CITY OF FRANKLIN
TENNESSEE

ROAD IMPACT FEE UPDATE

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INTRODUCTION AND SUMMARY

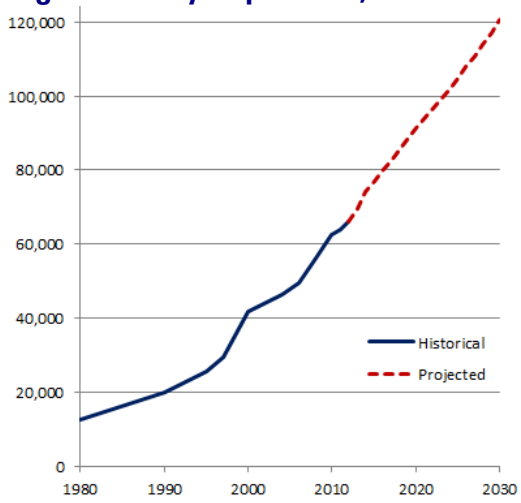
Impact fees are charges that are assessed on new development to help pay for the capital facility costs they impose on the community. Unlike other types of developer exactions, impact fees are based on a standard formula and a pre-determined fee schedule. Essentially, impact fees require that each new residential or commercial project pay its pro-rata share of the cost of new infrastructure facilities required to serve that development.

The City of Franklin has assessed road impact fees since 1988. The road impact fee ordinance requires the City to "revise the road impact fee study and the schedule of impact fees at least once every five years." In addition, when the impact fees were reviewed in 2005, the Board requested subsequent reviews every two to three years. The purpose of this study is to update the City of Franklin's road impact fee based on the most appropriate methodology and the most current data.

Growth Context

Impact fees are most appropriate for communities that are experiencing rapid growth. The City of Franklin added over 20,000 new residents in each of the last two decades, and is projected to add about 29,000 more in each of the next two decades, as illustrated in Figure 1.[1]

Figure 1. City Population, 1980-2030



This strong growth will necessitate numerous capacity-expanding improvements to the major roadway system. The City's *Major Thoroughfare Plan* projects that the population of the city and its urban growth area will increase from 74,650 in 2008 to 138,819 by 2035, and recommends 80 road construction and road widening projects, most of which will expand capacity to accommodate the resulting increase in traffic.[2]

Background

In 1987, the City of Franklin sought and obtained authority from the Tennessee legislature to enact road impact fees. That same year, Duncan Associates was commissioned to prepare an impact fee study to calculate the maximum road impact fees that the City could charge. Ordinance 1037 enacting road impact fees was adopted by the City in June of 1988. The fees were adopted at 60 percent of the maximum fees calculated in the original study.

[1] City of Franklin, Planning and Sustainability Department, *2012 Development Report*.
[2] Wilbur Smith and Associates, *City of Franklin Major Thoroughfare Plan*, adopted September 23, 2010.

Twelve years after the initial adoption, the City updated the road impact fees, based on a study prepared by Duncan Associates in 2000. The updated fees were adopted in July 2000 with the increase phased in over two years. Duncan Associates prepared two subsequent impact fee studies for the City of Franklin, with the City adopting updated fee schedules based on those studies in 2005 and 2007. Fees calculated in a study by Duncan Associates in 2010 were adopted in 2011, but phased in over two years.

Prior to the 2007 update, the road fees were based the cost of arterial roads, excluding I-65 and the Mack Hatcher expressway, and were based on peak hour travel. The 2007 update added Mack Hatcher to the definition of the major road system and based the fees on average daily travel. The most recent 2010 update provided the options of including right-of-way (ROW) costs and adding collector costs. The City opted to add ROW costs but to continue to exclude collectors.

The fees that have been in effect from 2005 to present are summarized in Table 1.

Table 1. History of Road Impact Fees, 2005-2013

Land Use Type	Unit	2005	2007	2011	2012	2013
Single-Family Detached	Dwelling	$1,617	$2,191	$2,700	$3,514	$4,227
Multi-Family	Dwelling	$896	$1,537	$1,844	$2,336	$2,766
Mobile Home Park	Site	$1,003	$1,144	$1,378	$1,752	$2,079
Congregate Care Facility	Dwelling	$221	$440	$566	$767	$943
Hotel/Motel	Room	$649	$1,126	$1,432	$1,922	$2,350
Retail/Commercial						
Shopping Center/Gen. Retail	1,000 sq. ft.	$3,508	$2,681	$3,510	$4,836	$5,996
Restaurant, Quality	1,000 sq. ft.	$3,773	$4,964	$6,499	$8,955	$11,104
Restaurant, Fast Food	1,000 sq. ft.	$5,609	$7,177	$9,426	$13,023	$16,171
Office/Institutional	1,000 sq. ft.					
Office, General	1,000 sq. ft.	$2,716	$1,891	$2,430	$3,291	$4,045
Hospital	1,000 sq. ft.	$1,199	$2,867	$3,595	$4,760	$5,779
Nursing Home	1,000 sq. ft.	$449	$996	$1,411	$2,074	$2,654
Church	1,000 sq. ft.	$754	$1,127	$1,447	$1,958	$2,406
Elementary/Sec. School	1,000 sq. ft.	$749	$543	$704	$960	$1,185
Industrial	1,000 sq. ft.					
Manufacturing	1,000 sq. ft.	$1,529	$830	$1,067	$1,445	$1,776
Industrial Park	1,000 sq. ft.	$1,497	$1,513	$1,944	$2,634	$3,237
Business Park	1,000 sq. ft.	$1,998	$2,773	$3,563	$4,828	$5,934
Warehouse	1,000 sq. ft.	$704	$1,078	$1,222	$1,453	$1,655
Mini-Warehouse	1,000 sq. ft.	$417	$388	$493	$662	$809

Notes: Fees effective July 1, 2011 based on 25% of increase from 2007 fees to 2013 fees; fees effective July 1 2012 based on 65% of increase from 2007 fees to 2013 fees; fees effective July 1, 2013 based on Duncan Associates, *Road Impact Fee Update*, November 2010 (which included right-of-way costs).

Approach and Findings

This update revises the road impact fee calculations by incorporating the most current data, including the most recent road improvement costs and the latest version of the *Trip Generation* manual.

The inclusion of collector roads in the road impact fee is the major policy option provided in this update. The inclusion of collector roads would increase the maximum fees by an average of about 91%. It would also require the City to provide credit against the fees for developer's who dedicate

right-of-way or construct collectors within their subdivisions. Finally, it would require the restriction of about 40.5% of the fees collected to be earmarked to be spent in the same benefit district in which it was paid.

In addition, this update proposes two significant changes to the methodology: design costs have been added to construction and ROW costs, and the debt credit has been eliminated. Design costs are a necessary component of road improvements, averaging about 6% of total project costs. The debt credit has been eliminated in this update because the City's outstanding road-related debt is for previous arterial street improvements that have created excess capacity for growth, and because road impact fees are being used to retire this debt.

The updated arterial fees are generally somewhat higher than current fees, although there is some variation by land use based on updated travel demand factors (trip generation rates and average trip lengths). The increase is primarily due to increased construction costs and the addition of design costs. If collector roads are added, the fees would increase significantly for all land use categories, as shown in Table 2.

Table 2. Comparison of Current and Updated Fees

			Arterials Only		All Major Roads	
Land Use Type	Unit	Current Fee	Updated Fee	Percent Change	Potential Fee	Percent Change
Single-Family Detached	Dwelling	$4,227	$4,911	16%	$8,251	95%
Multi-Family	Dwelling	$2,766	$3,112	13%	$5,233	89%
Mobile Home Park	Site	$2,079	$2,338	12%	$3,930	89%
Congregate Care Facility	Dwelling	$943	$1,093	16%	$1,836	95%
Hotel/Motel	Room	$2,350	$2,567	9%	$4,317	84%
Retail/Commercial						
Shopping Center/Gen. Retail	1,000 sq. ft.	$5,996	$6,484	8%	$10,878	81%
Restaurant, Quality	1,000 sq. ft.	$11,104	$12,069	9%	$20,255	82%
Restaurant, Fast Food	1,000 sq. ft.	$16,171	$17,442	8%	$29,304	81%
Office/Institutional						
Office, General	1,000 sq. ft.	$4,045	$4,632	15%	$7,802	93%
Hospital	1,000 sq. ft.	$5,779	$5,359	-7%	$9,012	56%
Nursing Home	1,000 sq. ft.	$2,654	$3,082	16%	$5,181	95%
Church	1,000 sq. ft.	$2,406	$3,258	35%	$5,476	128%
Elementary/Sec. School	1,000 sq. ft.	$1,185	$1,606	36%	$2,697	128%
Industrial						
Manufacturing	1,000 sq. ft.	$1,776	$2,030	14%	$3,419	93%
Industrial Park	1,000 sq. ft.	$3,237	$3,636	12%	$6,120	89%
Business Park	1,000 sq. ft.	$5,934	$6,613	11%	$11,132	88%
Warehouse	1,000 sq. ft.	$1,655	$1,893	14%	$3,187	93%
Mini-Warehouse	1,000 sq. ft.	$809	$885	9%	$1,487	84%

Source: Current fees from Table 1; updated and potential fees from Table 19.

Policy Options

As noted, whether to include collector roads in the road impact fee is the major policy option provided in this update. While adding collectors would result in higher fees, it would also require the City to provide developer credits against the fees for collector right-of-way dedication and

construction. In addition, it would require that a significant portion of the fees collected be earmarked to be spent in the same benefit district in which it was paid.

