Development of Trip Costs for an "Impact Fee" Based Excise Tax

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Traditional impact fees have stringent requirements for substantiating the basis of the fee and are frequently challenged in court. The use of an excise tax patterned after an impact fee allows the implementation of a similar trip-based financing mechanism without the potential legal uncertainties. Tran-Systems has been on a project team assisting two of the first cities in Missouri to develop this type of plan.

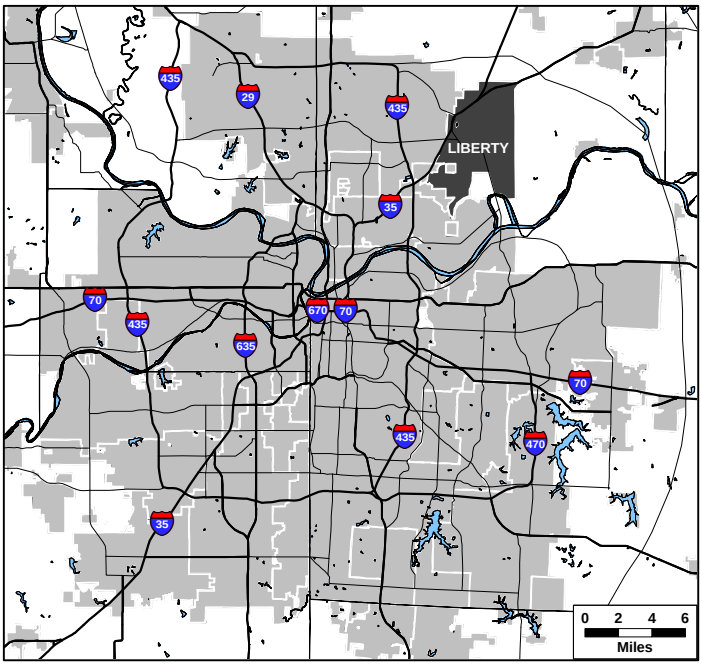

Figure 1 - The Kansas City Metropolitan Area

The City of Liberty, Missouri, population 21,000, is a suburb in the Kansas City metropolitan area. The city covers approximately 27 square miles, about one-third of which is currently developed.

As the City continues to grow, the roadway system will need to be expanded. In order to finance future street improvement needs, the City is developing a two-pronged approach: a transportation sales tax for increased capacity necessitated by non-development generated growth (i.e. traffic from outside the City or existing deficiencies) and an excise tax for additional traffic generated by new development within the City. The City desired to come up with an equitable excise tax rate that reflects the true cost of new trips generated by future development.

The development of the excise tax rate was conducted in two phases. The first phase was to determine what future road improvements that would be required to support transportation needs within the City limits and to assign responsibility for those improvements between new development and the City at-large. The second phase was to evaluate revenue alternatives to pay for the needed improvements.

NEEDS DETERMINATION

In order to calculate an equitable tax rate, an estimate of the cost of improvements had to be made. The steps taken in the needs determination phase of the study included the following: projection of future land use, identification of the major street system at full development, classification of the roadway improvements, allocation of responsibility for the improvements, and finally, scheduling and assignment of costs for the improvements. The timeline for the

forecasts was based on when anticipated growth would result in full build-out of the land within current City boundaries.

Future Development Forecast

The City of Liberty Community Development Department prepared the future development forecasts for the study. In order to determine the makeup of land uses at full development, historical trends were reviewed in conjunction with the City's long range plans, as well as development patterns in other similar-sized cities. Table 1 summarizes the City's current land use ratios compared to national averages.

Table 1
Land Use Ratios

Land Use	Liberty	National Average[1]
Residential	52%	52%
Commercial	5%	10%
Industrial	15%	7%
Public Use	28%	31%

[1]Planners Advisory Memo, APA, Aug. 1992

Using the above information, in conjunction with growth factors specific to the City of Liberty, projections were made for growth by specific land use categories. Based on the growth projections it is anticipated that the City will reach fill build-out in the year 2055. These projections are summarized in Table 2.

