)	
Sum Squared Residuals		1087.19
F Statistic	1,568.274*** (df = 1; 2294)	
Akaike criterion		-1712.42
Log-likelihood		-2399.67
Note:		*p**p***p<0.01

Sewer Line



	Baseline	Alternative A	Alternative B
Unit Cost ($ / ft.)	$20	$20	$20
Est. Sewer Line per Pop + Emp (ft.)	12.51	7.72	6.16
Est. Sewer Line Needed (ft.)	570,542	352,113	280,992
Est. Cost of Sewer Line ($)	11,410,840	7,042,259	5,619,838

Water Lines Per Capita by Pop + Emp Density

Dependent variable:	log(WaterLine_Per_Capita)	
Mean:	46.460	
Standard Deviation:	55.712	
OLS:		
=4.171+ -0.483*ln(population per acre)		
log(PopDensity)		-0.483
Standard Deviation:		-0.012
	t = -39.601	
	p = 0.000***	
Constant		4.171
Standard Deviation		-0.024
	t = 175.667	
	p = 0.000***	
Observations		2296
R^2		0.406
Adjusted R^2		0.406
Residual Std. Error	0.688 (df = 2294)	
Sum Squared Residuals		1087.19
F Statistic	1,568.274*** (df = 1; 2294)	
Akaike criterion		-1712.42
Log-likelihood		-2399.67
Note:		*p**p***p<0.01

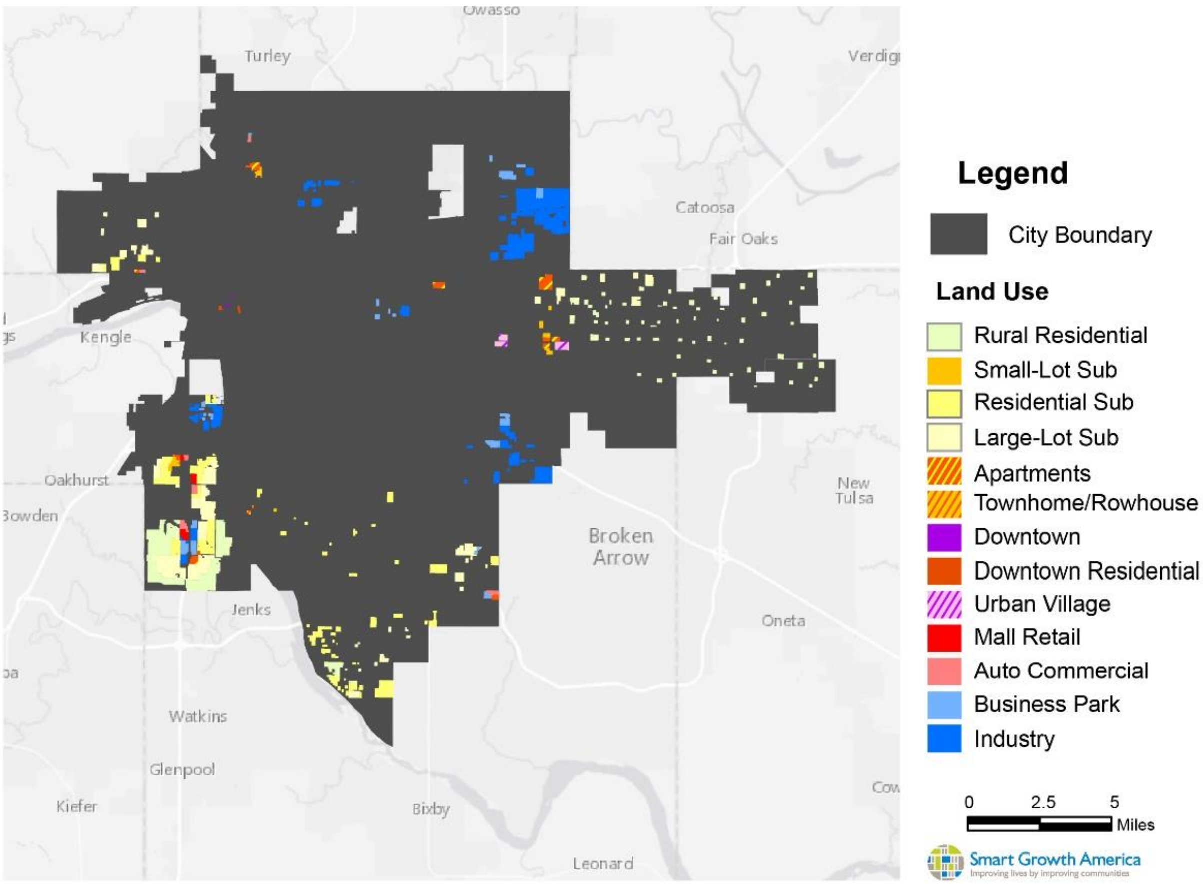
Appendix B – Scenario Densities

Baseline: Trends continue

Scenario Development Allocation
Baseline: Trends Continue

Land Use Category	HH	Empl	HH / Acre	Jobs / Acre	Area
Apartments	58.4%	2.0%	26.00	4.00	220
Auto-Commercial	0.0%	2.4%	-	12.00	46
Business Park	0.0%	14.0%	-	19.00	170
Downtown	0.8%	1.2%	26.00	91.00	3
Downtown Residential	2.3%	0.3%	42.00	12.00	5
Industry	0.0%	71.0%	-	19.00	858
Large-Lot Sub	6.5%	0.0%	1.00	-	640
Mall Retail	0.0%	3.3%	-	25.00	31
Residential Sub	23.7%	2.5%	4.00	1.00	584
Rural Residential	1.7%	0.0%	0.25	-	665
Small-Lot Sub	2.1%	0.0%	5.00	-	40
Townhome/Rowhouse	0.9%	0.0%	8.00	-	11
Urban Village	3.7%	3.1%	8.00	16.00	45
Total	100.0%	100.0%	-	-	3,320

