Lexington Area Long Range Transit Plan 2030

Final Report, June 22, 2005

Submitted to

Federal Transit Administration

Submitted by

Lexington Area Metropolitan Planning Organization

Executive Summary

The Long Range Transit Plan 2030 (LRTP 2030) is an amendment to the Long Range Transportation Plan 2030 which was completed by the Lexington Area Metropolitan Planning Organization in June 2004. The Transit Plan serves as a guideline for improving the public transit system of the Lexington Area for the next twenty five years. The Transit Plan determines potential transit improvement elements, presents transit demand analysis methodologies and a TransCAD-based transit model, identifies projects and implementation plan, estimates both operational and capital costs, and forecasts transit funds expected to be available to implement the recommended projects and improvement plans from now until the year 2030.

The basic procedure of transit plan starts with public involvement and outreach activities. Based on public requirements and a system-wide investigation of transit level of service, the potential transit improvement elements are determined, which are the tools that could be utilized to improve transit system performance and attract potential customers. The procedure then goes to transit demand analysis and transit modeling that analyze and compare the cost-effectiveness of different transit improvement plans. Meanwhile, financial analysis and forecasts are conducted and the projections are used as the control totals in the transit model. Finally, the recommended plan will be the one with the highest benefit /cost ratio.

This report has five chapters: Chapter 1 introduces the basic procedure of transit plan and the public involvement program; Chapter 2 presents the long-range transit improvement elements that are categorized into seven groups: transit route system design, transit level of service, fare system, bus stops, fleet age and conditions, specialized transit /paratransit service, and Bus Rapid Transit; Chapter 3 presents transit demand analysis and a TransCAD-based transit model; Chapter 4 presents short-range projects, implementation plan, long-term options, and both short-range and long-range cost projections; and Chapter 5 analyzes and projects each category of federal funding (FTA 5307, FTA 5309, FTA 5310, and CMAQ) and local funding (local tax levy, passenger fares, and LFUCG assistance) from FY 2006 through FY 2030.

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Chapter 1 Introduction

Transportation plan is the vision of the future. According to 23 CFR450C, Sec.450.322, the metropolitan transportation planning process shall include the development of a transportation plan addressing at least a twenty year planning horizon. The plan shall include both long-range and short-range strategies/actions that lead to the development of an integrated intermodal transportation system that facilitates the efficient movement of people and goods. As an important component of the transportation system, transit system should be planed in accordance with the comprehensive, continuing, and cooperative transportation planning process (3C process), required by the United States Department of Transportation. This document is the product of cooperative efforts of state and local officials, Lexington Area Metropolitan Planning Organization (Lexington Area MPO), and Lexington Transit Authority (LexTran).

The Long Range Transit Plan 2030 (LRTP 2030) is an amendment to the Long Range Transportation Plan 2030 which has been completed by Lexington Area MPO. The Transit Plan serves as a guideline for the improvement and development of public transit system of Lexington Area for the next thirty years. The Transit Plan determines potential transit improvement elements, presents transit demand analysis methodologies and a TransCAD-based transit model, identifies projects and projects implementation plan, estimates both operating and capital costs, and forecasts transit funds expected to be available to implement the recommended projects and facility improvements in Lexington Area from now until the year 2030.

1.1 The basic transit plan procedure

Figure 1-1 presents the basic procedure of transit plan. The procedure starts with public involvement and outreach activities which give us the knowledge of the public's needs with transit system. Based on public requirements and a system-wide investigation of transit level of service, the potential transit improvement elements are determined, which are the tools that could be utilized to improve transit system performance and attract potential customers. Since limited resources prevent the implementation of all the improvement elements, the procedure goes to transit demand analysis and transit modeling that analyze and compare the cost-effectiveness of alternative transit improvement plans. Meanwhile, financial analysis and forecast are performed and the projections are used as the control totals in the transit model. Finally, the recommended plan will be the alternative with the highest benefit / cost ratio.

Public involvement program is presented in the next section; transit improvement elements, transit demand analysis and transit modeling, and financial analysis are discussed in Chapters 2, 3, and 4 respectively.