Table 2
Future Land Use Projections

Land Use	Units	1998 est.	% of Total	2055 est.	% of Total
RESIDENTIAL					
Single Family	D.U.	6,867	72.9%	19,692	65.9%
Two to Four Family	D.U.	757	8.0%	3,607	12.1%
Multi Family	D.U.	1,433	15.2%	6,233	20.8%
Other (Mobile Home, etc.)	D.U.	368	3.9%	368	1.2%
TOTAL RESIDENTIAL	**D.U.**	**9,425**	**100.0%**	**29,900**	**100.0%**
COMMERCIAL					
Automotive Dealership	1000 s.f.	62	4.1%	204	4.1%
Bank	1000 s.f.	41	2.7%	135	2.7%
Hotel/Motel	1000 s.f.	24	1.6%	80	1.6%
Office Bldg (>15,000 s.f.)	1000 s.f.	200	13.1%	659	13.1%
Office Bldg (<15,000 s.f.)	1000 s.f.	215	14.1%	708	14.1%
Restaurant	1000 s.f.	66	4.3%	218	4.3%
Sit Down	1000 s.f.	33		109	
Fast Food	1000 s.f.	33		109	
Retail	1000 s.f.	669	43.9%	2,200	43.9%
Shopping Center (Neigh.)	1000 s.f.	210	13.8%	691	13.8%
Service Station/Garage	1000 s.f.	36	2.4%	118	2.4%
TOTAL COMMERCIAL	**1000 s.f.**	**1,523**	**100.0%**	**5,014**	**100.0%**
INDUSTRIAL					
Industrial Mfg (light)	1000 s.f.	861	27.5%	3,318	47.2%
Industrial Mfg (heavy)	1000 s.f.	221	7.1%	853	12.1%
Warehouse	1000 s.f.	148	4.7%	569	8.1%
Wholesale Trade	1000 s.f.	1,900	60.7%	2,290	32.6%
TOTAL INDUSTRIAL	**1000 s.f.**	**3,129**	**100.0%**	**7,029**	**100.0%**

Future Street System

In order to support the projected growth throughout the City limits, an arterial and collector street system was established as shown in Figure 2. The proposed street system includes both upgrades to existing roadways and new roadways. In all there are 78 street segments covering just over 56 miles, including 24 miles of new arterials, 18 miles of new collectors and 13 miles of rehabilitated collectors. Four interstate interchange improvement projects were also included.

These projects included both City streets and State routes. While the state has the primary responsibility for improving the state routes, as with most states, resources are limited and in order for roadway improvements to keep up with the anticipated growth, many of the improvements to the state routes may have to be financed without state funding assistance. Therefore, these projects were also included in the financing program.