If collectors are not added, there would be no change to the road impact fee structure. However, if collectors are included in the fee, multiple benefit districts are recommended in order to ensure benefit, given the more localized nature of collector roads. There are several alternatives for addressing benefit districts, as summarized below.

(1) **Benefit District Configuration**. This study recommends dividing the city into four benefit districts, corresponding to quadrants that intersect in the downtown and are defined by US 31 and SR 96 (see Figure 2). However, many other benefit district configurations are possible.

(2) **Structure of Collector Fee.** The collector portion of the fee is the difference between the fee for the total major road system (including collectors) and the fee for just the arterial system. The collector portion would be 40.5% of the total fee (see Table 19). There are three approaches here:

(a) Make no distinction between arterials and collector fees, and restrict all road fees to be spent in the benefit district in which they are collected.

(b) The collector portion could be adopted as a separate collector impact fee, with the collector fee earmarked to be spent only on collector improvements in the same benefit district. The arterial fee could be spent for arterial improvements city-wide.

(c) A single road fee could be retained, with the collector portion of the fees earmarked to be spent on major road improvements (either arterials or collectors) in the benefit district, with the rest of the fee paid put in an account that could be spent on any major road improvement anywhere in the city.

Finally, there are some implications of including collectors for developer credits. If separate arterial and collector fees are adopted, developers would be given credit only against the fee applicable to the developer-improved roadway type. By the same token, if the City retains a single road fee and has the flexibility to spend the revenue on arterial or collector improvements, developers should be provided credit against the total fee regardless of the type of improvement they made.

Recommendations

(1) **Don't Include Collectors**. This consultant would recommend against including collectors. The City must weigh the potential additional revenue against (a) the fact that much of the potential "revenue" increase would consist of developer credits for collectors that developers would have installed anyway, and (b) determining the amounts of individual developer credits and tracking them would impose significant administrative costs.

(2) **If Collectors are Added**. If the City decides to add collectors, the consultant would recommend: (a) dividing the city into multiple benefit districts, and (b) retaining a single road fee, but earmarking the collector portion (40.5%) to be spent in the benefit district in which it was collected.

LEGAL FRAMEWORK

Franklin received special authorization to impose a road impact fee from House Bill 1311, which was passed during the 1987 session of the Tennessee legislature. While Franklin's authorizing act provides a broad grant of authority, impact fees must also comply with constitutional standards that have been developed by the courts to ensure that local governments do not abuse their power to regulate the development of land. The courts have gradually developed guidelines for constitutionally valid impact fees, based on a "rational nexus" that must exist between the regulatory fee or exaction and the activity that is being regulated. The standards set by court cases generally require that an impact fee meet a two-part test:

1) The fees must be proportional to the need for new facilities created by the new development; and

2) The expenditure of impact fee revenues must provide benefit to the fee-paying development.

Impact fees for various types of developments should be proportional to the impact of each development on the need to construct additional or expanded facilities. The fees do not have to recover the full cost, but if the fees are reduced by a percentage from the full cost, the percentage reduction should apply evenly to all types of developments.

Impact fees were pioneered by local governments long before state legislatures passed explicit enabling acts. The authority to adopt such fees was found in local government's "police power" to regulate development so as to protect the health, safety and welfare of its citizens. Developers challenged early impact fees, and state court decisions gradually developed a body of case law setting out the standards that should govern impact fees. This section spells out our understanding of the general principles of impact fees and some implications for calculating Franklin's impact fees.

A fundamental principle of impact fees, rooted in both case law and norms of equity, is that impact fees should not charge new development for a higher level of service than is provided to existing development. While the impact fees could be based on a higher level of service than the one existing at the time of the adoption of the fees, two things are required if this is done. First, another source of funding other than impact fees must be identified and committed to fund the capacity deficiency created by the higher level of service. Second, the impact fees must generally be reduced to ensure that new development does not pay twice for the same level of service, once through impact fees and again through general taxes that are used to remedy the capacity deficiency for existing development. In order to avoid these complications, our general practice is to base the impact fees on the existing level of service.

A corollary principle is that new development should not have to pay twice for the same level of service. As noted above, if impact fees are based on a higher-than-existing level of service, the fees should be reduced by a credit that accounts for the contribution of new development toward remedying the existing deficiencies. A similar situation arises when the existing level of service has not been fully paid for. Outstanding debt on existing facilities that are counted in the existing level of service will be retired, in part, by revenues generated from new development. To avoid requiring new development to pay more than its proportional share, impact fees should be reduced to account for future tax payments that will retire outstanding debt on existing facilities.

In general, credit against impact fees is not required for funding that has historically been used for, or that is committed to be used for growth-related, capacity-expanding improvements. While new development may contribute toward such funding, so does existing development, and both existing and new development benefit from the higher level of service that the additional funding makes possible. However, consistent with past studies and standard impact fee practice, credit is provided in this update for State and Federal funding.

The City's road impact fee ordinance allows developers to receive offsets against their impact fees for right-of-way (ROW) dedication or construction of a thoroughfare shown on the Major Thoroughfare Plan map. Prior to the 2010 update, ROW costs had been excluded from the impact fee calculation, because the City required developers to dedicate a minimum of 60-foot ROW width without credit against the impact fee. The City is therefore now obligated to provide credit for ROW dedication. If collectors are included in the fee, developers will need to receive credit for ROW dedications and improvements to collector roads.

BENEFIT DISTRICTS

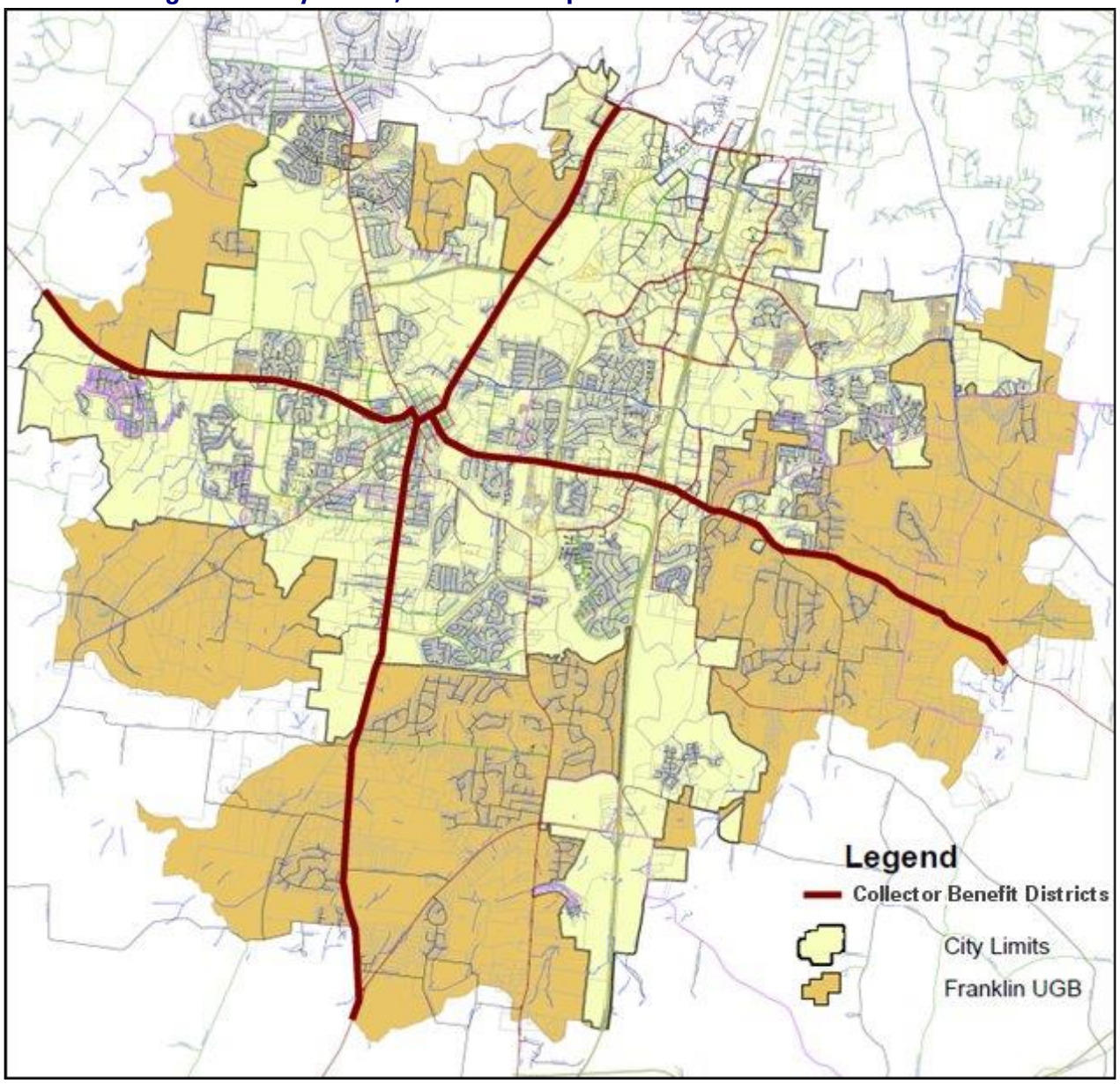
Impact fee case law states that impact fees must be spent so as to provide a reasonable benefit to the fee-paying development. One way of ensuring reasonable benefit is to create multiple benefit districts to ensure that the development fees paid by a development are spent closer to the development than would be the case under a single jurisdiction-wide benefit district. The need for multiple benefit districts increases with the geographic size of the community. On the other hand, the larger the number of benefit districts, the more difficult it is to accumulate sufficient funds in any one district to make any significant improvements. Deciding on the appropriate number and location of benefit districts requires balancing the need to show reasonable benefit to fee payers with the need to maintain sufficient flexibility in impact fee expenditures to address priority improvement needs.