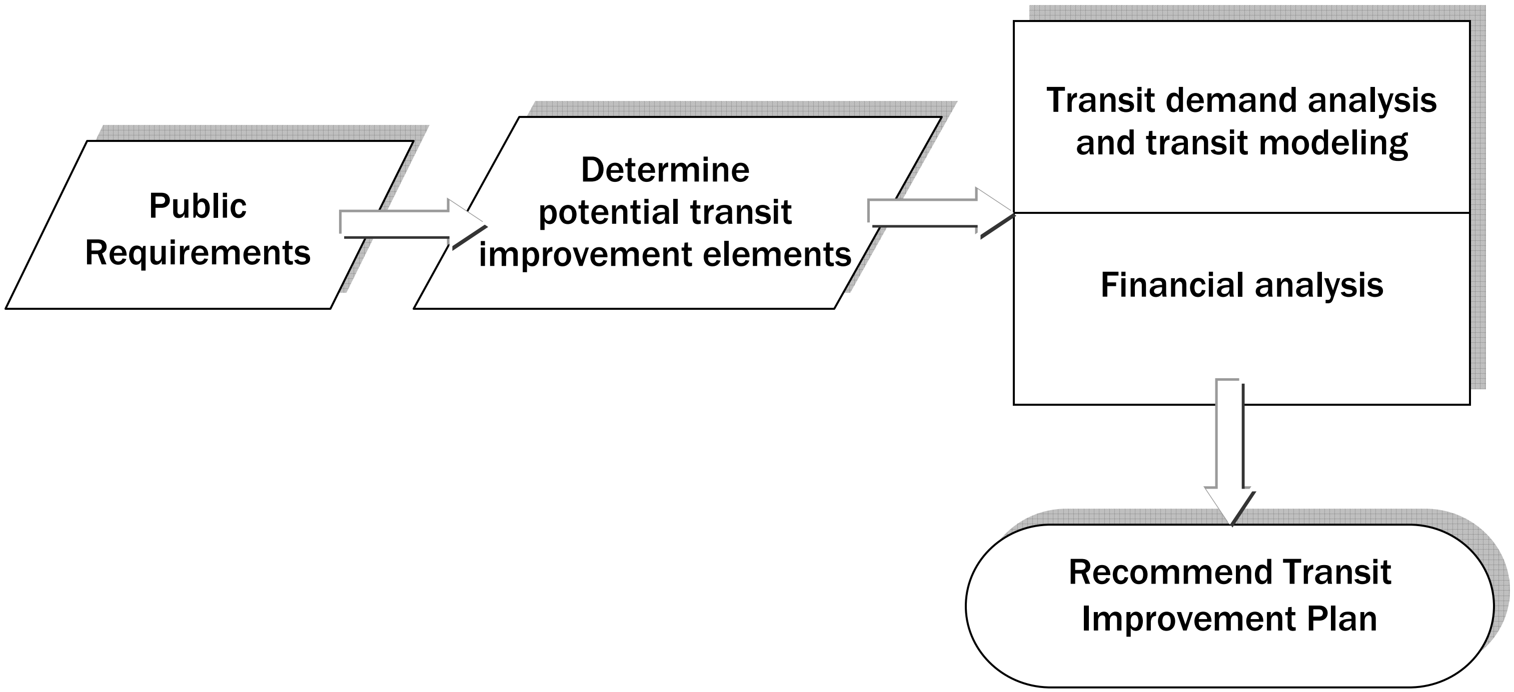


Figure 1-1 The basic transit plan procedure

1.2 Public involvement program

According to the publication of FHWA and FTA, The Metropolitan Transportation Planning Process: Key Issues, public involvement is integral to the MPO's transportation mission. Without meaningful public participation, there is a risk of making less than optimal decisions. With it, it is possible to make a lasting contribution to an area's quality of life. Public involvement is more than an agency requirement and more than a means of fulfilling a statutory obligation. True public participation is central to good decision-making.

