Research Report
KTC-01-04/SPR 226-00-1F

KENTUCKY TRANSPORTATION CENTER

College of Engineering

RICHMOND PUBLIC TRANSPORTATION STUDY REPORT

UNIVERSITY OF KENTUCKY

University of Kentucky
College of Engineering

KENTUCKY TRANSPORTATION CENTER

Our Mission

We provide services to the transportation community through research, technology transfer and education. We create and participate in partnerships to promote safe and effective transportation systems.

We Value...

Teamwork -- Listening and Communicating, Along with Courtesy and Respect for Others
Honesty and Ethical Behavior
Delivering the Highest Quality Products and Services
Continuous Improvement in All That We Do

For more information or a complete publication list, contact us at:

Kentucky Transportation Center
176 Raymond Building
University of Kentucky
Lexington, Kentucky 40506-0281

(859) 257-4513
(859) 257-1815 (FAX)
1-800-432-0719
www.engr.uky.edu/ktc
ktc@engr.uky.edu

Research Report
KTC-00-4

RICHMOND PUBLIC TRANSPORTATION STUDY REPORT

By

Lenahan O'Connell
Research Associate

Bruce Siria
Research Associate
Kentucky Transportation Center
College of Engineering

University of Kentucky
Lexington, Kentucky

May 2000

Table of Contents

Table of Tables

Table of Figures

Executive Summary

This study looked at the possible costs and benefits associated with the creation of a small deviated fixed route bus service in Richmond. It concluded that the circumstances in Richmond favor the creation of such a system. It also concluded that only one route--operating one bus, twelve hours per day, Monday through Saturday--is needed at this time. (For a map of the route, see page 45 in the report.)

There appears to be ample demand concentrated in the area defined by the proposed route. Many of those living within walking distance of the route are low-income residents and/or do not have access to an automobile. Many of the mostly likely destinations are on the proposed route, including the Madison County Court House, Eastern Kentucky University, Comprehensive Care, Patty Clay Hospital and its doctors' offices.

Moreover, much of the demand for pubic transportation is already being served by the current demand response system. The Richmond technical advisory committee concluded that resources and passengers could be transferred from the current demand response system without compromising the quality and availability of service to current riders. The proposed fixed route bus would not replace the current demand response system. Rather the latter would be reduced substantially in cost, as some passengers were transferred to the new system.

At this writing, Foothills Express supports seven buses in Richmond. It also devotes considerable resources to paying for cab service in Richmond. Many of those being transported live along the proposed route and are going to destinations on it. This study estimates the potential savings from transferring passengers to the proposed fixed route bus to range from a minimum of $44,104 per annum to a maximum of $83,858 per annum. The more modest estimate is based on the elimination of one of the seven demand response buses in Richmond and

the transfer of 10 percent of the TANF cab riders and 15 percent of the Medicaid cab riders to the proposed fixed route bus. The largest estimate of savings is based on the elimination of two demand response buses and the transfer of 25 percent of TANF cab riders and 25 percent of Medicaid cab riders to the fixed route.

Of course, the proposed route will generate new costs. It is estimated that the operating costs for a six day, 12 hours a day service for one bus will range from $76,452 to $84,900, depending on the total compensation for the two fulltime drivers such a route would require. The study added in the likely costs of fuel, maintenance, insurance, and an estimate of miscellaneous costs to make the estimate as accurate as possible.

The proposed route will also generate revenues from fare box customers, which at a fare of $1.00, are estimated to be $12, 480 per annum. This is based upon a conservative estimate of demand.

The study includes estimates of the annual net operating revenue of the proposed bus service. These estimates are computed by subtracting the anticipated fare box revenue of $12,480 and the anticipated savings under each of four scenarios from the largest operating cost estimate of $84,900. Under Scenario 1--the most conservative scenario--there is a net loss of $28,316. Under Scenario 2, the loss is $15,991. Scenarios 1 and 2 entail the elimination of only one of Foothills Express's demand response vehicles.

In contrast, Scenarios 3 and 4 call for the removal of two demand response vehicles. Under Scenario 3, the loss declines to only $887 and under Scenario 4, there is an operating surplus of $11,438. In other words, if Foothills Express can eliminate two of its demand response buses, it can add a fixed route for little or no additional cost or perhaps even realize a small operating revenue surplus.

Estimated Annual Net Operating Revenue of the Proposed Fixed Route (Total Operating Cost Less Farebox Revenues and Savings from Transfers)

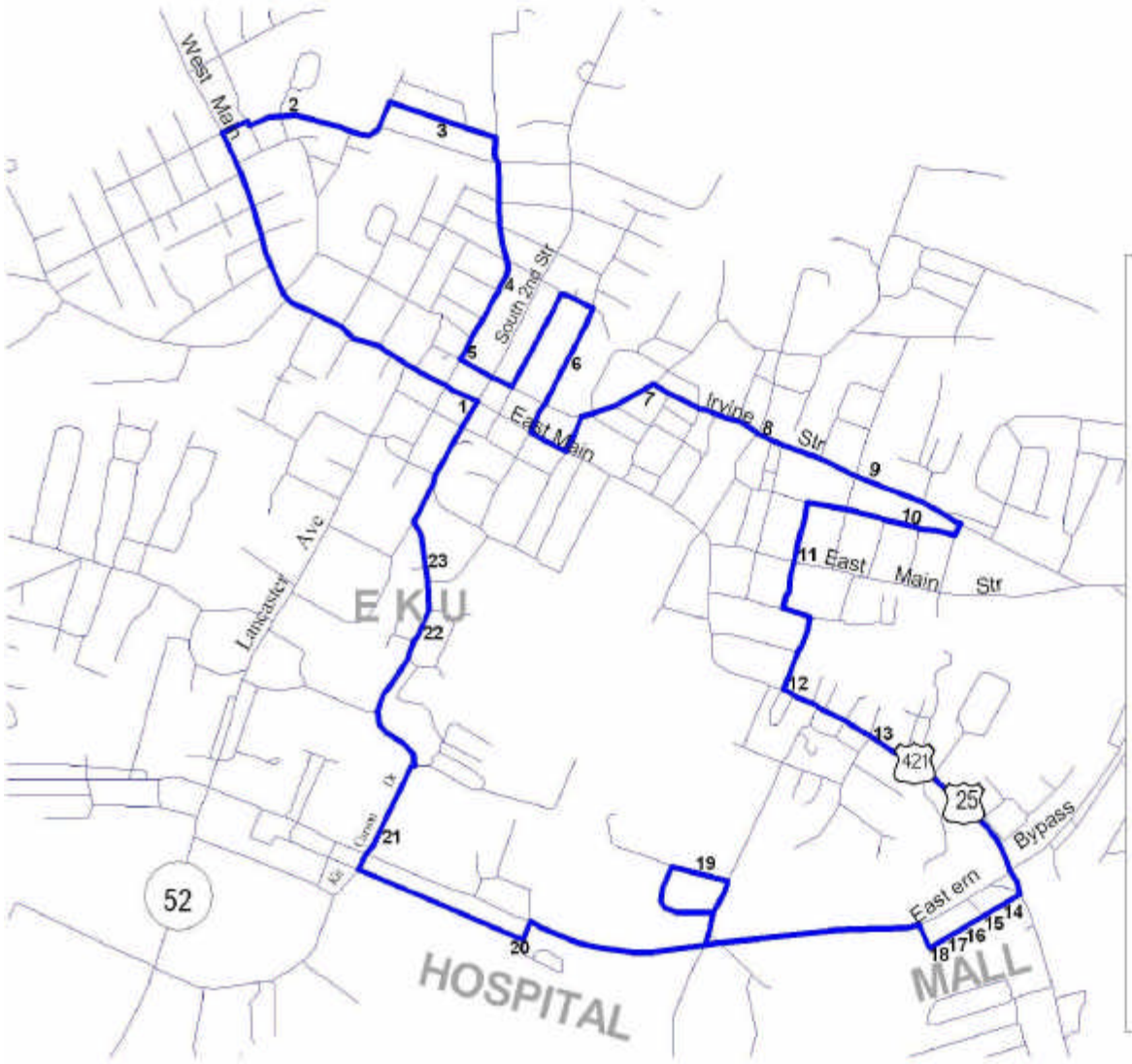
	Scenario 1. Eliminate One Bus 10% TANF Shift 15% Medicaid Shift	Scenario 2. Eliminate One Bus 25% TANF Shift 25% Medicaid Shift	Scenario 3. Eliminate Two Buses 10% TANF Shift 15% Medicaid Shift	Scenario 4. Eliminate Two Buses 25% TANF Shift 25% Medicaid Shift
Operating Cost Estimate	-$84,900	-$84,900	-$84,900	-$84,900
Add Farebox Revenue	$12,480	$12,480	$12,480	$12,480
Add Savings	$44,104	$56,429	$71,533	$83,858
Net Revenue	-$28,316	-$15,991	-$887	$11,438

There will be some start up costs, however. Richmond would need to buy some bus shelters. It will need signs with schedules at all the proposed stops. And it will need to acquire a bus, which, new or used, will be 90 percent subsidized from federal and state funds. We estimate these costs to total $37,200. Spread over ten years they are a modest $3,720 per year.

The bottom line appears to be this. Richmond may be able to acquire a fixed route service for no or only a small annual additional cost, provided it eliminates two of its current demand response vehicles. Foothills Express is well positioned to run the route and adjust it to circumstances. For instance, this study has identified 23 stops for the loop route. It is possible that additional stops could be added as more fine-grained knowledge of public needs emerges. The initial expenditure on advertising is designed to generate demand. If demand goes up dramatically, it is also possible that additional routes and buses could be added.

City of Richmond, KY

Proposed Bus Route



Stops and Schedule

1. Second Street and Main- Leaves at the top of the hour every hour between 7:00 A.M. and 6:00 P.M.
2. Robinson Terrace-7:03
3. Turpen Drive-7:07
4. Richmond Recreation Center-7:09
5. Court House-7:11
6. Madison Towers-7:12
7. First Baptist Church-7:13
8. Rail Crossing-7:18
9. Smith Village-7:20
10. Dillingham Heights-7:22
11. YMCA-7:24
12. Steep Street-7:26
13. Richmond East-7:27
14. Kroger-7:31
15. Lexington Clinic-7:32
16. Family Dollar-7:34
17. Mall Main Entrance-7:35
18. Wal-Mart-7:39
19. Comprehensive Care-7:43
20. Patty Clay Hospital-7:46
21. Begley-7:48
22. Wallace Building-7:50
23. Madison Dorm-7:52
24. Return to Second and Main-7:53

I. Introduction

Background

Early in the year 2000, the Kentucky River Foothills Development Council (KRFDC) requested a feasibility study of a fixed route bus service or other type of pubic transit system for the City of Richmond. Throughout the mid 1970's and early 1980's, this type of study was performed by the Kentucky Transportation Cabinet (KYTC) for a variety of small urban areas in Kentucky, including Richmond. Furthermore, there have been other sources of funding for transit feasibility studies. In fact, a similar study for Richmond was funded previously by the Community Transportation Association of America and the U.S. Department of Agriculture and conducted in 1990 by a private consultant. (1) However, The Transportation Cabinet advised KRFDC that resource limitations prevented the cabinet from performing such a study or employing a private consultant to perform a comprehensive study in the near-term. The Transportation Cabinet inquired about the University of Kentucky Transportation Center's (UKTC) interest in performing an abbreviated study for KRFDC. The Transportation Center agreed to conduct a feasibility study.