The City's current impact fee ordinance designates the entire area within the corporate boundaries as a single benefit district. The fact that the City's road impact fees are currently limited to funding improvements to major thoroughfares strengthens the case for a single benefit district. Major thoroughfares are designed to move traffic from one part of the city to another, and the entire network acts as an integrated system.

In the event that the City decided to expand the road impact fee to cover collector roads, the City should consider dividing its jurisdiction into multiple benefit districts in order to recognize the more localized benefit of collector roads. These benefit districts would earmark the collector portion of the fee to be spent in the same area of the city in which they were collected, while the arterial portion of the fee could still be spent city-wide. While many benefit district configurations are possible, one option would be to divide the city into quadrants defined by US 31 and SR 96, as shown in Figure 2.

If collectors are included, the collector portion would be about 41% of the total fee. This amount could be adopted as a separate fee, with the collector fee earmarked to be spent only on collectors in the same benefit district. Alternatively, a single road fee could be retained, with the collector percentage of the fee paid could be earmarked to be spent on major road improvements (arterials or collectors) in the benefit district, with the rest of the fee paid put in an account that could be spent anywhere in the city.

Figure 2. City Limits, UGB and Proposed Collector Benefit Districts

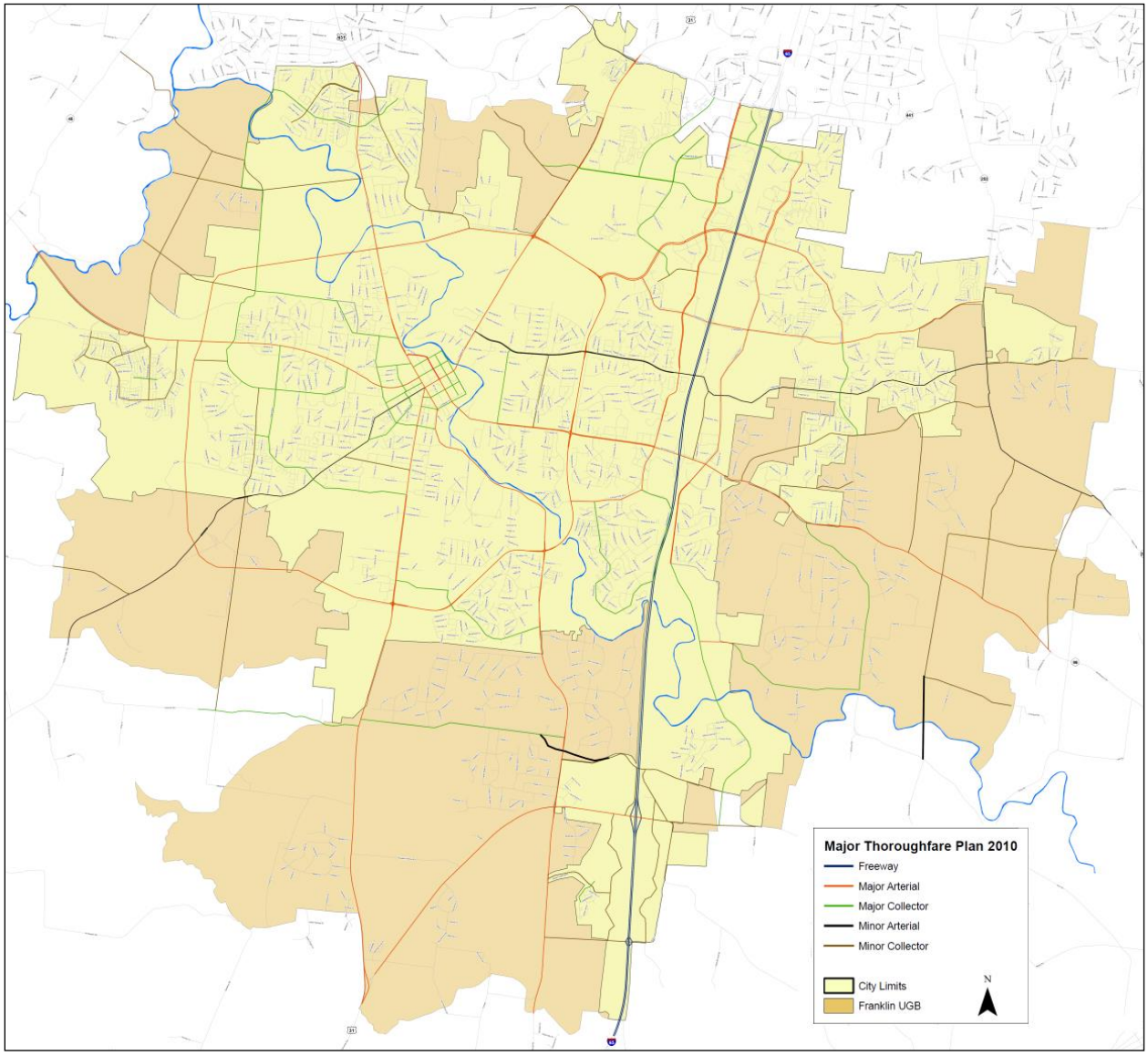


MAJOR ROADWAY SYSTEM

A road impact fee system should include a clear definition of the major roadway system that is to be funded with the impact fees. In the City's current ordinance, the use of impact fee proceeds is restricted to arterial road improvements, which is defined as "any capital improvement, including but not limited to new roads, additional lanes, widened lanes, intersection improvements, turn lanes, bridges, traffic signals, intelligent transportation system (ITS) improvements, and associated drainage facilities, that expands the capacity of the city's arterial road system." The arterial road system is defined as "all existing and planned arterials, excluding Interstate 65, identified on the city's adopted Major Thoroughfare Plan map." The major roadway system includes State roads as well as City roads. The current ordinance and impact fee excludes major and minor collector roads from the impact fee calculations. As mentioned in the introduction, this study includes the option of expanding the impact fee to include collector roads. Including collector roads in the calculation of the impact fee in this update will allow the City to program future impact fee revenue for planned collector road improvements. If this option is adopted, the City would need to amend the impact fee ordinance to allow for the expenditure of impact fee funds for major and minor collector road improvements by amending the definition of major roadway system.

The major roadway system is thus currently defined as existing and planned arterials identified on the adopted Major Thoroughfare Plan map (see Figure 3) within the city limits. Interstate 65, which primarily serves through traffic rather than local traffic, is excluded from the arterial roadway system to be funded with the road impact fees. The Major Thoroughfare Plan map also identifies the major and minor collector roads that are included in this update. Currently, capacity-expanding improvements include any improvements to arterial roadways, including signalization and intersection improvements, which primarily have the effect of expanding capacity of the arterial roadway system, rather than providing greater access to a particular development or promoting safety.

Figure 3. Major Thoroughfare Plan Map



METHODOLOGY

Key components of the road impact fee methodology described in this chapter include service units, roadway capacity and the overall formula for calculating the fees. Subsequent chapters address the travel demand schedule, cost per service unit and net cost per service unit (revenue credits). The final chapter presents the updated road impact fee schedule.

Service Units

Service units create the link between supply (roadway capacity) and demand (traffic generated by new development). An appropriate service unit basis for road impact fees is vehicle-miles of travel (VMT). Vehicle-miles is a combination of the number of vehicles traveling during a given time period and the distance (in miles) that these vehicles travel.

The two time periods most often used in traffic analysis are the 24-hour day (average daily trips or ADT) and the single hour of the day with the highest traffic volume (peak hour trips or PHT). As in the prior impact fee study, this update utilizes the ADT for calculating the road cost component of the impact fee and ADT for calculating the credit component of the impact fee. While peak hour trip (PHT) generation rates are appropriate for assessing the impact of a new development on the need for road improvements during the evening peak hour, they tend to be more variable than average daily trips depending on size and demographic make-up of a community. Average daily trips is also the best measure for the amount of motor fuel tax that will be generated by new development, which is used to calculate the revenue credit for each land use type. The Tennessee Department of Transportation measures traffic counts on major roads using average daily trips; as a result, utilizing the ADT for both the cost and credit component of the impact fee eliminates the need to convert available traffic counts and projected volumes into PHT. For these reasons, we recommend continuing to use average daily VMT as the service unit for the road impact fee update.

Roadway Capacity

Nationally-accepted transportation levels of service (LOS) categories have been developed by the transportation engineering profession. Six categories, ranging from LOS A to LOS F, generally describe driving conditions in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. LOS A represents free flow, while LOS F represents the breakdown of traffic flow, characterized by stop-and-go conditions.

In contrast to LOS, service volume capacity is a quantitative measure, expressed in terms of the rate of flow (vehicles passing a point during a period of time). Service volume capacity represents the maximum rate of flow that can be accommodated by a particular type of roadway while still maintaining a specified LOS. The service volume capacity at LOS E represents the maximum volume that can be accommodated before the flow breaks down into stop-and-go conditions that characterize LOS F, and thus represents the ultimate capacity of the roadway.

