An editorial published in the Columbia Daily Tribune, November 3, 2002, p. 3D

Growth demands costly infrastructure[1]

In this article we present data to show that infrastructure associated with urban and suburban population growth is very expensive. In subsequent articles we will show that existing taxpayers and utility users underwrite or subsidize much of the costs for infrastructure in Columbia and Boone County; we also will show what alternatives exist for financing infrastructure. Our purpose is to provide facts that can serve as a basis for stimulating and encouraging an open discussion within the community of various alternatives for financing infrastructure and their possible consequences.

The Boone County Smart Growth Coalition is concerned about possible undesirable consequences of current public financing of infrastructure in the outlying regions of the Columbia metropolitan area and Boone County. The Coalition believes that current practices may promote unregulated, leapfrog (noncontiguous) development and ultimately lead to the loss of natural areas important to the rural character of the county while draining potential resources from the central city.

Infrastructure consists of transportation systems, sanitary sewer systems, water systems, electrical systems, schools, parks, libraries, fire protection buildings and major equipment, police stations and jails, and buildings, land, and major equipment for other public services.

Costs associated with infrastructure can be divided into two categories: capital and operating. Capital costs typically are those large one-time investments made to construct or expand the infrastructure, such as building a new sewer line. Operating costs are expenses for operating and maintaining the infrastructure, such as keeping the water treatment plant operating 24 hours per day. Capital costs can be divided further into costs within subdivisions (internal) and costs outside of subdivisions (external) for infrastructure necessary for serving needs within subdivisions. What follows refers only to external infrastructure capital costs.

External infrastructure capital costs are a function of peak demand and distance from a service center. The greater the peak demand, the bigger the system needs to be. The peak demand is a function of the potential number of users and the amount used by each user during peak periods. Distance increases the cost for those systems that have service areas that distribute (e.g., water and electricity) or collect (e.g., sewers and roads).

A survey of recent literature, internet websites and by telephone was conducted to determine infrastructure costs and development/impact fees in some communities around the United States including all of the Big 12 cities. Only six (including Lincoln, NE) were found that provided recent infrastructure cost information; all of these data were generated by consultants who were hired by the respective governing units. The total median infrastructure cost per new residence was $32,689.

Are these numbers representative of Columbia and Boone County? We undertook several local studies to find out. We felt that if the numbers for these selected local numbers agreed with the survey numbers, then the other survey numbers probably are representative. We followed the methodological guidelines provided in a book, “A Practitioner’s Guide To Development Impact Fees” by James C. Nicholas, et al and published by The American Planning Association, which the City of Columbia is a member. To determine the cost of infrastructure associated with

growth, the users generally are broken up into user groups, i.e., residential, commercial, industrial, institutional, etc. In general, specific infrastructure capital costs for the typical user in each user group can be estimated in the following manner:

1.) determine the total cost of the project (e.g., $1,000,000),
2.) allocate cost to user groups based on their collective use of the infrastructure during peak periods (e.g., 60% of peak demand is residential, so 60% of $1,000,000=$600,000 of the cost is allocated to residential users), and
3.) allocate cost to the average user within user groups (e.g., $600,000/1,000 dwelling units = $600 per dwelling unit).

Each of these steps presented obstacles that were unique to the type of infrastructure and the type of data that were available. Assumptions were required for some of the calculations. We used what we felt were conservative assumptions so that we would not be accused of padding our numbers. Sometimes the assumptions were modified as new data became available. At all steps, experts within the appropriate City, school, or County department were consulted for input and review. (We thank them for their help because this project would have been impossible without it.) Two MU economists have agreed that our numbers are reasonable. Some specifics are provided in the accompanying table. The costs presented in the table are not the total costs; they represent only the infrastructure costs allocated to the residential user group. In addition, some cost categories were not included, e.g., solid waste.

One general assumption that was made was that, if facilities outside of a development are required for the internal system to function, then proportionate shares (based on number of users at capacity) of the external costs should be allocated to dwelling units in the development. It is obvious that each development needs external water, sanitary sewers, roads, electricity, etc.; others are less obvious, e.g., schools, parks, libraries, etc. Excess capacity was built into existing external systems to handle growth and costs were associated with this excess capacity. A full accounting of the costs of external infrastructure would allocate the proportionate share of costs for excess capacity to those who will eventually use them. Who should pay these costs is a topic for later discussion.

Another general assumption was that replacement costs are appropriate to use. Most of the infrastructure has a long life so little depreciation occurs in the short term. Due to the cost of inflation, most infrastructure actually increases in value in current dollars over time, e.g., most homes in Columbia that have been maintained are worth more today than when they were built. No interest costs were included in our calculations; it is reasonable to expect interest on bonds to increase the total cost over the life of 20 year bonds by 50-75%. Therefore, we believe that replacement cost probably is a reasonable estimate of present cost. An additional caveat is that replacement cost is relatively easy to determine, especially when similar infrastructure has been built recently.

Our cost analysis is based on maintaining the same level of service (except for transportation) that exists today as the population grows. Level of service refers to such parameters as pressure in water mains, number of pupils per teacher or building, level of pollutants in water, amount of congestion on roads, etc. The cost of maintaining level of service for transportation is prohibitive, so the cost we used allows for a significant increase in congestion.

For most City of Columbia calculations, we used 2000 census data as summarized by the Planning and Development Department of the City of Columbia. In April 2000 there were 33,689 households averaging 2.26 persons each in the City of Columbia. The Boone County Assessor's Office provided the current number of households (24,802) within the 1965 City of Columbia city limits that were used in the library calculations. The Water and Light Department of the City of Columbia provided information about the current and projected number of meters.