Goals and Objectives

The study in question has three major objectives. First, to identify the goals and objectives for any enhanced public transportation services in Richmond; second, to quantify the likely demand for any additional public transportation service in Richmond; and third, to recommend a preferred service arrangement to satisfy this demand.

The first objective was met primarily by identifying and

periodically meeting with a Technical Advisory Committee composed of a group of citizens from the Richmond area. Most of them are members of the Madison County Vision 2000 Committee. It was also met by a survey of community leaders.

The second objective was accomplished through the use of existing demographic data and input from the technical advisory committee. Neighborhoods with the highest probability to produce public transportation trips were identified, as well as areas to which these trips would likely be destined. An estimate of the number and types of such trips was also generated. As a special area of interest, the demand for service between Richmond and Berea was also examined. It was concluded, however, that this service was of low concern and not feasible at this time.

The third objective was to consider alternative methods of service provision, matched with the potential use of such service, to evaluate these alternative methods of service provision, and to recommend a preferred service arrangement.

Related Research at the Kentucky Transportation Center

The UKTC was well positioned to carry out the study. It has recently completed several projects for the Transportation Cabinet, which focused on public transportation services within the Commonwealth of Kentucky. One project analyzed the impact of Kentucky's "Empower Kentucky" initiative on public transportation operations throughout the Commonwealth. That project resulted in the most comprehensive portrait of the Kentucky public transportation system yet developed.

A second project provided an independent assessment, as required by the Health Care Financing Administration (HCFA), of the Cabinet's recently implemented Human Service Transportation Delivery Program. That study concluded that participating human services clients are receiving excellent transportation services that are diminished only by slightly longer wait

times for some participants due to an increase in trip-grouping.(2) Conversely, a much greater quantity of service is being delivered at a unit cost that is lower.

Organization of the Study

This study was selected by the KYTC to be included in its annual Transportation Planning and Research Program for FY 2001 as KYHPR-01-226. A Research Study Advisory Committee (RAC) was designated which included membership by the Federal Highway Administration, the Bluegrass Area Development District, KYTC, and Kentucky River Foothills Development Council. Barry House of KYTC's Division of Multimodal Programs was named Chair of the RAC.

On September 13, 2000, the Research Advisory Committee met. At that meeting it was decided that the Research Advisory Committee (RAC) would serve as a policy committee for the conduct of the study. It would approve the proposed work plan and draft, as well as the final reports from the study. It would not serve as the technical advisory committee for the study. That role would be served by the public transportation working group from Madison County, with members from The Vision 2000 Committee and additional representation by the City of Richmond. The University of Kentucky Transportation Center was advised to meet periodically with the Madison County group to complete the study. A series of meetings with the Madison County group was held in Richmond at the office of Kentucky River Foothills.

II. The Current Public Transportation System in Richmond

The Community

Richmond, the county seat of Madison County, was settled by John Miller in 1785 and incorporated in 1809. Richmond is located in the central part of the Commonwealth of Kentucky approximately thirty miles south of Lexington. Over the past decade its population has expanded rapidly. The Kentucky State Data Center at the University of Louisville estimated the 1998 population of Richmond to be 27, 644, an increase of thirty percent since 1990. Based on these estimates, Richmond is now the seventh largest city in the Commonwealth of Kentucky.

Richmond does not have a fixed route bus service. Transit eligible citizens (those enrolled in Medicaid and Temporary Assistance for Needy Families, mostly) are currently served by the Kentucky River Foothills Development Council's transit service—Foothills Express. It operates a demand response system of buses and pays for cab service.

Under the Human Services Transportation Delivery (HSTD), the Commonwealth is divided into 16 transportation regions, each of which has a transportation broker who is responsible for assigning all Medicaid and other transportation eligible persons to a transit provider—a bus, a taxicab or some other conveyance—in their region. Kentucky River Foothills Development Council's Foothills Express was selected to be the broker of public transportation services under the HSTD in Madison and seven nearby counties. They have operating authority in four—Madison, Estil, Clark, and Powell.

A recently completed evaluation of the HSTD showed that, in the first ten months of operation, Foothills Express has successfully expanded its role in transportation. Trip provision within the region brokered by Foothills Express had increased by 50%, while the unit cost of these trips had declined by 15%. (3)

Foothills Express

At this time, Foothills Express's current operation in Richmond is extensive, as it operates seven demand response buses in Richmond. In September of 2000, those seven drove a total of 14,497 miles in Richmond. Overall, Foothills Express currently provides in Madison County, or brokers the provision of, approximately 2300 monthly trips, or 105 daily, to medical facilities, day treatment centers, or job placements associated with the Temporary Assistance to Needy Families (TANF) Program.

Kentucky River Foothills Development Council is funded under a system of capitated rates. That is, it receives a fixed amount of money for each Medicaid and TANF transportation eligible person in its region. One of the goals of this study is to estimate the savings that could be generated by transferring those who currently ride in the demand response buses and cabs to a bus or buses in a fixed route bus system.

Recent research by the Kentucky Transportation Center suggests that fixed route service in small cities is less expensive than demand response service. Across the Commonwealth, more than 150 individual private and public sector entities provide public transportation services as a part of the HSTDP; within the KRFDC region there are 15 such providers. Statewide, five of the 150 transit providers are small city public transportation systems, which offer fixed route service. Given the higher densities of both origin and destination points for public transportation services within a small city, these services can be provided at substantially lower unit costs than for a rural area. A recent study indicated that the unit cost of urban public transportation service in Kentucky is about half of that for similar service in rural areas.

III. Which Type of Transit System in Best for Richmond?

Is some type of fixed route bus service appropriate in Richmond? In this section we answer in the affirmative by assessing the advantages and disadvantages of five types of bus systems. The total daily demand expected in Richmond is far below the minimum number of daily trips needed to warrant a detailed examination of the applicability of the other alternate public transportation technologies (e.g. light rail). Hence further consideration of public transportation alternatives will concentrate on the relative level of service concepts within the chosen technology of bus service.

As we established in the previous section, KRFDC's Foothills Express is devoting ample resources to a demand response system. It is possible, however, that the situation in Richmond may be suitable for transferring some of those resources to a small fixed route system. First we compare the advantages and disadvantages of the four types of systems. Then we describe the reasons that the technical advisory committee concluded that a small deviated fixed route system is most suitable for Richmond.

Alternative Service Concepts

It is the aim of this planning effort to evaluate the potential market for public transportation services in Richmond, as well as community goals and objectives, and to then select the service concept or combination of service concepts that most nearly align themselves with the identified needs. In small urban areas such as Richmond, where buses are the most appropriate technology for a public transportation system, there are nonetheless a number of possible service concepts that could be considered: fixed route-fixed schedule, fixed route-flexible schedule, flexible route-fixed schedule, flexible route-flexible schedule, and deviated

fixed-route. These represent basic concepts. There are a number of levels of sophistication available, as well as variations from the basic concepts. Some of the possible alternative service concepts are considered in detail in this section.

1. Fixed Route-Fixed Schedule

The fixed route-fixed schedule concept is the one most commonly identified with traditional bus service. Vehicles operating in this system travel over predefined and unchanging routes and operate at constant headways on a fixed time schedule. Anyone living within a quarter mile of the route is considered a potential bus rider. A walking distance of a quarter mile is the traditionally accepted service area for a fixed route system. Of the four basic concepts, this concept represents the lowest level of service; therefore justifiable fare levels tend to be at the lower extreme of the acceptable range. In general, operating expenses are lower for this system than for the others. This service type can be financially viable if capacity loads can be generated for relatively short trips as might occur during peak hours in highly developed corridors.

There are several well-established advantages to this type of service. (4) It is the easiest for potential patrons to become familiar with. Fixed route-fixed schedule service is very reliable from a predictability of time and point of access standpoint. This system is especially good where major traffic generators can be connected, high existing or potential volumes can be identified, residential neighborhood penetration is either not possible or not desirable, land use patterns are linear, a strong Central Business District (CBD) exists, patron habits are well established, and/or where funds are limited.

There are some problems to be expected with the fixed route-fixed schedule. Such routes cannot easily serve low density residential areas. Patrons must walk to the bus, which generates relative inconvenience. Last, the service is subject to traffic delays on major arterial streets.

2. Fixed Route-Flexible Schedule

Another basic concept is fixed route-flexible schedule service. This is actually closely related to the previously mentioned public transportation service option and exists in two basic levels of sophistication. In general, vehicles operate along predetermined routes, as in the first case; however, the intervals of operation are variable. For the simplest level of sophistication, service is merely suspended during certain periods of the day (for example, to give drivers a lunch break or to reduce costs which might otherwise be incurred by operating during low demand periods with small passenger loads). Carrying this concept to a higher level of sophistication results in something resembling subscription service, where the availability of service is a direct derivative of committed travel demand. This latter option describes a type of subscription service where fixed routes are served with varying number of vehicles that are determined by the committed patronage demand.

Like the fixed route-fixed schedule concept, this service is good when major traffic generators can be connected, population densities are high, significant concentrations of potential riders can be identified, and funds are limited.

But it has several drawbacks, as the variations in scheduling add complications. If service is suspended during non-peak hours, it may leave public transportation dependent persons without service during the midday period. Problems with driver scheduling may also occur due to the part-time nature of the service. Useful applications may be extremely limited by

community needs and goals, especially if providing service to the transportation disadvantaged is an important consideration.

3. Flexible Route-Fixed Schedule

A third basic concept is the flexible route-fixed schedule option. This type of service uses fixed checkpoints, as well as predefined and stable schedules. Drivers of the public transportation vehicles are required to stop at the checkpoints at the scheduled times; however, the routes that are used to travel from checkpoint to checkpoint are flexible and based on trip demand of public transportation patrons. This type of system generally provides the patron with three trip, and hence fare, options. The first option is to both board and disembark at the checkpoints. Since this represents the lowest level of service the system can provide, a relatively low fare is generally charged for this option. Another possibility is to request doorstep service at one of the trip ends while boarding or disembarking at a checkpoint at the other trip end. This represents a medium level of service and usually justifies a modestly higher fare than the checkpoint-to-checkpoint service. The third service possibility is for the public transportation patron to request door-to-door service. This possibility represents the highest level of service this option can offer and usually justifies the highest fare that is charged under the flexible route-fixed schedule option.

The obvious advantage of a flexible route-fixed schedule option is that it provides the highest level of service of the three discussed thus far. The variable route feature of the system expands the service area.

