System Development Charge Report

Prepared for:

Springfield, Tennessee

April 15, 2022

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EXECUTIVE SUMMARY

The City of Springfield evaluated the possibility of implementing system development charges in 1999 only to discover the City's Charter did not have language that permitted their implementation. In 2001, the City adopted a legislative amendment that added the following language: "To impose such fees on persons or entities developing land within the service area of any city-owned utility within and without the corporate limits as the city deems appropriate to pay the cost of capital improvements and other expenses related to such developments including, but not limited to, improvements and expenses for street repair and construction, water and wastewater services and facilities, natural gas services and facilities, electric services and facilities, and other city-owned utility services and facilities, storm sewers and facilities, educational services and facilities, parks and recreational facilities, police protection, fire protection, garbage collection and disposal, and the providing of administrative services."

In the Fall of 2021, the City retained TischlerBise to analyze the impacts of future development on capital facilities and to calculate system development charges based on that analysis. Through interviews and discussions with staff, TischlerBise developed the proposed system development charges discussed in this report. System development charges are collected from new construction at the time a building permit is issued and used to construct system improvements needed to accommodate future development. A system development charge represents future development's proportionate share of capital facility needs. System development charges do have limitations, and should not be regarded as the total solution for infrastructure funding needs. Rather, they are one component of a comprehensive portfolio to ensure provision of adequate public facilities needed to serve future development. In contrast to general taxes, system development charges may not be used for operations, maintenance, replacement of infrastructure, or correcting existing deficiencies.

The City of Springfield has experienced steady residential and industrial growth in recent years, and this growth is expected to continue in the future. As a result, Springfield must plan for future infrastructure improvements if existing levels of service are to be maintained. This report includes the following infrastructure categories:

- General Government
- Fire
- Parks
- Police
- Transportation
- Water
- Wastewater

TENNESSEE LEGAL FRAMEWORK

While the State of Tennessee does not have specific authorizing legislation for system development charges, the State does grant the power for municipalities with a mayor-aldermanic charter to impose

system development charges on new development. As a mayor-aldermanic charter city, the City of Springfield may:

"Establish, open, relocate, vacate, alter, widen, extend, grade, improve, repair, construct, reconstruct, maintain, light, sprinkle and clean public highways, streets, boulevards, parkways, sidewalks, alleys, parks, public grounds, public facilities, libraries and squares, wharves, bridges, viaducts, subways, tunnels, sewers and drains within or without the corporate limits, regulate their use within the corporate limits, assess fees for the use of or impact upon such property and facilities, and take and appropriate property therefor under § 7-31-107 -- 7-31-111 and § 29-16-203, or any other manner provided by general laws." (Tenn. Code Ann. § 6-2-201 (15))

GENERAL LEGAL FRAMEWORK

Both state and federal courts have recognized the imposition of system development charges as a legitimate form of land use regulation, provided the fees meet standards intended to protect against regulatory takings. Land use regulations, development exactions, and system development charges are subject to the Fifth Amendment prohibition on taking of private property for public use without just compensation. To comply with the Fifth Amendment, development regulations must be shown to substantially advance a legitimate governmental interest. In the case of system development charges, that interest is in the protection of public health, safety, and welfare by ensuring development is not detrimental to the quality of essential public services. The means to this end are also important, requiring both procedural and substantive due process. The process followed to receive community input (i.e., stakeholder meetings, work sessions, and public hearings) provides opportunities for comments and refinements to the system development charges.

There is little federal case law specifically dealing with system development charges, although other rulings on other types of exactions (e.g., land dedication requirements) are relevant. In one of the most important exaction cases, the U. S. Supreme Court found that a government agency imposing exactions on development must demonstrate an "essential nexus" between the exaction and the interest being protected (see *Nollan v. California Coastal Commission,* 1987). In a more recent case (*Dolan v. City of Tigard, OR,* 1994), the Court ruled that an exaction must also be "roughly proportional" to the burden created by development. However, the *Dolan* decision appeared to set a higher standard of review for mandatory dedications of land than for monetary exactions such as system development charges.

There are three reasonable relationship requirements for system development charges that are closely related to "rational nexus", or "reasonable relationship" requirements enunciated by a number of state courts. Although the term "dual rational nexus" is often used to characterize the standard by which courts evaluate the validity of system development charges under the U.S. Constitution, we prefer a more rigorous formulation that recognizes three elements: "need," "benefit," and "proportionality." The dual rational nexus test explicitly addresses only the first two, although proportionality is reasonably implied, and was specifically mentioned by the U.S. Supreme Court in the *Dolan* case. Individual elements of the nexus standard are discussed further in the following paragraphs.

All new development in a community creates additional demands on some, or all, public facilities provided by local government. If the capacity of facilities is not increased to satisfy that additional demand, the

quality or availability of public services for the entire community will deteriorate. System development charges may be used to recover the cost of development-related facilities, but only to the extent that the need for facilities is a consequence of development that is subject to the fees. The *Nollan* decision reinforced the principle that development exactions may be used only to mitigate conditions created by the developments upon which they are imposed. That principle clearly applies to system development charges. In this study, the impact of development on infrastructure needs is analyzed in terms of quantifiable relationships between various types of development and the demand for specific capital facilities, based on applicable level-of-service standards.

The requirement that exactions be proportional to the impacts of development was clearly stated by the U.S. Supreme Court in the *Dolan* case and is logically necessary to establish a proper nexus. Proportionality is established through the procedures used to identify development-related facility costs, and in the methods used to calculate system development charges for various types of facilities and categories of development. The demand for capital facilities is measured in terms of relevant and measurable attributes of development (e.g., a typical housing unit's average weekday vehicle trips).

A sufficient benefit relationship requires that system development charge revenues be segregated from other funds and expended only on the facilities for which the fees were charged. System development charges must be expended in a timely manner and the facilities funded by the fees must serve the development paying the fees. However, nothing in the U.S. Constitution or the state enabling legislation requires that facilities funded with fee revenues be available *exclusively* to development paying the fees. In other words, benefit may extend to a general area including multiple real estate developments. Procedures for the earmarking and expenditure of fee revenues are discussed near the end of this study. All of these procedural as well as substantive issues are intended to ensure that new development benefits from the system development charges they are required to pay. The authority and procedures to implement system development charges is separate from and complementary to the authority to require improvements as part of subdivision or zoning review.

As documented in this report, the City of Springfield has complied with applicable legal precedents. System development charges are proportionate and reasonably related to the capital improvement demands of new development. Specific costs have been identified using local data and current dollars. With input from City staff, TischlerBise identified demand indicators for each type of infrastructure and calculated proportionate share factors to allocate costs by type of development. This report documents the formulas and input variables used to calculate the system development charges for each type of public facility. System development charge methodologies also identify the extent to which new development is entitled to various types of credits to avoid potential double payment of growth-related capital costs.

General Methodologies

There are three general methodologies for calculating system development charges. The choice of a particular methodology depends primarily on the timing of infrastructure construction (past, concurrent, or future) and service characteristics of the facility type being addressed. Each methodology has advantages and disadvantages in a particular situation, and can be used simultaneously for different cost components.

Reduced to its simplest terms, the process of calculating system development charges involves two main steps: (1) determining the cost of development-related capital improvements and (2) allocating those costs equitably to various types of development. In practice, though, the calculation of system development charges can become quite complicated because of the many variables involved in defining the relationship between development and the need for facilities within the designated service area. The following paragraphs discuss three basic methodologies for calculating system development charges and how those methodologies can be applied.

Cost Recovery (Past Improvements)

The rationale for recoupment, often called cost recovery, is that future development is paying for its share of the useful life and remaining capacity of facilities already built, or land already purchased, from which future development will benefit. This methodology is often used for utility systems that must provide adequate capacity before future development can take place.

Incremental Expansion (Concurrent Improvements)

The incremental expansion methodology documents current level-of-service (LOS) standards for each type of public facility, using both quantitative and qualitative measures. This approach assumes there are no deficiencies or surplus capacity in existing infrastructure, and future development is paying only its proportionate share for growth-related infrastructure. Revenue will be used to expand or provide additional facilities, as needed, to accommodate future development. An incremental expansion cost methodology is best suited for public facilities that will be expanded in regular increments to keep pace with development.

Plan-Based (Future Improvements)

The plan-based methodology allocates costs for a specified set of improvements to a specified amount of development. Improvements are typically identified in a long-range facility plan and development potential is identified by a land use plan. There are two options for determining the cost per demand unit: (1) total cost of a public facility can be divided by total demand units (average cost), or (2) the growth-share of the public facility cost can be divided by the net increase in demand units over the planning timeframe (marginal cost).

CONCEPTUAL SYSTEM DEVELOPMENT CHARGE CALCULATION

In contrast to project-level improvements, system development charges fund growth-related infrastructure that will benefit multiple development projects, or the entire jurisdiction (referred to as system improvements). The first step is to determine an appropriate demand indicator for the particular type of infrastructure. The demand indicator measures the number of demand units for each unit of development. For example, an appropriate indicator of the demand for park facilities is population growth, and the increase in population can be estimated from the average number of residents per housing unit. The second step in the system development charge formula is to determine infrastructure units per demand unit, typically called level-of-service (LOS) standards. In keeping with the parks example, a common LOS standard is park amenities per resident. The third step in the system development charge formula is the cost of various infrastructure units. To complete the parks example, this part of the formula would establish the cost for purchasing and/or constructing new park amenities.

CREDITS

Regardless of the methodology, a consideration of credits is integral to the development of a legally defensible system development charge. There are two types of credits that should be addressed in system development charge studies and ordinances. The first is a revenue credit due to possible double payment situations, which could occur when other revenues may contribute to the capital costs of infrastructure covered by the system development charge. This type of credit is integrated into the fee calculation, thus reducing the fee amount. The second is a site-specific credit or developer reimbursement for dedication of land or construction of system improvements. This type of credit is addressed in the administration and implementation of the development fee program. For ease of administration, TischlerBise normally recommends developer reimbursements for system improvements.

PROPOSED FEE METHODOLOGIES AND COST COMPONENTS

Shown below, Figure 1 summarizes the methodologies and cost allocation components used for each infrastructure category in Springfield's system development charge report. Parks costs were allocated to residential development, while Fire and Police costs were allocated to both residential and nonresidential development. Population was used as the cost allocation factor for residential development, while nonresidential vehicle trips were used as the cost allocation factors for nonresidential development. General Government costs were allocated to population and employment. Transportation costs are allocated to vehicle miles of travel. Utility costs are allocated on a per single family equivalent dwelling unit basis and converted to a per meter charge.

Figure 1: Proposed System Development Charge Methodologies and Cost Components

Infrastructure Category	Service Area	Cost Recovery	Incremental Expansion	Plan-Based	Cost Allocation
General Government	Citywide	N/A	General Government Facilities	N/A	Population, Jobs
Fire	Citywide	N/A	Fire Facilities, Fire Apparatus	N/A	Population, Nonres. Vehicle Trips
Parks	Citywide	N/A	Park Improvements	N/A	Population
Police	Citywide	N/A	Police Facilities, Police Vehicles	N/A	Population, Nonres. Vehicle Trips
Transportation	Citywide	N/A	Street Improvements	N/A	VMT
Water	Citywide	Water System Iinvestment	N/A	N/A	EDU
Wastewater	Citywide	N/A	N/A	Wastewater Capacity Upgrades	EDU

SYSTEM DEVELOPMENT CHARGE SCHEDULE

System development charges for residential development will be assessed per dwelling unit, based on the type of unit. Nonresidential system development charges will be assessed per square foot of floor area, according to four general types of development. Utility system development charges will be assessed by

meter size. The fees shown in Figures 2 and 3 represent the maximum allowable system development charges – the proposed system development charges fund 100 percent of growth-related infrastructure. Springfield may adopt system development charges that are less than the amounts shown; however, a reduction in system development charge revenue will necessitate an increase in other revenues, a decrease in planned capital improvements and/or a decrease in Springfield's LOS standards. All costs in the system development charge study are in current dollars with no assumed inflation rate over time. If cost estimates change significantly over time, system development charges should be recalculated.

Maximum Allowable System Development Charges

Figures 2 and 3 summarize the maximum allowable system development charges for future development in Springfield. The amounts shown are based on the methodologies, levels of service, and costs for the capital improvements identified in this report. The fees represent the highest amount feasible for each type of applicable development, which represent future development's fair share of the system improvement costs detailed in this report. Springfield may adopt amounts that are lower than the maximum amounts shown; however, a reduction in fee revenue will necessitate an increase in other revenues, a decrease in planned capital expenditures, and/or a decrease in Springfield's level of service.

Figure 2: Maximum Allowable Non-Utility System Development Charges

Residential Development	Fees per Unit					
Development Type	General Government	Fire	Parks	Police	Transportation	Total
Single Family	$1,198	$1,110	$792	$760	$5,250	**$9,110**
Multi-Family	$901	$835	$596	$572	$2,199	**$5,102**

Nonresidential Development	Fees per 1,000 Square Feet					
Development Type	General Government	Fire	Parks	Police	Transportation	Total
Industrial	$558	$316	$0	$206	$949	**$2,030**
Commercial	$1,023	$2,293	$0	$1,496	$7,058	**$11,871**
Office & Other Service	$1,568	$1,018	$0	$664	$3,053	**$6,303**
Institutional	$1,376	$667	$0	$435	$2,002	**$4,481**

Figure 3: Maximum Allowable Utility System Development Charges

Meter Size and Type		Water	Wastewater	Total
0.75	Displacement	**$1,270**	**$4,778**	**$6,048**
1.00	Displacement	**$2,121**	**$7,979**	**$10,100**
1.50	Displacement	**$4,229**	**$15,910**	**$20,139**
2.00	Displacement	**$6,769**	**$25,466**	**$32,235**
3.00	Singlejet	**$13,551**	**$50,980**	**$64,531**
3.00	Compound	**$13,551**	**$50,980**	**$64,531**
3.00	Turbine	**$14,821**	**$55,757**	**$70,578**
4.00	Singlejet	**$21,171**	**$79,647**	**$100,818**
4.00	Compound	**$21,171**	**$79,647**	**$100,818**
4.00	Turbine	**$26,670**	**$100,335**	**$127,005**
6.00	Singlejet	**$42,329**	**$159,246**	**$201,575**
6.00	Compound	**$42,329**	**$159,246**	**$201,575**
6.00	Turbine	**$55,029**	**$207,024**	**$262,053**
8.00	Compound	**$67,729**	**$254,803**	**$322,532**
8.00	Turbine	**$118,529**	**$445,916**	**$564,445**
10.00	Turbine	**$177,800**	**$668,898**	**$846,698**
12.00	Turbine	**$224,371**	**$844,102**	**$1,068,473**

1. AWWA Manual of Water Supply Practices M-1, 7th Edition

A note on rounding: Calculations throughout this report are based on an analysis conducted using Excel software. Most results are discussed in the report using one-, two-, and three-digit places, which represent rounded figures. However, the analysis itself uses figures carried to their ultimate decimal places; therefore, the sums and products generated in the analysis may not equal the sum or product if the reader replicates the calculation with the factors shown in the report (due to the rounding of figures shown, not in the analysis).

GENERAL GOVERNMENT SYSTEM DEVELOPMENT CHARGES

METHODOLOGY

The General Government system development charge includes components for general government facilities. General Government system development charges use the incremental expansion methodology for general government facilities. Costs are allocated to both residential and nonresidential development using different demand indicators for each type of development.

PROPORTIONATE SHARE

TischlerBise recommends functional population to allocate the cost of general government infrastructure to residential and nonresidential development. Functional population is similar to what the U.S. Census Bureau calls "daytime population," by accounting for people living and working in a jurisdiction, but also considers commuting patterns and time spent at home and at nonresidential locations. OnTheMap is a web-based mapping and reporting application that shows where workers are employed and where they live. It describes geographic patterns of jobs by their employment locations and residential locations as well as the connections between the two locations. OnTheMap was developed through a unique partnership between the U.S. Census Bureau and its Local Employment Dynamics (LED) partner states.

Residents that do not work are assigned 20 hours per day to residential development and four hours per day to nonresidential development (annualized averages). Residents employed in Springfield are assigned 14 hours to residential development and 10 hours to nonresidential development. Residents employed outside Springfield are assigned 14 hours to residential development. Inflow commuters are assigned 10 hours to nonresidential development. Based on 2018 functional population data, the residential allocation is 63 percent, and the nonresidential allocation is 37 percent.

Figure GG1: Functional Population

Demand Units in 2018					
Residential				Demand Hours/Day	Person Hours
	Population	15,899			
	Residents Not Working	7,835		20	156,700
	Employed Residents	8,064			
	Residents Employed in Springfield		2,282	14	31,948
	Residents Employed outside Springfield		5,782	14	80,948
				Residential Subtotal	269,596
				Residential Share	**63%**
Nonresidential					
	Residents Not Working	7,835		4	31,340
	Jobs Located in Springfield	12,802			
	Residents Employed in Springfield		2,282	10	22,820
	Non-Resident Workers (Inflow Commuters)		10,520	10	105,200
				Nonresidential Subtotal	159,360
				Nonresidential Share	**37%**
				Total	428,956

Source: U.S. Census Bureau, OnTheMap 6.1.1 Application and LEHD Origin-Destination Employment Statistics.