As stated in the City's *Major Thoroughfare Plan*, the LOS C is generally considered to be the minimum acceptable LOS for the City of Franklin. This is consistent with the City's road impact fees, which

are based on LOS C. The City's 2004 *Major Thoroughfare Plan Update* identifies maximum daily service volumes at LOS C that are appropriate for planning purposes for a wide variety of roadway facilities (see Table 3).

Table 3. Road Capacity by Classification

Functional Classification	No. of Lanes	Vehicles/Day (LOS C)	Capacity/ Lane
Collector	2	9,100	4,550
Collector	3	11,300	3,767
Collector	4	14,900	3,725
Collector	5	19,000	3,800
Arterial	2	11,600	5,800
Arterial	3	14,400	4,800
Arterial	4	19,000	4,750
Arterial	5	21,900	4,380
Expressway	2	28,100	14,050
Expressway	4	56,200	14,050
Expressway	6	84,300	14,050

Source: RPM Transportation Consultants, *City of Franklin Major Thoroughfare Plan Update*, August 2004.

Formula

The methodology used in Franklin's current road impact fee system is based on a "consumption-based" approach. The consumption-based model simply charges a new development the cost of replacing the capacity that it consumes on the major roadway system. That is, for every vehicle-mile of travel (VMT) generated by the development, the road impact fee charges the net cost to construct an additional vehicle-mile of capacity (VMC). The consumption-based methodology is maintained in this update, and credits continue to be provided for outstanding road-related debt and outside funding.

Since travel is never evenly distributed throughout a roadway system, actual roadway systems require more than one unit of capacity for every unit of demand in order for the system to function at an acceptable level of service. Suppose for example, that the City completes a major arterial widening project. The completed arterial is likely to have a significant amount of excess capacity for some period of time. If the entire system has just enough capacity to accommodate all of the vehicle-miles of travel, then the excess capacity on this segment must be balanced by another segment being over-capacity. Clearly, roadway systems in the real world need more total aggregate capacity than the total aggregate demand, because the traffic does not always precisely match the available capacity. Consequently, the standard consumption-based model generally underestimates the full cost of accommodating new development at the existing level of service. Nevertheless, it is a conservative, legally-defensible methodology that is simpler to update and provides more flexibility in the expenditure of funds than the alternative improvements-driven approach.

In most rapidly growing communities, some of the roadways will be experiencing an unacceptable level of congestion at any given point in time. However, it is not necessary to address segment-specific existing deficiencies in a consumption-based system, which, unlike an improvements-driven system, is not designed to recover the full costs to maintain the desired LOS on all roadway

segments. Instead, it is only designed to maintain a minimum one-to-one overall ratio between system demand and system capacity. As discussed above, virtually all major roadway systems have more capacity (VMC) than demand (VMT) on a system-wide basis. Consequently, under a consumption-based system, the level of service standard is really a system-wide VMC/VMT ratio of 1.00. Since Franklin's major roadway system currently operates at better than this level of service (see Table 13), there are no existing deficiencies on a system-wide basis.

The recommended impact fee formula is presented in Figure 4.

Figure 4. Road Impact Fee Formula

Impact Fee	=	**VMT x NET COST/VMT**
VMT	=	TRIPS x %NEW x LENGTH ÷ 2
NET COST/VMT	=	COST/VMC x VMC/VMT - CREDIT/VMT
Where:		
TRIPS	=	Trip ends during an average weekday
2	=	Dividing by two avoids double-counting trips for origin and destination
% NEW	=	Percent of trips that are primary trips, as opposed to pass-by or diverted-linked trips
LENGTH	=	Average length of a trip on the major road system
COST/VMC	=	Average cost to add a new daily vehicle-mile of capacity
VMC/VMT	=	System-wide ratio of VMC to VMT on major road system (assumed 1:1)
CREDIT/VMT	=	Revenue credit per VMT

TRAVEL DEMAND SCHEDULE

The travel demand generated by specific land use types is a product of three factors: 1) trip generation, 2) percent primary trips and 3) trip length. The first two factors are well documented in the professional literature, and the average trip generation characteristics identified in studies of communities around the nation should be reasonably representative of trip generation characteristics in Franklin. In contrast, trip lengths are much more likely to vary between communities, depending on the geographic size and shape of the community and its major roadway system.

Trip Generation

Trip generation rates were based on information published in the most recent edition of the Institute of Transportation Engineers' (ITE) Trip Generation manual. Trip generation rates represent trip ends, or driveway crossings from the site of a land use. Thus, a one-way trip from home to work counts as one trip end for the residence and one trip end for the work place. To avoid over-counting, all trip rates have been divided by two. This places the burden of travel equally between the origin and destination of the trip and eliminates double-charging for any particular trip.

Primary Trip Factor

Trip rates also need to be adjusted by a "primary trip factor" to exclude pass-by and diverted trips. This adjustment is intended to reduce the possibility of over-counting additional travel induced by the new development. Pass-by trips are those trips that are already on a particular route for a different purpose and simply stop at a development on that route. For example, a stop at a convenience store on the way home from the office is a pass-by trip for the convenience store. A pass-by trip does not create an additional burden on the street system and therefore should not be counted in the assessment of impact fees. A diverted-linked trip is similar to a pass-by trip, but a diversion is made from the regular route to make an interim stop. The reduction for pass-by and diverted trips utilized in this study was drawn from the ITE *Trip Generation Handbook* and other published information.

Average Trip Length

The average trip length is the most difficult travel demand factor to determine. In the context of a road impact fee using a consumption-based methodology, the relevant input is the average length of a trip on the major roadway system within the city limits. The starting point is national data for average trip length for specific land uses and trip purposes. However, these national trip lengths are likely to be unrepresentative of travel on the City's major roadway system. An adjustment factor can be derived by dividing the VMT actually observed on the major roadway system by the VMT that would be expected using national average trip lengths and trip generation rates.

The first step in developing the adjustment factor for the local trip length is to estimate the total VMT that would be expected on Franklin's major roadway system based on national travel demand characteristics. Existing land use data for the City were compiled using information from the Franklin Planning Department. Existing land uses are multiplied by trip generation rates, percent primary trips and average trip lengths and summed to estimate total city-wide VMT. As shown in

Table 4, existing land uses within the city limits, using national trip length data, would be expected to generate approximately 2.28 million VMT every day.

Table 4. Expected Vehicle-Miles of Travel

Land Use Type	Unit	Existing Units	Trip Rates	Primary Trips	Daily Trips	Length (miles)	Daily VMT
Single-Family Detached	Dwelling	16,746	4.76	100%	79,711	9.16	730,153
Multi-Family	Dwelling	11,080	3.33	100%	36,896	8.30	306,237
Mobile Home	Dwelling	408	2.50	100%	1,020	8.30	8,466
Gen. Retail/Commercial	1,000 sq. ft.	12,320	21.35	43%	113,104	6.27	709,162
Office/Institutional	1,000 sq. ft.	8,479	5.52	75%	35,103	9.96	349,626
Industrial/Warehouse	1,000 sq. ft.	5,334	3.42	95%	17,330	9.96	172,607
Total					283,164		2,276,251

Source: Existing residential and nonresidential units from City of Franklin, *2012 Development Report*, December 2012; daily trip rates and primary trip factors from Table 8; daily trips is product of trip rate and primary trips; national average trip length from Table 7; daily VMT is product of trips and trip length.

The next step in developing the local trip length adjustment factor is to determine actual daily VMT on the City's major roadway system. An inventory of the existing major roadway system was prepared as part of this study (see Table 20 in the Appendix). Roadway segment lengths and recent traffic volumes are used to estimate actual daily VMT. Since counts were not available for all segments, total VMT must be estimated from VMT for segments for which counts are available. As shown in Table 5, the City's major roadway system has an estimated 1.17 million total daily VMT.

Table 5. Actual Existing Vehicle-Miles of Travel

Functional Classification	Road Segments w/Counts			Total Ln-Mi.	Total VMT
	VMT	Ln-Mi.	Veh./Ln		
Expressway	138,462	17.60	7,867	17.60	138,459
Other Arterial	613,824	121.27	5,062	145.49	736,470
Subtotal, Arterials					874,929
Collector	97,743	35.40	2,761	107.11	295,731
Total	850,028	174.27	15,690	270.20	1,170,660

Source: VMT and lane-miles of segments with traffic counts and total lane-miles from Table 20 in the Appendix; vehicles per lane is VMT on segments with counts divided by lane-miles with counts; total VMT is product of vehicles per lane and total lane-miles.

Comparing the results of the last two tables, it can be seen that expected VMT using existing land use data and national travel demand characteristics significantly over-estimates VMT actually observed on the major roadway system. This result is not surprising, since the VMT estimate does not include travel on local roads, the Interstate or on any roadways outside of the Franklin city limits. Consequently, it is necessary to develop an adjustment factor to account for this variation. The local travel demand adjustment factor is the ratio of actual to expected VMT on the major roadway system. As shown in Table 6, the national average trip length should be multiplied by a local adjustment factor of 0.384 if the major road system continues to be defined as arterials, and 0.514 if collector roads are included in the impact fee. The difference between the two adjustment factors reflects the share of traffic attributable to collector roads

Table 6. Local Trip Length Adjustment Factors

	Arterials Only	All Major Roads
Actual Daily Vehicle-Miles of Travel (VMT)	874,929	1,170,660
÷ Expected Daily Vehicle-Miles of Travel (VMT)	2,276,251	2,276,251
Local Adjustment Factor	0.384	0.514

Source: Actual VMT from Table 5; expected VMT from Table 4.