But there are disadvantages. It is very difficult to remain on schedule. The type of system described works best in a demand environment that does not demonstrate extreme peak hour characteristics. If such peaking does exist, the large demand and the requirement to arrive and depart checkpoints at the proper times would probably lead to a system breakdown. In such cases, some doorstep demand may go unsatisfied. Another disadvantage may be the relative complexity of the system, as some patrons may have difficulty understanding the system due to its uniqueness and flexibility.

4. Flexible Route-Flexible Schedule

Foothills Express currently operates this type of service. This is the official designation for the classic demand response system. Vehicles operating under this broad service concept respond directly to patron demand, usually a request for service over the telephone. The patron is picked up at the door of his or her trip origin and delivered to the door of the requested destination. This service closely parallels traditional taxi service with several important differences. First, in order to both encourage and facilitate ridership among lower income patrons, the fares that are charged to the public transportation patron are generally much lower than those that would be incurred for making the same trip by traditional taxi service. Secondly, the shared-ride concept is encouraged because combining trips increases vehicle productivity. Finally, higher occupancy vehicles (such as vans or small buses) are sometimes (but not always) used; however, shared-ride taxi is actually one of the many forms a demand responsive system can take.

The basic demand response system works best where population densities are relatively low. But its cost problems are self-evident. It is expensive. Overall it has higher operating costs,

lower productivity, relatively greater difficulty in reliable operation and management, and a relatively greater difficulty for potential patrons to become familiar with the system.

5. Deviated Fixed Route

In a route deviation system, the bus operates along a fixed route and follows a set schedule. Vehicles can deviate from the set route, if a request is made by a rider eligible for paratransit services. After deviating from the route, the bus returns to the same point to continue its run. This type of route is practical in rural and small urban areas and when the number of deviations is relatively few. It requires a schedule that allows the driver sufficient time to deviate yet remain on schedule for most of the scheduled stops.

Why a Deviated Fixed Route Is Best

As noted above, a fixed-route-fixed-schedule system is especially good in communities where major traffic generators can be connected, high volumes can be identified, land use patterns are linear, a strong Central Business District (CBD) exists and funds are limited. All of these favorable conditions exist in Richmond. There is another favorable condition--it is possible to combine the advantages of route deviation to those of a fixed route

The City of Richmond is very compact. Many low-income people live within a mile of the County Court House. The main shopping areas, the hospital, most doctors' offices, and Eastern Kentucky University are located within a mile of the County Court House. The population density in this area is quite high, especially during the school year. In addition, many of Richmond's minorities live in this area.

The technical advisory committee concluded that it would be possible to arrange a bus route that can service all of the above areas each hour. The route is described in chapter VII. It is

a loop along the main arteries. It has 23 stops and takes approximately 53 minutes to complete, when the driver stops at all 23 stops. It is within walking distance of most low-income neighborhoods.

The bus driver can finish the route with seven minutes to spare even when stopping at all the stops. That seven minutes in combination with the probability that the driver will not have to pick up or drop off passengers at many of the 23 stops will provide ample time for occasional route deviation. The bus will deviate from the route to pick up those riders who cannot walk to the scheduled bus stops and who do not want to use the paratransit vehicles. (It is possible, however, that during the late afternoon peak hour, it may occasionally fall behind schedule.)

Foothills Express will continue to offer paratransit during the hours the new route is operating. The combination of a deviated fixed route and the paratransit will ensure that Foothills Express meets the requirements of the Americans with Disabilities Act (ADA). Foothills Express will be able to provide equal access to all. Individuals with disabilities will have access to both the new deviated fixed route as well as to comparable paratransit services.

Before designing a route, however, it was necessary to investigate the potential demand for a fixed route as well as the potential savings from transferring riders to the fixed route system. Only then is it possible to estimate costs and net returns.

IV. Estimating Demand for a Fixed Route Service

The previous section of this report reviewed existing public transportation services available in the city of Richmond. Clearly, KRFDC's Foothills Express is providing a large number of trips in Richmond. In order to estimate the potential demand for a new service, it was necessary to estimate the likely demand from two types of riders: those who are not being served at this time by Foothills Express's current programs, and those currently being served who could be transferred to a new system. The logic of our analysis is as follows. Foothills Express is receiving a lump sum of capitated revenue at this time, which it is spending on demand response vehicles. If it can place many of those served at this time by demand response buses and cabs on a new fixed route system, it can shift resources from the demand response to the fixed route.

Moreover, the fixed route should generate fare-paying customers from the neighborhoods along the bus route. In theory, the savings from reducing the size of the demand response system combined with the fare box revenues from the new service might pay the entire cost of the new service, or even result in a net savings compared to the existing service.

Even if a new service fails to pay for itself, one of the goals of this research is to maximize the number of riders on the new service. This required identifying the areas with the greatest number of likely riders—the production zones—and the destinations to which they are most likely to go—the attraction zones. Once that is done, it is possible to estimate future demand, as well as the revenues associated with different types of new systems.

Identification of Production Zones

To identify the areas most likely to generate additional public transportation trips we gathered data in two steps. The first was quantitative, involving a review of 1990 Census Data of Richmond's population and its attributes. The abbreviated nature of this study necessitated the

use of ten-year-old Census data for the quantitative phase of this process. Although it was felt that use of this aged data posed no significant problem, we gathered additional data in the qualitative phase of the research, as a check on the validity of the quantitative data.

In the qualitative phase, we conducted discussions with individuals having some insight into or particular interest in public transportation service in Richmond. To supplement this information we conducted several windshield surveys to locate areas of high potential for generating public transportation trips. Census data was used to identify the areas within the city of Richmond which exhibited those socioeconomic characteristics that are traditionally associated with a higher than average propensity to generate public transportation trips. Further, these data were used to both determine and analyze the Environmental Justice impacts of various proposals.

After consideration of a wide variety of possible socioeconomic characteristics to use, examination of the availability of Census data about these characteristics at the block group level, and discussions with the Richmond Technical Advisory Committee the following socioeconomic characteristics were selected:

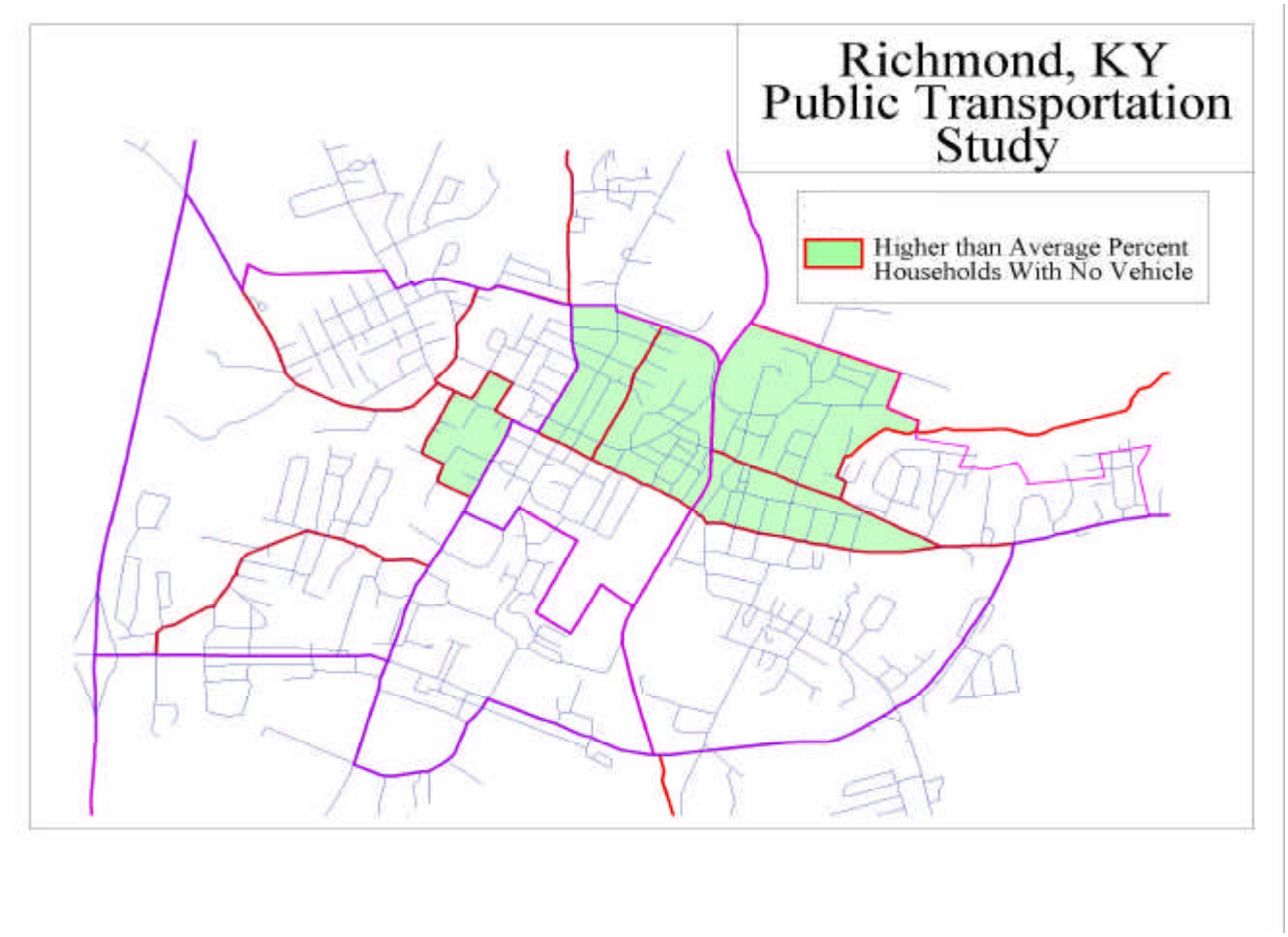
1. Households with no vehicle
2. Percent of population over age 65
3. Median household income
4. Percent African American population

Research on transit usage shows that those without automobiles, the elderly, the low–income and minorities are most likely to use transit. Therefore, demand for transit can be estimated as a function of those four attributes.

Auto availability, or lack thereof, is a (perhaps the) key socioeconomic indicator of potential public transportation trip demand. Recent public transportation research has indicated that those without automobiles are eight times more likely to use public transportation than those with at least one automobile.(1) Thus, households with access to no automobile are felt to be the most robust socioeconomic indicator of potential public transportation trip generation.