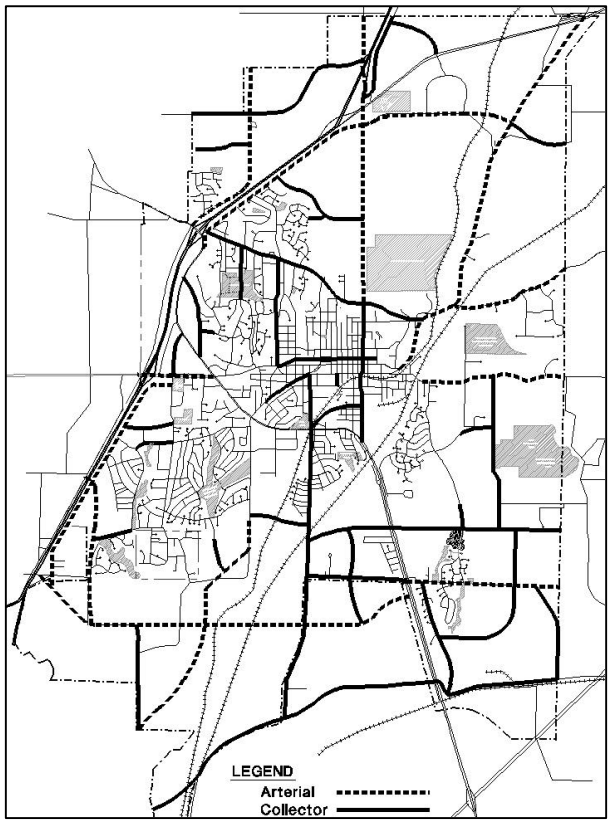

Figure 2 - Future Primary Street System

Project Cost Estimates

In order to estimate construction costs for these improvements without having to conduct extensive engineering analysis, a set of typical construction costs were estimated based on roadway cross-section and the amount of grading required. Cross-sections included 36-foot collector streets and 52-foot and 72-foot arterial streets, with normal and "high" grading requirements. Typical construction costs per linear foot were then estimated based on construction costs in the area. These estimates included pavement, curb and gutter, storm sewers, sidewalks, medians, pavement marking and signing, fencing, traffic controls and a contingency and were calculated based on 1998 dollars. Table 3 shows a summary of these cost estimates. After multiplying these costs times the project lengths, additional costs were then added in including right-of-way, structures and traffic signals on a case by case basis to arrive at a total estimated cost for each project. Costs for the interchange improvement projects were based on a previously completed study.

The total estimated cost for the 84 improvement projects was $159,039,000. This amount then became the basis for the amount of revenue that needed to be generated over the 56 years until build-out was achieved.

Table 3
Linear Roadway Improvement Costs

Classification	Grading Level	Cost Per Foot
Two-Lane Replacement (Full)	Normal	$255.22
	High	$276.58
Two-Lane Replacement (Partial)	Normal	$104.05
	High	$109.74
Collector (36')	Normal	$279.13
	High	$314.73
Collector (36') Rehab.	Normal	$348.91
	High	$393.41
Arterial (52')	Normal	$415.02
	High	$468.41
Arterial (52') Rehab.	Normal	$498.02
	High	$597.63
Arterial (52') Upgrade (52' Arterial - 36' Collector)	Normal	$135.89
	High	$153.69
Arterial (72')	Normal	$556.85
	High	$620.92
Arterial (72') Rehab.	Normal	$668.22
	High	$745.11
Right-of-Way (per Sq. Ft.)	All	$1.50

Improvement Categories

In the early stages of this project, the City established a task force made up of representatives from the City council, residents and the development community. This advisory committee developed a Strategies Report that included a number of Policy Guidelines to direct the development of the excise tax. Policy Guideline 9 requires that the excise tax must recognize that different allocations of responsibility may be appropriate for different types of street improvements. Seven improvement categories were established:

A. Improvements to existing streets to cure physical deficiencies;

B. Improvements to existing streets to cure physical deficiencies and to add additional capacity;

C. Improvements to existing streets with operational deficiencies;

D. Improvements to existing streets with both physical and operational deficiencies;

E. New streets which would not be built except to accommodate new development;

F. New streets which would not be built except to serve existing development; and

G. New streets which are planned to accommodate both existing and new development.

Each of the 84 improvement projects was then placed into one of the categories. It was determined that none of the existing streets had operational deficiencies (operated below level-of-service D) and therefore categories C and D were eliminated. It was also determined that none of the projects fell into category F. Several of the projects did not fit into the remaining categories due to special circumstances, therefore, two new categories were added. Category 'I'

consists of the four interstate interchange improvement projects. The cost of these projects was considered too high to be accomplished without state or federal assistance. Category 'X' was added for one project where a TIF financing system was already in place.

Category B was eventually split into two sub-categories 'B1' and 'B2' depending on the cost of improvements. Roads in category B1 were unimproved, typically with rural cross sections and would require complete reconstruction. Roads in category B2 had already been improved to City standards, but would require improvements to add additional capacity to accommodate future traffic.

Cost Allocation

Once the categories were established and assigned to each improvement project, appropriate cost allocations between development projects and the City at-large. Category A projects (improvements to existing streets to cure physical deficiencies) were determined to be entirely the responsibility of the city at-large. Category E projects (new streets which would not be built except to accommodate new development), on the other hand, were determined to be entirely the responsibility of new development.