It is the long-term policy of Lexington Area MPO and LexTran to ensure that public concerns and issues are identified and addressed in an open, cooperative, and collaborative process that provides meaningful opportunities to influence transportation decisions. After a property tax increase was approved to support LexTran, the public transit system that provides service for Lexington-Fayette County, by the voters of Fayette County, Kentucky in November, 2004, LexTran would expect to obtain approximately $11 million stabilized funding from the tax levy. Lexington Area MPO is now in the position of developing both a long-range and a short-range Transit Improvement Plans, which will serve as the guideline for transit system development for Lexington Area. Meanwhile, a Comprehensive Operational Analysis (COA) of the LexTran system has been prepared by RLS & Associates, Inc. under contract with LexTran. A variety of purposeful, specific, effective and productive public involvement activities have been conducted to determine what the current and potential transit markets are, what service improvements are desired by current and potential riders, and generally how LexTran can serve the needs of the Lexington community.

Specially-designed public input forms that focus on specific issues

Three public input forms for transit related issues are designed and distributed at the public meetings and outreach activities (Appendices A, B, and C). The first form is to collect requirements and comments about the general issues about LexTran; the second one focuses on bus stops and bus shelters; and the third one divides the whole urban area into five parts and a map for each part is provided, the public is asked to identify on the maps the locations of new bus services they need most. These public input forms are distributed at the public meetings and also to individuals and a variety of local organizations/academies such as the Bluegrass Council of the Blind, Building a United Interfaith Lexington through Direct-action (BUILD), the Society for Human Resources Management (SHRM), University of Kentucky, etc.

Public meetings

Three public meetings were held at the onset of the COA to afford an opportunity for the public to provide input before any recommendations are made. Three meetings were held at the following times and locations:

1. September 7, 2004 at 12:00 p.m., Lexington Public Library, Main Street, Lexington;
2. September 8, 2004 at 6:00 p.m., Lexington Senior Center, Nicholasville Road, Lexington;
3. September 9, 2004 at 6:00 p.m., Tates Creek Country Club, Lexington.

Those in attendance at these meetings desired the following service improvements:

- Restore bus service on Sundays.
- Some nighttime service is needed, even if it is at a lower level of service than daytimes. Meeting all three primary work shifts is desired.
- Smaller buses should be used on selected routes.
- The frequency of most routes needs to be improved to at least every 30 minutes in the peak period. Better headways are more desirable such as 15-minute peaks and 30 minute at other times.
- Routes in the south end of the City need to be extended to serve new developments.
- Some cross-town service should be provided to reduce travel time for some trips.
- There should be more service on Saturdays and holidays.
- Extend service on selected routes to 2:00 a.m. on Thursday, Friday and Saturday.
- New routes should be more widely advertised.
- Routes should be modified to service Beaumont 7, the Coop on Southland Drive, Camelot, and several apartment complexes that are not served.

Presentations were made at six additional public meetings to inform the public on two alternative service plans that were developed and to solicit comments and other input on these alternatives. The location and times for these meetings were as follows:
1. October 12, 2004 at 12:00 p.m., Lexington Public Library, Main Street, Lexington;
2. October 13, 2004 at 9:00 a.m., Metropolitan Planning Organization, Nicholasville;
3. October 14, 2004 at 12:30 p.m., Beaumont Public Library, Lexington;
4. October 19, 2004 at 1:30 p.m., LFUCG Council Meeting, Lexington;
5. October 20, 2004 at 6:30 p.m., LexTran Board Meeting, Lexington;
6. October 21, 2004 at 6:30 p.m., YMCA, Loudon Avenue, Lexington.

In addition, two public meetings were held after the draft report of COA was produced and LexTran had announced proposed dates for the implementation of initial service changes. These were:

1. March 16, 2005 at 12:00 p.m., Lexington Public Library, Main Street, Lexington;
2. March 16, 2005 at 6:30 p.m., LexTran Board Meeting, Lexington;
3. March 17, 2005 at 12:00 p.m., Lexington Public Library Branch, Russell Cave Road, Lexington.