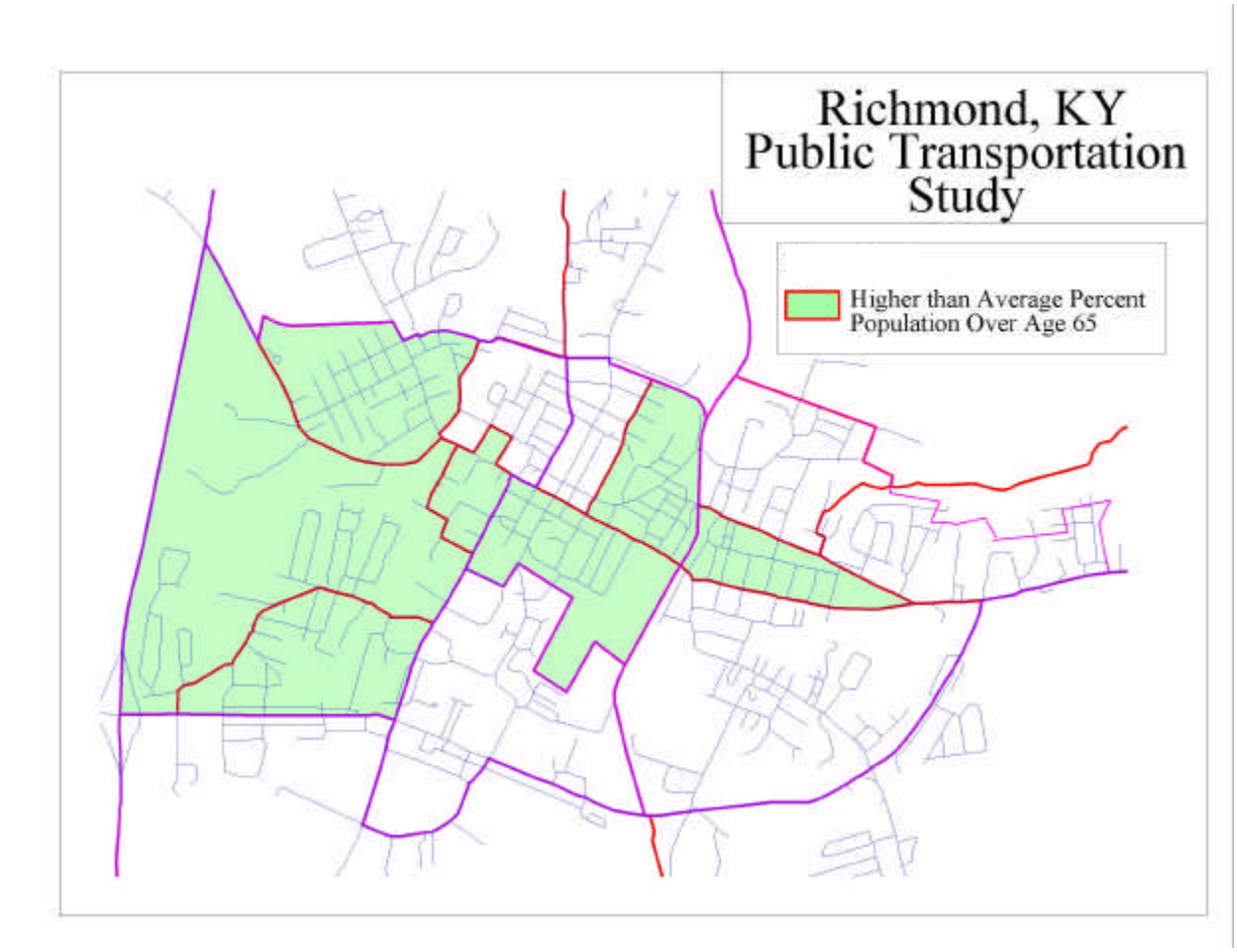
To determine the best place for bus routes, we identified the Census blocks in which the percentage of households with no vehicle was higher than the average for Richmond. Census Block Groups meeting this criterion are shown in Figure 4-1.

Figure 4-1: Households with No Vehicles



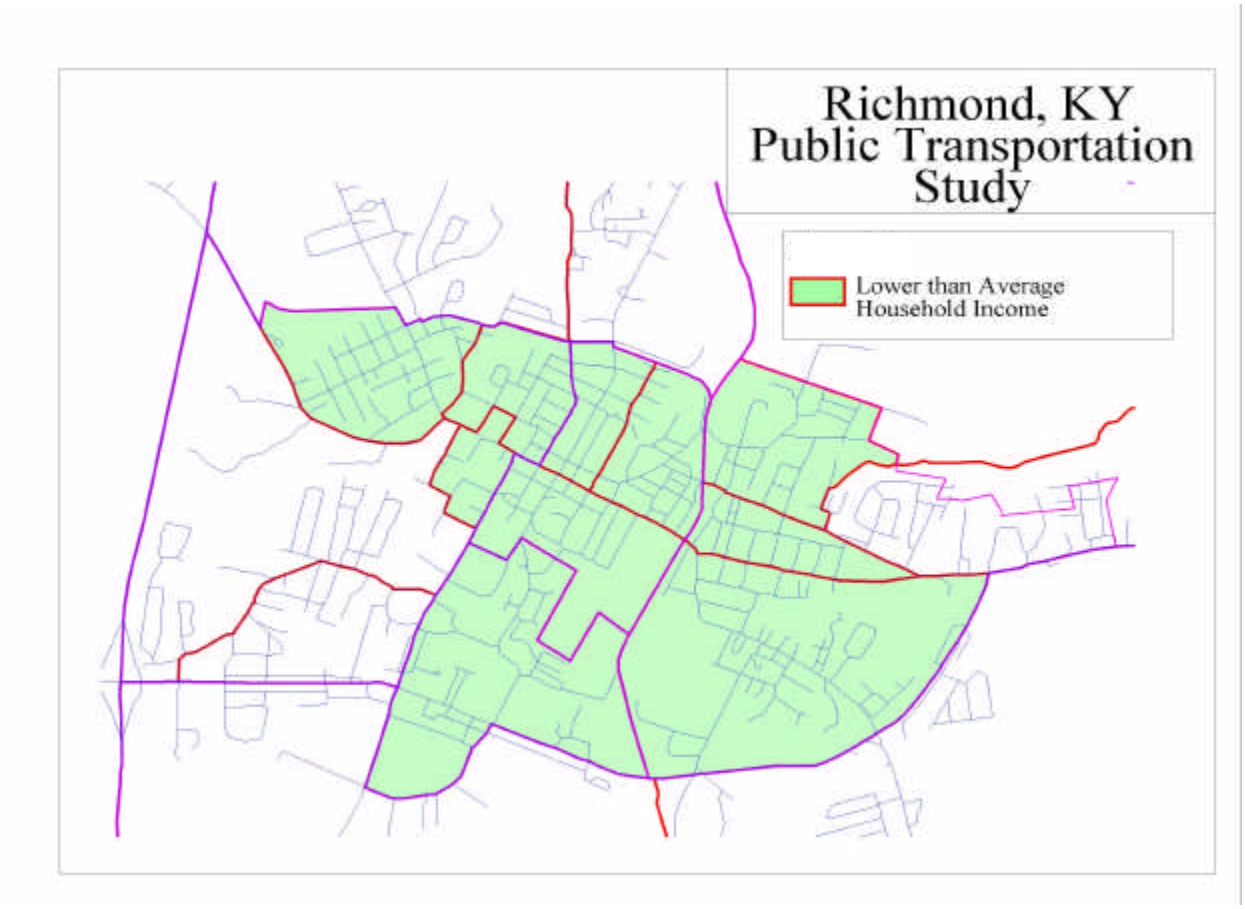
Age is another important index of transit usage. Seniors are less likely for physical, psychological, or financial reasons to be able to effectively use a private automobile for their transportation needs, even when an automobile is physically available to them. We used census data to identify Census blocks in which the percentage of the population over age 65 was higher than the average for Richmond. Census block groups meeting this criterion are shown in Figure 4-2.

Figure 4-2. Population Over Age 65



Lower income households are also more likely to generate patrons of public transportation. Areas with a median household income less than that of Madison County as a whole were identified. Census block groups meeting this criterion are shown in Figure 4-3.

Figure 4-3. Lower than Average Household Income



Finally, neighborhoods with a significant percentage of African-American residents were identified. TCRP Report 28 has shown a higher propensity for public transportation use by Blacks irrespective of income level.(5) More importantly, to comply with the principles of Environmental Justice, it is essential that transportation agencies consider minority concerns in the allocation of public services. We identified Census block groups where the percentage of Black population was higher than the average for Richmond. Census block groups meeting this criterion are shown in Figure 4-4.

Figure 4-4. Higher than Average Black Population

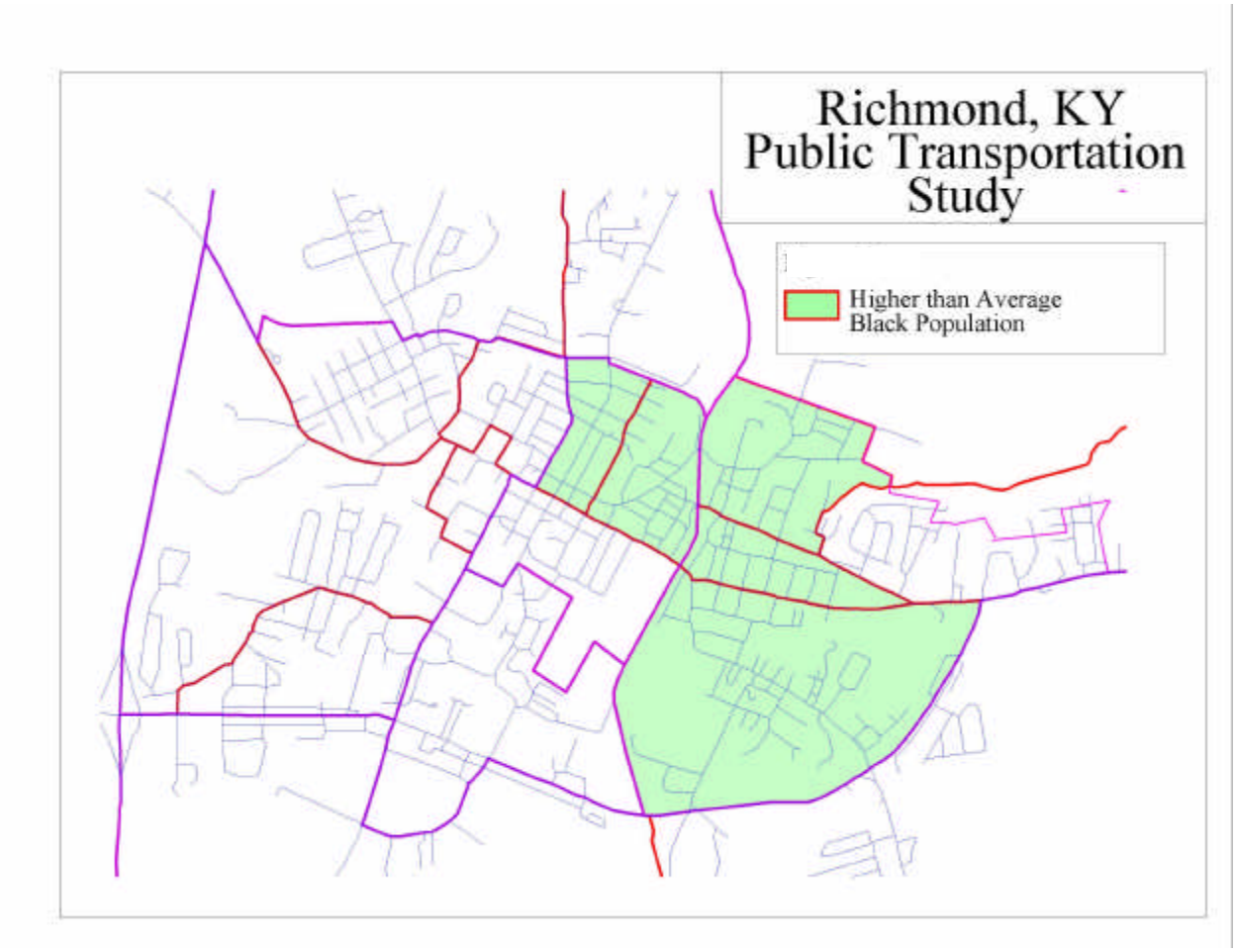


Table 4-1 on the next page summarizes the selected Census data indicated above. Census block groups meeting the threshold criteria identified above are shown in **bold**.