SERVICE UNITS

Residential system development charges are calculated on a per capita basis, then converted to an appropriate amount for each type of housing unit based on the number of persons per housing unit (PPHU). As shown in Figure GG2, the current PPHU factors are 2.46 persons per single-family unit and 1.85 persons per multi-family unit. These factors are based on the U.S. Census Bureau's 2015-2019 American Community Survey 5-year estimates (further discussed in Appendix A).

Nonresidential general government system development charges are calculated on a per job basis, then converted to an appropriate amount for each type of nonresidential development based on the number of jobs per 1,000 square feet of floor area. As shown below, the current jobs per 1,000 square feet of floor area are 1.16 jobs for industrial, 2.12 jobs for commercial, 3.26 jobs for office and other service, and 2.86 jobs for institutional. These factors are defined in *Trip Generation, 11th Edition*, published in 2021 by the Institute of Transportation Engineers (further discussed in Appendix A).

Figure GG2: Service Units

Development Type	Persons per Housing Unit[1]
Single Family	2.46
Multi-Family	1.85

Development Type	Jobs per 1,000 Sq Ft[1]
Industrial	1.16
Commercial	2.12
Office & Other Service	3.26
Institutional	2.86

1. See Land Use Assumptions

General Government Facilities – Incremental Expansion

The City of Springfield plans to expand its current inventory of general government facilities to serve future development. As shown in Figure GG3, Springfield's existing general government facilities total 28,688 square feet. Functional population provides the proportionate share of demand for general government facilities from residential and nonresidential development. Springfield's existing general government facilities level of service for residential development is 0.9364 square feet per person (28,688 square feet X 63 percent residential share / 19,301 persons) and nonresidential general government facilities level of service is 0.9263 square feet per job (28,688 square feet X 37 percent nonresidential share / 11,459 jobs).

Construction of general government facilities is estimated to cost $520 per square foot. For general government facilities, the cost is $486.93 per person (0.9364 square feet per person X $520 per square foot) and $481.68 per job (0.9263 square feet per job X $520 per square foot).

Figure GG3: General Government Facilities Level of Service

Description	Square Feet
City Hall	16,388
Public Works Building	12,300
Total	**28,688**

Cost Allocation Factors	
Cost per Square Foot	$520

Level-of-Service (LOS) Standards	
Existing Square Feet	28,688
Residential	
Residential Share	63%
2021 Population	19,301
Square Feet per Person	0.9364
Cost per Person	**$486.93**
Nonresidential	
Nonresidential Share	37%
2021 Jobs	11,459
Square Feet per Job	0.9263
Cost per Job	**$481.68**

Source: Springfield, Tennessee

PROJECTED DEMAND FOR GROWTH-RELATED GENERAL GOVERNMENT INFRASTRUCTURE

To accommodate projected development over the next ten years, Springfield will construct additional general government facilities as development occurs. Figure GG4 demonstrates growth-related demand for general government facilities.

General Government Facilities

Shown in Figure GG4, Springfield's population is projected to increase by 5,187 persons by 2031, and jobs are projected to increase by 3,403 during the same period. Using the 2021 LOS, future residential development will demand 4,857 additional square feet of general government facilities (5,187 additional persons X 0.9364 square feet per person) and future nonresidential development will demand 3,152 additional square feet of general government facilities (3,403 additional jobs X 0.9263 square feet per job). Based on demand for approximately 8,010 square feet of new general government facilities and an average cost of $520 per square foot the growth-related expenditure of general government facilities is $4,165,135.

Figure GG4: Growth-Related Demand for General Government Facilities

Type of Infrastructure	Level of Service	Demand Unit	Cost per Sq Ft
General Government Facilities	0.9364 Square Feet	per Person	$520
	0.9263 Square Feet	per Job	

Demand for General Government Facilities					
Year	Population	Jobs	Square Feet		
			Residential	Nonresidential	Total
2021	19,301	11,459	18,073	10,615	28,688
2022	19,819	11,799	18,559	10,930	29,489
2023	20,338	12,140	19,045	11,245	30,290
2024	20,857	12,480	19,531	11,560	31,091
2025	21,376	12,820	20,016	11,876	31,892
2026	21,894	13,161	20,502	12,191	32,693
2027	22,413	13,501	20,988	12,506	33,494
2028	22,932	13,841	21,474	12,821	34,295
2029	23,451	14,182	21,959	13,136	35,096
2030	23,969	14,522	22,445	13,452	35,897
2031	24,488	14,862	22,931	13,767	36,698
10-Yr Increase	**5,187**	**3,403**	**4,857**	**3,152**	**8,010**

Total Growth-Related Expenditures	**$4,165,135**

MAXIMUM ALLOWABLE GENERAL GOVERNMENT SYSTEM DEVELOPMENT CHARGES

Infrastructure components and cost factors used to calculate maximum allowable general government system development charges are summarized in the upper portion of Figure GG5. Residential fees are calculated using a cost of $486.93 per person and the average number of persons per housing unit. Nonresidential fees are calculated using a cost of $481.68 per job and the number of jobs per 1,000 square feet of floor area.

Maximum allowable general government system development charges for residential development are assessed according to the number of persons per housing unit. For a single-family unit, the fee of $1,198 is calculated using a cost of $486.93 per person multiplied by 2.46 persons per housing unit.

Maximum allowable general government system development charges for nonresidential development are assessed according to the number of jobs per 1,000 square feet of floor area. For industrial development, the fee of $558 per 1,000 square feet of floor area is calculated using a cost of $481.68 per job multiplied by 1.16 jobs per 1,000 square feet of floor area.

Figure GG5: Maximum Allowable General Government System Development Charges

Fee Component	Cost per Person	Cost per Job
General Government Facilities	$486.93	$481.68
Total	**$486.93**	**$481.68**

Residential Development	Fees per Unit	
Development Type	Persons per Housing Unit[1]	Proposed Fees
Single Family	2.46	**$1,198**
Multi-Family	1.85	**$901**

Nonresidential Development	Fees per 1,000 Square Feet	
Development Type	Jobs per 1,000 Sq Ft[1]	Proposed Fees
Industrial	1.16	**$558**
Commercial	2.12	**$1,023**
Office & Other Service	3.26	**$1,568**
Institutional	2.86	**$1,376**

1. See Land Use Assumptions

PROJECTED GENERAL GOVERNMENT SYSTEM DEVELOPMENT CHARGE REVENUE

Revenue projections assume implementation of the maximum allowable general government system development charges and that development over the next ten years is consistent with the development projections in Appendix A. To the extent the rate of development either accelerates or slows down, there will be a corresponding change in the system development charge revenue. As shown in Figure GG6, projected fee revenue equals $4.16 million over the next ten years compared to projected expenditures of $4.16 million.

Figure GG6: Projected General Government System Development Charge Revenue

Fee Component	Growth Share	Existing Share	Total
General Government Facilities	$4,165,135	$0	$4,165,135
Total	**$4,165,135**	**$0**	**$4,165,135**

Year		Single Family $1,198 per unit	Multi-Family $901 per unit	Industrial $558 per KSF	Commercial $1,023 per KSF	Office & Other $1,568 per KSF	Institutional $1,376 per KSF
		Hsg Unit	Hsg Unit	KSF	KSF	KSF	KSF
Base	2021	5,777	1,799	3,508	1,200	472	1,159
Year 1	2022	5,945	1,856	3,613	1,235	486	1,193
Year 2	2023	6,113	1,913	3,717	1,271	500	1,228
Year 3	2024	6,281	1,970	3,821	1,307	514	1,262
Year 4	2025	6,449	2,027	3,925	1,342	528	1,297
Year 5	2026	6,617	2,084	4,029	1,378	542	1,331
Year 6	2027	6,785	2,141	4,134	1,414	556	1,366
Year 7	2028	6,953	2,198	4,238	1,449	570	1,400
Year 8	2029	7,121	2,255	4,342	1,485	584	1,434
Year 9	2030	7,289	2,312	4,446	1,520	598	1,469
Year 10	2031	7,457	2,369	4,550	1,556	612	1,503
10-Year Increase		1,680	570	1,042	356	140	344
Projected Revenue		**$2,012,402**	**$513,472**	**$581,230**	**$364,646**	**$219,732**	**$473,653**

Projected Fee Revenue	$4,165,135
Existing Development Share	$0
Total Expenditures	$4,165,135

FIRE SYSTEM DEVELOPMENT CHARGES

METHODOLOGY

The Fire system development charge includes components for fire facilities and fire apparatus. Fire system development charges use the incremental expansion methodology for fire facilities and fire apparatus. Costs are allocated to both residential and nonresidential development using different demand indicators for each type of development.

PROPORTIONATE SHARE

TischlerBise recommends functional population to allocate the cost of fire infrastructure to residential and nonresidential development. Functional population is similar to what the U.S. Census Bureau calls "daytime population," by accounting for people living and working in a jurisdiction, but also considers commuting patterns and time spent at home and at nonresidential locations. OnTheMap is a web-based mapping and reporting application that shows where workers are employed and where they live. It describes geographic patterns of jobs by their employment locations and residential locations as well as the connections between the two locations. OnTheMap was developed through a unique partnership between the U.S. Census Bureau and its Local Employment Dynamics (LED) partner states.

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Figure F1: Functional Population

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Source: U.S. Census Bureau, OnTheMap 6.1.1 Application and LEHD Origin-Destination Employment Statistics.

SERVICE UNITS

Residential system development charges are calculated on a per capita basis, then converted to an appropriate amount for each type of housing unit based on the number of persons per housing unit (PPHU). As shown in Figure F2, the current PPHU factors are 2.46 persons per single-family unit and 1.85 persons per multi-family unit. These factors are based on the U.S. Census Bureau's 2015-2019 American Community Survey 5-year estimates (further discussed in Appendix A).

Nonresidential Fire system development charges are calculated on a per vehicle trip basis, then converted to an appropriate amount for each type of nonresidential development based on the number of vehicle trip ends generated per 1,000 square feet of floor area. Trip generation rates are used because vehicle trips are highest for retail developments, such as shopping centers, and lowest for industrial development. Office and institutional trip rates fall between the other two categories. This ranking of trip rates is consistent with the relative demand for public safety services from nonresidential development. Other possible nonresidential demand indicators, such as employment or floor area, will not accurately reflect the demand for service. For example, if employees per thousand square feet were used as the demand indicator, public safety development fees would be disproportionately high for office and institutional development because offices typically have more employees per 1,000 square feet than retail uses. If floor area were used as the demand indicator, public safety development fees would be disproportionately high for industrial development.

A trip end represents a vehicle either entering or exiting a development (as if a traffic counter were placed across a driveway). Trip ends for nonresidential development are calculated per thousand square feet and require an adjustment factor to avoid double counting each trip at both the origin and destination points. As shown below, the current vehicle trip generation factors per 1,000 square feet of floor area are 1.69 trips for industrial, 12.21 trips for commercial, 5.42 trips for office and other service, and 3.55 trips for institutional. These factors are defined in *Trip Generation, 11th Edition*, published in 2021 by the Institute of Transportation Engineers (further discussed in Appendix A).

Figure F2: Service Units

Development Type	Persons per Housing Unit[1]
Single Family	2.46
Multi-Family	1.85

Development Type	Avg Wkdy Veh Trip Ends[1]	Trip Rate Adjustment	Average Weekday Vehicle Trips
Industrial	3.37	50%	1.69
Commercial	37.01	33%	12.21
Office & Other Service	10.84	50%	5.42
Institutional	10.77	33%	3.55

1. See Land Use Assumptions

FIRE FACILITIES – INCREMENTAL EXPANSION

Springfield plans to expand its current inventory of fire facilities to serve future development. As shown in Figure F3, Springfield's existing fire stations total 17,250 square feet and 2.2 acres of land. Functional population provides the proportionate share of demand for fire facilities from residential and nonresidential development. Springfield's existing level of service for residential development is 0.5631 square feet per person (17,250 square feet X 63 percent residential share / 19,301 persons) and .0001 acres per person (2.2 acres X 63 percent residential share / 19,301 persons). The nonresidential level of service is 0.2343 square feet per trip (17,250 feet X 37 percent nonresidential share / 27,242 trips) and .00003 acres per trip (2.2 acres X 37 percent nonresidential share / 27,242 trips).

Construction of a new fire station is estimated to cost $520 per square foot– this results in a total facility cost of $5,200,000 based on the need for a 10,000 square foot station as outlined in information provided by the Springfield Fire Department. The cost of an acre of land is estimated at $175,000 based on information provided by the City. For fire facilities, the cost is $305.36 per person (0.5631 square feet per person X $520 per square foot + 0.0001 acres per person X $175,000 per acre) and $127.06 per non-residential trip (0.2343 square feet per trip X $520 per square foot + .00003 acres per trip X $175,000 per acre).

Figure F3: Fire Facilities Level of Service

Description	Square Feet	Acreage
Station 1	10,750	1.2
Station 2	6,500	1.0
Total	**17,250**	**2.2**

Cost Allocation Factors	
Cost per Square Foot	$520
Cost per Acre	$175,000

Level-of-Service (LOS) Standards	
Existing Square Feet	17,250
Existing Acreage	2.2
Residential	
Residential Share	63%
2021 Population	19,301
Square Feet per Person	0.5631
Acres per Person	0.0001
Cost per Person	**$305.36**
Nonresidential	
Nonresidential Share	37%
2021 Trips	27,242
Square Feet per Trip	0.2343
Acres per Trip	0.00003
Cost per Trip	**$127.06**

Source: Springfield, Tennessee

Fire Apparatus – Incremental Expansion

Springfield plans to expand its current inventory of fire apparatus to serve future development. As shown in Figure F4, Springfield's existing fleet includes 13 fire apparatus with an average replacement cost of $343,709 per apparatus. Functional population provides the proportionate share of demand for fire apparatus from residential and nonresidential development. Springfield's existing level of service for residential development is 0.0004 units per person (13 apparatus X 63 percent residential share / 19,301 persons). The nonresidential level of service is 0.0002 units per non-residential trip (13 apparatus X 37 percent nonresidential share / 27,242 trips).

Based on the total replacement cost of $4,468,215 for Springfield's existing 13 apparatus, the average replacement cost is $343,709 per unit. For fire apparatus, the cost is $145.85 per person (0.0004 units per person X $343,709 per unit) and $60.69 per non-residential trip (0.0002 units per trip X $343,709 per unit).

Figure F4: Fire Apparatus Level of Service

Description	Unit Cost
Engine 1	$700,000
Engine 2	$700,000
Engine 3	$700,000
Engine 4	$500,000
Tower 1	$1,400,000
Brush 1	$160,000
Support 1	$46,245
Support 2	$48,395
Car 1	$38,540
Car 2	$38,540
Car 3	$27,495
Rescue Trailer	$9,000
Mobile Cascade Trailer	$100,000
Total	**$4,468,215**

Cost Allocation Factors	
Cost per Unit	$343,709

Level-of-Service (LOS) Standards	
Existing Apparatus	13
Residential	
Residential Share	63%
2021 Population	19,301
Apparatus per Person	0.0004
Cost per Person	**$145.85**
Nonresidential	
Nonresidential Share	37%
2021 Trips	27,242
Apparatus per Trip	0.0002
Cost per Trip	**$60.69**

Source: Springfield, Tennessee

PROJECTED DEMAND FOR GROWTH-RELATED FIRE INFRASTRUCTURE

To accommodate projected development over the next ten years, Springfield will construct additional fire facilities and purchase additional apparatus as development occurs. Figure F5 demonstrates growth-related demand for fire facilities, and Figure F6 demonstrates growth-related demand for fire apparatus.

Fire Facilities

Shown in Figure F5, Springfield's population is projected to increase by 5,187 persons by 2031, and nonresidential vehicle trips are projected to increase by 8,090 during the same period. Using the 2021 LOS, future residential development will demand 2,921 additional square feet of fire facilities (5,187 additional persons X 0.5631 square feet per person), and future nonresidential development will demand 1,896 additional square feet of fire facilities (8,090 additional trips X 0.2343 square feet per trip). Additionally future residential development will demand 0.4 additional acres of land (5,187 additional persons X 0.0001 acres per person), and future nonresidential development will demand 0.2 additional acres of land (8,090 additional trips X 0.00003 acres per trip). Based on demand for approximately 4,816 square feet of new fire facilities and an average cost of $520 per square foot and 0.6 acres of additional land with a cost of $175,000 per acre the growth-related expenditure on fire facilities is $2,611,976.