In addition, a successful public meeting was hosted by Lexington Area MPO on February 1st, 2005 at Joseph-Beth Booksellers in Lexington Green Shopping Center (Figure 1-2). The notifications of the public meetings were posted in buses and at the transit center and advertised on-line two weeks before the meeting (Appendix D). More than one hundred individuals and organizations attended the meeting and discussed with MPO staff and local and state officials about their requirements and concerns of the transportation system and transit related issues. Public input sheets, contact information of MPO staff members, and MPO meeting schedule of the year 2005 were distributed at the meeting. The public requirements have been input into the MPO Public Involvement Access-Database.

Figure 1-2 Lexington Area MPO public meeting, February 1st, 2005

LexTran staff meetings
Four separate meetings were held with LexTan staff to solicit input for the COA. Attendance was voluntary but over 25 LexTran employees attended at least one of these meetings. Those in attendance included drivers, dispatchers, and management staff. Fixed route service and operations related issues were discussed. The primary service-related suggestions include the following:

- Thirty-minute headways during the peak period should be restored and the time they are operated should be increased. The peak period should be from 6:00 a.m. to 9:00 a.m. and from 3:00 p.m. to 6:00 p.m. on weekdays.
- Route 3 should be modified to serve the Wal-Mart on Nicholasville Road by eliminating the Lexington Green and the Reynolds Road segments.
- If the levy does not pass, routes should be combined in a one-way loop configuration. This would maintain service coverage in the more low-density areas, but reduce costs. This approach could also be used to help restore evening and/or Sunday service if the levy passes.
- Reversing loops should be eliminated throughout the system and kept in one direction at all times. One of these reversing loops exists in the Tates Creek area.
- Attempts should be made to maintain clockface schedules throughout the day. Other approaches should be used to compensate for changing traffic conditions.
- Time points should be scheduled to eliminate mid-route stopping to avoid getting ahead of schedule.
- Look to expand LexTran service out of the county to include the surrounding communities.
- Begin a route to the airport and Keeneland.
- Operation around the transit center should be less time consuming.
- Routes should start earlier, such as 5:20 a.m., to allow more people to get to work on time.
- Loading and unloading wheelchair passengers in the Transit Center should be improved.
- Offer transfer points outside of the downtown transfer center.
- Improve communication and sharing of ideas between drivers and management. Include driver input on route and time changes.

On-board survey
A survey of weekday on-board passengers was conducted to discern information relating to the referendum, passenger demographic and trip making characteristics, assess service priorities, and also to determine the current rider image of LexTran. The survey was conducted August 31 through September 2, 2004. Approximately fifty percent of the weekday

trips were surveyed. Survey forms were handed out and collected by a surveyor on board each trip that was being surveyed. Refer to the COA report for the detailed survey instrument and results.

Telephone household survey
A telephone survey was conducted in July 2004 of 500 households in Fayette County. A CATI system was used for accurate data collection and so that certain questions could be "rotated." This means that they were asked in a different order from one respondent to the next so that question order did not bias the result for any one question more than for others. Prior to the survey, focus groups were conducted which included both potential transit users and persons with no potential to use transit. The focus groups helped shape the questions asked in the survey and reported here. Resulting survey data were weighted to equal the age and gender distribution of Fayette County of the population eighteen years of age and older. Refer to the COA report for the detailed survey instrument and results.

Stakeholder interviews
In order to assure that the COA is responsive to community needs and desires, the consulting team conducted a number of interviews with LexTran stakeholders. In each interview, the interviewer described the study goals and the community outreach and public participation process. A summary of the interviews appears in Appendix E.

Routine public hearings / committee meetings
Public hearings are routinely conducted at LexTran Board meetings that are held at the LFUCG Council Chambers are televised on a cable television local public access channel. The public is also welcome to attend any of the seven committee/board meetings held monthly at the Government Center, including Air Quality Advisory Committee (AQAC), Bicycle Pedestrian Advisory Committee (BPAC), Congestion Management Committee (CMC), Incident Management Committee (IMC), Transportation Policy Committee (TPC), Transportation Technical Coordinating Committee (TTCC), and LexTran Board Meeting. Transit related issues are discussed at all these meetings and the public could present their comments and requirements about the transit system.