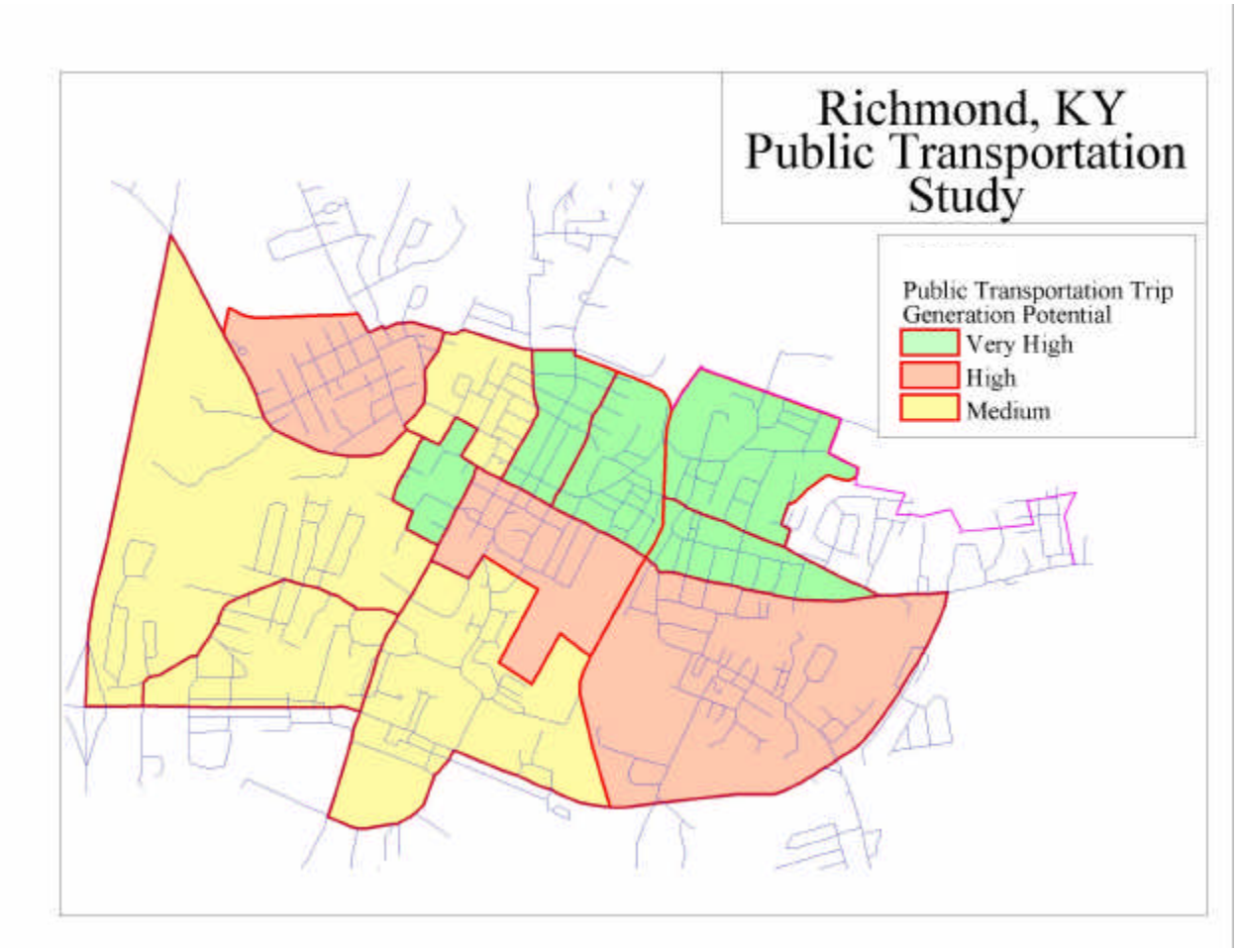
Table 4-1. Selected Census Block Group Data for Richmond

Census Tract	Block Group	Percent Households with No Vehicles	Percent Over 65	Median Household Income	Percent African-American Population
103	1	**23.48%**	11.91%	**$11,157**	**31.54%**
	2	8.09%	4.06%	$20,671	9.18%
	3	**42.92%**	**22.90%**	**$7,282**	**33.66%**
	4	10.34%	10.34%	**$11,786**	**12.15%**
104	1	**21.31%**	10.37%	**$15,139**	**17.23%**
	2	**43.14%**	**18.08%**	**$7,561**	**35.34%**
	3	4.51%	**19.64%**	**$12,228**	4.46%
105		1.47%	0.00%	**$10,483**	9.53%
106	1	10.86%	**23.93%**	**$15,994**	4.06%
	2	9.75%	11.03%	**$15,494**	0.00%
	3	**32.44%**	**45.89%**	**$13,472**	7.76%
	4	3.86%	**17.74%**	$41,176	0.00%
	5	9.78%	**31.51%**	$18,824	2.53%
Total		15.54%	11.92%	$16,003	11.45%

Figure 4-5 also summarizes this information in graphical format. Census block groups in which three or four of the threshold criteria were met are earmarked as areas of very high potential for public transportation trip generation. Census block groups in which two of the threshold criteria were met are shown as areas of high potential for public transportation trip generation. Finally, Census block groups in which only one of the threshold criteria was met are shown as areas of only medium potential for public transportation trip generation.

In addition to the above analysis of Census data, discussions were held with individuals having some insight or particular interest in public transportation service in Richmond. They confirmed that the poor and minority residents were most likely to live in the neighborhoods shown in Figure 4-5.

Figure 4-5. Public Transportation Trip Generation Potential



Further, a windshield survey was conducted to geographically locate additional areas of high potential public transportation trip generation that have emerged in the ten years since the 1990 Census. This windshield survey indicated that area north of Irvine Street between Douglas Court and the US 25 bypass, as well as the area immediately south of KY 876 between I-75 and KY 52, were likely additional areas that would generate public transportation trips.

Identification of Attraction Zones

The identification of attraction zones was more straightforward. Members of the Technical Advisory Committee were asked to identify the places people were most likely to need a ride to. In addition, a survey was sent to 30 civic leaders in which they were asked to identify popular destinations. Analysis of the response to the interviews and questionnaires revealed a consensus on the most likely destinations. Most of those who identified destinations mentioned the following: Pattie Clay Hospital and its associated doctors' offices, the Richmond Mall, WalMart, Main Street government buildings and offices, EKU, Comprehensive Care, elderly housing and public housing. These destinations are geographically close to one another and can be joined on a loop route, which will be described in Section VII of this report.

Demand Estimates

The methodology employed for an estimation of the potential demand for public transportation service was a modified version of the methodology used in a previous study of public transportation needs in Richmond. That study adapted a demand estimation methodology based on a geographic assessment of the various demographic factors known to increase the potential need for public transportation services. Specifically, it used an empirical demand estimation model based on operating statistics from more than one hundred public transportation programs across the country. The demand estimation model used in the current study was based on a previous study by CGA Consulting Services (6) but modified to reflect the Census socioeconomic characteristics described above as well as the more recent findings of TCRP Report 28.(7)

In order to estimate the total potential for public transportation trip generation, it was necessary to break the population down into four separate groups and estimate a separate rate of

transit usage per hundred members in each group. Thus we needed to estimate: (1) a rate for persons without an automobile; (2) a rate for low income persons with an automobile; (3) a rate for Black auto owners who were not low income; (4) a rate for senior auto owners who were not Black. These rates were estimated from a base rate in the CGA study and relative indices in the TCRP-28 report. Using this methodology, the total number of daily potential public transportation trips in Richmond was estimated to be 265. This is about twenty-six percent lower than the estimate in the CGA study, but was felt to be a reasonable if somewhat conservative estimate of daily potential public transportation trips in Richmond.

Another data source was available as a check of the reasonableness of this estimate. The Kentucky Transportation Cabinet recently participated in an overall transportation planning study for the city of Richmond. As a part of that study, trip tables were developed showing the total current daily trips between a series of traffic analysis zones defined for that study. Those daily trip interchanges between traffic analysis zones were converted to daily trip interchanges between Census block groups. A total of 26,309 daily trips between these Census block groups were thus identified. The number of daily potential public transportation trips in Richmond identified above (265) is thus about one percent of the total number of overall daily trips identified in the Richmond CGA Study.(7) Thus the total number of trips and our estimate of transit usage appear to be consistent with one another. For, as a general rule, it is reasonable to assume that approximately one percent of all trips in a community the size of Richmond will be taken on public transportation. By comparison, the entire state shows a transit usage of approximately three percent.

The estimate of 265 riders should not, however, be construed as an estimate of new paying or fare box customers. Some portion of this potential demand for public transportation

service is presently being provided within the city of Richmond. At noted previously, KRFDC currently provides, or brokers the provision of approximately 105 daily trips. It is reasonable to assume that these 105 daily trips should be subtracted from the total demand estimate of 265 daily trips to provide an estimate of 160 daily unsatisfied public transportation trips. The portion of these 160 potential trips that would actually materialize would be a function of the level of service provided by the service options to be considered in this study.

V. Estimated Savings from Shifting Current Demand Response Riders to a Fixed Route Bus System in Richmond

The transportation operation run by Foothills Express is multifaceted and serves customers with different needs. Some are welfare recipients going to work or job training (or their children going to daycare). Many are Medicaid recipients being transported to various types of medical facilities. Others have disabilities that render them eligible for transportation services.

Foothills Express carries many of these transportation eligible passengers on its small buses. In addition, it compensates local taxicab companies for transporting riders. A fixed route bus system could save Foothills Express money by shifting some of its passengers from the demand-response buses and private-sector taxicabs to the fixed route system.

To estimate the potential savings generated by a fixed route system in Richmond, we look only at data from Madison County. Many of the current passengers in Madison County live near the proposed bus route. Therefore it is reasonable to assume that a significant percentage of Medicaid, TANF, and other ambulatory categories of passengers could ride the bus. This would produce two types of expenditure savings—a reduction in expenditures on small, demand response buses in the city of Richmond and a reduction in money spent on cab fares. At present, Foothills Express has seven small buses operating in Richmond. As will be explained later in this chapter, it is estimated that it may be feasible to reduce this commitment of costly personnel and material resources from seven down to five vehicles.