Figure F5: Growth-Related Demand for Fire Facilities

Type of Infrastructure	Level of Service	Demand Unit	Cost per Acre
Fire Land	0.0001 Acres	per Person	$175,000
	0.00003 Acres	per Trip	

Type of Infrastructure	Level of Service	Demand Unit	Cost per Sq Ft
Fire Facilities	0.5631 Square Feet	per Person	$520
	0.2343 Square Feet	per Trip	

Demand for Fire Facilities								
Year	Population	Nonresidential Trips	Square Feet			Acreage		
			Residential	Nonresidential	Total	Residential	Nonresidential	Total
2021	19,301	27,242	10,867.5	6,382.5	17,250.0	1.4	0.8	2.2
2022	19,819	28,051	11,159.6	6,572.1	17,731.6	1.4	0.8	2.3
2023	20,338	28,860	11,451.7	6,761.6	18,213.3	1.5	0.9	2.3
2024	20,857	29,669	11,743.7	6,951.2	18,694.9	1.5	0.9	2.4
2025	21,376	30,478	12,035.8	7,140.7	19,176.5	1.5	0.9	2.4
2026	21,894	31,287	12,327.9	7,330.3	19,658.2	1.6	0.9	2.5
2027	22,413	32,096	12,620.0	7,519.8	20,139.8	1.6	1.0	2.6
2028	22,932	32,905	12,912.0	7,709.4	20,621.4	1.6	1.0	2.6
2029	23,451	33,714	13,204.1	7,898.9	21,103.0	1.7	1.0	2.7
2030	23,969	34,523	13,496.2	8,088.5	21,584.7	1.7	1.0	2.8
2031	24,488	35,332	13,788.3	8,278.0	22,066.3	1.8	1.1	2.8
10-Yr Increase	**5,187**	**8,090**	**2,921**	**1,896**	**4,816**	**0.4**	**0.2**	**0.6**

Total Growth-Related Expenditures	**$2,611,976**

Fire Apparatus

Shown in Figure F6, Springfield's population is projected to increase by 5,187 persons by 2031, and nonresidential vehicle trips are projected to increase by 8,090 during the same period. Using the 2021 LOS, future residential development will demand approximately 2.2 additional apparatus (5,187 additional persons X 0.0004 units per person), and future nonresidential development will demand approximately 1.4 additional apparatus (8,090 additional trips X 0.0002 units per trip). Based on demand for approximately 3.6 additional fire apparatus and an average cost of $343,709 per unit, the growth-related expenditure on fire apparatus is $1,247,554.

Figure F6: Growth-Related Demand for Fire Apparatus

Type of Infrastructure	Level of Service	Demand Unit	Cost per Unit
Fire Apparatus	0.0004 Units	per Person	$343,709
	0.0002 Units	per Trip	

Demand for Fire Apparatus					
Year	Population	Nonresidential Trips	Units		
			Residential	Nonresidential	Total
2021	19,301	27,242	8.2	4.8	13.0
2022	19,819	28,051	8.4	5.0	13.4
2023	20,338	28,860	8.6	5.1	13.7
2024	20,857	29,669	8.9	5.2	14.1
2025	21,376	30,478	9.1	5.4	14.5
2026	21,894	31,287	9.3	5.5	14.8
2027	22,413	32,096	9.5	5.7	15.2
2028	22,932	32,905	9.7	5.8	15.5
2029	23,451	33,714	10.0	6.0	15.9
2030	23,969	34,523	10.2	6.1	16.3
2031	24,488	35,332	10.4	6.2	16.6
10-Yr Increase	**5,187**	**8,090**	**2.2**	**1.4**	**3.6**

Total Growth-Related Expenditures	**$1,247,554**

MAXIMUM ALLOWABLE FIRE SYSTEM DEVELOPMENT CHARGES

Infrastructure components and cost factors used to calculate maximum allowable Fire system development charges are summarized in the upper portion of Figure F7. Residential fees are calculated using a cost of $451.21 per person and the average number of persons per housing unit. Nonresidential fees are calculated using a cost of $187.75 per job and the average number of jobs per 1,000 square feet of floor area.

Maximum allowable Fire system development charges for residential development are assessed according to the number of persons per housing unit. For a single-family unit, the fee of $1,110 is calculated using a cost of $451.21 per person multiplied by 2.46 persons per housing unit.

Maximum allowable Fire system development charges for nonresidential development are assessed according to the number of jobs per 1,000 square feet of floor area. For industrial development, the fee of $316 per 1,000 square feet of floor area is calculated using a cost of $187.75 per job multiplied by 1.69 jobs per 1,000 square feet of floor area.

Figure F7: Maximum Allowable Fire System Development Charges

Fee Component	Cost per Person	Cost per Trip
Fire Facilities	$305.36	$127.06
Fire Apparatus	$145.85	$60.69
Total	**$451.21**	**$187.75**

Residential Development	Fees per Unit	
Development Type	Persons per Housing Unit[1]	Proposed Fees
Single Family	2.46	**$1,110**
Multi-Family	1.85	**$835**

Nonresidential Development	Fees per 1,000 Square Feet	
Development Type	Vehicle Trips per 1,000 Sq Ft[1]	Proposed Fees
Industrial	1.69	**$316**
Commercial	12.21	**$2,293**
Office & Other Service	5.42	**$1,018**
Institutional	3.55	**$667**

1. See Land Use Assumptions

PROJECTED FIRE SYSTEM DEVELOPMENT CHARGE REVENUE

Revenue projections assume implementation of the maximum allowable Fire system development charges and that development over the next ten years is consistent with the development projections in Appendix A. To the extent the rate of development either accelerates or slows down, there will be a corresponding change in the system development charge revenue. As shown in Figure F8, projected fee revenue and expenditures equal $3.8 million over the next ten years.

Figure F8: Projected Fire System Development Charge Revenue

Fee Component	Growth Share	Existing Share	Total
Fire Facilities	$2,611,976	$0	$2,611,976
Fire Apparatus	$1,247,554	$0	$1,247,554
Total	**$3,859,531**	**$0**	**$3,859,531**

		Single Family $1,110 per unit	Multi-Family $835 per unit	Industrial $316 per KSF	Commercial $2,293 per KSF	Office & Other $1,018 per KSF	Institutional $667 per KSF
Year		Hsg Unit	Hsg Unit	KSF	KSF	KSF	KSF
Base	2021	5,777	1,799	3,508	1,200	472	1,159
Year 1	2022	5,945	1,856	3,613	1,235	486	1,193
Year 2	2023	6,113	1,913	3,717	1,271	500	1,228
Year 3	2024	6,281	1,970	3,821	1,307	514	1,262
Year 4	2025	6,449	2,027	3,925	1,342	528	1,297
Year 5	2026	6,617	2,084	4,029	1,378	542	1,331
Year 6	2027	6,785	2,141	4,134	1,414	556	1,366
Year 7	2028	6,953	2,198	4,238	1,449	570	1,400
Year 8	2029	7,121	2,255	4,342	1,485	584	1,434
Year 9	2030	7,289	2,312	4,446	1,520	598	1,469
Year 10	2031	7,457	2,369	4,550	1,556	612	1,503
10-Year Increase		1,680	570	1,042	356	140	344
Projected Revenue		**$1,864,748**	**$475,798**	**$329,634**	**$817,061**	**$142,603**	**$229,687**

Projected Fee Revenue	$3,859,531
Existing Development Share	$0
Total Expenditures	$3,859,531

PARKS SYSTEM DEVELOPMENT CHARGES

METHODOLOGY

The Parks system development charge includes components for park improvements. Parks system development charges use the incremental expansion methodology for park improvements. Costs are allocated only to residential development using different demand indicators for each type of development.

PROPORTIONATE SHARE

TischlerBise recommends allocating 100 percent of the cost of parks infrastructure to residential development since nonresidential development generates negligible demand for parks infrastructure.

SERVICE UNITS

Residential system development charges are calculated on a per capita basis, then converted to an appropriate amount for each type of housing unit based on the number of persons per housing unit (PPHU). As shown in Figure PR1, the current PPHU factors are 2.46 persons per single-family unit and 1.85 persons per multi-family unit. These factors are based on the U.S. Census Bureau's 2015-2019 American Community Survey 5-year estimates (further discussed in Appendix A).

Nonresidential system development charges are calculated on a per job basis, then converted to an appropriate amount for each type of nonresidential development based on the number of jobs per 1,000 square feet of floor area as reported by the Institute of Transportation Engineers. As shown below, the current employment factors per 1,000 square feet of floor area are 1.16 jobs for industrial, 2.12 jobs for commercial, 3.26 jobs for office and other service, and 2.86 jobs for institutional. These factors are defined in *Trip Generation, 11th Edition*, published in 2021 by the Institute of Transportation Engineers (further discussed in Appendix A).

Figure PR1: Service Units

Development Type	Persons per Housing Unit[1]
Single Family	2.46
Multi-Family	1.85

Development Type	Jobs per 1,000 Sq Ft[1]
Industrial	1.16
Commercial	2.12
Office & Other Service	3.26
Institutional	2.86

1. See Land Use Assumptions

PARK IMPROVEMENTS – INCREMENTAL EXPANSION

The City of Springfield plans to expand its current inventory of 111 park improvements to serve future development. The analysis allocates 100 percent of demand for park improvements to residential development. Springfield's existing level of service is 0.0058 improvements per person (111 improvements X 100 percent residential share / 19,301 persons).

Based on the total replacement cost of $6,212,000 for Springfield's existing 111 park improvements, the average replacement cost is $55,972 per improvement. For park improvements, the cost is $321.90 per person (0.0058 improvements per person X $55,972 per improvement).

Figure PR2: Park Improvements Level of Service

Description	Improvements	Unit Cost	Replacement Cost
Baseball/Softball Fields	5	$100,000	$500,000
Soccer Fields	6	$100,000	$600,000
Football Fields	1	$120,000	$120,000
Basketball Courts	1	$15,000	$15,000
Tennis Courts	6	$100,000	$600,000
Restrooms	16	$200,000	$3,200,000
Playgrounds	7	$50,000	$350,000
Splash Pad	1	$500,000	$500,000
Grills	8	$300	$2,400
Benches	26	$1,000	$26,000
Picnic Tables	33	$1,500	$49,500
Dog Parks	1	$250,000	$250,000
Total	**111**	**$55,972**	**$6,212,900**

Cost Allocation Factors	
Cost per Improvement	$55,972

Level-of-Service (LOS) Standards	
Existing Improvements	111
Residential	
Residential Share	100%
2021 Population	19,301
Improvements per Person	0.0058
Cost per Person	**$321.90**

Source: Springfield, Tennessee

PROJECTED DEMAND FOR GROWTH-RELATED PARKS INFRASTRUCTURE

To accommodate projected development over the next ten years, Springfield will construct additional park improvements as development occurs. Figure PR3 demonstrates growth-related demand for park improvements. Springfield's population is projected to increase by 5,187 persons by 2031. Using the 2021 LOS, future residential development will demand approximately 29.8 additional park improvements (5,187 additional persons X 0.0058 improvements per person). Based on demand for 29.8 park improvements and an average cost of $55,972 per improvement, the growth-related expenditure on park improvements is $1,669,791.

Figure PR3: Growth-Related Demand for Park Improvements

Type of Infrastructure	Level of Service	Demand Unit	Cost per Unit
Park Improvements	0.0058 Improvements	per Person	$55,972

Demand for Park Improvements					
Year	Population	Jobs	Improvements		
			Residential	Nonresidential	Total
2021	19,301	11,459	111.0	0.0	111.0
2022	19,819	11,799	114.0	0.0	114.0
2023	20,338	12,140	117.0	0.0	117.0
2024	20,857	12,480	119.9	0.0	119.9
2025	21,376	12,820	122.9	0.0	122.9
2026	21,894	13,161	125.9	0.0	125.9
2027	22,413	13,501	128.9	0.0	128.9
2028	22,932	13,841	131.9	0.0	131.9
2029	23,451	14,182	134.9	0.0	134.9
2030	23,969	14,522	137.8	0.0	137.8
2031	24,488	14,862	140.8	0.0	140.8
10-Yr Increase	**5,187**	**3,403**	**29.8**	**0.0**	**29.8**

Growth-Related Expenditures	**$1,669,791**

MAXIMUM ALLOWABLE PARKS SYSTEM DEVELOPMENT CHARGES

Infrastructure components and cost factors used to calculate maximum allowable Parks system development charges are summarized in the upper portion of Figure PR4. Residential fees are calculated using a cost of $321.90 per person and the average number of persons per housing unit. Maximum allowable Parks system development charges for residential development are assessed according to the number of persons per housing unit. For a single-family unit, the fee of $792 is calculated using a cost of $321.90 per person multiplied by 2.46 persons per housing unit.

Figure PR4: Maximum Allowable Parks System Development Charges

Fee Component	Cost per Person
Park Improvements	$321.90
Total	**$321.90**

Residential Development	Fees per Unit	
Development Type	Persons per Housing Unit[1]	Proposed Fees
Single Family	2.46	**$792**
Multi-Family	1.85	**$596**

1. See Land Use Assumptions

PROJECTED PARKS SYSTEM DEVELOPMENT CHARGE REVENUE

Revenue projections assume implementation of the maximum allowable Parks system development charges and that development over the next ten years is consistent with the development projections in Appendix A. To the extent the rate of development either accelerates or slows down, there will be a corresponding change in the system development charge revenue. As shown in Figure PR5, projected fee revenue equals $1.67 million over the next ten years compared to projected expenditures of $1.67 million.

Figure PR5: Projected Parks System Development Charge Revenue

Fee Component	Growth Share
Park Improvements	$1,669,791
Total	**$1,669,791**

		Single Family $792 per unit	Multi-Family $596 per unit
Year		Hsg Unit	Hsg Unit
Base	2021	5,777	1,799
Year 1	2022	5,945	1,856
Year 2	2023	6,113	1,913
Year 3	2024	6,281	1,970
Year 4	2025	6,449	2,027
Year 5	2026	6,617	2,084
Year 6	2027	6,785	2,141
Year 7	2028	6,953	2,198
Year 8	2029	7,121	2,255
Year 9	2030	7,289	2,312
Year 10	2031	7,457	2,369
10-Year Increase		1,680	570
Projected Revenue		**$1,330,347**	**$339,443**

Projected Fee Revenue	$1,669,791
Total Expenditures	$1,669,791

POLICE SYSTEM DEVELOPMENT CHARGES

METHODOLOGY

The Police system development charge includes components for police facilities, animal control facilities, police vehicles and animal control vehicles. Police system development charges use the incremental expansion methodology for police facilities and police vehicles. Costs are allocated to both residential and nonresidential development using different demand indicators for each type of development.

PROPORTIONATE SHARE

TischlerBise recommends functional population to allocate the cost of police infrastructure to residential and nonresidential development. Functional population is similar to what the U.S. Census Bureau calls "daytime population," by accounting for people living and working in a jurisdiction, but also considers commuting patterns and time spent at home and at nonresidential locations. OnTheMap is a web-based mapping and reporting application that shows where workers are employed and where they live. OnTheMap was developed through a unique partnership between the U.S. Census Bureau and its Local Employment Dynamics (LED) partner states.

Residents that do not work are assigned 20 hours per day to residential development and four hours per day to nonresidential development (annualized averages). Residents employed in Springfield are assigned 14 hours to residential development and 10 hours to nonresidential development. Residents employed outside Springfield are assigned 14 hours to residential development. Inflow commuters are assigned 10 hours to nonresidential development. Based on 2018 functional population data, the residential allocation is 63 percent, and the nonresidential allocation is 37 percent for police facilities and vehicles. For animal control facilities and vehicles, 100 percent of costs are allocated towards residential development.

Figure P1: Functional Population

Demand Units in 2018					
Residential				Demand Hours/Day	Person Hours
	Population	15,899			
	Residents Not Working	7,835		20	156,700
	Employed Residents	8,064			
	Residents Employed in Springfield		2,282	14	31,948
	Residents Employed outside Springfield		5,782	14	80,948
				Residential Subtotal	269,596
				Residential Share	**63%**
Nonresidential					
	Residents Not Working	7,835		4	31,340
	Jobs Located in Springfield	12,802			
	Residents Employed in Springfield		2,282	10	22,820
	Non-Resident Workers (Inflow Commuters)		10,520	10	105,200
				Nonresidential Subtotal	159,360
				Nonresidential Share	**37%**
				Total	428,956

Source: U.S. Census Bureau, OnTheMap 6.1.1 Application and LEHD Origin-Destination Employment Statistics.

SERVICE UNITS

Residential system development charges are calculated on a per capita basis, then converted to an appropriate amount for each type of housing unit based on the number of persons per housing unit (PPHU). As shown in Figure P2, the current PPHU factors are 2.46 persons per single-family unit and 1.85 persons per multi-family unit. These factors are based on the U.S. Census Bureau's 2015-2019 American Community Survey 5-year estimates (further discussed in Appendix A).

Nonresidential Police system development charges are calculated on a per vehicle trip basis, then converted to an appropriate amount for each type of nonresidential development based on the number of vehicle trip ends generated per 1,000 square feet of floor area. Trip generation rates are used because vehicle trips are highest for retail developments, such as shopping centers, and lowest for industrial development. Office and institutional trip rates fall between the other two categories. This ranking of trip rates is consistent with the relative demand for public safety services from nonresidential development. Other possible nonresidential demand indicators, such as employment or floor area, will not accurately reflect the demand for service. For example, if employees per thousand square feet were used as the demand indicator, public safety development fees would be disproportionately high for office and institutional development because offices typically have more employees per 1,000 square feet than retail uses. If floor area were used as the demand indicator, public safety development fees would be disproportionately high for industrial development.