Formalized procedures for public complaint process

There are two formalized procedures for public complaint process, and both of them are in accordance with the Title VI complaint procedures: the first procedure is implemented by Lexington Fayette Urban County Government, Administrative Officer / EEO Coordinator. They record, manage, and process any Title VI issues or complaints related to the activities of the MPO. The contact information is:

Phone: 859-258-3132
Email: dwhite@lfucg.com
Address: 200 E. Main Street, Lexington, KY 40507

The second procedure is implemented by LexTran, Director of Transportation. Figure 1-3 shows LexTran complaint record / investigation report. LexTran processes the complaints complying with the Title VI procedures. They also inform the MPO of any Title VI issues or complaints related to the activities of the MPO. The contact information is

Phone: 859-255-7756
Email: tsewell@lextran.com
Address: 109 West Loudon Ave., Lexington, KY 40508

Date Received January 31,2005 — Complaint #B № 0459

REPORT OF [redacted]OMPLAINT
NAME [redacted] TELEPHONE [redacted]
ADDRESS
DATE OF INCIDENT 01/31/05 TIME 12:35 a.m. p.m. BUS #
BUS ROUTE 4-North Limestone PLACE Limestone

BUS DIRECTION: X Outbound / ___ Inbound; ___ North / ___ North; ___ South / ___ South; ___ East / ___ East; ___ West / ___ West
OPERATOR Milford Taylor

INCIDENT	SERVICE	
x Discourtesy	___ Headway	___ Bus Stop Sign
___ Passed Boarding Stop	___ Overload	___ Schedule
___ Passed Exit Stop	___ Route	___ Shelters
___ Careless Operation	___ Breakdown	___ Benches
___ Transfer	___ Fare	___ Air Conditioner
___ Smoking on Bus	___ Walking Distance	___ Heater
___ Miscellaneous	___ Transfer Location	

REMARKS BY PASSENGER – See Attached –

REFERRED TO:
Manager of Transportation X
Executive Director
Director of Operations
COMPLAINT RECEIVED BY Tracy Sewell, Director of Transportation

REPORT OF INVESTIGATION

DATE 2 - 1 20 05

✓ Recalls Incident ___ Misunderstanding
___ No Knowledge of Incident
REMARKS Mr. Taylor said that passenger did drop part of fare in the box and part fell in the trash can Mr. Taylor said that he told this Gentleman that he need to come up with the rest of his fare

RECORD OF ACTION TAKEN

✓ Re-Instructed ___ Suspended
___ Cautioned
___ Unnecessary to Contact Operator
REMARKS Schedule a meeting with passenger and operator.

FOLLOW-UP REPORT TO COMPLAINTANT

___ Telephone ___ Letter ___ Personal Contract ___ No Report

SIGNED

Figure 1-3 LexTran complaint record / investigation report

Lexington MPO Public Involvement Access-Database
An Access database has been developed by Lexington Area MPO to store, categorize, organize, and manage public requirements and remarks (Figures 1-4, 1-5, and 1-6). This advanced input / management tool has provided great convenience and benefits to the public involvement program. The basic functions of the database are summarized as below:

1) Record the requestor's name, contact information, remarks/requirements, and comments by MPO staff;
2) Organize the records by resources (email, interview, mail, newspaper, personal visit, phone call, public meeting, TPC meeting, TTCC meeting, and others), by categories (ADA (Americans With Disabilities Act), air quality, bike/pedestrian, carpool/vanpool, congestion management, downtown, freight, pavement condition, public transit, roadway development, safety, surveillance, and traffic impact), and by process statuses (pending, in process, processed, and completed);
3) Select, filter, sort, or combine the records by date received, name of the requestor, resource, category, MPO staff in charge, or process status; and
4) Generate reports.