The national average trip lengths derived from the U.S. Department of Transportation's 2009 *National Household Travel Survey* for a variety of trip purposes, including home-to-work, doctor/dentist, school/church, shopping, and other personal trips, have been adjusted by the local trip length adjustment factor. Since this study provides an option to include collector roads, the study will include two separate travel demand schedules: one that reflects travel on arterial roads only and one that reflects travel on both arterial and collector roads. The localized trip lengths are shown in Table 7.

Table 7. Average Trip Length by Trip Purpose

		Arterials Only		All Major Roads	
Trip Purpose	National Trip Length (miles)	Local Adjustment Factor	Local Trip Length (miles)	Local Adjustment Factor	Local Trip Length (miles)
To or from work	11.98	0.384	4.60	0.514	6.16
Office/Industrial	9.96	0.384	3.82	0.514	5.12
Medical/Dental	9.61	0.384	3.69	0.514	4.94
Average	9.28	0.384	3.56	0.514	4.77
Single-Family Det.	9.16	0.384	3.52	0.514	4.71
Multi-Family	8.30	0.384	3.19	0.514	4.27
School/Church	8.47	0.384	3.25	0.514	4.35
Family/Personal	6.61	0.384	2.54	0.514	3.40
Shopping	6.27	0.384	2.41	0.514	3.22

Source: National trip lengths from U.S. Department of Transportation, *National Household Travel Survey*, 2009 (office/industrial is 25% work trip length and 75% average trip length); local adjustment factors from Table 6.

Travel Demand Schedule

The result of combining trip generation rates, primary trip factors and average trip lengths is a travel demand table that establishes the vehicle-miles of travel (VMT) during the average weekday generated by various land use types per unit of development. The recommended travel demand schedules associated with both of the road impact fee options are presented in Table 8.

Table 8. Travel Demand by Land Use

		Daily	%	Arterials Only		All Major Roads	
Land Use Type	Unit	Trips/ Unit	Primary Trips	Trip Length	Daily VMT	Trip Length	Daily VMT
Single-Family Detached	Dwelling	4.76	100%	3.52	16.76	4.71	22.42
Multi-Family	Dwelling	3.33	100%	3.19	10.62	4.27	14.22
Mobile Home Park	Site	2.50	100%	3.19	7.98	4.27	10.68
Congregate Care Facility	Dwelling	1.01	100%	3.69	3.73	4.94	4.99
Hotel/Motel	Room	3.45	100%	2.54	8.76	3.40	11.73
Retail/Commercial							
Shopping Center/Gen. Retail	1,000 sq. ft.	21.35	43%	2.41	22.13	3.22	29.56
Restaurant, Quality	1,000 sq. ft.	44.98	38%	2.41	41.19	3.22	55.04
Restaurant, Fast Food	1,000 sq. ft.	248.06	30%	0.80	59.53	1.07	79.63
Office/Institutional	1,000 sq. ft.						
Office, General	1,000 sq. ft.	5.52	75%	3.82	15.81	5.12	21.20
Hospital	1,000 sq. ft.	6.61	75%	3.69	18.29	4.94	24.49
Nursing Home	1,000 sq. ft.	3.80	75%	3.69	10.52	4.94	14.08
Church	1,000 sq. ft.	4.56	75%	3.25	11.12	4.35	14.88
Elementary/Sec. School	1,000 sq. ft.	7.02	24%	3.25	5.48	4.35	7.33
Industrial	1,000 sq. ft.						
Manufacturing	1,000 sq. ft.	1.91	95%	3.82	6.93	5.12	9.29
Industrial Park	1,000 sq. ft.	3.42	95%	3.82	12.41	5.12	16.63
Business Park	1,000 sq. ft.	6.22	95%	3.82	22.57	5.12	30.25
Warehouse	1,000 sq. ft.	1.78	95%	3.82	6.46	5.12	8.66
Mini-Warehouse	1,000 sq. ft.	1.25	95%	2.54	3.02	3.40	4.04

Source: Trips are ½ of average daily trip ends on a weekday from ITE, *Trip Generation*, 9th ed., 2012 (hotel/motel based on average of two; elementary/secondary based on average of elementary, middle and high school); percent of all trips that are primary trips from ITE, *Trip Generation Handbook*, June 2004; primary trip percentage for schools based on Preston Hitchens, "Trip Generation for Day Care Centers," ITE *1990 Compendium of Technical Papers*, 1990); average trip length from Table 7 (fast food restaurant assumes one-third shopping trip length).

COST PER SERVICE UNIT

The cost per vehicle-mile in this update is based on a set of recent actual major road construction projects that add capacity to the roadway system. Unlike the previous update, the road construction costs include the costs of design. Recent road improvement project costs are summarized in Table 9. These recent projects added lanes and measurable capacity to the roadway system.

Table 9. Road Improvement Costs

Project Name	Improvement	Year	Design/ Construction	ROW	Total Cost
Carothers Pkwy, S Carothers-Ladd Pk	New 2 Lane	2014	$13,818,227	$344,000	$14,162,227
Carothers Pkwy, Liberty Pike-McEwen	New 4 Lane	2009	$6,628,430	$4,000,000	$10,628,430
Mack Hatcher, Hillsoboro-SR 96 W	New 4 Lane	2012	$73,500,000	$12,500,000	$86,000,000
McEwen, Carothers-Cool Spgs	New 4 Lane	2012	$10,172,167	$1,770,384	$11,942,551
McEwen, Cool Spgs-Jordan	Widen 3-5 Lns	2009	$1,444,450	$237,680	$1,682,130
McEwen Dr Temporary Connector	New 4 Lane	2013	$2,263,322	$361,253	$2,624,575
S Carothers Parkway	New 4 Lane	2012	$16,335,000	$1,942,000	$18,277,000
Subtotal, Arterial			$107,826,596	$19,213,317	$145,316,913
3rd Ave N, N Margin-5th Ave	New 2 Lane	2014	$4,856,330	$186,500	$5,042,830
Nichol Mill Ln, Seaboard-Mallory	New 2 Lane	2012	$1,372,742	$800,975	$2,173,717
Subtotal, Collectors			$6,229,072	$987,475	$7,216,547
Total, All Major Roads			$114,055,668	$20,200,792	$152,533,460

Source: City of Franklin, Engineering Department.

The average cost to create an additional lane-mile of roadway can be derived by dividing the cost of the recent capacity-expanding road improvement projects by the additional lane-miles created by the improvements. Based on the cost of recent and current arterial and collector road improvements, the average costs per lane-mile are calculated in Table 10.

Table 10. Road Improvement Cost per Lane-Mile

Project Name	Miles	New Lanes	Lane-Miles	Total Cost	Cost per Lane-Mile
Carothers Pkwy, S Carothers-Ladd Pk	2.00	2	4.00	$14,162,227	$3,540,557
Carothers Pkwy, Liberty Pike-McEwen	0.74	4	2.96	$10,628,430	$3,590,686
Mack Hatcher, Hillsoboro-SR 96 W	3.22	4	12.88	$86,000,000	$6,677,019
McEwen, Carothers-Cool Spgs	0.97	4	3.88	$11,942,551	$3,077,977
McEwen, Cool Spgs-Jordan	0.15	2	0.30	$1,682,130	$5,607,100
McEwen Dr Temporary Connector	0.33	4	1.32	$2,624,575	$1,988,314
S Carothers Parkway	1.70	4	6.80	$18,277,000	$2,687,794
Subtotal, Arterial	7.41		32.14	$145,316,913	$4,521,373
3rd Ave N, N Margin-5th Ave	0.26	2	0.52	$5,042,830	$9,697,749
Nichol Mill Ln, Seaboard-Mallory	0.37	2	0.74	$2,173,717	$2,937,455
Subtotal, Collectors	0.63		1.26	$7,216,547	$5,727,418
Total, All Major Roads	8.04		33.40	$152,533,460	$4,566,870

Source: Miles and number of lanes from City of Franklin Engineering Department; lane-miles is product of new lanes and miles; total cost from Table 9; cost per lane-mile is cost divided by lane-miles.

The average cost per unit of capacity added to the major roadway system can be determined by dividing the average cost of a new lane-mile by the average daily capacity per lane at LOS C. The average daily capacities per new lane added by the set of recent projects are calculated in Table 11.

Table 11. Average Capacity per Lane

Project Name	Improvement	Miles	New Capacity	New VMC	New Ln-Mi.	Capacity/ Lane
Carothers Pkwy, S Carothers-Ladd Pk	New 2 Lane	2.00	9,100	18,200	4.00	4,550
Carothers Pkwy, Liberty Pike-McEwen	New 4 Lane	0.74	19,000	14,060	2.96	4,750
Mack Hatcher, Hillsoboro-SR 96 W	New 4 Lane	3.22	56,200	180,964	12.88	14,050
McEwen, Carothers-Cool Spgs	New 4 Lane	0.97	19,000	18,430	3.88	4,750
McEwen, Cool Spgs-Jordan	Widen 3-5 Lns	0.15	7,500	1,125	0.30	3,750
McEwen Dr Temporary Connector	New 4 Lane	0.33	19,000	6,270	1.32	4,750
S Carothers Parkway	New 4 Lane	1.70	19,000	32,300	6.80	4,750
Subtotal, Arterial		9.11		271,349	32.14	8,443
3rd Ave N, N Margin-5th Ave	New 2 Lane	0.26	9,100	2,366	0.52	4,550
Nichol Mill Ln, Seaboard-Mallory	New 2 Lane	0.37	9,100	3,367	0.74	4,550
Subtotal, Collectors		0.63		5,733	1.26	4,550
Total, All Major Roads		9.74		277,082	33.40	8,296

Source: Improvement length and new lane-miles from Table 10; new capacity added derived from Table 3; new VMC is product of miles and new capacity; capacity per lane is new VMC divided by new lane-miles.