A trip end represents a vehicle either entering or exiting a development (as if a traffic counter were placed across a driveway). Trip ends for nonresidential development are calculated per thousand square feet and require an adjustment factor to avoid double counting each trip at both the origin and destination points. As shown below, the current vehicle trip generation factors per 1,000 square feet of floor area are 1.69 trips for industrial, 12.21 trips for commercial, 5.42 trips for office and other service, and 3.55 trips for institutional. These factors are defined in *Trip Generation, 11th Edition*, published in 2021 by the Institute of Transportation Engineers (further discussed in Appendix A).

Figure P2: Service Units

Development Type	Persons per Housing Unit[1]
Single Family	2.46
Multi-Family	1.85

Development Type	Avg Wkdy Veh Trip Ends[1]	Trip Rate Adjustment	Average Weekday Vehicle Trips
Industrial	3.37	50%	1.69
Commercial	37.01	33%	12.21
Office & Other Service	10.84	50%	5.42
Institutional	10.77	33%	3.55

1. See Land Use Assumptions

POLICE FACILITIES – INCREMENTAL EXPANSION

Springfield plans to expand its current inventory of police facilities to serve future development. As shown in Figure P3, Springfield's existing police facilities total 12,964 square feet. Functional population provides the proportionate share of demand for police facilities from residential and nonresidential development. Springfield's existing police facilities level of service for residential development is 0.4232 square feet per person (12,964 square feet X 63 percent residential share / 19,301 persons) and nonresidential police facilities level of service is 0.1761 square feet per vehicle trip (12,964 square feet X 37 percent nonresidential share / 27,242 vehicle trips.

The construction of a replacement police station is estimated to cost $520 per square foot. For police facilities, the cost is $220.04 per person (0.4232 square feet of police facilities per person X $520 per square foot) and $91.56 per vehicle trip (0.1761 square feet per vehicle trip X $520 per square foot).

Figure P3: Police Facilities Level of Service

Description	Square Feet
Police Station	12,964

Cost Allocation Factors	
Police Station Cost per Square Foot	**$520**

Level-of-Service (LOS) Standards	
Existing Police Station Square Feet	12,964
Residential	
Residential Share of Police Facilities	63%
2021 Population	19,301
Police Square Feet per Person	0.4232
Cost per Person	**$220.04**
Nonresidential	
Nonresidential Share of Police Facilities	37%
2021 Vehicle Trips	27,242
Police Square Feet per Vehicle Trip	0.1761
Cost per Vehicle Trip	**$91.56**

Source: Springfield, Tennessee

ANIMAL CONTROL FACILITIES – INCREMENTAL EXPANSION

Springfield plans to expand animal control facilities to serve future development. As shown in Figure P4, Springfield's existing animal control facilities total 3,950 square feet. 100 percent of demand for animal control facilities is assessed on residential development. Springfield's existing residential level of service of animal control facilities .2047 square feet per person (3,950 square feet X 100 percent residential share / 19,301 persons).

Cost estimates for animal control facilities are based on RS Means data and result in a cost of $55 per square foot. For animal control facilities, the cost is $11.26 per person (0.2047 square feet of animal control facilities per person X $55 per square foot).

Figure P4: Animal Control Facilities Level of Service

Description	Square Feet
Animal Control	3,950

Cost Allocation Factors	
Animal Control Cost per Square Foot	**$55**

Level-of-Service (LOS) Standards	
Existing Animal Control Square Feet	3,950
Residential	
Residential Share of Animal Control Facilities	100%
2021 Population	19,301
Animal Control Square Feet per Person	0.2047
Cost per Person	**$11.26**

Source: Springfield, Tennessee

POLICE VEHICLES – INCREMENTAL EXPANSION

Springfield will purchase additional police vehicles to serve future development. As shown in Figure P5, Springfield's existing fleet includes 48 police vehicles with an average replacement cost of $47,470 per vehicle. Functional population provides the proportionate share of demand for police vehicles from residential and nonresidential development. Springfield's existing level of service for residential development is 0.0016 police units per person (48 police vehicles X 63 percent residential share / 19,301 persons) and nonresidential level of service is 0.0007 police units per vehicle trip (48 police vehicles X 37 percent nonresidential share / 27,242 vehicle trips).

Based on estimates from Springfield's Police Department, the average cost is $47,470 per police unit. For police vehicles, the cost is $74.38 per person (0.0016 police units per person X $47,470 per unit) and $30.95 per vehicle trip (0.0007 police units per vehicle trip X $47,470 per).

Figure P5: Police Vehicles Level of Service

Description	Units
Police Vehicles	48

Cost Allocation Factors	
Cost per Patrol Vehicle	$47,470

Level-of-Service (LOS) Standards	
Existing Units	48
Residential	
Residential Share	63%
2021 Population	19,301
Police Vehicles per Person	0.0016
Cost per Person	**$74.38**
Nonresidential	
Nonresidential Share	37%
2021 Vehicle Trips	27,242
Units per Vehicle Trip	0.0007
Cost per Vehicle Trip	**$30.95**

Source: Springfield, Tennessee

ANIMAL CONTROL VEHICLES – INCREMENTAL EXPANSION

Springfield will purchase additional animal control vehicles to serve future development. As shown in Figure P6, Springfield's existing fleet includes 2 animal control vehicles with an average replacement cost of $33,000 per vehicle. 100 percent of animal control vehicle demand growth is proportioned to residential development. Springfield's existing level of service for residential development is .0001 animal control units per person (2 animal control vehicles X 100 percent residential share / 19,301 persons).

Based on estimates from Springfield's Police Department, the average cost is $33,000 per animal control unit. For animal control vehicles, the cost is $3.42 per person (0.0001 animal control units per person X $33,000 per unit).

Figure P6: Animal Control Vehicles Level of Service

Description	Units
Animal Control Vehicles	2

Cost Allocation Factors	
Cost per Animal Control Vehicle	$33,000

Level-of-Service (LOS) Standards	
Existing Units	2
Residential	
Residential Share	100%
2021 Population	19,301
Animal Control Vehicles per Person	0.0001
Cost per Person	**$3.42**

PROJECTED DEMAND FOR GROWTH-RELATED POLICE INFRASTRUCTURE

To accommodate projected development over the next ten years, Springfield will construct additional police facilities, animal control facilities, purchase additional police vehicles, and purchase additional animal control vehicles as development occurs. Figure P7 demonstrates growth-related demand for police facilities, Figure P8 demonstrates growth-related demand for animal control facilities, Figure P9 demonstrates growth-related demand for police vehicles, and Figure P10 demonstrates growth-related demand for animal control vehicles.

Police Facilities

Shown in Figure P7, Springfield's population is projected to increase by 5,187 persons by 2031, and nonresidential vehicle trips are projected to increase by 8,090 vehicle trips during the same period. Using the 2021 LOS, future residential development will demand 2,195 additional square feet of police facilities (5,187 additional persons X 0.4232 police square feet per person) and future nonresidential development will demand 1,425 additional square feet of police facilities (8,090 additional vehicle trips X 0.1761 police square feet per vehicle trip). Based on demand for approximately 3,620 square feet of new police facilities and an average cost of $520 per square foot the growth-related expenditure on police facilities is $1,882,209.

Figure P7: Growth-Related Demand for Police Facilities

Type of Infrastructure	Level of Service	Demand Unit	Cost per Sq Ft
Police Facilities	0.4232 Square Feet	per Person	$520
	0.1761 Square Feet	per Vehicle Trip	

Demand for Police Facilities					
Year	Population	Vehicle Trips	Police Station Square Feet		
			Residential	Nonresidential	Total
2021	19,301	27,242	8,167	4,797	12,964
2022	19,819	28,051	8,387	4,939	13,326
2023	20,338	28,860	8,606	5,082	13,688
2024	20,857	29,669	8,826	5,224	14,050
2025	21,376	30,478	9,045	5,367	14,412
2026	21,894	31,287	9,265	5,509	14,774
2027	22,413	32,096	9,484	5,651	15,136
2028	22,932	32,905	9,704	5,794	15,498
2029	23,451	33,714	9,923	5,936	15,860
2030	23,969	34,523	10,143	6,079	16,222
2031	24,488	35,332	10,362	6,221	16,584
10-Yr Increase	**5,187**	**8,090**	**2,195**	**1,425**	**3,620**

Growth-Related Expenditures	**$1,882,209**

Animal Control Facilities

Shown in Figure P8, Springfield's population is projected to increase by 5,187 persons by 2031, and nonresidential vehicle trips are projected to increase by 8,090 vehicle trips during the same period. Using the 2021 LOS, future residential development will demand 1,062 additional square feet of animal control facilities (5,187 additional persons X 0.2047 animal control square feet per person). Based on demand for approximately 1,062 square feet of new animal control facilities and an average cost of $55 per square foot, the growth-related expenditure on police facilities is $58,389.

Figure P8: Growth-Related Demand for Animal Control Facilities

Type of Infrastructure	Level of Service	Demand Unit	Cost per Sq Ft
Animal Control Facilities	0.2047 Square Feet	per Person	$55

Demand for Animal Control Facilities					
Year	Population	Vehicle Trips	Animal Control Facilities Square Feet		
			Residential	Nonresidential	Total
2021	19,301	27,242	3,950	0	3,950
2022	19,819	28,051	4,056	0	4,056
2023	20,338	28,860	4,162	0	4,162
2024	20,857	29,669	4,268	0	4,268
2025	21,376	30,478	4,375	0	4,375
2026	21,894	31,287	4,481	0	4,481
2027	22,413	32,096	4,587	0	4,587
2028	22,932	32,905	4,693	0	4,693
2029	23,451	33,714	4,799	0	4,799
2030	23,969	34,523	4,905	0	4,905
2031	24,488	35,332	5,012	0	5,012
10-Yr Increase	**5,187**	**8,090**	**1,062**	**0**	**1,062**

Growth-Related Expenditures	**$58,389**

Police Vehicles

Shown in Figure P9, Springfield's population is projected to increase by 5,187 persons by 2031, and vehicle trips are projected to increase by 8,090 vehicle trips during the same period. Using the 2021 LOS, future residential development will demand approximately 8.1 additional police vehicles (5,187 additional persons X 0.0016 units per person), and future nonresidential development will demand approximately 5.3 additional police vehicles (8,090 additional vehicle trips X 0.0007 units per vehicle trip). Based on demand for approximately 13.4 additional police vehicles and an average cost of $47,470 per unit, the growth-related expenditure on police vehicles is $636,189.

Figure P9: Growth-Related Demand for Police Vehicles

Type of Infrastructure	Level of Service	Demand Unit	Cost per Unit
Police Vehicles	0.0016 Units	per Person	$47,470
	0.0007 Units	per Vehicle Trip	

Demand for Police Vehicles					
Year	Population	Vehicle Trips	Police Vehicles		
			Residential	Nonresidential	Total
2021	19,301	27,242	30.2	17.8	48.0
2022	19,819	28,051	31.1	18.3	49.3
2023	20,338	28,860	31.9	18.8	50.7
2024	20,857	29,669	32.7	19.3	52.0
2025	21,376	30,478	33.5	19.9	53.4
2026	21,894	31,287	34.3	20.4	54.7
2027	22,413	32,096	35.1	20.9	56.0
2028	22,932	32,905	35.9	21.5	57.4
2029	23,451	33,714	36.7	22.0	58.7
2030	23,969	34,523	37.6	22.5	60.1
2031	24,488	35,332	38.4	23.0	61.4
10-Yr Increase	**5,187**	**8,090**	**8.1**	**5.3**	**13.4**

Growth-Related Expenditures	**$636,189**

Animal Control Vehicles

Shown in Figure P10, Springfield's population is projected to increase by 5,187 persons by 2031, and vehicle trips are projected to increase by 8,090 vehicle trips during the same period. Using the 2021 LOS, future residential development will demand approximately 0.5 additional animal control vehicles (5,187 additional persons X 0.0001 units per person). Based on demand for approximately 0.5 additional animal control vehicles and an average cost of $33,000 per unit, the growth-related expenditure on animal control vehicles is $17,738.

Figure P10: Growth-Related Demand for Animal Control Vehicles

Type of Infrastructure	Level of Service	Demand Unit	Cost per Unit
Animal Control Vehicles	0.0001 Units	per Person	$33,000

Demand for Animal Control Vehicles					
Year	Population	Vehicle Trips	Animal Control Vehicles		
			Residential	Nonresidential	Total
2021	19,301	27,242	2.0	0.0	2.0
2022	19,819	28,051	2.1	0.0	2.1
2023	20,338	28,860	2.1	0.0	2.1
2024	20,857	29,669	2.2	0.0	2.2
2025	21,376	30,478	2.2	0.0	2.2
2026	21,894	31,287	2.3	0.0	2.3
2027	22,413	32,096	2.3	0.0	2.3
2028	22,932	32,905	2.4	0.0	2.4
2029	23,451	33,714	2.4	0.0	2.4
2030	23,969	34,523	2.5	0.0	2.5
2031	24,488	35,332	2.5	0.0	2.5
10-Yr Increase	**5,187**	**8,090**	**0.5**	**0**	**0.5**

Growth-Related Expenditures	**$17,738**

MAXIMUM ALLOWABLE POLICE SYSTEM DEVELOPMENT CHARGES

Infrastructure components and cost factors used to calculate maximum allowable Police system development charges are summarized in the upper portion of Figure P11. Residential fees are calculated using a cost of $309.09 per person and the average number of persons per housing unit. Nonresidential fees are calculated using a cost of $122.51 per vehicle trip and the average number of vehicle trips per 1,000 square feet of floor area.

Maximum allowable Police system development charges for residential development are assessed according to the number of persons per housing unit. For a single-family unit, the fee of $760 is calculated using a cost of $309.09 per person multiplied by 2.46 persons per housing unit.

Maximum allowable Police system development charges for nonresidential development are assessed according to the number of vehicle trips per 1,000 square feet of floor area. For industrial development, the fee of $206 per 1,000 square feet of floor area is calculated using a cost of $122.51 per vehicle trip multiplied by 1.69 vehicle trips per 1,000 square feet of floor area.

Figure P11: Maximum Allowable Police System Development Charges

Fee Component	Cost per Person	Cost per Trip
Police Facilities	$220.04	$91.56
Animal Control Facilities	$11.26	$0.00
Police Vehicles	$74.38	$30.95
Animal Control Vehicles	$3.42	$0.00
Total	**$309.09**	**$122.51**

Residential Development	Fees per Unit	
Development Type	Persons per Housing Unit[1]	Proposed Fees
Single Family	2.46	$760
Multi-Family	1.85	$572

Nonresidential Development	Fees per 1,000 Square Feet	
Development Type	Average Wkdy Vehicle Trips[1]	Proposed Fees
Industrial	1.69	$206
Commercial	12.21	$1,496
Office & Other Service	5.42	$664
Institutional	3.55	$435

1. See Land Use Assumptions

PROJECTED POLICE SYSTEM DEVELOPMENT CHARGE REVENUE

Revenue projections assume implementation of the maximum allowable Police system development charges and that development over the next ten years is consistent with the development projections in Appendix A. To the extent the rate of development either accelerates or slows down, there will be a corresponding change in the system development charge revenue. As shown in Figure P12, projected fee revenue equals $2.59 million over the next ten years compared to projected expenditures of $2.59 million.

Figure P12: Projected Police System Development Charge Revenue

Fee Component	Growth Share	Existing Share	Total
Police Facilities	$1,882,209	$0	$1,882,209
Animal Control Facilities	$58,389	$0	$58,389
Police Vehicles	$636,189	$0	$636,189
Animal Control Vehicles	$17,738	$0	$17,738
Total	$2,594,524	$0	$2,594,524

Year		Single Family $760 per unit	Multi-Family $572 per unit	Industrial $206 per KSF	Commercial $1,496 per KSF	Office & Other $664 per KSF	Institutional $435 per KSF
		Hsg Unit	Hsg Unit	KSF	KSF	KSF	KSF
Base	2021	5,777	1,799	3,508	1,200	472	1,159
Year 1	2022	5,945	1,856	3,613	1,235	486	1,193
Year 2	2023	6,113	1,913	3,717	1,271	500	1,228
Year 3	2024	6,281	1,970	3,821	1,307	514	1,262
Year 4	2025	6,449	2,027	3,925	1,342	528	1,297
Year 5	2026	6,617	2,084	4,029	1,378	542	1,331
Year 6	2027	6,785	2,141	4,134	1,414	556	1,366
Year 7	2028	6,953	2,198	4,238	1,449	570	1,400
Year 8	2029	7,121	2,255	4,342	1,485	584	1,434
Year 9	2030	7,289	2,312	4,446	1,520	598	1,469
Year 10	2031	7,457	2,369	4,550	1,556	612	1,503
10-Year Increase		1,680	570	1,042	356	140	344
Projected Revenue		$1,277,426	$325,940	$215,091	$533,143	$93,050	$149,874

Projected Fee Revenue	$2,594,524
Existing Development Share	$0
Total Expenditures	$2,594,524

TRANSPORTATION DEVELOPMENT CHARGES

METHODOLOGY

The Transportation system development charge include a component for street improvements. Transportation system development charges use the incremental expansion methodology. Costs are allocated to both residential and nonresidential development using different demand indicators for each type of development.