Currently, expenditures on cab fares are quite substantial. In the first five months of the year 2000, Foothills Express spent an average of $10,444.20 each month on taxicab service for TANF and Medicaid recipients. The agency calls upon two Richmond cab companies—OK Cab and Colonel's Cab—for transportation services. Clearly, it is not possible to move all those assigned to cabs to the proposed fixed route bus system. However, as we estimate, transferring a

relatively small percentage of cab riders to the fixed route bus will produce substantial savings each month.

Projected Savings from Reducing the Number of Demand Response Buses Providing Rides in Richmond

Currently, Foothills Express operates seven small buses in the city of Richmond. Each vehicle has a fulltime driver. The drivers often get overtime hours. But to keep the estimate conservative we do not compute overtime hours. The average total compensation for drivers—hourly wage plus benefits—is approximately $10.00 per hour. They work 22 days per month on average. Multiplying their expected work day of eight hours times 22 work days shows that the typical driver can be expected to work 176 hours per month. Multiplying that number by their average wage rate gives the total monthly wage cost per driver, which is $1,760 for personnel costs per bus per route.

The average Richmond bus drives 1,986 miles per month. The estimate of monthly fuel cost per Richmond bus or van was calculated in the following manner. Approximately 26.5 percent of all miles driven by Foothill Express's buses are driven in Richmond. In September, the agency's total gasoline bill was $8,230. To compute the average fuel cost for a Richmond bus or passenger van, we multiplied .265 times $8,230, which gave us the cost of fuel for all seven Richmond vehicles--$2181. We then divided that number by seven, which gave us the monthly cost of fuel per vehicle operating in Richmond--$312 for fuel per bus per month.

The buses are old and tend to need substantial repair. We computed an average monthly maintenance bill per bus by dividing the total maintenance bill ($4,286) by 20—the number of vehicles that Foothills Express has in operation. This resulted in an average monthly maintenance bill of $214 per bus per month.

Adding the three estimates together--wages, fuel, and maintenance--provides an estimate of the average cost of running a demand response bus in Richmond. The total monthly cost per bus is $2,286. Thus, if foothills Express can move enough demand response passengers to the fixed route bus to eliminate a bus from its current demand response system, it can expect to save $2286 each month. If it can eliminate two demand response vehicles, it can save $4572. Since we are ignoring insurance and other costs, these are conservative estimates. (Of course, we are also ignoring the expenses associated with the new fixed-route bus.)

Estimates of Number of Riders Who Can be Transferred to Demand Response

It is estimated that a large number of the current demand response bus riders in Richmond could rely on the fixed route bus. Some 90 percent of these riders are ambulatory. During the first six months of 2000, an average of 1,004 trips were made each month on a demand response bus to a medical appointment. Each month, 354 additional people rode a demand response vehicle to Cardinal House, a day treatment facility.

If 50 percent of those 1,358 monthly trips move to the fixed route bus, then a total of 679 trips (or 30 per day) would be eliminated from the demand response system. KRFDC officials estimate that this should make it possible to reduce the demand response bus fleet by two vehicles, eliminating the associated costs. If only 25 percent were transferred to the fixed route bus, an estimated 340 trips (or 15 per day) could be eliminated. This would lead to reduction in the fleet of one bus and its related costs.

Projected Savings from Moving Medicaid and TANF Recipients from Taxis to the Fixed Route Bus

Foothills Express assigns riders to two cab companies in Richmond. A third taxicab company is assigned riders in Berea. We base our estimates on data for the two Richmond companies. Over the first six months of the year 2000, Foothills Express has spent an average of $6.89 per trip to transport a TANF recipient on OK Cab and $5.84 per trip for a TANF rider on Colonel's Cab. Medicaid recipients are more expensive to transport by taxi-- $12.53 per trip to transport on OK Cab and $16.47 by Colonel's Cab. The differences in average cost per trip are due to differences in average miles driven per trip.

We estimate that a substantial number of these recipients can ride the proposed bus. Most of the medical offices and the Pattie Clay Hospital are on the route as are a number of employers for TANF recipients. TANF and Medicaid recipients are different in several respects, so we constructed separate estimates of their potential to shift to the proposed bus route.

TANF Savings. TANF requires welfare recipients to take job training and/ or a job. It is a new program that has yet to reach maturity. Therefore predictions about possible savings from shifting TANF cab riders to the bus are very tentative. In fact, since most TANF recipients are mothers with children and many of them need to take their children to daycare, it may not be possible to shift more than a tiny percentage of the TANF recipients to the fixed route bus. Moreover, even if they do not need to take their children to a day care facility, they may not be able to find training or a job on or within walking distance of the bus route. With the inherent difficulty of projecting TANF ridership on the fixed route bus in mind, we will offer three projections, based on moving 25, 15, and 10 percent, respectively, of the current TANF cab riders to the new bus route.

During the first five months of 2000, Colonel's Cab billed an average of 88 TANF trips per month at an average cost of $5.84 per trip. Over the same period, OK Cab billed an average of 226 TANF trips at an average cost of $6.89 per trip. Thus, in Richmond, the total cost per month was $2,071.06.

To compute our estimate of the number of TANF recipients who can be placed on the proposed bus route, we began with the data for the first six months of 2000. We added the trips for employment and training together, but subtracted from that total the number of trips for daycare. Mothers who take their children to daycare will continue to use cabs, because they must first go to daycare prior to travelling to work. This gave us an estimate of 185 TANF trips per month that are candidates for transfer from a cab to the bus. An estimated 56 of these are provided by Colonel's Cab and 129 by OK Cab.

If 25 percent of the 185 ride the bus (14 trips from Colonel's Cab and 32 from OK Cab) the estimated monthly saving from TANF riders is $302.22. If 15 percent ride the bus (28 riders

in all) the estimated monthly saving is $181.22. And, if only 10 percent can take the bus, the monthly savings is $120.89.

Annually (the monthly estimate multiplied by 12), we estimate the savings for 25 percent usage to be $3,627, for 15 percent to be $2175, and for 10 percent to be $1,451.

Medicaid Savings. During the first six months of 2000, Colonel's Cab billed an average of 124 trips per month at an average cost of $16.47 for Medicaid transport. In the same time frame, OK Cab billed an average of 513 Medicaid trips at an average cost of $12.53 per trip. The total monthly cost for Medicaid transportation in Richmond was $ 8,470.

If 25 percent of the 637 Medicaid riders take the bus (31 trips from Colonel's Cab and 128 from OK Cab) the estimated monthly saving from Medicaid riders is $2114. And if only 15 percent ride the bus (19 trips from colonel's cab and 77 from OK cab) the estimated monthly saving is $1269.

Estimated Total Savings

Monthly. We have arrayed our estimates of possible savings per month from least to greatest in Table 5-1. Four possible scenarios are presented: (1) A minimum of savings, because only one demand response bus is eliminated and only 10 percent of TANF and 15 percent of Medicaid riders can be assigned to the fixed route bus; (2) one demand response bus is eliminated, but 25 percent of TANF and 25 percent of Medicaid recipients go on the fixed route bus; (3) two demand response buses are eliminated from the system but only 15 percent of Medicaid recipients and 10 percent of TANF recipients ride the new bus; and (4) a maximum of savings by eliminating two demand response buses and a full 25 percent of TANF and Medicaid riders move to the fixed route.

We begin with the most optimistic scenario. Assuming that 25 percent of TANF and Medicaid eligible persons ride the proposed fixed route bus and it is possible to eliminate two Richmond demand response buses, we estimate a total savings on an annual basis of $83,856. To reach this number we added up the three monthly estimates of savings--$4,572 from eliminating two buses, $302 from reduced spending on TANF cab fares, and 2114 from reduced spending on Medicaid cab fares—and then multiplied by 12. This estimate is located in column four.

Column one contains the most conservative estimate. It assumes only one bus was removed from demand response and only 15 of Medicaid and 10 percent of TANF taxicab riders can be assigned to the fixed route.

Table 5-1. Estimated Monthly Savings from Transferring Current Riders to the Proposed Fixed Route

	Scenario 1. Eliminate One Bus 10% TANF Shift 15% Medicaid Shift	Scenario 2. Eliminate One Bus 25% TANF Shift 25% Medicaid Shift	Scenario 3. Eliminate Two Buses 10% TANF Shift 15% Medicaid Shift	Scenario 4. Eliminate Two Buses 25% TANF Shift 25% Medicaid Shift
Demand Response Buses	$2,286	$2,286	$4,572	$4,572
TANF	$121	$302	$121	$302
Medicaid	$1,269	$2,114	$1,269	$2,114
Total Savings	$3,675	$4,702	$5,962	$6,986

Annual. Table 5-2 presents the estimates of annual savings. These were computed by multiplying the monthly total estimates by twelve. Even under the most conservative scenario, the estimate of annual savings is quite substantial, $44,100. Under scenario four, the least conservative, the estimate is $83,856. The table also contains two intermediate estimates of $56,424 and $71,544.

Table 5-2. Estimated Annual Savings from Transferring Current Riders to the Proposed Fixed Route

	Scenario 1. Eliminate One Bus 10% TANF Shift 15% Medicaid Shift	Scenario 2. Eliminate One Bus 25% TANF Shift 25% Medicaid Shift	Scenario 3. Eliminate Two Buses 10% TANF Shift 15% Medicaid Shift	Scenario 4. Eliminate Two Buses 25% TANF Shift 25% Medicaid Shift
Total Savings	$44,100	$56,424	$71,544	$83,856

Estimated Number of Current Riders Transferred

The above estimates of savings are based upon the transfer of riders to the fixed route. Table 5-3 gives estimates of the monthly and daily number of riders thus transferred. It is

noteworthy that the relatively large dollar savings are generated by the shifting of a relatively small number of riders each day to the fixed route.

Table 5-3. Estimated Daily and Monthly Riders Transferred to Fixed Route

	Scenario 1. Eliminate One Bus 10% TANF Shift 15% Medicaid Shift	Scenario 2. Eliminate One Bus 25% TANF Shift 25% Medicaid Shift	Scenario 3. Eliminate Two Buses 10% TANF Shift 15% Medicaid Shift	Scenario 4. Eliminate Two Buses 25% TANF Shift 25% Medicaid Shift
Riders To Fixed Route Monthly	454	545	793	884
Riders per Day	21	25	36	40

VI. Estimated Cost of a Fixed Route Service

This estimate is based on one route in a loop from Main Street to the Mall and back via Irvine, Kit Carson, US 25, the By-Pass and Turpen Drive (See Table 6-1). Monday through Friday, the bus would make the loop once each hour starting at 7:00 a.m.. and making the last run at six at night. It would run 12 hours each day during the week for a total of 60 hours. On Saturday, it would run from nine in the morning until nine at night, for a total of twelve hours. The total weekly operating time would be 72 hours. This would require the services of two drivers, each of whom would be compensated for 40 hours of work each week. Except for occasions of illness or other unforeseen circumstances, we anticipate no need to pay for overtime hours.

We assume that there will be no additional costs for dispatchers or administration. All additional costs will concern the delivery of the new service (i.e. for drivers, fuel, insurance, and maintenance.)