So far we have developed local estimates for external infrastructure for schools, water, sanitary sewers, fire stations, and libraries in Columbia and for some sanitary sewers and libraries in Boone County. We are still working on other costs and will add them as they become finalized; until then we are using the national survey figures discussed above. The results are presented in the accompanying table.

Using this analysis, the allocated cost per dwelling unit for Columbia is slightly over $30,000. In other words, it costs about $30,000 to supply external infrastructure for each new home in Columbia! This number will change as we collect more data. This local number is lower than the survey figures. Note that for Boone County, electric and water infrastructure are co-ops, but we assumed that their costs probably are similar to those of public facilities. In fact, Consolidated Public Water System District #1 currently is asking members to approve $20,000,000 of bonding authority for system improvements.

The most important point to get out of this article is that external infrastructure costs are huge. When allocated per new home, these costs remain very large. The cost of building new schools is the largest one of all – 40% of the total. The cost of electrical facilities is a distant second at 23% of the total; however, this may change after the local electric infrastructure cost is determined. Transportation is next at 14% of the total, but we haven't determined local costs for this area yet. An external infrastructure cost of $30,000 per dwelling unit does not mean that each new home in Columbia or Boone County should or would cost $30,000 more. It does show that there are large expenses involved to the community as a whole and in subsequent articles we will show who pays for infrastructure in Columbia and Boone County and what alternatives exist for financing infrastructure.

[1]This article is presented by the Infrastructure Cost Committee of the Boone County Smart Growth Coalition. Members of the Committee are Elaine Blodgett, John G. Clark, Norman Lenhardt, and Ben Londeree. Please contact Ben Londeree for more detailed information on how we calculated our estimates and for updated estimates. The Coalition is an umbrella organization of fourteen local organizations who are concerned about urban sprawl and related environmental issues in Columbia and Boone County. Also visit our website at: smartgrowth.missouri.org. (8/13/02)

An editorial published in the Columbia Daily Tribune, November 3, 2002, p. 3D

Cost of Infrastructure for Columbia and Boone County[1]

Service	Costs/Lot[2]	
	Columbia	Boone Co.
Schools	$12,112[3]	$9,815[4]
Transportation	$4,232[4]	$4,232[4]
Sanitary sewers	$1,358[5]	$0-1,735[6,10]
Water	$1,951[7]	$1,960[4,10]
Parks	$1,574[4]	$1,574[4]
Stormwater	$515[4,8]	$515[4,8]
Fire	$371[9]	$227[4]
Library	$603[11]	$124[11]
Electric	$7,021[4]	$7,021[4,10]
Police/jails	$151[4]	$151[4]
Municipal	$340[4]	$340[4]
Total	$30,177	$27,694

[1]It is expected that the final estimates will differ somewhat from the numbers presented here.

[2]The costs are not the total costs but only those that can be allocated to residential users. These cost figures do not include interest associated with bond levies. Interest probably would increase these costs by 50-75% over a 20 year bond levy period. The costs do not include solid waste or the full costs of transportation.

[3] The new elementary school under construction will cost about $9,786,902, assuming land value to be $500,000. It will house 600 students at capacity for the foreseeable future unless additions are made. Therefore the cost per student will be the total cost divided by the number of students at capacity or $16,312. The primary stimulus for a need for new schools is new homes that have the potential to house school aged children. In order to determine the cost per home, some assumptions were required. On average there are 0.67 school-aged children per residence. In addition, on average, each dwelling unit will have 0.42 elementary, 0.13 junior high, and 0.12 secondary students. Finally it was assumed that junior high schools cost 1.25 times and high schools cost 1.33 times what it costs per student for elementary schools (more space per student in the higher grade levels). Therefore the cost per new residence for a new elementary school is $16,312X0.42=$6,851, junior high school is $16,312X1.25X0.13=$2,651, and senior high school is $16,312X1.33X0.12=$2,610 for a total of $12,112. No interest or system wide costs were included in these calculations.

[4]Figures represent the median costs for a limited national sample and will be adjusted as local costs are determined.

[5]The new Cow Branch Watershed sewer was used as a representative region. Engineering blueprints were studied to determine replacement costs of all downstream facilities and prorated for the estimated number of users at capacity for each component. Allowances were made for large amounts of stormwater that enter the system during rains and floods.

[6] Boone County Regional Sewer District data were used for Boone County sanitary sewers. Since there are a number of separate systems, ranges of values are provided. Data were obtained from consultants' reports and the BCRSD Director.

[7] When determining water system costs for Columbia, a survey of all current infrastructure was obtained from Water and Light Department personnel and from detailed maps of the entire system. Comprehensive studies by consultants were reviewed. The total replacement value was allocated to all users - current and future up to the capacity for each component. Costs for planned expansions were allocated to new users except those that were designed to correct deficiencies in level of service.

[8]The figure is at the low end of a range due to unique variable watershed conditions. Costs for most stormwater infrastructure projects would be higher.

[9] Columbia's eighth fire station was completed this year. It was assumed that this fire station would serve one-eighth of the City's dwelling units and other structures.

[10]Special districts or co-ops.

[11]The Columbia Library District is the 1965 Columbia city limits and the Boone County Library District is the rest of Boone County except Centralia. If the districts are combined, the total cost would be $320. If the costs are calculated using 2001 Columbia city limits, the cost would be $354.

Prepared by The Infrastructure Cost Committee of The Boone County Smart Growth Coalition 1/7//02