SERVICE UNITS

Springfield will use vehicle miles traveled (VMT) as the demand units for Transportation system development charges. Components used to determine VMT include average weekday vehicle trip generation rates, adjustments for commuting patterns and pass-by trips, and trip length weighting factors.

Residential Trip Generation Rates

As an alternative to simply using the national average trip generation rate for residential development, the ITE publishes regression curve formulas that may be used to derive custom trip generation rates, using local demographic data. Key independent variables needed for the analysis (i.e., vehicles available, housing units, households, and persons) are available from American Community Survey data. Shown in Figure T1, single-family units generate 9.55 average weekday vehicle trip ends per unit, and multi-family units generate 4.00 average weekday vehicle trip ends per unit.

Figure T1: Average Weekday Vehicle Trip Ends by Housing Type

		Households by Structure Type[2]			
Tenure by Units in Structure	Vehicles Available[1]	Single-Family	Multi-Family	Total	Vehicles per HH by Tenure
Owner-Occupied	6,126	3,488	53	3,541	1.73
Renter-Occupied	2,063	1,435	1,380	2,815	0.73
Total	8,189	4,923	1,433	6,356	1.29
Housing Units[3]		5,311	1,652	6,963	

Units in Structure	Persons in Households[4]	Trip Ends[5]	Vehicles by Type of Unit	Trip Ends[6]	Average Trip Ends	Local Trip Ends per Unit
Single-Family	12,627	35,232	7,086	66,189	50,710	**9.55**
Multi-Family	3,519	7,994	1,103	5,215	6,605	**4.00**
Total	16,146	43,226	8,189	71,404	57,315	**8.23**

1. Vehicles available by tenure from Table B25046, American Community Survey, 2015-2019 5-Year Estimates.
2. Households by tenure and units in structure from Table B25032, American Community Survey, 2015-2019 5-Year Estimates.
3. Housing units from Table B25024, American Community Survey, 2015-2019 5-Year Estimates.
4. Total population in households from Table B25033, American Community Survey, 2015-2019 5-Year Estimates.
5. Vehicle trips ends based on persons using formulas from Trip Generation (ITE 2021). For single-family housing (ITE 210), the fitted curve equation is EXP(0.89*LN(persons)+1.72). To approximate the average population of the ITE studies, persons were divided by 23 and the equation result multiplied by 23. For multi-family housing (ITE 221), the fitted curve equation is (2.29*persons)-64.48 (ITE 2017).
6. Vehicle trip ends based on vehicles available using formulas from Trip Generation (ITE 2021). For single-family housing (ITE 210), the fitted curve equation is EXP(0.92*LN(vehicles)+2.68). To approximate the average number of vehicles in the ITE studies, vehicles available were divided by 27 and the equation result multiplied by 27. For multi-family housing (ITE 221), the fitted curve equation is (4.77*vehicles)-46.46 (ITE 2021).
7. Trip Generation, Institute of Transportation Engineers, 11th Edition (2021).

Nonresidential Trip Generation Rates

For nonresidential development, TischlerBise uses trip generation rates published in Trip Generation, Institute of Transportation Engineers, 11th Edition (2021). The prototype for industrial development is Industrial Park (ITE 130) which generates 3.37 average weekday vehicle trip ends per 1,000 square feet of floor area. Institutional development uses Hospital (ITE 610) and generates 10.77 average weekday vehicle trip ends per 1,000 square feet of floor area. For office & other services development, the proxy is General Office (ITE 710), and it generates 10.84 average weekday vehicle trip ends per 1,000 square feet of floor area. The prototype for commercial development is Shopping Center (ITE 820) which generates 37.01 average weekday vehicle trips per 1,000 square feet of floor area.

Figure T2: Average Weekday Vehicle Trip Ends by Land Use

ITE Code	Land Use Group	Demand Unit	Avg Wkdy Trip Ends Per Demand Unit[1]	Avg Wkdy Trip Ends Per Employee[1]	Employees Per Demand Unit	Square Feet Per Employee
110	Light Industrial	1,000 Sq Ft	4.87	3.10	1.57	637
130	Industrial Park	1,000 Sq Ft	3.37	2.91	1.16	864
140	Manufacturing	1,000 Sq Ft	4.75	2.51	1.89	528
150	Warehousing	1,000 Sq Ft	1.71	5.05	0.34	2,953
254	Assisted Living	bed	2.60	4.24	0.61	na
310	Hotel	room	7.99	14.34	0.56	na
565	Day Care	student	4.09	21.38	0.19	na
610	Hospital	1,000 Sq Ft	10.77	3.77	2.86	350
620	Nursing Home	bed	3.06	3.31	0.92	na
710	General Office (avg size)	1,000 Sq Ft	10.84	3.33	3.26	307
720	Medical-Dental Office	1,000 Sq Ft	36.00	8.71	4.13	242
730	Government Office	1,000 Sq Ft	22.59	7.45	3.03	330
750	Office Park	1,000 Sq Ft	11.07	3.54	3.13	320
820	Shopping Center (avg size)	1,000 Sq Ft	37.01	17.42	2.12	471

1. Trip Generation, Institute of Transportation Engineers, 11th Edition (2021).

Trip Rate Adjustments

To calculate Transportation system development charges, trip generation rates require an adjustment factor to avoid double counting each trip at both the origin and destination points. Therefore, the basic trip adjustment factor is 50 percent. As discussed further in this section, the development fee methodology includes additional adjustments to make the fees proportionate to the infrastructure demand for particular types of development.

Commuter Trip Adjustment

Residential development has a larger trip adjustment factor of 61 percent to account for commuters leaving Springfield for work. According to the 2009 National Household Travel Survey (see Table 30) weekday work trips are typically 31 percent of production trips (i.e., all out-bound trips, which are 50 percent of all trip ends). As shown in Figure T3, the U.S. Census Bureau's OnTheMap web application indicates 72 percent of resident workers traveled outside of Springfield for work in 2018. In combination, these factors (0.31 x 0.50 x 0.72 = 0.11) support the additional 11 percent allocation of trips to residential development.

Figure T3: Commuter Trip Adjustment

Trip Adjustment Factor for Commuters[1]	
Employed Residents	8,064
Residents Living and Working in Springfield	2,282
Residents Commuting Outside Springfield for Work	5,782
Percent Commuting out of Springfield	72%
Additional Production Trips[2]	11%
Residential Trip Adjustment Factor	61%

1. U.S. Census Bureau, OnTheMap Application (version 6.1.1) and LEHD Origin-Destination Employment Statistics, 2018.

2. According to the National Household Travel Survey (2009)*, published in December 2011 (see Table 30), home-based work trips are typically 30.99 percent of "production" trips, in other words, out-bound trips (which are 50 percent of all trip ends). Also, LED OnTheMap data from 2018 indicate that 72 percent of Springfield's workers travel outside the city for work. In combination, these factors (0.3099 x 0.50 x 0.72 = 0.11) account for 11 percent of additional production trips. The total adjustment factor for residential includes attraction trips (50 percent of trip ends) plus the journey-to-work commuting adjustment (11 percent of production trips) for a total of 61 percent.
*http://nhts.ornl.gov/publications.shtml ; Summary of Travel Trends - Table "Daily Travel Statistics by Weekday vs. Weekend"

Adjustment for Pass-By Trips

For commercial and institutional development, the trip adjustment factor is less than 50 percent because these types of development attract vehicles as they pass by on arterial and collector roads. For example, when someone stops at a convenience store on the way home from work, the convenience store is not the primary destination. For the average shopping center, ITE data indicate 34 percent of the vehicles that enter are passing by on their way to some other primary destination. The remaining 66 percent of attraction trips have the commercial site as their primary destination. Because attraction trips are half of all trips, the trip adjustment factor is 66 percent multiplied by 50 percent, or approximately 33 percent of the trip ends.

Average Weekday Vehicle Trips

Shown below in Figure T4, multiplying average weekday vehicle trip ends and trip adjustment factors (discussed on the previous page) by Springfield's existing development units provides the average weekday vehicle trips generated by existing development. As shown below, Springfield's existing development generates 65,284 vehicle trips on an average weekday.

Figure T4: Average Weekday Vehicle Trips by Land Use

Development Type	Dev Unit	ITE Code	Avg Wkday VTE	Trip Adjustment	2021 Dev Units	2021 Veh Trips
Single Family	HU	210	9.55	61%	5,777	33,653
Multi-Family	HU	220	4.00	61%	1,799	4,390
Industrial	KSF	130	3.37	50%	3,508	5,912
Commercial	KSF	820	37.01	33%	1,200	14,653
Office & Other Services	KSF	710	10.84	50%	472	2,557
Institutional	KSF	610	10.77	33%	1,159	4,119
Total						65,284

National Average Trip Length

To calculate Transportation system development charges, it is necessary to determine the average trip length on Springfield's arterial and collector network. To do this, the analysis uses national trip generation rates and average trip lengths from the 2017 National Household Travel Survey.

Figure T5: National Average Trip Lengths

Land Use	National Avg Trip Length
Residential	12.32
Industrial	7.70
Commercial/Retail	7.90
Office and Other	7.70
Institutional	7.70

Source: U.S. Department of Transportation, Federal Highway Administration, 2017 National Household Transportation Survey, adjusted for land use

Expected Vehicle Miles Traveled

The national average trip length should be adjusted to reflect actual local demand on Springfield's arterial and collector network. To do this, TischlerBise determines expected demand (VMT) on Springfield's complete transportation network by multiplying the national average trip lengths by average weekday vehicle trips. Based on this analysis, existing development generates an expected 681,378 VMT.

Figure T6: Expected Vehicle Miles Traveled

Land Use	Avg Weekday Vehicle Trips[1]	National Avg Trip Length	Expected VMT[3]
Single Family	33,653	12.32	414,603
Multi-Family	4,390	12.32	54,085
Industrial	5,912	7.70	45,520
Commercial	14,653	7.90	115,760
Office & Other Services	2,557	7.70	19,692
Institutional	4,119	7.70	31,718
Total			681,378

1. Average weekday vehicle trips from Figure T4
2. 2017 National Household Transportation Survey
3. TischlerBise calculation, Average Weekday Vehicle Trips X National Average Trip Length

Local Adjustment Factor

Expected VMT reflects anticipated travel demand on the entire roadway system; therefore, it is necessary to calibrate demand to the arterial system. To calibrate demand on the arterial and collector system, actual travel demand, based on local traffic counts obtained from the City of Springfield (Appendix C), is compared to expected travel demand. The ratio between actual VMT and expected VMT provides the local adjustment factor used to adjust national average trip lengths by type of land use.

Figure T7: Local Adjustment Factor

Local Adjustment Factor	
Actual VMT[1]	118,968
Expected VMT	681,378
Actual to Expected VMT	0.17

1. TischlerBise analysis of trip counts provided by the City of Springfield

Local Trip Lengths

Shown below in Figure T8, TischlerBise applies the local adjustment factor to the national average trip lengths to calculate the local trip lengths. The analysis will use the local trip lengths shown below to calculate VMT.

Figure T8: Local Trip Lengths

Land Use	National Avg Trip Length	Local Adjustment	Local Trip Length
Residential	12.32	0.17	2.15
Industrial	7.70	0.17	1.34
Commercial/Retail	7.90	0.17	1.38
Office and Other	7.70	0.17	1.34
Institutional	7.70	0.17	1.34

Source: 2017 NHTS and TischlerBise analysis; local adjustment from Figure T7

Local Vehicle Miles Traveled

Shown below are the demand indicators for residential and nonresidential land uses related to vehicle miles traveled (VMT). For residential development, the table displays VMT per housing unit. For nonresidential development, the table displays VMT generated per 1,000 square feet of floor area.

Figure T9: Service Units

Development Type	Avg Wkdy Veh Trip Ends[1]	Trip Rate Adjustment	Avg Trip Length (Miles)	Avg Wkdy VMT per Unit
Single Family	9.55	61%	2.15	12.53
Multi-Family	4.00	61%	2.15	5.25

Development Type	Avg Wkdy Veh Trip Ends[1]	Trip Rate Adjustment	Avg Trip Length (Miles)	Avg Wkdy VMT per Unit
Industrial	3.37	50%	1.34	2.27
Commercial	37.01	33%	1.38	16.85
Office & Other Service	10.84	50%	1.34	7.29
Institutional	10.77	33%	1.34	4.78

1. See Land Use Assumptions

CAPACITY RATIO

As shown in Appendix C, the City of Springfield provided average daily traffic (ADT) counts and an inventory of arterial and collector road segments, including segment lengths and lane quantities. Multiplying each segment's length by the number of lanes yields the number of lane miles per segment, and multiplying the traffic counts and segment lengths provides the average weekday vehicle miles traveled (VMT). Springfield's arterial and collector road network consists of 71.30 lane miles and 118,968 VMT.

Shown below, Figure T10 documents the capacity of Springfield's arterial and collector road network. Springfield's network is designed to operate at Level of Service D or better. Applying lane capacities published by the Florida Department of Transportation to Springfield's network shown in Appendix C generates lane capacity of 434,056 vehicle miles of capacity (VMC) and a weighted average of 6,088 vehicles per lane (434,056 VMC / 71.30 lane miles).

As noted above, current daily volume on Springfield's arterial and collector road network is approximately 118,968 VMT. The resulting VMC to VMT ratio is 3.65 (434,056 VMC / 118,968 VMT). The baseline VMC / VMT ratio for any incremental expansion method is 1.0 (i.e., VMC = VMT); therefore, the current ratio of 3.65 exceeds the current LOS ensuring new capacity built with system development charges will not exceed the current LOS.

Figure T10: Transportation Network Capacity and Usage

Capacity Ratio	
Total Lane Miles	71.30
Capacity per Lane Mile	6,088
Vehicle Miles of Capacity	434,056
Vehicle Miles of Travel	118,968
VMC / VMT Ratio	3.65

STREET IMPROVEMENTS – INCREMENTAL EXPANSION

Springfield provided a list of street improvements to use as a proxy for future growth-related transportation improvements. Based on the growth-related cost of these projects, the weighted average cost is $2,550,737 per lane mile ($40,403,680 total cost / 15.84 lane miles). TischlerBise will apply the weighted average cost per lane mile to the projected demand for additional lane miles over the next 10 years. Springfield may use system development charges to construct the projects shown in Figure T11 or to construct other growth-related street improvements.

Figure T11: Potential Street Improvement Projects

Project	Description	Miles	Lanes	Lane Miles	Total Cost
William A Batson Parkway Expansion	Expand to 4 lanes	2.90	2	5.80	$14,368,200
William A Batson Parkway Extension	Extend to 49	2.51	4	10.04	$26,035,480
Total				**15.84**	**$40,403,680**

Source: City of Springfield

To allocate the proportionate share of demand for street improvements to residential and nonresidential development, this analysis uses trip generation rates, trip adjustment factors, trip length weighting factors, and average trip lengths shown in Figure T9. Springfield's existing LOS is 1.6425 lane miles per 10,000 VMT (71.30 lane miles / 3.65 capacity ratio / (118,968 VMT / 10,000 VMT)). Based on a weighted average cost of $2,550,737 per lane mile, the street improvements cost is $418.97 per VMT (71.30 lane miles / 3.65 capacity ratio / 188,968 VMT X $2,550,737 per lane mile).

Figure T12: Transportation Level of service

Cost Factors	
Total Cost	$40,403,680
÷ Lane Miles	15.84
Cost per Lane Mile	$2,550,737

Source: City of Springfield

Level-of-Service (LOS) Standards	
Existing Lane Miles	71.30
÷ VMC / VMT Ratio	3.65
Adjusted Lane Miles	19.54
2022 VMT	118,968
Lane Miles per 10,000 VMT	1.6425
Cost per VMT	$418.97

PROJECTED DEMAND FOR GROWTH-RELATED TRANSPORTATION INFRASTRUCTURE

As shown in Appendix A, Springfield's housing stock is expected to increase by 2,250 units and nonresidential floor area is expected to increase by 1,883,000 square feet over the next 10 years. Based on the trip generation factors discussed in this section, projected development generates an additional 35,073 VMT over the next 10 years. Shown below in Figure T13, Springfield will need to construct approximately 5.8 lane miles of street improvements over the next 10 years to maintain the existing level of service. The growth-related cost of street improvements is $14,694,288 ($2,550,737 per lane mile X 5.8 lane miles).