Drivers

Our cost estimate is based on the expenses associated with having two drivers for one bus. At this time, the typical Foothills bus driver costs the agency $10.00 per hour (wages plus benefits) or $1,760 per month. Two drivers at that rate would cost approximately $3,520 per month. If the fixed route drivers are paid an additional $2.00 premium for a total compensation of $12.00 per hour, the monthly wage cost per driver would rise to $2,112 or $4,224 for two drivers.

Fuel, Insurance, and Maintenance

The fuel cost should be somewhat greater than that for the other buses run by KRFDC. The bus will be larger, which will increase fuel consumption. It will also be in operation twelve hours per day, not eight, and the engine will be running all the time. However, it may run fewer miles each day—the loop 12 times per day. The loop is 7.9 miles long, so the total mileage per day will be approximately 94.8 miles. Over the course of a year the bus will drive 29,578 miles or 2,465 per month.

LexTrans currently averages 3.8 miles to the gallon for its buses. It is paying 94 cents per gallon for diesel fuel, but purchases fuel in bulk on contract. Foothills would have to buy from a retail outlet. However, because it is exempt from fuel taxes, it can obtain diesel fuel below the retail price. We estimate its fuel cost per gallon to be $1.25. At 3.8 miles to the gallon, Foothills Express will need to purchase approximately 7,780 gallons annually or 648 gallons per month. At $1.25 per gallon fuel would cost $810 per month.

Currently, KRFDC is paying $150 monthly per bus for insurance. We inquired into the cost of insuring a large, fixed route vehicle and were informed by their current insurance agency—Kentucky Associations of Counties (KACO) that the new vehicle would cost approximately $2,000 per year, which is $167 per month. The KACO representative added that removal of one or two buses from the demand response system would probably not reduce the current premium for Foothills Express. So their total premium would go up by about $2,000. He suggested that Foothills Express would need a driver with a commercial driver's license and have a policy of drug testing and regular driving history checks.

Currently, KRFDC is spending a modest $214 per month for maintenance. It is operating vans and small buses. A large bus would be significantly more expensive to maintain. Michael Pence, the purchasing manager for LexTrans, informed us that LexTrans has a maintenance

budget of $1,400,000 for its 46 vehicles. It thus spends $30,435 per bus per year. Maintenance costs are directly proportional to use. LexTrans buses drive an average of 3,850 miles per month. We estimate that Foothills Express's bus will drive 2,465 miles per month or 64 percent as many miles. Therefore, its anticipated maintenance costs per bus would be 64 percent of LexTran's, which annually would be an expenditure of $19,485. On a monthly basis, we estimate an expense of $1,624. This estimate is in line with the maintenance expenditures of Paducah Transit Authority, which operates 8 large buses with diesel engines. In a conversation with its director, Gary Kitchen, he informed us that his annual maintenance budget for the eight diesel buses was $155,232, or approximately $19,400 per bus. He speculated that he spent less than LexTrans on maintenance per bus because Paducah Transit's buses are newer and therefore require less maintenance.

On balance then, it appears that the $20,000 per annum estimate for Foothills Express's maintenance budget is reasonable. In all likelihood, Foothills Express will operate an older bus than does Paducah transit, but run it fewer miles, which will result in an overall maintenance budget of similar size.

Repairs will take the bus out of service. Foothills Express has a large bus in its fleet at this time, which is suitable as a back-up. Therefore, there is no need to purchase two buses.

In Table 6-1, we present two estimates of costs for this route offering service on a six day schedule, 72 hours per week. The first estimate is for two drivers at $10.00 per hour, the second is for two drivers at $12.00 per hour. The other costs stay the same.

Table 6-1. Estimated Monthly Cost of Service for One Bus on Loop*
(Main Street to the Mall and back via Irvine, Kit Carson, US 25, Turpen and the By-Pass)

	$10 Hourly Compensation	$12 Hourly Compensation
Two Drivers	$3,520	$4,224
Fuel	810	810
Maintenance	1,624	1,624
Insurance	167	167
Miscellaneous	250	250
Total per Month	6,371	7,075
Total per Annum	76,452	84,900

***This is for 72 hours of service, 12 hours a day, Monday through Saturday.**

Estimated Farebox Revenue

Our estimate of potential demand was 265 riders per day in Richmond. It is expected that, of that number, approximately 105 will continue to ride on the demand response vehicles and cabs provided by KRFDC. That leaves 160 likely paying customers each day. However, since the route in question does not cover all areas of Richmond and only runs once an hour, it is not realistic to assume that all, or even a majority, will use it. To err on the conservative side, we expect only 25 percent of the 160 to find it useful. That gives us an estimate of approximately 40 paying customers per day. With a fare of one dollar per customer, this produces a revenue estimate of $40 per day, $240 per week, or $12,480 per year.

Estimated Annual Net Operating Revenue

Table 6-2 presents estimates of the annual net operating revenue of the proposed fixed route. These estimates are computed by subtracting the anticipated fare box revenue of $12,480 and the anticipated savings under each of four scenarios from the largest operating cost estimate of $84,900. We used the savings estimates under the four scenarios of transferring riders that were computed previously. As Table 6.2 shows under Scenario 1—the most conservative scenario--there is a net loss of $28,316. Under Scenario 2, the loss is $15,991. Under Scenario 3, the loss declines to only $887, and under Scenario 4 there is an operating surplus of $11,438. In other words, if Foothills Express can eliminate two of its demand response buses, it can add a fixed route for little or no additional cost or even a small operating revenue surplus.

Table 6-2. Estimated Annual Net Operating Revenue of the Proposed Fixed Route (Total Operating Cost Less Farebox Revenues and Savings from Transfers)

	Scenario 1. Eliminate One Bus 10% TANF Shift 15% Medicaid Shift	**Scenario 2. Eliminate One Bus 25% TANF Shift 25% Medicaid Shift**	**Scenario 3. Eliminate Two Buses 10% TANF Shift 15% Medicaid Shift**	**Scenario 4. Eliminate Two Buses 25% TANF Shift 25% Medicaid Shift**
Operating Cost Estimate	-$84,900	-$84,900	-$84,900	-$84,900
Add Farebox Revenue	$12,480	$12,480	$12,480	$12,480
Add Savings	$44,104	$56,429	$71,533	$83,858
Net Revenue	-$28,316	-$15,991	-$887	$11,438

Additional Funding Issues

As noted above, much of the needed revenue will be generated by transferring riders from the current demand response buses and cabs to the fixed route. And, approximately $ 240 per week, or $12,480 per year, will come from new riders through fare box revenue.

In addition, there is a federal program—Section 5311 FTA—that provides public rural transportation grants. Both fixed and deviated routes in rural areas are eligible. Richmond would be eligible, because the definition of rural under this program is under 50,000 population, and Richmond's population in 1998 was less than 28,000. There are some other conditions but Richmond would be able to meet them. For instance, Foothills Express runs a paratransit system and would have no difficulty showing that those needing paratransit services would still have access to them. That is, the proposed fixed route would not reduce the availability of paratransit services to those, such as the handicapped, in need of them.

Start-Up Costs

There will, of course, be some start-up costs that we did not include in the previous estimates of operating costs. Foothills Express will need to add a bus to its fleet. One local transit agency has made a verbal commitment to transfer a bus to Foothills. This would cost Foothills Express 10 percent of the fair market value, which is probably about $20,000. (The federal government would pay 80 percent of the value and the state 10 percent.) Hence, Foothills would have to pay $2,000 to acquire the used bus.

If Foothills were to buy a new bus, it would have to pay 10 percent of its cost. According to Michael Pence, purchasing manager for LexTrans, a new 30 foot bus currently sells for approximately $245,000 (a new 35 foot bus sells for $250,000, and a new 40 foot bus sells for $265,000.) So Foothills would need to spend in the vicinity of $25,000 for a new bus.

He estimated that a good used bus sells for $125-150,000. The used bus appears to be the cost-effective choice. However, Mr. Pence estimates that used buses may require $10,000 to $15,000 in repair work before they can be placed on the road.

Foothills will also need to purchase signs for the stops along the route, two fare boxes—one for the regular route bus and one for the back-up bus. It will also need to purchase several bus shelters. The price of a mechanical fare box is $800 and the price of an electronic fare box is $6,000. An ADA accessible bus shelter is $4,500 to $5,000. Signage will be approximately $600 in total; however, the city of Richmond may be able to provide the signs. In addition, it will be necessary to purchase advertising in local media outlets to supplement the free public service advertising Foothills currently uses. The additional advertising is estimated to cost $5,000.

Table 6-3. Estimated Start Up Costs

Item	Cost
2 Mechanical Fare Boxes	$1,600
4 Bus Shelters	$18,000
Signage	$600
Advertising	$5,000
Foothills' Share of Used Bus Purchase From Other Transit Agency	$2,000
Preliminary Repair On Used Bus	$10,000
Total	**$37,200**

VII. The Proposed Deviated Fixed Route

Given Richmond's geographic and demographic structure and the existing financial constraints, the technical advisory committee selected a deviated fixed route. The route is a loop that reaches the areas most likely to generate riders as well as the destinations most likely to attract riders. (The route is depicted in the map on page 45.) It will run hourly and will have the advantage of a fixed schedule to attract riders. However, given the projected ridership and the short length of the route there is sufficient time to leave the route to pick up riders. In other words, there appears to be sufficient leeway for occasional deviations.

It was determined that this new service was financially feasible, because many of those currently riding on Foothills Express's demand response system could be transferred to the new route. We estimated the potential savings as well as the costs of a fixed route system in the prior sections. This section concludes with a description of the recommended route and the rationale for it.

Route Rationale

In devising the route, we were guided by the most recent research on the various factors that increase ridership on transit systems. Since some income and demographic groups are more likely than others to ride public transportation, it is advisable to design routes that serve those individuals and groups most inclined to patronize the service.

It is known, for example, that African-Americans are more likely to use transit. A TCRP study concludes that: "black workers in very low density metropolitan areas under 200,000 [population] were about 5 times more likely to use transit as the average worker." (9) One possible reason for this is that African-Americans are less likely to own an automobile. The

TCRP notes that people without automobiles are 5.76 times more likely to use transit. (10) This, of course, is to be expected. We, therefore, looked at the concentration of African Americans in each census block. We also identified the census blocks containing the greatest percentage of residents who did not own an automobile. The blocks overlap. The recommended route is the one most likely to serve minorities and those without access to an automobile. These census blocks also contain the greatest percentages of low income families.

Young people and the old are also inclined to rely disproportionately on transit, as are college students. The selected route has stops at Eastern Kentucky University and Madison Towers, an apartment complex for the elderly. EKU has 5,200 students living on campus. It also has stops at the Richmond Recreation Center and the Richmond YMCA, both of which are popular with teenagers.

Studies of public transit have consistently found that some destinations are more likely that others to attract riders. People take transit to workplaces and to shopping centers. In addition, they often take transit to universities, either as workers or students, and to healthcare facilities, either as workers or patients.