Costs for projects in categories B and G were divided between the city at-large and new development. For category B projects, it was assumed that the city at-large would be responsible for the portion of the cost that it would take to improve the roadway to the City's minimum standards, a two-lane roadway with the City's standard cross section. New development would be responsible for the portion of the cost that it would take to further improve the roadway to the required collector or arterial cross section.

Projects in category G weren't easily prorated, as the City did not have a method such as a traffic model available to help establish how much of the traffic on these roads would be generated by existing or new development. As such, it was decided to allocate these projects on a 50/50 basis between the City at-large and new development.

For category I projects, the 20% local share was split evenly between the City and new development with the remaining 80% to be covered by State and Federal funds. The category X project was assigned 100% to new development for the portion not covered by the existing TIF program. The balance was eliminated from the cost analysis. A summary of the cost allocations is shown in Table 4.

After assigning the cost allocations to each project, total costs for the City at-large, new development, and State and Federal government were calculated. The results of these calculations are shown in Table 5. These totals were then used as the foundation for calculating the sales tax and excise tax rates.

Table 4
Cost Allocation Categories

Description	Category	Allocation	
		City-at-Large	New Development
Improvements to existing streets to cure physical deficiencies	A	100%	0%
Improvements to existing streets to cure physical deficiencies and to add capacity	B1	*	*
Same as B1 except existing roadway substantially meets City standards	B2	*	*
New streets which would not be built except to accommodate new development	E	0%	100%
New streets which are planned to accommodate both existing and new development	G	50%	50%
Interstate Interchanges (State/Federal Govt. pay 80%)	I	10%	10%
Improve City Standard Collector to Arterial. City portion by TIF	X	0%	100%

* For Category B, City-at-Large will be responsible for cost to improve the roadway to a 28' two-lane street prorated up to include the City's share of additional costs of other features such as structures and traffic signals (but not right-of-way). New Development will be responsible for the remaining costs as calculated by the formula below:

$$City\ at\ Large\ Share = \frac{Cost\ to\ Complete - Cost\ of\ ROW}{Cost\ of\ Roadway} \times 2\ Lane\ Replacement\ Cost\ per\ Foot \times \frac{Project\ Length}{Cost\ to\ Complete}$$

Table 5
Total Roadway Improvement Cost Allocation

	Allocated Cost	Percentage
City At-Large	$52,367,000	33%
New Development	$97,636,000	61%
State/Federal Government	$9,036,000	6%
Total	**$159,039,000**	**100%**

Schedule and Inflation Factors

The final step in the process of the needs determination phase of the study was to spread the projects out over the development period to full build-out and factor in inflation. Near term projects were assigned annually for the first 5 years as allocated in the City's CIP and then in five-year increments through the year 2056. Costs were factored for inflation using a 4 percent annual rate the first five years and then 5 percent per year after that. These rates were based on historical trends in construction costs.

Table 6 summarizes the project costs by period after being factored for inflation. As can be seen in this table, inflation increases the total cost of the projects to over $676 million.

REVENUE DETERMINATION

The second phase of the study was to determine an equitable method of generating revenue to cover the projected project costs using an excise tax for development based costs and a sales tax increase for City at-large costs.

Table 6
Project Costs (in $1,000) Factored for Inflation

Period	Development Costs Total for Period	Development Costs Annualized	City At-Large Costs Total for Period	City At-Large Costs Annualized	Total Costs Total for Period	Total Costs Annualized
1999	$2,345	$2,345	$2,345	$2,345	$4,690	$4,690
2000	$88	$88	$88	$88	$177	$177
2001	$0	$0	$0	$0	$0	$0
2002	$3,101	$3,101	$526	$526	$3,627	$3,627
2003	$13,064	$13,064	$439	$439	$13,502	$13,502
2004-08	$11,862	$2,372	$8,508	$1,702	$20,369	$4,074
2009-13	$21,431	$4,286	$13,532	$2,706	$34,964	$6,993
2014-18	$10,363	$2,073	$17,800	$3,560	$28,163	$5,633
2019-23	$20,510	$4,102	$9,295	$1,859	$29,805	$5,961
2024-28	$21,737	$4,347	$17,655	$3,531	$39,392	$7,878
2029-33	$32,102	$6,420	$18,687	$3,737	$50,789	$10,158
2034-38	$49,254	$9,851	$20,417	$4,083	$69,671	$13,934
2039-43	$66,197	$13,239	$12,616	$2,523	$78,814	$15,763
2044-48	$59,348	$11,870	$37,120	$7,424	$96,468	$19,294
2049-53	$84,662	$16,932	$48,715	$9,743	$133,377	$26,675
2054-55	$57,063	$28,531	$16,005	$8,002	$73,067	$36,534
Total	**$453,128**		**$223,749**		**$676,877**	