Figure T13: Projected Travel Demand

Springfield, TN		Base	1	2	3	4	5	10	10-Year
		2021	2022	2023	2024	2025	2026	2031	Increase
Development	Single Family Units	5,777	5,945	6,113	6,281	6,449	6,617	7,457	1,680
	Multi-Family Units	1,799	1,856	1,913	1,970	2,027	2,084	2,369	570
	Industrial KSF	3,508	3,613	3,717	3,821	3,925	4,029	4,550	1,042
	Commercial KSF	1,200	1,235	1,271	1,307	1,342	1,378	1,556	356
	Office & Other Services KSF	472	486	500	514	528	542	612	140
	Institutional KSF	1,159	1,193	1,228	1,262	1,297	1,331	1,503	344
Avg Weekday Vehicle Trips	Single-Family Trips	33,653	34,632	35,610	36,589	37,568	38,546	43,440	9,787
	Multi-Family Trips	4,390	4,529	4,668	4,807	4,946	5,085	5,781	1,391
	Residential Trips	38,043	39,161	40,278	41,396	42,514	43,632	49,220	11,178
	Industrial Trips	5,912	6,087	6,263	6,438	6,614	6,790	7,667	1,756
	Commercial Trips	14,653	15,088	15,524	15,959	16,394	16,829	19,005	4,352
	Office & Other Services Trips	2,557	2,633	2,709	2,785	2,861	2,937	3,317	760
	Institutional Trips	4,119	4,242	4,364	4,486	4,609	4,731	5,343	1,223
	Nonresidential Trips	27,242	28,051	28,860	29,669	30,478	31,287	35,332	8,090
	Total Vehicle Trips	**65,284**	**67,211**	**69,138**	**71,065**	**72,992**	**74,918**	**84,552**	**19,268**
VMT	**Vehicle Miles Traveled (VMT)**	**118,968**	**122,475**	**125,982**	**129,490**	**132,997**	**136,504**	**154,040**	**35,073**
Need	Additional Lane Miles		0.6	0.6	0.6	0.6	0.6	0.6	5.8
	Growth-Related Cost		$1,469,429	$1,469,429	$1,469,429	$1,469,429	$1,469,429	$1,469,429	$14,694,288

MAXIMUM ALLOWABLE TRANSPORTATION SYSTEM DEVELOPMENT CHARGES

Infrastructure components and cost factors used to calculate maximum allowable Transportation system development charges are summarized in the upper portion of Figure T14. All fees are calculated using a cost of $418.97 per VMT.

Maximum allowable Transportation system development charges for residential development are assessed according to the VMT generated per housing unit. For a single-family unit, the fee of $5,250 is calculated using a cost of $418.97 per VMT multiplied by 12.53 VMT per housing unit.

Maximum allowable Transportation system development charges for nonresidential development are assessed according to the VMT generated per 1,000 square feet of floor area. For industrial development, the fee of $949 per 1,000 square feet of floor area is calculated using a cost of $418.97 per VMT multiplied by 2.27 VMT per 1,000 square feet of floor area.

Figure T14: Maximum Allowable Transportation System Development Charges

Fee Component	Cost per VMT
Street Improvements	$418.97
Total	$418.97

Residential Development	Fees per Unit	
Development Type	Avg Wkdy VMT per Unit[1]	Proposed Fees
Single Family	12.53	$5,250
Multi-Family	5.25	$2,199

Nonresidential Development	Fees per 1,000 Square Feet	
Development Type	Avg Wkdy VMT per 1,000 Sq Ft[1]	Proposed Fees
Industrial	2.27	$949
Commercial	16.85	$7,058
Office & Other Services	7.29	$3,053
Institutional	4.78	$2,002

1. See Land Use Assumptions

PROJECTED TRANSPORTATION SYSTEM DEVELOPMENT CHARGE REVENUE

Revenue projections assume implementation of the maximum allowable Transportation system development charges and that development over the next ten years is consistent with the development projections in Appendix A. To the extent the rate of development either accelerates or slows down, there will be a corresponding change in the system development charge revenue. As shown in Figure T15, projected fee revenue equals $14.69 million over the next ten years compared to projected expenditures of $14.69 million.

Figure T15: Projected Transportation System Development Charge Revenue

Fee Component	Growth Share	Existing Share	Total
Street Improvements	$14,694,288	$0	$14,694,288
Total	$14,694,288	$0	$14,694,288

		Single Family $5,250 per unit	Multi-Family $2,199 per unit	Industrial $949 per sq ft	Commercial $7,058 per sq ft	Office & Other $3,053 per sq ft	Institutional $2,002 per sq ft
Year		Hsg Unit	Hsg Unit	KSF	KSF	KSF	KSF
Base	2022	5,777	1,799	3,508	1,200	472	1,159
Year 1	2023	5,945	1,856	3,613	1,235	486	1,193
Year 2	2024	6,113	1,913	3,717	1,271	500	1,228
Year 3	2025	6,281	1,970	3,821	1,307	514	1,262
Year 4	2026	6,449	2,027	3,925	1,342	528	1,297
Year 5	2027	6,617	2,084	4,029	1,378	542	1,331
Year 6	2028	6,785	2,141	4,134	1,414	556	1,366
Year 7	2029	6,953	2,198	4,238	1,449	570	1,400
Year 8	2030	7,121	2,255	4,342	1,485	584	1,434
Year 9	2031	7,289	2,312	4,446	1,520	598	1,469
Year 10	2032	7,457	2,369	4,550	1,556	612	1,503
10-Year Increase		1,680	570	1,042	356	140	344
Projected Revenue		$8,820,000	$1,253,430	$988,858	$2,514,914	$427,834	$689,115

Projected Fee Revenue	$14,694,151
Existing Development Share	$0
Total Expenditures	$14,694,288

WATER SYSTEM DEVELOPMENT CHARGES

METHODOLOGY

The City of Springfield Water Utility current draws 2.7 million gallons a day from the Red River and also has a contracted purchase of 2.3 million gallons a day from the Logan-Todd Regional Water Commission. The City operates a water treatment plant with 10 million gallons a day of capacity. The City's overhead water storage capacity is 11.4 million gallons.

Since the City's Water utility has excess capacity in the system to serve future development, the Water system development charge include buy-in components for the City's investment in its water system for treatment, transmission, storage and administration functions.

SERVICE UNITS

The Water system development charges are assessed on both residential and nonresidential development, using an equivalent dwelling unit approach. In order to the determine water system demand from an equivalent single family dwelling unit, TischlerBise obtained water billing data for 2021. According to this billing data, the 12,135 residential customers served by the City accounted for 592.7 million gallons in 2021, or 1.62 million gallons daily. The City's 1,197 nonresidential customers accounted for 520.9 million gallons, or 1.42 million gallons daily. To determine an equivalent dwelling unit (EDU) for the water system, the 12,135 residential customers are compared to the average daily consumption (1,623,961 gallons), for an average of 134 gallons a day. Although average daily demand is slightly over 3 million gallons, peak demand is roughly double that at 6.1 million gallons. This results in a peaking factor of 2.0 and an EDU factor of 268 gallons per day.

Figure W1: Water Demand Factors

Account Type		Annual Consumption	Daily Consumption	Avg. Daily Usage	Peaking Factor*	Peak Daily Usage
Residential	12,135	592,745,800	1,623,961	134	2.00	268
Commercial	1,197	520,933,200	1,427,214	1,192	2.00	2,385
Total	**13,332**	**1,113,679,000**	**3,051,175**	**229**	**2.00**	**458**

Source: City of Springfield

*According to City staff, peak demand is 6.1 mgd

As discussed above, Water system development charges are calculated by multiplying the number of gallons per single family unit equivalent (EDU) by the capacity ratio for the corresponding size and type of meter multiplied by the cost per EDU. The City's peak demand for a single-family equivalent dwelling unit is 268 gallons per day. Figure W2 shows the capacity ratio by meter size from the *AWWA Manual of Water Supply Practices,* which is used for water meters larger than .75 inches.

Figure W2: Water Ratio of Service Units to Development Units

Meter Size and Type		Capacity Ratio[1]
0.75	Displacement	1.00
1.00	Displacement	1.67
1.50	Displacement	3.33
2.00	Displacement	5.33
3.00	Singlejet	10.67
3.00	Compound	10.67
3.00	Turbine	11.67
4.00	Singlejet	16.67
4.00	Compound	16.67
4.00	Turbine	21.00
6.00	Singlejet	33.33
6.00	Compound	33.33
6.00	Turbine	43.33
8.00	Compound	53.33
8.00	Turbine	93.33
10.00	Turbine	140.00
12.00	Turbine	176.67

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WATER SYSTEM DEVELOPMENT CHARGE COMPONENTS

Treatment and Transmission System Investment Buy-In

The Water system development charge contains a buy-in component for the City's investment (original cost, no inflation included) in the water treatment plant, transmission lines, vehicles and equipment, as well as administrative components. As shown in Figure W3, this investment is $40,426,125. The City has the capacity to treat 10 million gallons a day. When this is compared to the peak demand of single-family equivalent dwelling unit (268 gallons a day), the system has capacity for 37,363 equivalent dwelling units. This results in an investment per equivalent dwelling unit of $1,080.

Figure W3: Water Treatment and Transmission System Investment Buy-In

Treatment/Transmission System Investment	
Description	**Original Investment**
Pumping	$5,420,814
Treatment Plant	$13,432,970
Transmission	$17,532,822
Construction in Progress	$1,196,180
Meters	$1,638,684
Vehicles/Equipment	$784,833
General Administrative	$419,822
Subtotal	**$40,426,125**
Sytem Capacity in Equivalent Dwelling Units (EDUs)	
System Capacity (GPD)	10,000,000
Demand per EDU (GPD)	268
Total System Capacity (EDUs)	37,363
Cost per Equivalent Dwelling Unit	
Total Capital Facilities System Investment	$40,426,125
Total System Capacity (EQUs)	37,363
Investment per EDU	**$1,080.00**

Storage System Investment Buy-In

The Water system development charge contains a buy-in component for the City's investment (original cost, no inflation included) in its storage towers. As shown in Figure W4, this investment is $8,103,467. The City has 11.4 million gallons of storage capacity. When this is compared to the peak demand of single-family equivalent dwelling unit (268 gallons a day), the system has capacity for 42,594 equivalent dwelling units. This results in an investment per equivalent dwelling unit of $190.

Figure W4: Water Storage Investment Buy-In

Storage System Investment	
Description	**Original Investment**
Storage	$7,293,096
Hydrants	$810,371
Subtotal	**$8,103,467**
Storage Capacity in Equivalent Dwelling Units (EDUs)	
System Capacity (GPD)	11,400,000
Demand per EDU (GPD)	268
Total System Capacity (EDUs)	42,594
Cost per Equivalent Dwelling Unit	
Total Capital Facilities System Investment	$8,103,467
Total System Capacity (EQUs)	42,594
Investment per EDU	**$190.00**

MAXIMUM ALLOWABLE WATER SYSTEM DEVELOPMENT CHARGES

The proposed Water system development charges are shown in Figure W5. As shown in Figure W5, the total water system investment totals $1,270 per equivalent dwelling unit. For water meters larger than .75 inches, the cost per EDU is multiplied the capacity ratio by meter size from the *AWWA Manual of Water Supply Practice*.

Figure W5: Maximum Allowable Water System Development Charges

Fee Component	Cost per EDU
Plant	$1,080
Storage	$190
Total Investment per EDU	**$1,270**

Meter Size and Type		Capacity Ratio[1]	Proposed Fees
0.75	Displacement	1.00	**$1,270**
1.00	Displacement	1.67	**$2,121**
1.50	Displacement	3.33	**$4,229**
2.00	Displacement	5.33	**$6,769**
3.00	Singlejet	10.67	**$13,551**
3.00	Compound	10.67	**$13,551**
3.00	Turbine	11.67	**$14,821**
4.00	Singlejet	16.67	**$21,171**
4.00	Compound	16.67	**$21,171**
4.00	Turbine	21.00	**$26,670**
6.00	Singlejet	33.33	**$42,329**
6.00	Compound	33.33	**$42,329**
6.00	Turbine	43.33	**$55,029**
8.00	Compound	53.33	**$67,729**
8.00	Turbine	93.33	**$118,529**
10.00	Turbine	140.00	**$177,800**
12.00	Turbine	176.67	**$224,371**

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WASTEWATER SYSTEM DEVELOPMENT CHARGES

METHODOLOGY

The City of Springfield Wastewater Utility operates a wastewater treatment plant with a current capacity of 3.4 million gallons a day. The Wastewater system development charge utilizes a plan-based approach for planned wastewater capacity projects.

SERVICE UNITS

The Wastewater system development charges are assessed on both residential and nonresidential development, using an equivalent dwelling unit approach. In order to the determine wastewater system demand from an equivalent single family dwelling unit, TischlerBise obtained sewer billing data for 2021. According to this billing data, the 6,368 residential customers served by the City accounted for 285.7 million gallons in 2021, or almost 783,000 gallons daily. The City's 787 nonresidential customers accounted for 207.3 million gallons, or approximately 568,000 gallons daily. To determine an equivalent dwelling unit (EDU) for the wastewater system, the 6,368 residential customers are compared to the average daily consumption (782,998 gallons), for an average of 123 gallons a day. Similar to the Water utility, peak water demand also creates peak wastewater demand. Therefore, the same 2.0 peaking factor is used to determine a peak EDU factor of 246 gallons per day.

Figure WW1: Wastewater Demand Factors

Account Type		Annual Consumption	Daily Consumption	Avg. Daily Usage	Peaking Factor*	Peak Daily Usage
Residential	6,368	285,794,400	782,998	123	2.00	246
Commercial	787	207,328,600	568,024	722	2.00	1,443
Total	**7,156**	**493,123,000**	**1,351,022**	**189**	**2.00**	**378**

Source: City of Springfield

*According to City staff, peak demand is 6.1 mgd

As discussed above, Wastewater system development charges are calculated by multiplying the number of gallons per single family unit equivalent (EDU) by the capacity ratio for the corresponding size and type of meter multiplied by the cost per EDU. The City's peak demand for a single family equivalent dwelling unit is 246 gallons per day. Figure WW2 shows the capacity ratio by meter size from the *AWWA Manual of Water Supply Practices,* which is used for meters larger than .75 inches.

Figure WW2: Wastewater Ratio of Service Units to Development Units

Meter Size and Type		Capacity Ratio[1]
0.75	Displacement	1.00
1.00	Displacement	1.67
1.50	Displacement	3.33
2.00	Displacement	5.33
3.00	Singlejet	10.67
3.00	Compound	10.67
3.00	Turbine	11.67
4.00	Singlejet	16.67
4.00	Compound	16.67
4.00	Turbine	21.00
6.00	Singlejet	33.33
6.00	Compound	33.33
6.00	Turbine	43.33
8.00	Compound	53.33
8.00	Turbine	93.33
10.00	Turbine	140.00
12.00	Turbine	176.67

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WASTEWATER SYSTEM DEVELOPMENT CHARGE COMPONENTS

Planned Wastewater Treatment Plant Upgrade

The City of Springfield plans to construct an upgrade to the existing wastewater treatment plant to serve future development. This project will add 7.0 million gallons of treatment capacity to the wastewater system, at a cost of $45 million. To calculate the cost per demand unit (gallons), the costs of planned improvements ($45 million) are allocated to the additional treatment capacity added (7.0 million gallons). This results in a cost of $6.43 per gallon.

Figure WW3: Planned Wastewater Treatment Plant Upgrade Cost

Description	Total Cost
Wastewater Treatment Plant Upgrade	$45,000,000
Total	$45,000,000
Total Capacity (Gallons)	7,000,000
Cost per Gallon	**$6.43**

Planned Wastewater Interceptor Upgrades

The City of Springfield plans to construct two interceptor upgrades to serve future development. These projects will add an additional 1.5 million gallons of wastewater collection capacity to the system, at a cost of $19.5 million. To calculate the cost per demand unit (gallons), the costs of planned improvements ($19.5 million) are allocated to the additional collection capacity added (1,500,000 gallons). This results in a cost of $13.00 per gallon.

Figure WW4: Planned Interceptor Upgrade Cost

Description	Cost
Wartrace Creek Interceptor Upgrade (15 to 24 inches)	$4,500,000
Carrs Creek Interceptor Upgrade (18 to 24 inces)	$15,000,000
Total Cost	**$19,500,000**
Total Capacity (Gallons)	1,500,000
Cost per Gallon	$13.00

MAXIMUM ALLOWABLE WASTEWATER SYSTEM DEVELOPMENT CHARGES

Cost factors for Wastewater infrastructure components are summarized in the upper portion of Figure WW5. The Wastewater system development charge is derived from the peak gallons per day per single family equivalent residential connection of 246 gallons multiplied by the capital cost per gallon of capacity ($19.43). New residential units needing a 3/4" meter will pay a Wastewater system development charge of $4,778 (246 gallons X capital cost per gallon of capacity of $19.43 X 1.0 capacity ratio), and future development needing a 1.0" meter will pay a Wastewater system development charge of $7,979 (246 gallons X capital cost per gallon of capacity of $19.43 X 1.67 capacity ratio).