The physical layout of a route can also stimulate ridership. Downtown and neighborhood loops are most likely to attract riders. These are especially attractive when they facilitate reverse commuting (i.e. travel from a home in the center of town to a job on the periphery.) They are also attractive when they provide access to services—dry cleaning, the post office, banking, drug stores, etc.

The route recommended does all of the above. It includes the three low-income housing complexes, as well as the other major residential areas for poor and/or African-American residents of Richmond. We interviewed the director of the Richmond Pubic Housing Authority,

and she estimated that approximately 25 percent of the families in public housing do not own an automobile. The proposed route will give them access to the Richmond Mall, Main Street government buildings, and to the Hospital and University.

In addition to the above trip attractors and generators, ridership can also be elicited with low cost fares, bike carriers on the bus, transfers, monthly fares and passes, and effective marketing of services to the public. Without any of these incentives, we expect a base daily ridership of 61 to 80 passengers--40 fare box customers and 21 to 40 transfers from the demand response system each day (See Table 6-3).

The Stops and Schedule

1. Second Street and Main—Leaves at the top of the hour every hour between 7:00 a.m. and 6:00 p.m.
2. Robinson Terrace—7:03
3. Turpen Drive—7:07
4. Richmond Recreation Center—7:09
5. Court House—7:11
6. Madison Towers—7:12
7. First Baptist Church—7:13
8. Rail Crossing—7:18
9. Smith Village—7:20
10. Dillingham Heights—7:22
11. YMCA—7:24
12. Steep Street—7:26
13. Richmond East—7:27

14. Kroger—7:31

15. Lexington Clinic—7:32

16. Family Dollar—7:34

17. Mall Main Entrance—7:35

18. Wal-Mart—7:39

19. Comprehensive Care—7:43

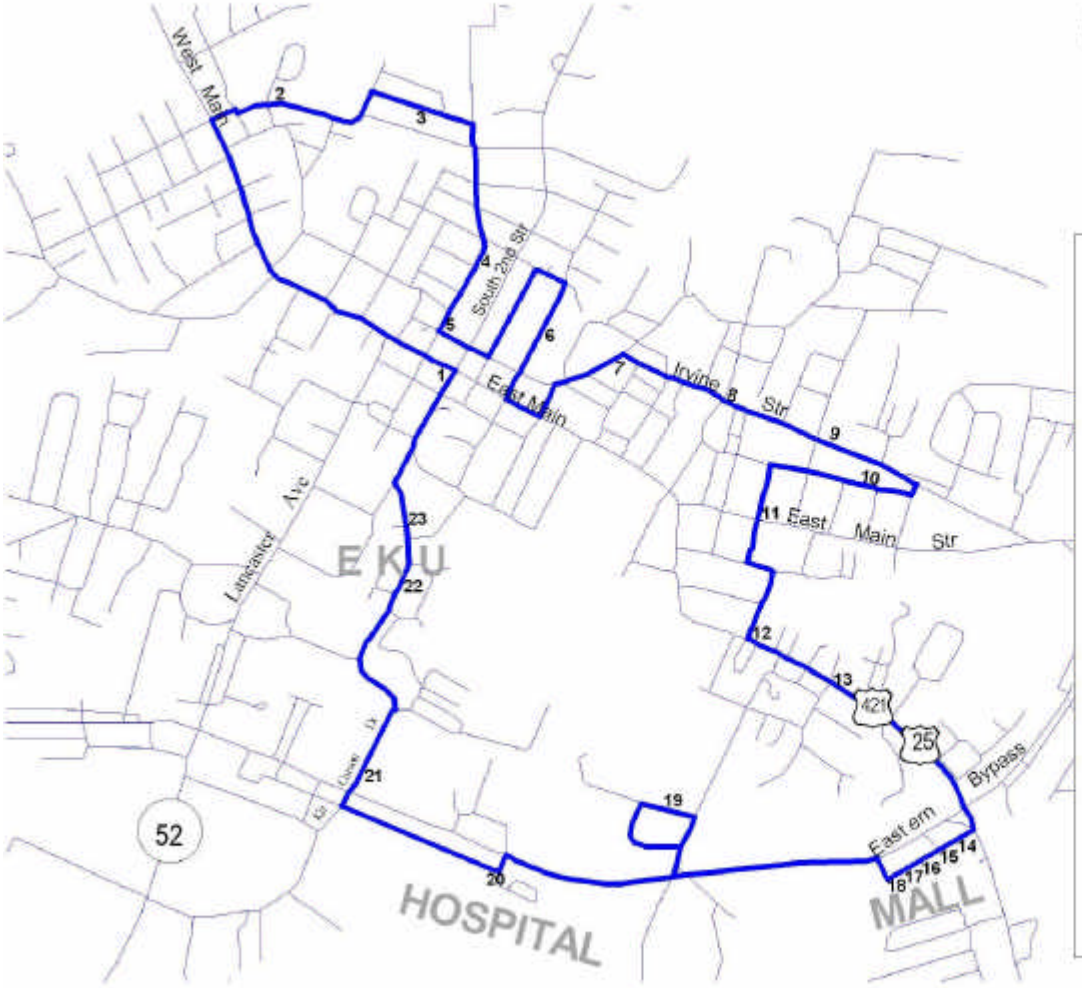
20. Patty Clay Hospital—7:46

21. Begley—7:48

22. Wallace Building—7:50

23. Madison Dorm—7:52

24. Return to Second and Main—7:53



City of Richmond, KY

Proposed Bus Route

Stops and Schedule

1. Second Street and Main- Leaves at the top of the hour every hour between 7:00 A.M. and 6:00 P.M.
2. Robinson Terrace-7:03
3. Turpen Drive-7:07
4. Richmond Recreation Center-7:09
5. Court House-7:11
6. Madison Towers-7:12
7. First Baptist Church-7:13
8. Rail Crossing-7:18
9. Smith Village-7:20
10. Dillingham Heights-7:22
11. YMCA-7:24
12. Steep Street-7:26
13. Richmond East-7:27
14. Kroger-7:31
15. Lexington Clinic-7:32
16. Family Dollar-7:34
17. Mall Main Entrance-7:35
18. Wal-Mart-7:39
19. Comprehensive Care-7:43
20. Patty Clay Hospital-7:46
21. Begley-7:48
22. Wallace Building-7:50
23. Madison Dorm-7:52
24. Return to Second and Main-7:53

VIII. Summary

This study looked at the possible costs and benefits associated with the creation of a small deviated fixed route bus service in Richmond. It concluded that the circumstances in Richmond favor the creation of such a system. There appears to be ample demand concentrated in the area defined by the proposed route, as discussed in the previous section. Moreover, much of that demand is already being served by the current demand response system. The Richmond technical advisory committee concluded that resources and passengers could be transferred from the current demand response system without compromising the quality and availability of service to current riders. The proposed fixed route bus would not replace the current demand response system. Rather the latter would be reduced substantially in cost, as some passengers were transferred to the new system.

At this writing, Foothills Express supports seven buses in Richmond. It also devotes considerable resources to paying for cab service in Richmond. Many of those being transported live along the proposed route and are going to destinations on it. This study estimates the potential savings from transferring passengers to the proposed fixed route bus to range from a minimum of $44,104 per annum to $83,858 per annum. The more modest estimate is based on the elimination of one of the seven demand response buses in Richmond and the transfer of 10 percent of the TANF cab riders and 15 percent of the Medicaid cab riders to the proposed fixed route bus. The largest estimate of savings is based on the elimination of two demand response buses and the transfer of 25 percent of TANF cab riders and 25 percent of Medicaid cab riders to the fixed route.

Of course, the proposed route will generate new costs. It is estimated that the operating costs for a six day, 12 hours a day service for one bus will range from $76,452 to $84,900,

depending on the total compensation for the two fulltime drivers such a route would require. The study added in the likely costs of fuel, maintenance, insurance, and an estimate of miscellaneous costs to make the estimate as accurate as possible.

The proposed route will also generate revenues from fare box customers, which at a fare of $1.00, are estimated to be $12, 480 per annum.

The study includes estimates of the annual net operating revenue of the proposed bus service. These estimates are computed by subtracting the anticipated fare box revenue of $12,480 and the anticipated savings under each of four scenarios from the largest operating cost estimate of $84,900. Under Scenario 1--the most conservative scenario--there is a net loss of $28,316. Under Scenario 2, the loss is $15,991. Scenarios 1 and 2 entail the elimination of only one of Foothills Express's demand response vehicles

In contrast, Scenarios 3 and 4 call for the removal of two demand response vehicles. Under Scenario 3, the loss declines to only $887 and under Scenario 4, there is an operating surplus of $11,438. In other words, if Foothills Express can eliminate two of its demand response buses, it can add a fixed route for little or no additional cost or even a small operating revenue surplus.

There will be some start up costs, however. Richmond would need to buy some bus shelters. It will need signs with schedules at all the proposed stops. And it will need to acquire a bus, which, new or used, will be 90 percent subsidized from federal and state funds. We estimate these costs to total $37,200. Spread over ten years they are a modest $3,720 per year.

The bottom line appears to be this. Richmond may be able to acquire a fixed route service for no or only a small annual additional cost, provided it eliminates two of its current demand response vehicles. Foothills Express is well positioned to run the route and adjust it to

circumstances. For instance, this study has identified 23 stops for the loop route. It is possible that additional stops could be added as more fine-grained knowledge of public needs emerges. The initial expenditure on advertising is designed to generate demand. If demand goes up dramatically, it is also possible that additional routes and buses could be added.

IX. References

(1) Richmond, KY 2020 Transportation Plan, prepared for the City of Richmond by Woolpert LLP, 1999

(2) "Evaluation of Medicaid Transportation Service Delivery in Kentucky Human Service Transportation Regions" Kentucky Transportation Center. 2000

(3) Ibid.

(4) TCRP Report 28 "Transit Markets of the Future: The Challenge of Change", University of Arizona, 1998

(5) Ibid.

(6) Existing Service Improvement and Richmond Circulator Service Study, CGA Consulting Services, Inc., 1990

(7) TCRP Report 28 "Transit Markets of the Future: The Challenge of Change", University of Arizona, 1998

(8) Existing Service Improvement and Richmond Circulator Service Study, CGA Consulting Services, Inc., 1990

(9) TCRP Report 28 "Transit Markets of the Future: The Challenge of Change", University of Arizona, 1998, 16.

(10) Ibid.

University of Kentucky
College of Engineering

KENTUCKY TRANSPORTATION CENTER

Our Mission

We provide services to the transportation community through research, technology transfer and education. We create and participate in partnerships to promote safe and effective transportation systems.

We Value...

Teamwork -- Listening and Communicating, Along with Courtesy and Respect for Others
Honesty and Ethical Behavior
Delivering the Highest Quality Products and Services
Continuous Improvement in All That We Do

For more information or a complete publication list, contact us at:

Kentucky Transportation Center
176 Raymond Building
University of Kentucky
Lexington, Kentucky 40506-0281

(859) 257-4513
(859) 257-1815 (FAX)
1-800-432-0719
www.engr.uky.edu/ktc
ktc@engr.uky.edu