The cost per service unit is calculated by dividing the average cost per lane-mile by the average daily capacity added. As shown in Table 12, the arterial cost per service unit is $536 per VMC. If collectors are included, the major road cost per service unit is $550 per VMC.

Table 12. Cost per Vehicle-Mile of Capacity

Arterials Only	
Average Cost per Lane-Mile	$4,521,373
÷ Average Daily Capacity per Lane at LOS C	8,443
Arterial Cost per Vehicle-Mile of Capacity (VMC)	$536
All Major Roads	
Average Cost per Lane-Mile	$4,566,870
÷ Average Daily Capacity per Lane at LOS C	8,296
Major Road Cost per Vehicle-Mile of Capacity (VMC)	$550

Source: Average cost per lane-mile from Table 10; average daily capacity per lane from Table 11.

As discussed in the methodology section, the modified consumption-based approach does not calculate the cost to have all roadways functioning at LOS C, only the cost to replace capacity consumed so that a 1:1 ratio of capacity to demand is maintained system-wide. Dividing the road capacity (VMC) by demand (VMT) yields the system-wide VMC/VMT ratios for the arterial system and for the major road system if it is expanded to include collectors. As shown in Table 13, the major roadway system provides 1.12 units of capacity (at LOS C) for every unit of demand on the arterial system, and 1.23 when collectors are included. The cost per VMC does not need to be adjusted by the actual VMC/VMT ratio if it is greater than one-to-one, because a ratio of one-to-one is assumed in this study. Consequently, the cost per VMT is the same as the cost per VMC calculated above.

Table 13. Existing System-Wide Capacity/Demand Ratio

Functional Class	Total VMC	Total VMT	VMC/VMT
Arterials/Expressways	980,344	874,929	1.12
Collectors	461,281	295,731	1.56
Total Major Roads	1,441,625	1,170,660	1.23

Source: Estimated total daily VMT from Table 4; actual total daily VMC from Table 20 in the Appendix.

NET COST PER SERVICE UNIT

As discussed in the Legal Framework section, credit is due against impact fees under three situations: (1) there are existing deficiencies, (2) there is outstanding debt on facilities serving existing development, or (3) there are dedicated local revenues or outside funding for the same improvements. These are each addressed below. The resulting revenue credits are deducted from the cost per service unit calculated in the previous chapter in the final section of this chapter to calculate the net cost per service unit.

Existing Deficiencies

From an impact fee perspective, there are no existing deficiencies. The fees are based on a system-wide level of service, defined as a 1-to-1 ratio of system-wide capacity (VMC) to system-wide demand (VMT). There are no existing deficiencies on a system-wide basis as long as the VMC/VMT ratio is greater than 1.00. The actual existing major roadway level of service is a 1.12 VMC/VMT ratio for arterials only, and a 1.23 ratio if collectors are included (see Table 13 above). Because the fees are based on a LOS that is lower than the actual existing LOS, no deficiency credit is warranted.

Outstanding Debt

The City of Franklin currently has seven outstanding debt issues that have been used to fund improvements on the arterial system. As shown in Table 14, the road-related balance for these outstanding debt issues is $41.3 million.

Table 14. Outstanding Road Debt Issues

Bond Issue	Outstanding Balance	Road-Related	Road-Related Balance
General Obligation Refunding Bonds 2004	$1,375,000	55.0%	$756,250
County Club & McEwen Reimbursement 2005	$2,715,000	45.0%	$1,221,750
Capital Improvement Bonds 2007	$20,000,000	43.0%	$8,600,000
Capital Improvement Bonds 2009A	$8,060,000	34.6%	$2,788,760
Capital Improvement Bonds 2009B	$30,625,000	34.6%	$10,596,250
Capital Improvement Bonds 2010	$15,725,000	40.0%	$6,290,000
Capital Improvement Refunding Bonds 2012	$21,710,000	51.0%	$11,072,100
Outstanding Road Debt	$100,210,000		$41,325,110

Source: City of Franklin, December 19, 2013.

In cases where outstanding debt is for improvements that are serving existing development, a credit is due for future taxes that new development will generate that will be used to retire that debt. In the case of Franklin's road impact fees, however, no such credit is warranted. As noted above, the road fees are based on a lower level of service. The cost of the excess capacity in the arterial system alone is significantly greater than the amount of the outstanding road-related debt. The replacement value of the excess arterial capacity is $56.5 million (see Table 15 below), compared to only $41.3 million in outstanding debt.

From the facts presented above, it is clear that the outstanding road debt is for improvements that have built excess capacity into the system, not improvements that are serving existing development

at the level of service on which the impact fees are based. In addition, new development will not be paying the debt. The City is using road impact fees, not ad valorem taxes or general funds, to retire the road-related debt. For these reasons, no debt credit against the road impact fees is warranted.

Table 15. Replacement Value of Excess Arterial Capacity

Existing Arterial Vehicle-Miles of Capacity (VMC)	980,344
– Existing Arterial Vehicle-Miles of Travel (VMT)	-874,929
Existing Excess Arterial Capacity (VMC)	105,415
x Average Arterial Cost per VMC	$536
Replacement Cost of Arterial Excess Capacity	$56,502,440

Source: Arterial VMC and VMT from Table 13; cost per VMC from Table 12.

Outside Funding

The amount of intergovernmental revenue that is applied toward funding capacity-expanding capital improvements in Franklin is based on anticipated funding over a 7-year period covered by the last two adopted regional Transportation Improvement Programs. Only improvements that are both capacity-expanding and on the major road network are eligible for credit. For example, improvements on I-65 do not occur on the major roadway system used in this study. The non-local share of funding includes funds programmed from the portion of State gas tax revenues that the City receives through the State Street Aid program. The improvements and funding are summarized in Table 16 below. The creditable funding over the 7-year period totaled $116.7 million.

Table 16. Road Improvements and Funding, FY 2011-2017

			Non-Local Cost	
Project Name	Description	Total Cost	Total	Creditable
Columbia South, Downs to SR 397	New Road	$5,000,000	$0	$0
Franklin Greenway	Multi-Use Path	$1,147,500	$630,000	$0
Franklin Traffic Operations	ITS Infrastructure	$6,000,000	$4,800,000	$4,800,000
Goose Creek Bypass at I-65	New Interchange	$30,000,000	$30,000,000	$0
Goose Creek Bypass	New Road	$2,050,000	$0	$0
Hillsboro Rd, Hwy 96-M. Hatcher	New Road	$25,000,000	$1,250,000	$1,250,000
I-65 Widening from SR 96-SR840	Freeway Widening	$70,000,000	$70,000,000	$0
Mack Hatcher NE Widening	Widen Road	$15,800,000	$15,800,000	$15,800,000
Mack Hatcher NW Extension	Extend Existing Road	$76,500,000	$76,500,000	$76,500,000
Mack Hatcher SE Widening	Widen Road	$15,000,000	$15,000,000	$15,000,000
McEwen Drive Phase 3	Widen Existing Road	$15,000,000	$0	$0
McEwen Drive Phase 4	Widen Existing Road	$17,500,000	$0	$0
McEwen Drive Extension	Extend Existing Road	$12,500,000	$0	$0
Lewisburg Pike, SR 397-Donnellson	Widen Existing Road	$2,800,000	$0	$0
Lewisburg Pike, Donnellson-Old Peyton	Widen Existing Road	$1,000,000	$0	$0
Lewisburg Pike, Old Peyton-Goose Ck	Widen to 4 Lane Divided	$8,010,000	$0	$0
Lewisburg Pike, I-65 to 0.3 mi. west	Widen 2-4 lanes	$1,500,000	$1,500,000	$1,500,000
Franklin ITS Infrastructure	ITS infrastructure	$2,300,000	$1,840,000	$1,840,000
Total, FY 2011-2017		$307,107,500	$217,320,000	$116,690,000

Source: Nashville Area Metropolitan Planning Organization, *Transportation Improvement Program ,FY 2011-2014* and *FY 2014-2017*.

The State and Federal funding credit is shown in Table 14. At the current cost of borrowing, the present value of State and Federal funding revenue that can be anticipated over the next 20 years,

which is the typical long-term debt repayment period, is about $243 per daily vehicle-mile of travel on the arterial system, and $182 per VMT when collectors are included.

Table 17. State/Federal Funding Credit

	Arterials Only	All Major Roads
Total Federal/State Capacity Funding, FY 2011-2016	$116,690,000	$116,690,000
÷ Years	7	7
Annual Federal/State Capacity Funding	$16,670,000	$16,670,000
÷ Daily Vehicle-Miles of Travel (VMT)	874,929	1,170,660
Average Annual Funding per VMT	$19.05	$14.24
x Net Present Value Factor (20 Years @ 4.73%)	12.75	12.75
State/Federal Funding Credit per VMT	$243	$182

Source: Total Federal/State capacity funding from Table 16; daily VMT from Table 5; present value factor based on 20 years at 4.73% discount rate based on average interest rate on state and local bonds in December 2013 from the Federal Reserve at http://www.federalreserve.gov/releases/ h15/data.htm.