Scenario Development Area
Baseline: Trends Continue



Source: Tulsa Department of Planning

Alternative A: Focus Areas

Scenario Development Allocation
Alternative A: Focus Areas

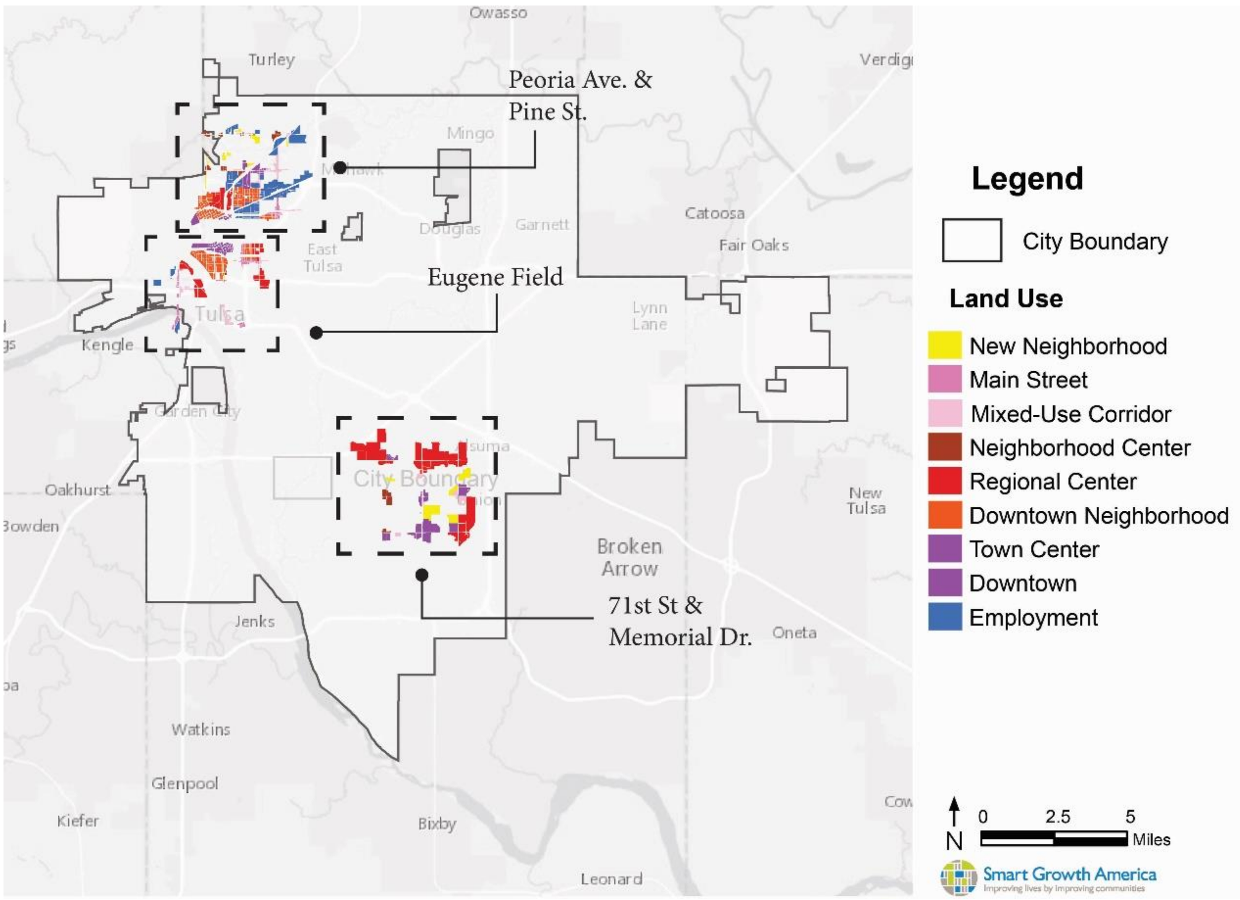
Land Use Category	HH	Emp	HH / Acre	Jobs / Acre	Area
Downtown	8.1%	17.7%	26.00	91.00	45
Downtown Neighborhood	46.2%	5.5%	42.00	12.00	108
Employment	0.0%	16.4%	-	19.00	199
Main Street	2.1%	2.5%	8.00	16.00	36
Mixed-Use Corridor	4.0%	3.1%	9.00	12.00	59
Neighborhood Center	1.4%	2.0%	5.00	12.00	37
New Neighborhood	2.5%	0.2%	4.00	1.00	60
Regional Center	23.2%	42.6%	8.00	25.00	391
Town Center	12.6%	10.0%	14.00	19.00	121
Total	100.0%	100.0%	-	-	1056

Alternative B: Focus Areas with Increased Density

Scenario Development Allocation
Alternative B: Focus Areas + Increased Density

Land Use Category	HH	Emp	HH / Acre	Jobs / Acre	Area
Downtown	8.1%	17.7%	39	91	30
Downtown Neighborhood	46.2%	5.5%	84	12	54
Employment	0.0%	16.4%	0	19	151
Main Street	2.1%	2.5%	16	16	36
Mixed-Use Corridor	4.0%	3.1%	18	12	59
Neighborhood Center	1.4%	2.0%	15	12	37
New Neighborhood	2.5%	0.2%	6	1	40
Regional Center	23.2%	42.6%	16	25	326
Town Center	12.6%	10.0%	28	19	121
Total	100.0%	100.0%	-	-	855

Scenario Development Area
Alternatives A & B: Focus Areas



Source: Tulsa Department of Planning