Figure WW5: Maximum Allowable Wastewater System Development Charges

Fee Component	Cost per Gallon
Interceptor Upgrades	$13.00
Treatment Upgrade	$6.43
Total	**$19.43**

Equivalent Dwelling Unit (Single Family Unit) Demand Factor	
Peak Gallons per Day	246

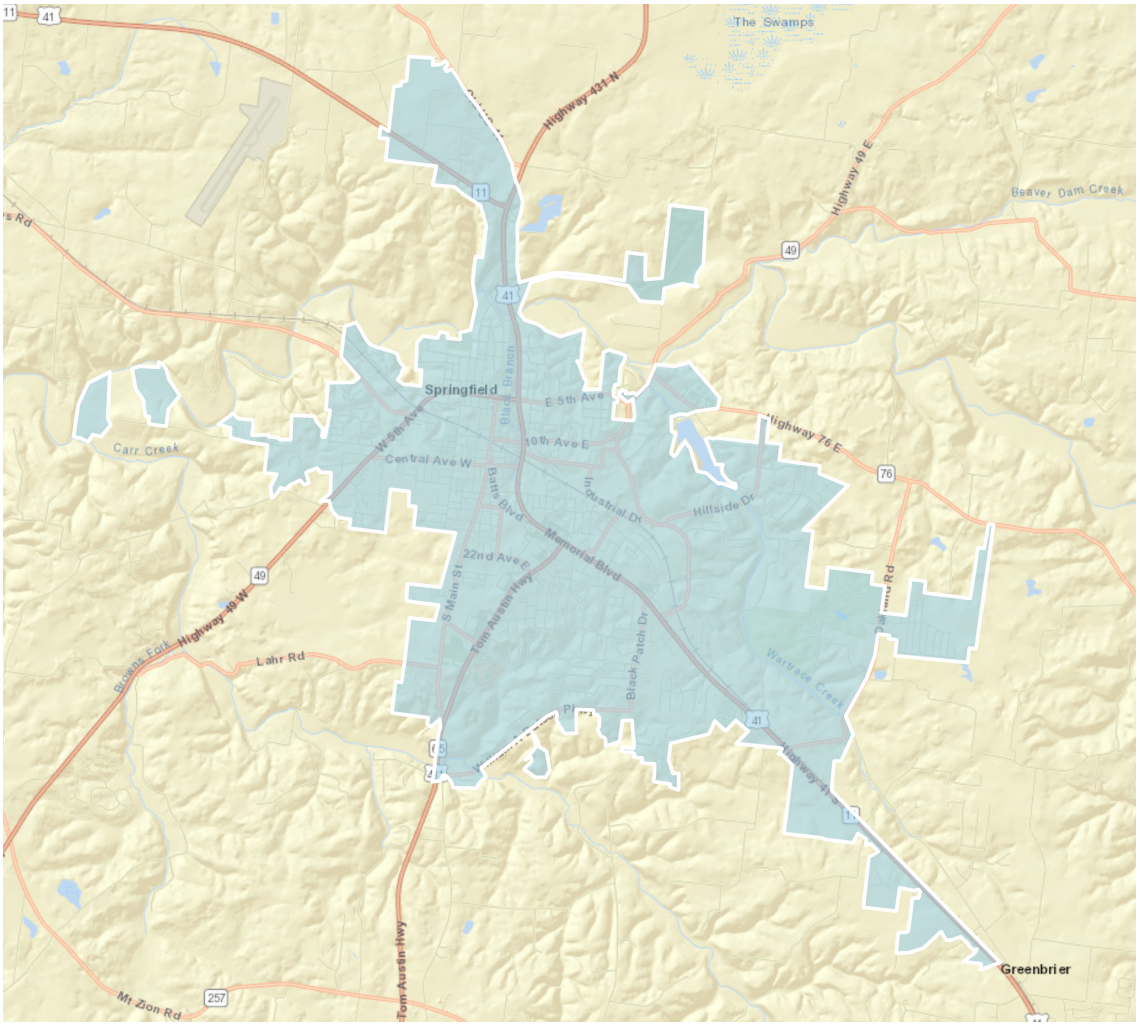
Meter Size and Type		Capacity Ratio[1]	Proposed Fees
0.75	Displacement	1.00	**$4,778**
1.00	Displacement	1.67	**$7,979**
1.50	Displacement	3.33	**$15,910**
2.00	Displacement	5.33	**$25,466**
3.00	Singlejet	10.67	**$50,980**
3.00	Compound	10.67	**$50,980**
3.00	Turbine	11.67	**$55,757**
4.00	Singlejet	16.67	**$79,647**
4.00	Compound	16.67	**$79,647**
4.00	Turbine	21.00	**$100,335**
6.00	Singlejet	33.33	**$159,246**
6.00	Compound	33.33	**$159,246**
6.00	Turbine	43.33	**$207,024**
8.00	Compound	53.33	**$254,803**
8.00	Turbine	93.33	**$445,916**
10.00	Turbine	140.00	**$668,898**
12.00	Turbine	176.67	**$844,102**

1. AWWA Manual of Water Supply Practices M-1, 7th Edition

APPENDIX A: LAND USE ASSUMPTIONS

The City of Springfield, Tennessee, retained TischlerBise to analyze the impacts of development on its capital facilities and to calculate system development charges based on that analysis. TischlerBise prepared current demographic estimates and future development projections for both residential and nonresidential development that will be used in the calculation of the system development charges. Current demographic data estimates for 2021 are used in calculating levels of service (LOS) provided to existing development in the City of Springfield. The estimates and projections of residential and nonresidential development in this *Land Use Assumptions* document are for areas within the boundaries of the City of Springfield.

Figure A1: Service Area Map



SUMMARY OF GROWTH INDICATORS

Key land use assumptions for the City of Springfield System Development Charges Study are population, housing units, and employment. Based on discussions with City of Springfield staff, TischlerBise projects housing units based on recent residential construction trends. For population, TischlerBise applies occupancy factors derived from 2015-2019 American Community Survey 5-Year Estimates to housing unit estimates and projections. For nonresidential development, TischlerBise projects nonresidential floor area based on recent nonresidential construction trends. For employment, the base year estimate is calculated based on data from Esri Business Analyst. TischlerBise converts projected floor area to employment based on average square feet per job multipliers published by the Institute of Transportation Engineers (ITE). The projections contained in this document provide the foundation for the system development charges study. These metrics are the service units and demand indicators used in the system development charges study.

Development projections, summarized below, will be used to estimate system development charges revenue and to indicate the anticipated need for growth-related infrastructure. However, system development charge methodologies are designed to reduce sensitivity to development projections in the determination of the proportionate share fee amounts. If actual development is slower than projected, fee revenue will decline, but so will the need for growth-related infrastructure. In contrast, if development is faster than anticipated, fee revenue will increase, but the City of Springfield will the need to accelerate infrastructure improvements to keep pace with the actual rate of development. During the next 10 years, Springfield development projections indicate an increase of 2,250 housing units and approximately 1,883,000 square feet of nonresidential floor area.

Figure A2: Summary of Development Projections

Springfield, Tennessee	2021	2022	2023	2024	2025	2026	2031	10-Year
	Base Year	1	2	3	4	5	10	Increase
Population	**19,301**	**19,819**	**20,338**	**20,857**	**21,376**	**21,894**	**24,488**	**5,187**
Housing Units	**7,576**	**7,801**	**8,026**	**8,251**	**8,476**	**8,701**	**9,826**	**2,250**
Employment								
Industrial	4,063	4,184	4,304	4,425	4,546	4,666	5,270	1,207
Commercial	2,549	2,625	2,700	2,776	2,852	2,928	3,306	757
Office & Other Service	1,536	1,582	1,627	1,673	1,718	1,764	1,992	456
Institutional	3,311	3,409	3,508	3,606	3,704	3,803	4,294	983
Total Employment	**11,459**	**11,799**	**12,140**	**12,480**	**12,820**	**13,161**	**14,862**	**3,403**
Nonres. Floor Area (x1,000)								
Industrial	3,508	3,613	3,717	3,821	3,925	4,029	4,550	1,042
Commercial	1,200	1,235	1,271	1,307	1,342	1,378	1,556	356
Office & Other Service	472	486	500	514	528	542	612	140
Institutional	1,159	1,193	1,228	1,262	1,297	1,331	1,503	344
Total Nonres. Floor Area	**6,339**	**6,527**	**6,716**	**6,904**	**7,092**	**7,280**	**8,222**	**1,883**

RESIDENTIAL DEVELOPMENT

Current estimates and future projections of residential development are detailed in this section including population and housing units by type.

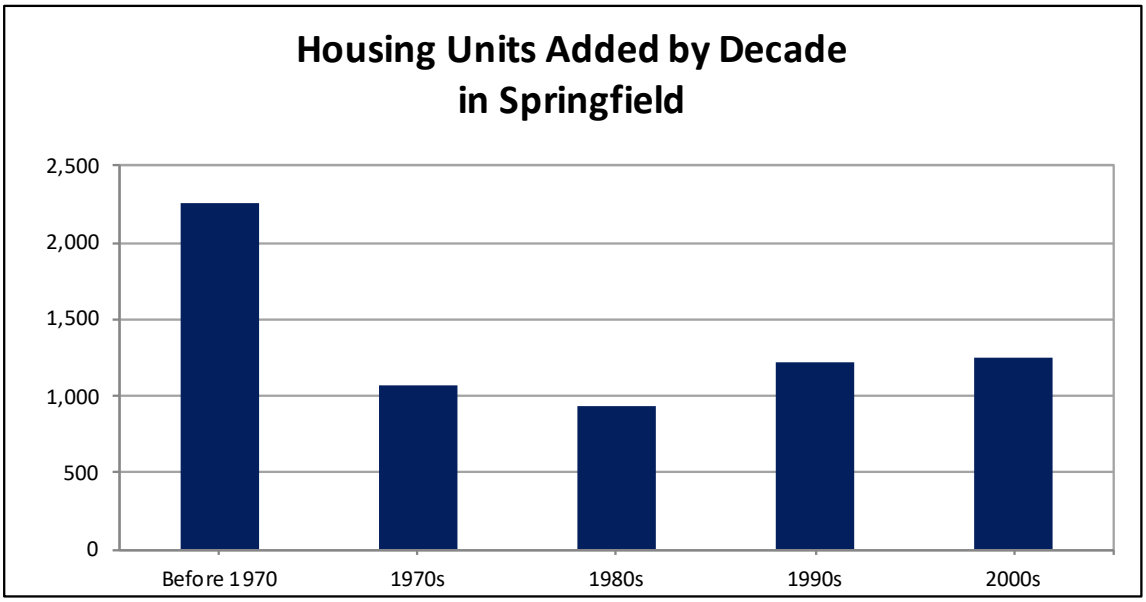
Recent Residential Construction

System development charges require an analysis of current levels of service. For residential development, current levels of service are determined using estimates of population and housing units. Shown below, Figure A2 indicates the estimated number of housing units added by decade according to data obtained from the U.S. Census Bureau. Springfield's growth has been relatively consistent since the 1970s. From 2010 to 2020, Springfield's housing inventory increased by an average of 61 units per year.

Figure A2: Housing Units by Decade

Census 2010 Housing Units	6,745
Census 2020 Housing Units	7,351
New Housing Units 2010 to 2020	606

Springfield added an average of 61 housing units per year from 2010 to 2020.



Source: U.S. Census Bureau, Census 2010 Summary File 1, Census 2000 Summary File 1, 2015-2019 5-Year American Community Survey (for 2000s and earlier, adjusted to yield total units in 2010).

Housing Unit Size

According to the U.S. Census Bureau, a household is a housing unit occupied by year-round residents. system development charges often use per capita standards and persons per housing unit (PPHU) or persons per household (PPH) to derive proportionate share fee amounts. When PPHU is used in the fee calculations, infrastructure standards are derived using year-round population. When PPHU is used in the fee calculations, the system development charge methodology assumes a higher percentage of housing units will be occupied, thus requiring seasonal or peak population to be used when deriving infrastructure standards. TischlerBise recommends the City of Springfield impose system development charges for residential development according to the number of persons per housing unit (PPHU).

Occupancy calculations require data on population and the types of units by structure. The 2010 census did not obtain detailed information using a "long-form" questionnaire. Instead, the U.S. Census Bureau switched to a continuous monthly mailing of surveys, known as the American Community Survey (ACS), which has limitations due to sample-size constraints. For example, data on detached housing units are now combined with attached single units (commonly known as townhouses, which share a common sidewall, but are constructed on an individual parcel of land). For system development charges in Springfield, detached units, attached units, and mobile homes are included in the "single-family" category. The second residential category includes duplexes and all other structures with two or more units on an individual parcel of land. This is referred to as the "multi-family" category.

Figure A3 below shows the occupancy estimates for the City of Springfield. Single-family units average 2.46 persons per housing unit and multi-family units average 1.85 persons per housing unit.

Figure A3: Persons per Housing Unit

Housing Type	Persons	Households	Persons per Household	Housing Units	Persons per Housing Unit	Housing Mix	Vacancy Rate
Single-Family Units[1]	13,091	4,923	2.66	5,311	**2.46**	76.3%	7.30%
Multi-Family Units[2]	3,055	1,433	2.13	1,652	**1.85**	23.7%	13.30%
Total	16,146	6,356	2.54	6,963	**2.32**	100.0%	8.70%

Source: U.S. Census Bureau, 2015-2019 American Community Survey 5-Year Estimates

1. Includes detached, attached (i.e. townhouses), and mobile home units.
2. Includes dwellings in structures with two or more units.

Residential Estimates

For 2020, data published by the U.S. Census Bureau includes 18,782 persons living in 7,351 housing units citywide. Applying the occupancy factors shown in Figure A3 to recent building permit data, Springfield's 2021 residential development base includes 19,301 persons living in 7,576 housing units.

Figure A4: Residential Estimates

Springfield, Tennessee	2020	2021
		Base Year
Population		
Single Family	15,228	15,642
Multi-Family	3,554	3,659
Total	**18,782**	**19,301**
Housing Units		
Single Family	5,609	5,777
Multi-Family	1,742	1,799
Total	**7,351**	**7,576**

Residential Projections

Based on discussions with City of Springfield staff, TischlerBise projects housing units based on recent residential construction trends – 168 single-family units per year and 57 multi-family units per year. For population, TischlerBise applies occupancy factors derived from 2015-2019 American Community Survey 5-Year Estimates shown in Figure A3 to housing unit projections. This analysis projects 2,250 additional housing units over the next 10 years with an associated population increase of 5,187 persons.

Population and housing unit projections are used to illustrate the possible future pace of service demands, revenues, and expenditures. To the extent these factors change, the projected need for infrastructure will also change. If development occurs at a more rapid rate than projected, the demand for infrastructure will increase at a corresponding rate. If development occurs at a slower rate than projected, the demand for infrastructure will also decrease.

Figure A5: Residential Estimates and Projections

Springfield, Tennessee	2021	2022	2023	2024	2025	2026	2031	10-Year
	Base Year	1	2	3	4	5	10	Increase
Population	**19,301**	**19,819**	**20,338**	**20,857**	**21,376**	**21,894**	**24,488**	**5,187**
Housing Units	**7,576**	**7,801**	**8,026**	**8,251**	**8,476**	**8,701**	**9,826**	**2,250**

NONRESIDENTIAL DEVELOPMENT

Current estimates and future projections of nonresidential development are detailed in this section including jobs and nonresidential floor area. TischlerBise uses the term jobs to refer to employment by place of work. In Figure A6, gray shading indicates the nonresidential development prototypes used by TischlerBise to derive employment densities and average weekday vehicle trip ends. For nonresidential development, TischlerBise uses data published in Trip Generation, Institute of Transportation Engineers, 11th Edition (2021).

The prototype for industrial development is Industrial Park (130) which generates 3.37 average weekday vehicle trip ends per 1,000 square feet of floor area and has 864 square feet of floor area per employee. For office development, the proxy is General Office (ITE 710); it generates 10.84 average weekday vehicle trip ends per 1,000 square feet of floor area and has 307 square feet of floor area per employee. The prototype for institutional development is Hospital (ITE 610) which generates 10.77 average weekday vehicle trips per 1,000 square feet of floor area and has 350 square feet of floor area per employee. The prototype for commercial development is Shopping Center (ITE 820) which generates 37.01 average weekday vehicle trips per 1,000 square feet of floor area and has 471 square feet of floor area per employee.

Figure A6: Nonresidential Demand Units

ITE Code	Land Use Group	Demand Unit	Avg Wkdy Trip Ends Per Demand Unit[1]	Avg Wkdy Trip Ends Per Employee[1]	Employees Per Demand Unit	Square Feet Per Employee
110	Light Industrial	1,000 Sq Ft	4.87	3.10	1.57	637
130	Industrial Park	1,000 Sq Ft	3.37	2.91	1.16	864
140	Manufacturing	1,000 Sq Ft	4.75	2.51	1.89	528
150	Warehousing	1,000 Sq Ft	1.71	5.05	0.34	2,953
254	Assisted Living	bed	2.60	4.24	0.61	na
310	Hotel	room	7.99	14.34	0.56	na
565	Day Care	student	4.09	21.38	0.19	na
610	Hospital	1,000 Sq Ft	10.77	3.77	2.86	350
620	Nursing Home	bed	3.06	3.31	0.92	na
710	General Office (avg size)	1,000 Sq Ft	10.84	3.33	3.26	307
720	Medical-Dental Office	1,000 Sq Ft	36.00	8.71	4.13	242
730	Government Office	1,000 Sq Ft	22.59	7.45	3.03	330
750	Office Park	1,000 Sq Ft	11.07	3.54	3.13	320
820	Shopping Center (avg size)	1,000 Sq Ft	37.01	17.42	2.12	471

1. Trip Generation, Institute of Transportation Engineers, 11th Edition (2021).

Nonresidential Estimates

TischlerBise uses Esri Business Analyst data to derive 2021 base year employment estimates. Shown below in Figure A7, City of Springfield employment estimates equal 11,459 jobs in 2021.