Trip Tax Calculation

The basis to be used for the excise tax was P.M. peak hour trips. Trip generation rates for the anticipated development were calculated using ITE's *Trip Generation* manual. These rates were then reduced to reflect the percentage of trips which are "captured" trips. Captured trip rates were calculated based on data presented in ITE's *Trip Generation, 5th Edition Update* and from an article in the May 1991 ITE Journal, *Impact Fees-Issues, Concepts and Approaches*, by Tindale. For each type of development a typical development size was used to determine likely rates.

As can be seen in Table 7, it was estimated that development projected through full build-out would generate an estimated 41,496 P.M. peak hour trips. Dividing the $97,636,000 in road costs assigned to development responsibility by the total number of trips resulted in a trip cost of $2,353 in 1999 dollars. This rate was then multiplied by typical development sizes to show approximate excise tax costs for various land uses. For example, calculations show that a single-family residence would be assessed a tax of $2,517, a 50,000 square-foot office building $292,977, and a 150,000 square-foot shopping center $1,409,451.

In order to account for the effect of inflation on construction costs, the excise tax rate would be increased annually based on the same construction cost index that is used for the project cost estimates.

The task force had concerns that some types of development, particularly commercial developments would feel that they were assigned a disproportionate share of road improvements as they already generate a substantial portion of the existing City sales tax that is used in part for road improvements. Therefore the task force decided to implement "credits" at a rate of 40% for commercial development and 20% for industrial development. This reduced the tax rate to $1,411 per trip for commercial uses and $2,028 for industrial development. However, these

credits were not offset by increases in the rates for other uses, therefore, this reduction in revenue will have to be made up by an increase in the City at-large share of the improvements.

Table 7
Trip Generation Calculations

Land Use	Units	ITE Code	1999-2055 Develop-ment	Avg. Dev. Size[7]	P.M. Trip Rate[1]	% Capture Trips[5]	Adj. P.M. Trip Rate	Adj. P.M. Trips	% of Total Trips	$ Cost/ Avg. Dev.[8]
RESIDENTIAL										
Single Family	D.U.	210	12,514	100	1.07	0%	1.07	13,436	32.4%	252,625
Two to Four Family	D.U.	230[2]	2,812	50	0.69	0%	0.69	1,947	4.7%	81,442
Multi Family	D.U.	220	4,800	200	0.63	0%	0.63	3,047	7.3%	298,684
Other (Mobile Home, etc.)	D.U.		0							
TOTAL RESIDENTIAL	D.U.		20,475					18,429	44.4%	
COMMERCIAL										
Automotive Dealership	1000 s.f.	841	142.3	25	2.97	21%	2.34	333	0.8%	137,785
Bank	1000 s.f.	912	93.9	4	54.77	59%	22.46	2,109	5.1%	211,344
Hotel/Motel[3]	1000 s.f.	310	55.6	20	0.65	41%	0.38	21	0.1%	18,016
Office Bldg (>15,000 s.f.)	1000 s.f.	710	458.7	50	2.71	8%	2.49	1,142	2.8%	292,977
Office Bldg (<15,000 s.f.)	1000 s.f.	710	493.2	10	9.05	8%	8.33	4,107	9.9%	195,913
Restaurant[4]	1000 s.f.									
Sit Down	1000 s.f.	832	68.7	6	10.86	40%	6.52	448	1.1%	91,989
Fast Food	1000 s.f.	834	68.7	3	33.48	47%	17.74	1,220	2.9%	125,252
Retail	1000 s.f.	820	1,506.1	50	7.95	41%	4.69	7,063	17.0%	551,670
Shopping Center (Neigh.)	1000 s.f.	820	481.2	150	5.47	27%	3.99	1,922	4.6%	1,409,451
Service Station/Garage	1000 s.f.	853[6]	82.5	2.5	60.61	66%	20.61	1,700	4.1%	121,218
TOTAL COMMERCIAL	1000 s.f.		3,490.7					20,064	48.4%	
INDUSTRIAL										
Industrial Mfg (light)	1000 s.f.	110	2,390.1	100	0.98	8%	0.90	2,155	5.2%	212,137
Industrial Mfg (heavy)	1000 s.f.	140	631.8	100	0.65	8%	0.60	376	0.9%	140,086
Warehouse	1000 s.f.	150	398.7	100	0.74	8%	0.68	270	0.7%	159,264
Wholesale Trade	1000 s.f.	150	390.0	300	0.56	8%	0.52	201	0.5%	364,643
TOTAL INDUSTRIAL	1000 s.f.		3,900.0					3,002	7.2%	
							TOTAL TRIPS	***41,496***		
TOT. DEV. SHARE (000)	***$97,636***						***TRIP TAX RATE***	***$2,353***		