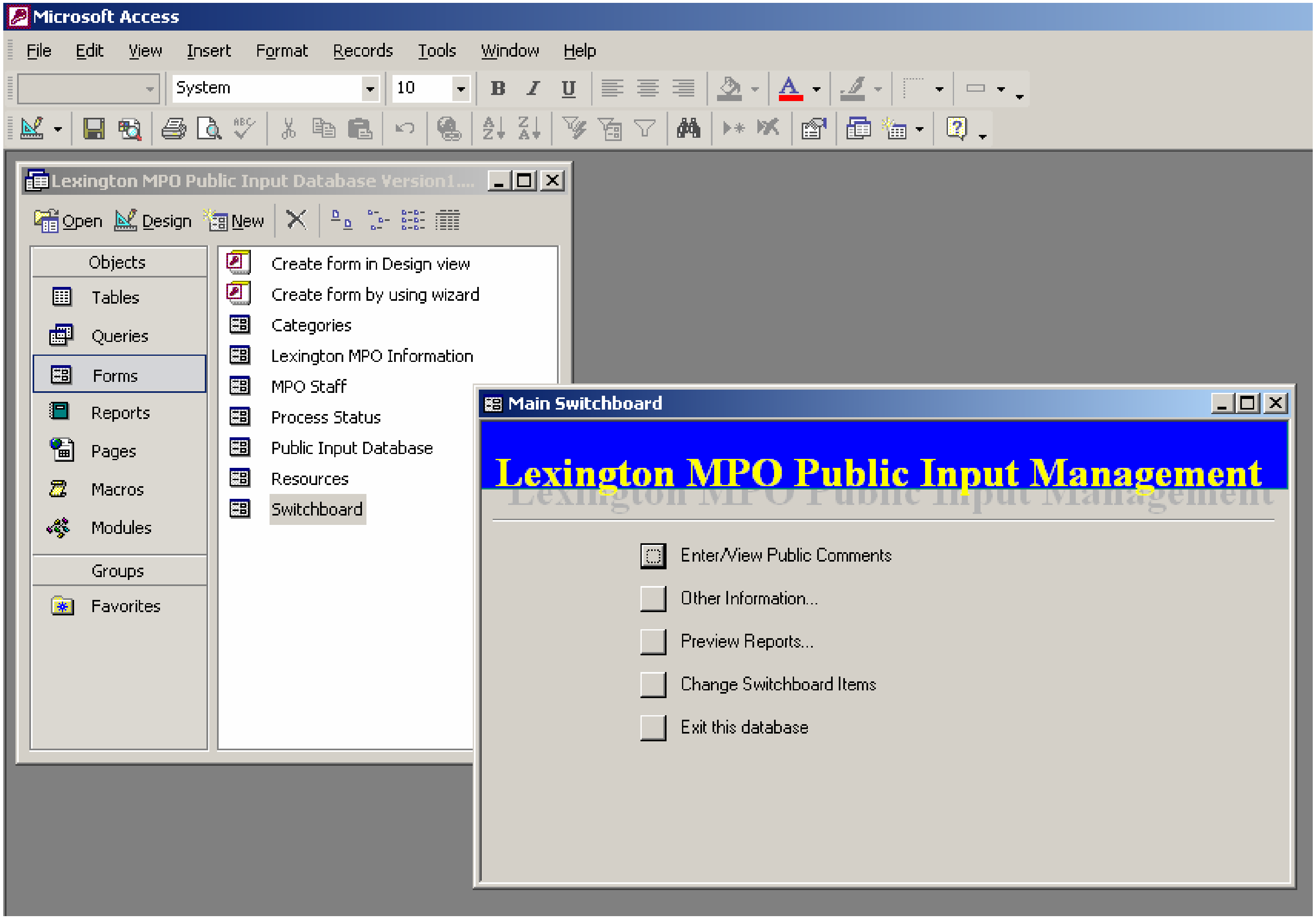


Figure 1-4 Lexington MPO Involvement Access-Database: Main switchboard