To estimate nonresidential floor area, TischlerBise applies the employment density factors shown in Figure A6 to employment estimates, by industry sector, shown below in Figure A7. For example, 2021 industrial employment of 4,063 jobs multiplied by an employment density factor of 864 square feet per employee equals 3,508,407 square feet of industrial floor area. TischlerBise repeats this process for commercial, office, and institutional development. The 2021 base year estimate includes 6,339,035 square feet of nonresidential floor area.

Figure A7: Nonresidential Estimates

Nonresidential Category	2021 Jobs[1]	Percent of Total Jobs	Square Feet per Job[2]	2021 Estimated Floor Area[3]	Jobs per 1,000 Sq. Ft.[2]
Industrial[4]	4,063	35%	864	3,508,407	1.16
Commercial[5]	2,549	22%	471	1,199,772	2.12
Office & Other Service[6]	1,536	13%	307	471,852	3.26
Institutional[7]	3,311	29%	350	1,159,004	2.86
Total	11,459	100%		6,339,035	1.81

1. Esri Business Analyst Online, Business Summary, 2021.
2. Trip Generation, Institute of Transportation Engineers, 11th Edition (2021).
3. TischlerBise calculation (2021 jobs X square feet per job).
4. Major sector is the Wholesale Trade.
5. Major sectors are Retail, Accommodation and Food Services.
6. Major sectors are Finance, Insurance, and Other Services.
7. Major sectors are Health Care, Social Assistance, and Public Administration.

Nonresidential Projections

TischlerBise projects nonresidential floor area based on increases in housing units. This results in approximately 1,883,000 additional square feet of nonresidential floor area in 2031. TischlerBise converts projected floor area to projected employment using the same steps outlined in the previous section. Based on these projections, Springfield's employment base will increase by 3,403 jobs in 2031.

Employment and nonresidential floor area projections are used to illustrate the possible future pace of service demands, revenues, and expenditures. To the extent these factors change, the projected need for infrastructure will also change. If development occurs at a more rapid rate than projected, the demand for infrastructure will increase at a corresponding rate. If development occurs at a slower rate than projected, the demand for infrastructure will also decrease.

Figure A8: Nonresidential Projections

Springfield, Tennessee	2021	2022	2023	2024	2025	2026	2031	10-Year
	Base Year	1	2	3	4	5	10	Increase
Housing Units	**7,576**	**7,801**	**8,026**	**8,251**	**8,476**	**8,701**	**9,826**	**2,250**
Employment								
Industrial	4,063	4,184	4,304	4,425	4,546	4,666	5,270	1,207
Commercial	2,549	2,625	2,700	2,776	2,852	2,928	3,306	757
Office & Other Service	1,536	1,582	1,627	1,673	1,718	1,764	1,992	456
Institutional	3,311	3,409	3,508	3,606	3,704	3,803	4,294	983
Total Employment	**11,459**	**11,799**	**12,140**	**12,480**	**12,820**	**13,161**	**14,862**	**3,403**
Nonres. Floor Area (x1,000)								
Industrial	3,508	3,613	3,717	3,821	3,925	4,029	4,550	1,042
Commercial	1,200	1,235	1,271	1,307	1,342	1,378	1,556	356
Office & Other Service	472	486	500	514	528	542	612	140
Institutional	1,159	1,193	1,228	1,262	1,297	1,331	1,503	344
Total Nonres. Floor Area	**6,339**	**6,527**	**6,716**	**6,904**	**7,092**	**7,280**	**8,222**	**1,883**

DEVELOPMENT PROJECTIONS

Provided below are summaries of development projections used in the System Development Charges Study. Development projections are used to illustrate a possible future pace of demand for service units and cash flows resulting from revenues and expenditures associated with those demands.

Figure A9: Development Projections Summary

	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	10-Year	20-Year
	Base Year	1	2	3	4	5	6	7	8	9	10	Increase	Increase
Population	**19,301**	**19,819**	**20,338**	**20,857**	**21,376**	**21,894**	**22,413**	**22,932**	**23,451**	**23,969**	**24,488**	**5,187**	10,375
Housing Units	**7,576**	**7,801**	**8,026**	**8,251**	**8,476**	**8,701**	**8,926**	**9,151**	**9,376**	**9,601**	**9,826**	**2,250**	4,500
Employment													
Industrial	4,063	4,184	4,304	4,425	4,546	4,666	4,787	4,908	5,028	5,149	5,270	1,207	2,413
Commercial	2,549	2,625	2,700	2,776	2,852	2,928	3,003	3,079	3,155	3,230	3,306	757	1,514
Office & Other Service	1,536	1,582	1,627	1,673	1,718	1,764	1,810	1,855	1,901	1,947	1,992	456	912
Institutional	3,311	3,409	3,508	3,606	3,704	3,803	3,901	3,999	4,098	4,196	4,294	983	1,967
Total Employment	**11,459**	**11,799**	**12,140**	**12,480**	**12,820**	**13,161**	**13,501**	**13,841**	**14,182**	**14,522**	**14,862**	**3,403**	6,806
Nonres. Floor Area (x1,000)													
Industrial	3,508	3,613	3,717	3,821	3,925	4,029	4,134	4,238	4,342	4,446	4,550	1,042	2,084
Commercial	1,200	1,235	1,271	1,307	1,342	1,378	1,414	1,449	1,485	1,520	1,556	356	713
Office & Other Service	472	486	500	514	528	542	556	570	584	598	612	140	280
Institutional	1,159	1,193	1,228	1,262	1,297	1,331	1,366	1,400	1,434	1,469	1,503	344	688
Total Nonres. Floor Area	**6,339**	**6,527**	**6,716**	**6,904**	**7,092**	**7,280**	**7,469**	**7,657**	**7,845**	**8,033**	**8,222**	**1,883**	3,765

APPENDIX B: LAND USE DEFINITIONS

RESIDENTIAL DEVELOPMENT

As discussed below, residential development categories are based on data from the U.S. Census Bureau, American Community Survey. The City of Springfield will collect system development charges from all new residential units. One-time system development charges are determined by site capacity (i.e., number of residential units).

Single-Family Units:

1. Single-family detached is a one-unit structure detached from any other house, that is, with open space on all four sides. Such structures are considered detached even if they have an adjoining shed or garage. A one-family house that contains a business is considered detached as long as the building has open space on all four sides.
2. Single-family attached (townhouse) is a one-unit structure that has one or more walls extending from ground to roof separating it from adjoining structures. In row houses (sometimes called townhouses), double houses, or houses attached to nonresidential structures, each house is a separate, attached structure if the dividing or common wall goes from ground to roof.
3. Mobile home includes both occupied and vacant mobile homes, to which no permanent rooms have been added. Mobile homes used only for business purposes or for extra sleeping space and mobile homes for sale on a dealer's lot, at the factory, or in storage are not counted in the housing inventory.

Multi-Family Units:

1. 2+ units (duplexes and apartments) are units in structures containing two or more housing units, further categorized as units in structures with "2, 3 or 4, 5 to 9, 10 to 19, 20 to 49, and 50 or more apartments."
2. Boat, RV, Van, Etc. includes any living quarters occupied as a housing unit that does not fit the other categories (e.g., houseboats, railroad cars, campers, and vans). Recreational vehicles, boats, vans, railroad cars, and the like are included only if they are occupied as a current place of residence.

NONRESIDENTIAL DEVELOPMENT

The proposed general nonresidential development categories (defined below) can be used for all new construction within the City of Springfield. Nonresidential development categories represent general groups of land uses that share similar average weekday vehicle trip generation rates and employment densities (i.e., jobs per thousand square feet of floor area).

Commercial: Establishments primarily selling merchandise, eating/drinking places, and entertainment uses. By way of example, *Commercial* includes shopping centers, supermarkets, pharmacies, restaurants, bars, nightclubs, automobile dealerships, and movie theaters.

Industrial: Establishments primarily engaged in the production, transportation, or storage of goods. By way of example, *Industrial* includes manufacturing plants, distribution warehouses, trucking companies, utility substations, power generation facilities, and telecommunications buildings.

Institutional: Public and quasi-public buildings providing educational, social assistance, or religious services. By way of example, *Institutional* includes schools, universities, churches, daycare facilities, hospitals, and government buildings.

Office: Establishments providing management, administrative, professional, or business services. By way of example, *Office* includes banks, business offices, medical offices, and veterinarian clinics.

APPENDIX C: TRANSPORTATION INVENTORY

Roadway Name	Section	Functional Classification	ADT[1]	Lanes	Miles	Lane Miles	VMT	Capacity[2]	VMC
E. 10TH	MAIN ST TO BILL JONES INDUSTRIAL DR	MINOR ARTERIAL	3,199	2	1.03	2.06	3,295	11,840	12,195
16TH	BATTS BLVD TO CLAY ST	COLLECTOR	1,450	2	0.71	1.43	1,034	10,360	7,386
W. 17TH	JOHN L PATTERSON TO MAIN	COLLECTOR	1,450	2	0.25	0.50	363	10,360	2,590
E. 17TH	MAIN ST TO BATTS BLVD	COLLECTOR	1,450	2	0.13	0.26	189	10,360	1,347
E. 17TH (OFFSET STREET) A	KIRBY ST TO MEMORIAL BLVD	COLLECTOR	2,305	2	1.42	2.84	3,273	10,360	14,711
W. 21ST	20TH TO MAIN ST	COLLECTOR	776	2	0.32	0.64	248	10,360	3,315
E. 3RD	MAIN ST TO MEMORIAL AVE	COLLECTOR	904	2	0.13	0.26	118	10,360	1,347
7TH	5TH AVE TO HILL ST	MINOR ARTERIAL	2,552	2	0.61	1.21	1,549	11,840	7,185
8TH	MAIN ST TO 10TH AVE	MINOR ARTERIAL	2,952	2	0.75	1.50	2,214	11,840	8,880
ALSUP DR	5TH AVE TO SCHOOL	COLLECTOR	1,450	2	0.30	0.59	429	10,360	3,061
BATTS BLVD	MAIN ST TO MEMORIAL AVE	MINOR ARTERIAL	2,476	2	0.69	1.37	1,698	11,840	8,120
BILL JONES INDUSTRIAL DR	MEMORIAL BLVD TO 5TH AVE	MAJOR ARTERIAL	6,740	2	1.93	3.86	13,001	10,360	19,984
BLACKWOOD	MEMORIAL BLVD TO J PORTER DR	COLLECTOR	1,344	2	0.98	1.96	1,319	10,360	10,170
BRANSFORD DR	SCHOOL ST TO JOHN L PATTERSON ST	COLLECTOR	1,450	2	0.27	0.54	392	10,360	2,797
CENTRAL AVE	5TH AVE TO MEMORIAL AVE	MAJOR ARTERIAL	12,273	3	1.16	3.48	14,237	10,360	12,018
CHEATHAM ST	17TH AVE TO 7TH AVE	COLLECTOR	680	2	0.66	1.32	448	10,360	6,829
CIRCLE DR	LINDA LN TO MEMORIAL DR	COLLECTOR	1,450	2	0.48	0.96	695	10,360	4,962
DRIVEWAY AVE	MEMORIAL BLVD TO HILL ST	COLLECTOR	1,450	2	0.12	0.24	174	10,360	1,243

Roadway Name	Section	Functional Classification	ADT[1]	Lanes	Miles	Lane Miles	VMT	Capacity[2]	VMC
ELECTROLUX DR	INDUSTRIAL DR TO REID RD	COLLECTOR	1,450	2	0.15	0.30	218	10,360	1,554
FAIRWAY TRAIL	MASTERS DR TO RUTH ST	COLLECTOR	1,450	2	1.05	2.10	1,523	10,360	10,878
GOLF CLUB LN	MEMORIAL BLVD TO CUL-DE-SAC	COLLECTOR	1,450	2	0.72	1.45	1,048	10,360	7,485
HILLSIDE DR	BILL JONES INDUSTRIAL DR TO HWY 76 E	MINOR ARTERIAL	2,855	2	1.37	2.74	3,911	11,840	16,218
INDUSTRIAL DR	MEMORIAL BLVD TO BILL JONES INDUSTRIAL DRIVE	MAJOR ARTERIAL	5,629	2	1.18	2.37	6,667	10,360	12,270
JOHN L PATTERSON ST	21ST AVE TO CENTRAL AVE	COLLECTOR	1,450	2	0.51	1.02	740	10,360	5,284
JOSEPHINE ST	INDUSTRIAL DR TO 5TH AVE	COLLECTOR	972	2	0.49	0.97	472	10,360	5,032
KINNEYS RD	5TH AVE TO CITY LIMITS	COLLECTOR	2,732	2	0.75	1.50	2,044	10,360	7,750
KINNEYS SCHOOL RD	5th AVE TO CITY LIMITS	COLLECTOR	1,450	2	0.85	1.69	1,229	10,360	8,777
LAHR RD	MAIN ST TO CITY LIMIT	COLLECTOR	1,817	2	0.28	0.56	506	10,360	2,887
LEGACY DR	OLD GREENBRIAR PIKE TO DEAD END	COLLECTOR	1,450	2	1.68	3.36	2,433	10,360	17,380
LINDA LN	CIRCLE DR TO GOLF CLUB LN	COLLECTOR	757	2	0.24	0.49	184	10,360	2,523
MAIN ST	MEMORIAL AVE TO MEMORIAL AVE	MAJOR ARTERIAL	8,966	2	3.65	7.30	32,726	10,360	37,814
MEADOWBROOK DR	17TH AVE E TO DEAD END	COLLECTOR	1,450	2	0.19	0.38	278	10,360	1,989
NEW CHAPEL RD	5TH AVE TO CITY LIMITS	COLLECTOR	1,450	2	0.69	1.39	1,005	10,360	7,180
NEW CUT RD	WILLIAM A BATSON PARKWAY TO CITY LIMITS	COLLECTOR	2,172	2	0.36	0.73	789	10,360	3,762
NICKLAUS DR	TOM AUSTIN PARKWAY TO EAGLE TRAIL	COLLECTOR	1,450	2	0.32	0.64	464	10,360	3,315
OAKLAND RD	OLD GREENBRIAR PIKE TO CITY LIMIT	MINOR ARTERIAL	2,734	2	0.85	1.70	2,329	11,840	10,085
OLD GREENBRIER PIKE	BILL JONES INDUSTRIAL DR TO CITY LIMITS	MINOR ARTERIAL	3,242	2	1.55	3.10	5,020	11,840	18,332

Roadway Name	Section	Functional Classification	ADT[1]	Lanes	Miles	Lane Miles	VMT	Capacity[2]	VMC
OLD HIGHWAY 431	WILLIAM A BATSON PARKWAY TO CITY LIMITS	COLLECTOR	913	2	0.05	0.11	49	10,360	559
PITT LN	5TH AVE TO COFER DR	COLLECTOR	1,450	2	0.40	0.80	580	10,360	4,144
R W GORDON DR	CENTRAL AVE TO WESTWIND DR	COLLECTOR	1,450	2	0.65	1.30	940	10,360	6,712
REID RD	ELECTROLUX DR TO BILL JONES INDUSTRIAL DR	COLLECTOR	1,450	2	0.31	0.63	455	10,360	3,251
RICHARD ST	CENTRAL AVE TO 7TH AVE	COLLECTOR	808	2	0.44	0.88	356	10,360	4,565
RUTH ST	TOM AUSTIN HWY TO CIRCLE DR	COLLECTOR	1,735	2	0.51	1.03	892	10,360	5,326
STONEWALL DR	MEMORIAL BLVD TO CUL-DE-SAC	COLLECTOR	1,450	2	0.42	0.84	612	10,360	4,372
WALNUT ST	7TH AVE TO MAIN ST	COLLECTOR	632	2	0.82	1.64	520	10,360	8,517
WATSON RD	MAIN ST TO DEAD END CROSSING TOM AUSTIN HWY	COLLECTOR	1,450	2	0.33	0.65	473	10,360	3,378
WILLIAM A BATSON PARKWAY	TOM AUSTIN HWY TO BLACK PATCH RD	MINOR ARTERIAL	3,276	2	1.67	3.34	5,471	11,840	19,773
WILLOW ST	10TH AVE TO 3RD AVE	COLLECTOR	563	2	0.64	1.28	361	10,360	6,649
Total			**106,462**		**35.07**	**71.30**	**118,968**		**375,899**

1. City of Springfield, Tennessee
2. Florida Department of Transportation, LOS D