[1]ITE Trip Generation, 6th Edition. Calculated using Fitted Curve formula if available
[2]Condo/Townhouse Rate Used
[3]Trip Rate based on Occupied Rooms. Assumes 600 sq. ft. per room, 83% occupancy
[4]Assumes 50% High-Turnover Sit Down Restaurants (832) and 50% Fast Food with Drive Thru (834)
[5]Capture Trips are "Pass-by" trips only. Diverted trips not included. Source: ITE Trip Gen. 5th Ed. Update; Tindall, ITE Journal 5/91
[6]Convenience Store with Gas Pumps Rate Used.
[7]Some trip rates vary by development size, therefore this size was used to determine rate. N/A indicates only Average Rate Available.
[8]Estimated tax based on the trips generated for a development of the size shown in the "Average Development Size" column. No credits included.

Sales Tax Calculation

Currently the City of Liberty has a sales tax base of about $277 million. Current City sales taxes generate about $800,000 per year for road improvements. This is expected to increase to about $1.3 million by 2002. However, this amount will likely not be sufficient to cover the City at-large portion of the roadway improvement needs in the future, and therefore, will likely have to be supplemented by an increase in the sales tax rate.

By this point in the analysis process, calculating what the appropriate sales tax increase should be had become very complex. A wide range of variables had been introduced into the calculation of costs and revenues, including growth projections, roadway needs, construction costs, trip generation rates, project scheduling and inflation rates. In addition to these, several more factors need to be added in order to estimate the amount of new sales tax that will need to be generated in order to cover the full cost of the roadway needs projected for the future. These include the actual sales tax rate, projections of how much the sales tax revenue will increase due to inflation as well as bonding and interest rate costs, as often the roadway projects will not be built in the same years as the revenue from the sales and excise taxes are generated.

In order to balance all of these factors and determine an appropriate sales tax rate, a spreadsheet was developed that allowed an iterative process to be used to test a variety of scenarios. An abbreviated form of this spreadsheet is shown in Table 8. The data shown in this spreadsheet was calculated using the 20% and 40% credits for industrial and commercial development, and additional 0.25% sales tax, a 5% increase in sales tax revenue per year, bonding costs of 6% per year and interest rates on held funds of 5% per year.