Net Cost Summary

As shown in Table 18, reducing the cost per service unit associated by the State and Federal funding credit leaves a net cost of $293 per VMT for the arterial system and $368 per VMT if collectors are included.

Table 18. Net Cost per Vehicle-Mile of Travel

Average Cost per VMT, Arterials Only	$536
– State/Federal Funding Credit per VMT	-$243
Arterial Net Cost per Daily VMT	$293
Average Cost per VMT, All Major Roads	$550
– State/Federal Funding Credit per VMT	-$182
All Major Roads Net Cost per Daily VMT	$368

Source: Average cost per VMT based on cost per VMC from Table 12; State/Federal funding credit from Table 17.

POTENTIAL FEE SCHEDULE

The net cost per unit of development is the product of daily vehicle-miles of travel generated by a unit of development and the net cost per VMT. The option of including collector roadways in this update results in two potential impact fee schedules. The final two columns in Table 19 present the updated fees for arterials only and for the total major roadway system, including collector roads.

Table 19. Potential Fee Schedules

		VMT/Unit		Net Cost/VMT		Potential Fee	
Land Use Type	**Unit**	**Arterials**	**Total**	**Arterials**	**Total**	**Arterials**	**Total**
Single-Family Detached	Dwelling	16.76	22.42	$293	$368	$4,911	$8,251
Multi-Family	Dwelling	10.62	14.22	$293	$368	$3,112	$5,233
Mobile Home Park	Site	7.98	10.68	$293	$368	$2,338	$3,930
Congregate Care Facility	Dwelling	3.73	4.99	$293	$368	$1,093	$1,836
Hotel/Motel	Room	8.76	11.73	$293	$368	$2,567	$4,317
Retail/Commercial							
Shopping Center/Gen. Retail	1,000 sq. ft.	22.13	29.56	$293	$368	$6,484	$10,878
Restaurant, Quality	1,000 sq. ft.	41.19	55.04	$293	$368	$12,069	$20,255
Restaurant, Fast Food	1,000 sq. ft.	59.53	79.63	$293	$368	$17,442	$29,304
Office/Institutional	1,000 sq. ft.						
Office, General	1,000 sq. ft.	15.81	21.20	$293	$368	$4,632	$7,802
Hospital	1,000 sq. ft.	18.29	24.49	$293	$368	$5,359	$9,012
Nursing Home	1,000 sq. ft.	10.52	14.08	$293	$368	$3,082	$5,181
Church	1,000 sq. ft.	11.12	14.88	$293	$368	$3,258	$5,476
Elementary/Sec. School	1,000 sq. ft.	5.48	7.33	$293	$368	$1,606	$2,697
Industrial	1,000 sq. ft.						
Manufacturing	1,000 sq. ft.	6.93	9.29	$293	$368	$2,030	$3,419
Industrial Park	1,000 sq. ft.	12.41	16.63	$293	$368	$3,636	$6,120
Business Park	1,000 sq. ft.	22.57	30.25	$293	$368	$6,613	$11,132
Warehouse	1,000 sq. ft.	6.46	8.66	$293	$368	$1,893	$3,187
Mini-Warehouse	1,000 sq. ft.	3.02	4.04	$293	$368	$885	$1,487

Source: Daily VMT per unit from Table 8; net cost per VMT from Table 18.

APPENDIX

Table 20. Existing Major Roadway Inventory

Roadway	From	To	Lns	Mi.	Lane-Miles Total	Lane-Miles w/Ct.	ADT	Cap.	VMC	VMT
Mack Hatcher	Hillsboro Rd	Franklin Rd	4	1.70	6.80	6.80	17,933	56,200	95,540	30,486
Mack Hatcher	Franklin Rd	Liberty Pike	2	1.50	3.00	3.00	21,950	28,100	42,150	32,925
Mack Hatcher	Liberty Pike	Murfreesboro	2	0.85	1.70	1.70	13,340	28,100	23,885	11,339
Mack Hatcher	Murfreesboro	Lewisberg Av	2	1.30	2.60	2.60	25,057	28,100	36,530	32,574
Mack Hatcher	Lewisberg Av	Columbia Av	2	1.75	3.50	3.50	17,793	28,100	49,175	31,138
Subtotal, Expressways				7.10	17.60	17.60			247,280	138,462
3rd Ave North	Main St	5th Ave N	2	0.34	0.68	0.68	4,574	11,600	3,944	1,555
3rd Ave South	Main St	S Margin St	2	0.24	0.48	0.48	6,142	11,600	2,784	1,474
5th Ave, N	3rd Ave N	Main St	4	0.38	1.52	1.52	17,515	19,000	7,220	6,656
5th Ave, S	Main St	S Margin St	2	0.24	0.48	0.48	5,752	11,600	2,784	1,380
Carothers Pkwy	S of Moores Ln	Cool Springs	4	1.08	4.32	4.32	22,213	19,000	20,520	23,990
Carothers Pkwy	Cool Springs	Murfreesboro	4	2.45	9.80	9.80	11,703	19,000	46,550	28,672
Carothers Pw S	Murfreesboro	S Carothers Rd	3	1.12	3.36	3.36	6,040	14,400	16,128	6,765
Carters Cr Pike	Downs Blvd	SW City Limit	2	0.86	1.72	1.72	6,591	11,600	9,976	5,668
Columbia Ave	Mack Hatcher	Fairground St	3	1.25	3.75	3.75	19,090	14,400	18,000	23,863
Columbia Ave	Fairground St	Five Points	3	1.00	3.00	3.00	10,542	14,400	14,400	10,542
Columbia Pike	S Boundary	Mack Hatcher	2	1.10	2.20	2.20	15,264	11,600	12,760	16,790
Cool Springs	Mack Hatcher	Carothers Pky	4	1.93	7.72	7.72	26,217	19,000	36,670	50,599
Cool Springs	Carothers	E McEwen Dr	4	1.35	5.40	-	-	19,000	25,650	-
Franklin Rd	E Main St	Mack Hatcher	2	1.59	3.18	3.18	16,392	11,600	18,444	26,063
Franklin Rd	Mack Hatcher	Moores Lane	2	2.11	4.22	4.22	12,975	11,600	24,476	27,377
Goose Creek By	Lewisburg Pike	I-65	4	0.84	3.36	3.36	13,685	19,000	15,960	11,495
Hwy 96 W	W Bndry	11th Ave	2	2.72	5.44	5.44	17,541	11,600	31,552	47,712
Hwy 96 W	11th Ave	5th Ave	3	0.43	1.29	1.29	18,962	14,400	6,192	8,154
Hillsboro Rd	3rd Ave N	Mack Hatcher	3	1.12	3.36	3.36	17,515	14,400	16,128	19,617
Hillsboro Rd	Mack Hatcher	Fieldstone Pw	5	1.00	5.00	5.00	16,740	21,900	21,900	16,740
Hillsboro Rd	Fieldstone Pw	N Boundary	5	0.93	4.65	4.65	18,710	21,900	20,367	17,400
Lewisburg Ave	S Margin St	Mack Hatcher	2	2.10	4.20	4.20	5,165	11,600	24,360	10,847
Lewisburg Pike	Mack Hatcher	Bowman Rd	2	1.09	2.18	2.18	9,359	11,600	12,644	10,201
Lewisburg Pike	Old Peytonsville	Goose Cr Byps	4	0.55	2.20	-	-	19,000	10,450	-
Liberty Pike	Waverly Pl	Turning Wheel	2	1.47	2.94	-	-	11,600	17,052	-
Liberty Pike	Turning Wheel	Carothers Pky	2	0.86	1.72	-	-	11,600	9,976	-
Liberty Pike	Carothers Pky	Mallory Lane	4	0.51	2.04	-	-	19,000	9,690	-
Liberty Pike	Mallory Lane	Mack Hatcher	3	0.95	2.85	2.85	14,238	14,400	13,680	13,526
Liberty Pike	Mack Hatcher	Franklin Rd	3	1.15	3.45	3.45	7,528	14,400	16,560	8,657
Main St	1st Ave S	5th Ave	2	0.34	0.68	0.68	10,362	11,600	3,944	3,523
W Main St	5th Ave	11th Ave	2	0.43	0.86	0.86	7,389	11,600	4,988	3,177
W Main St	11th Ave	Downs Blvd	2	1.11	2.22	2.22	7,692	11,600	12,876	8,538
Mallory Lane	Moores Lane	Cool Springs	4	1.36	5.44	5.44	24,542	19,000	25,840	33,377
Mallory Lane	Cool Springs	Liberty Pike	4	1.50	6.00	6.00	18,279	19,000	28,500	27,419
W McEwen Dr	Cool Springs	I-65	4	0.93	3.72	-	-	19,000	17,670	-
E McEwen Dr	I-65	Cool Springs	4	1.38	5.52	-	-	19,000	26,220	-
E McEwen Dr	Cool Springs	Wilson Pike	2	1.55	3.10	3.10	6,442	11,600	17,980	9,985