Table 8
Cash Flow Projections
with ¼ Cent Sales Tax Increase

	Development Portion					City At-Large Portion					Combined Totals		
Year	Devlmt Costs	Trip Tax Revenue	Cumu-lative Balance	Interest	Balance with Interest	City-at-Large Costs	Sales Tax Revenue	Cumu-lative Balance	Interest	Balance with Interest	City + Dev. Costs	Trip + Sales Revenue	City + Dev. Balance
1999	2,345	0	-2,345	-141	-2,486	2,345	1,493	-853	-51	-904	4,690	1,493	-3,390
2000	88	1,436	-1,138	-68	-1,206	88	1,627	635	32	667	177	3,063	-540
2001	0	1,494	288	14	302	0	763	1,430	72	1,502	0	2,257	1,804
2002	3,101	1,554	-1,245	-75	-1,320	526	2,152	3,127	156	3,283	3,627	3,705	1,963
2003	13,064	1,616	-12,768	-766	-13,534	439	2,259	5,104	255	5,359	13,502	3,875	-8,175
2010	4,286	2,252	-26,834	-1,610	-28,445	2,706	3,179	13,520	676	14,196	6,993	5,431	-14,248
2020	4,102	3,668	-51,862	-3,112	-54,974	1,859	5,178	36,301	1,815	38,117	5,961	8,846	-16,857
2030	6,420	5,974	-90,904	-5,454	-96,358	3,737	8,435	106,060	5,303	111,363	10,158	14,409	15,005
2040	13,239	9,732	-181,599	-10,896	-192,495	2,523	13,739	263,526	13,176	276,703	15,763	23,471	84,207
2050	16,932	15,852	-333,165	-19,990	-353,155	9,743	22,380	576,663	28,833	605,496	26,675	38,232	252,341
2055	28,531	20,232	-462,089	-27,725	-489,815	8,002	28,563	828,532	41,427	869,959	36,534	48,795	380,144

All values are in thousands of dollars ($1,000)
This table shows data for selected years only, data from intervening years impacts totals.

Several things can be noted from these calculations. The development portion of the costs runs a continual deficit; this is in part due to the credits given to commercial and industrial development. The additional 0.25% sales tax generates a surplus in every year except 1999 for the City at-large portion. By the year 2010, the program shows a deficit of over $14 million ($8.7 million in 1999 dollars), however, in later years the program runs a large surplus increasing to over $380 million ($26 million in 1999 dollars) by 2055. As is common with calculations involving compound interest, testing of other scenarios found that small changes in sales tax and interest rates as well as modifications to the road construction schedule could have large impacts in the forecasts, particularly in later years.

As so many assumptions are built into the process and the timeline spans over 50 years, the establishment of this framework for determining the tax rates is essential, as the forecasts should be revised on a regular basis, most likely every 5 to 10 years.

DISCUSSION

In the fall of 1998 the Liberty Street Improvement Task force recommended to the City Council that it place a measure on the ballot (the State of Missouri requires that all tax increases be put to a public referendum) that would institute the excise tax as described here as well as a ¼ cent sales tax increase to fund the street improvement program. However, the City Council voted against placing the measure on the ballot, partly due to concerns raised by a council member (who is also a developer in the City and served on the Task Force supporting the measure) about the impact of the excise tax on development and unresolved implementation issues.

There were numerous implementation details that had not yet been addressed, such as how the taxes would be collected, specifics on how interest rates would be indexed, whether impact studies would be required to determine trip generation data, and how to handle uses that weren't specifically identified in the *Trip Generation* manual. To the Task Force, resolving these issues became a "chicken or the egg" issue. These issues would take a substantial effort by City staff and the consultant team to resolve. Some members felt that it would have been a waste of effort to proceed with this work until it was determined whether the public supported the measure, while others felt that the public wouldn't support the measure without the details.

After the defeat of the measure by the Council, a new committee was established to take a second look at the taxes. To date, discussions have generally centered on refinements to the original proposal, including different methods of "phasing in" the taxes, shortening the horizon of the study and excluding certain projects. Final recommendations have not yet been made to the council.

Although, the fate of the excise tax is still undecided in the City of Liberty, this method has been successfully implemented in another Kansas City suburb, and interest has been sparked in other communities across Missouri.

Michael R. Wahlstedt, P.E. is an Associate with TranSystems Corporation in Kansas City, Missouri and is a Member of ITE. TranSystems Corporation and Stinson, Mag & Fizzell, P.C. performed the study under contract with the City of Liberty, Missouri.