Table 20 Continued

Roadway	From	To	Lns	Lane-Miles Mi.	Total	w/Ct.	ADT	Cap.	VMC	VMT
Murfreesboro Rd	S Margin St	Mack Hatcher	2	1.32	2.64	2.64	17,935	11,600	15,312	23,674
Murfreesboro Rd	Mack Hatcher	I-65	5	1.13	5.65	5.65	24,796	21,900	24,747	28,019
Murfreesboro Rd	I-65	E Boundary	2	1.87	3.74	3.74	23,343	11,600	21,692	43,651
Peytonsville Rd	I-65	Long Lane	4	0.17	0.68	-	-	19,000	3,230	-
N Royal Oaks	Liberty Pike	Hwy 96	3	0.81	2.43	2.43	15,077	14,400	11,664	12,212
S Royal Oaks	Hwy 96	Mack Hatcher	4	1.18	4.72	4.72	19,435	19,000	22,420	22,933
Wilson Pike	N Boundary	Clovercroft Rd	2	0.79	1.58	1.58	1,987	11,600	9,164	1,570
Subtotal, Major and Minor Arterials				48.63	145.49	121.27			733,064	613,824
1st Ave N	Bridge St	E. Main St	2	0.12	0.24	-	-	9,100	1,092	-
1st Ave S	E. Main St	S. Margin St	2	0.24	0.48	0.48	3,000	9,100	2,184	720
2nd Ave N	Main St	N Margin St	2	0.24	0.48	-	-	9,100	2,184	-
2nd Ave S	Main St	S. Margin St	2	0.24	0.48	0.48	2,054	9,100	2,184	493
4th Ave N	3rd Ave N	Main St	2	0.37	0.74	-	-	9,100	3,367	-
4th Ave S	Main St	S. Margin St	2	0.24	0.48	0.48	2,253	9,100	2,184	541
9th Ave	Mt Hope St	Columbia Ave	2	0.54	1.08	1.08	2,207	9,100	4,914	1,192
11th Ave	Mount Hope	Natchez St	2	0.62	1.24	1.24	4,338	9,100	5,642	2,690
Acadia Ave	Championship	Jewell Ave	2	0.59	1.18	-	-	9,100	5,369	-
Addison Ave	Stonewater Bld	State Blvd	2	0.42	0.84	-	-	9,100	3,822	-
Aspen Grove Dr	Jordan Rd	Seaboard Ln	3	0.54	1.62	-	-	11,300	6,102	-
Bakers Bridge Ave	W Terminus	Traffic Circle	4	1.16	4.64	-	-	14,900	17,284	-
Bakers Bridge Ave	Mallory Ln	Carothers Pkwy	4	0.77	3.08	-	-	14,900	11,473	-
Battle Ave	Columbia Ave	W Main St	2	0.68	1.36	1.36	3,666	9,100	6,188	2,493
Boyd Mill Ave	SR 96 W	SR 96 W	2	1.75	3.50	3.50	4,092	9,100	15,925	7,161
Bridge St.	5th Ave N	1st Ave N	2	0.33	0.66	-	-	9,100	3,003	-
Carlisle Ln	SR 96 W	Del Rio Pike	2	0.62	1.24	-	-	9,100	5,642	-
S Carothers Rd	Carothers Pwy	City Limits	2	0.34	0.68	-	-	9,100	3,094	-
Championship Bvd	Stonewater	Acadia	2	0.80	1.60	-	-	9,100	7,280	-
Chester Stevens Rd	SR 96E	East City Limits	2	0.61	1.22	-	-	9,100	5,551	-
Church St	Columbia Ave	1st Ave N	2	0.42	0.84	-	-	9,100	3,822	-
Clovercroft Rd	E City Limits	Wilson Pike	2	0.89	1.78	1.78	3,218	9,100	8,099	2,864
Clovercroft Rd	City Limits	City Limits	2	1.00	2.00	2.00	3,155	9,100	9,100	3,155
Cotton Ln	Del Rio Pike	N City Limits	2	0.18	0.36	-	-	9,100	1,638	-
Crossroads Blvd	Seaboard Ln	City Limits	3	0.24	0.72	-	-	11,300	2,712	-
Del Rio Pike	5th Ave N	Cotton Ln	2	3.21	6.42	6.42	8,519	9,100	29,211	27,346
Donelson Crk Pwy	Southeast Pkwy	Lewisburg Pike	2	1.24	2.48	-	-	9,100	11,284	-
Downs Blvd	Columbia Ave	SR 96 W	2	2.67	5.34	5.34	8,224	9,100	24,297	21,958
Eddy Lane	Liberty Park	Murfreesboro	2	0.77	1.54	1.54	2,126	9,100	7,007	1,637
Fair St	11th Ave N	9th Ave N	2	0.42	0.84	-	-	9,100	3,822	-
Fieldstone Pwy	Bexley Park Dr	Hillsboro Rd	3	0.53	1.59	-	-	11,300	5,989	-
Fieldstone Pwy	Hillsboro Rd	Lexington Pkwy	4	0.53	2.12	-	-	14,900	7,897	-
Fieldstone Pwy	Lexington Pkwy	Cotton Ln	2	0.42	0.84	-	-	9,100	3,822	-
Forest Xing Blvd	S Royal Oaks	Riverview Dr	4	0.46	1.84	-	-	14,900	6,854	-
E Fowlkes St	Lewisburg Ave	Columbia Ave	2	0.15	0.30	-	-	9,100	1,365	-
W Fowlkes St	Columbia Ave	Natchez St	2	0.21	0.42	0.42	2,424	9,100	1,911	509
Galleria Blvd	Bakers Brdg Av	Moorse Ln	3	0.38	1.14	-	-	11,300	4,294	-
Gen. Patton Dr	City Limits	Mallory Station	3	0.60	1.80	-	-	11,300	6,780	-
Horton Ln	Boyd Mill	Main	2	1.15	2.30	-	-	9,100	10,465	-

Table 20 Continued

Roadway	From	To	Lns	Lane-Miles Mi.	Lane-Miles Total	Lane-Miles w/Ct.	ADT	Cap.	VMC	VMT
Jewell Ave	Cormac St	Townsend Blvd	2	0.53	1.06	-	-	9,100	4,823	-
Jordan Rd	Mallory Ln	Aspen Grove Dr	2	0.31	0.62	-	-	9,100	2,821	-
Long Ln	Peytonsville Rd	City Limits	2	2.07	4.14	-	-	9,100	18,837	-
Lynnwood Way	Franklin Rd	West City Limits	2	0.59	1.18	1.18	9,486	9,100	5,369	5,597
Magnolia Dr	Del Rio Pike	Mt Hope St	2	0.32	0.64	0.64	5,333	9,100	2,912	1,707
Mallory Sta. Rd	Franklin Rd	Mallory Ln	3	1.49	4.47	4.47	10,490	11,300	16,837	15,630
N Margin St.	5th Ave N	2nd Ave N	2	0.26	0.52	-	-	9,100	2,366	-
S Margin St.	Columbia Ave	5th Ave S	2	0.16	0.32	-	-	9,100	1,456	-
S Margin St.	5th Ave S	1st Ave S	2	0.35	0.70	-	-	9,100	3,185	-
Mount Hope St	5th Ave N	11th Ave N	2	0.34	0.68	0.68	1,902	9,100	3,094	647
Natchez St	W Main St	9th Ave S	2	0.57	1.14	-	-	9,100	5,187	-
Oak Meadow Dr	Royal Oaks	Country Wood	3	0.80	2.40	-	-	11,300	9,040	-
Old Peytonsville	Lewisburg Pike	Goose Ck Bypass	2	1.38	2.76	-	-	9,100	12,558	-
Oxford Glenn	E McEwen Dr	Clovercroft Rd	2	1.08	2.16	-	-	9,100	9,828	-
Peytonsville Rd	Long Lane	South City Limits	2	0.80	1.60	-	-	9,100	7,280	-
Ralston Ln	SR 96 E	Liberty Pike	3	0.77	2.31	2.31	1,824	11,300	8,701	1,404
River View Dr	Forest Crossing	Country Wood	2	1.79	3.58	-	-	9,100	16,289	-
Seaboard Ln	Aspen Grove Dr	Bakers Bridge Av	3	1.32	3.96	-	-	11,300	14,916	-
S Springs Dr	Perimeter Dr	Mallory Ln	4	0.23	0.92	-	-	14,900	3,427	-
Southeast Pkwy	Donelson Ck Pw	Columbia Ave	2	0.55	1.10	-	-	9,100	5,005	-
Spencer Crk Rd	Spencer Crk Ps	Mack Hatcher	2	1.93	3.86	-	-	9,100	17,563	-
State Blvd	Championship	Westhaven	2	0.44	0.88	-	-	9,100	4,004	-
Stonewater Blvd	Fleetwood Dr	SR 96 W	2	0.54	1.08	-	-	9,100	4,914	-
Stream Valley Bvd	Lewisburg Pike	Streamside Ln	2	0.57	1.14	-	-	9,100	5,187	-
Townsend Blvd	Cheltenham Av	Jewell Ave	2	0.41	0.82	-	-	9,100	3,731	-
Westhaven Blvd	Acadia Ave	SR 96 W	2	0.67	1.34	-	-	9,100	6,097	-
Willowsprings Dr	Horton Ln	Boyd Mill Ave	2	0.11	0.22	-	-	9,100	1,001	-
Subtotal, Major and Minor Collectors				47.07	107.11	35.40			461,281	97,743
Total				102.80	270.20	174.27			1,441,625	850,028

Source: City of Franklin Engineering Department, December 19, 2013; average daily traffic counts (ADT) from Tennessee Department of Transportation traffic history (http://www.tdot.state.tn.us/traffichistory/); "w/ct." indicates lane-miles for which counts are available; "VMT" is vehicle-miles of travel, which is product of miles and ADT for segments with counts; "VMC" is vehicle-miles of capacity, which is product of daily capacity and ADT.