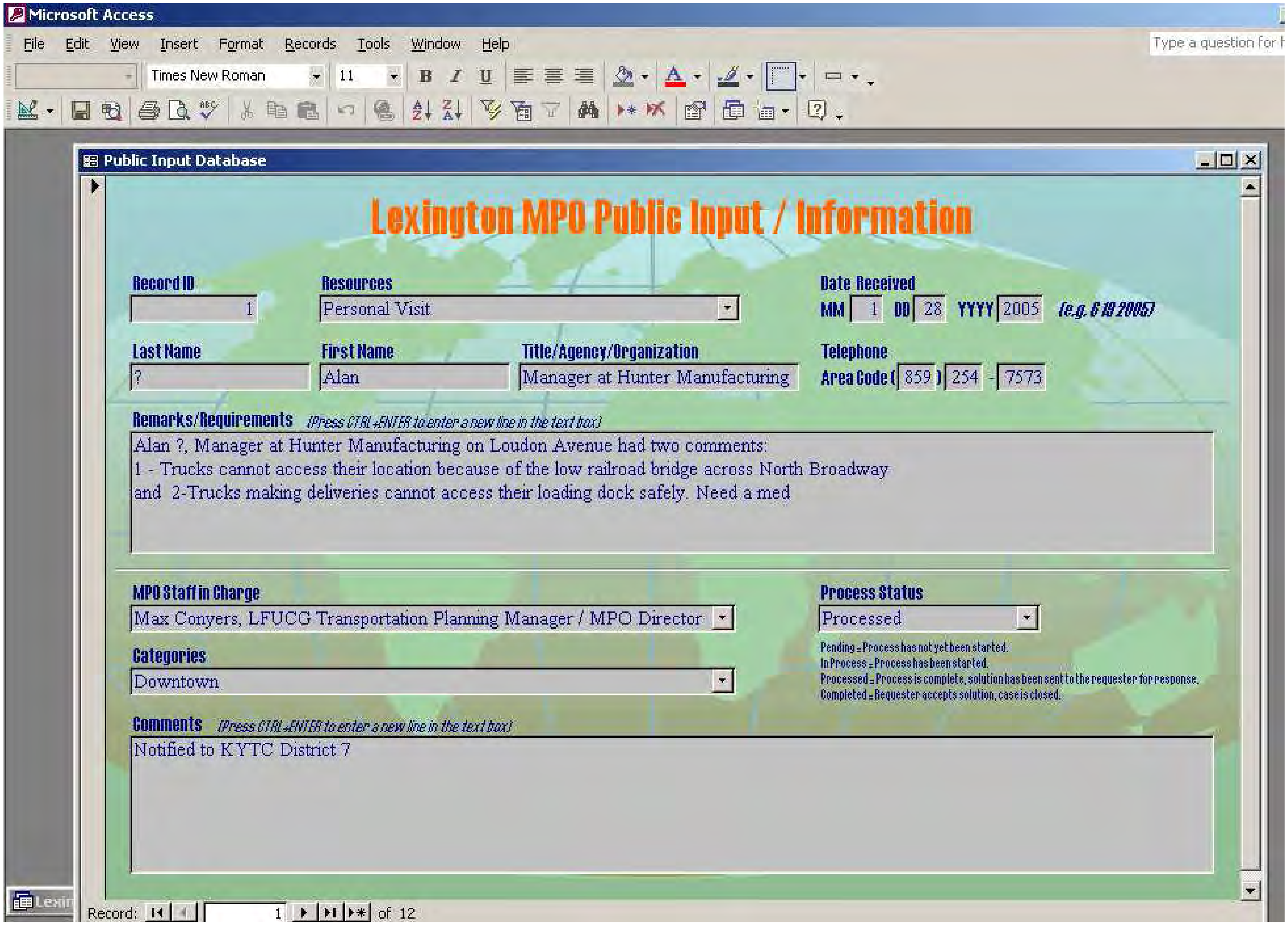


Figure 1-5 Lexington MPO Public Involvement Access-Database: Main form - Public Input / Information

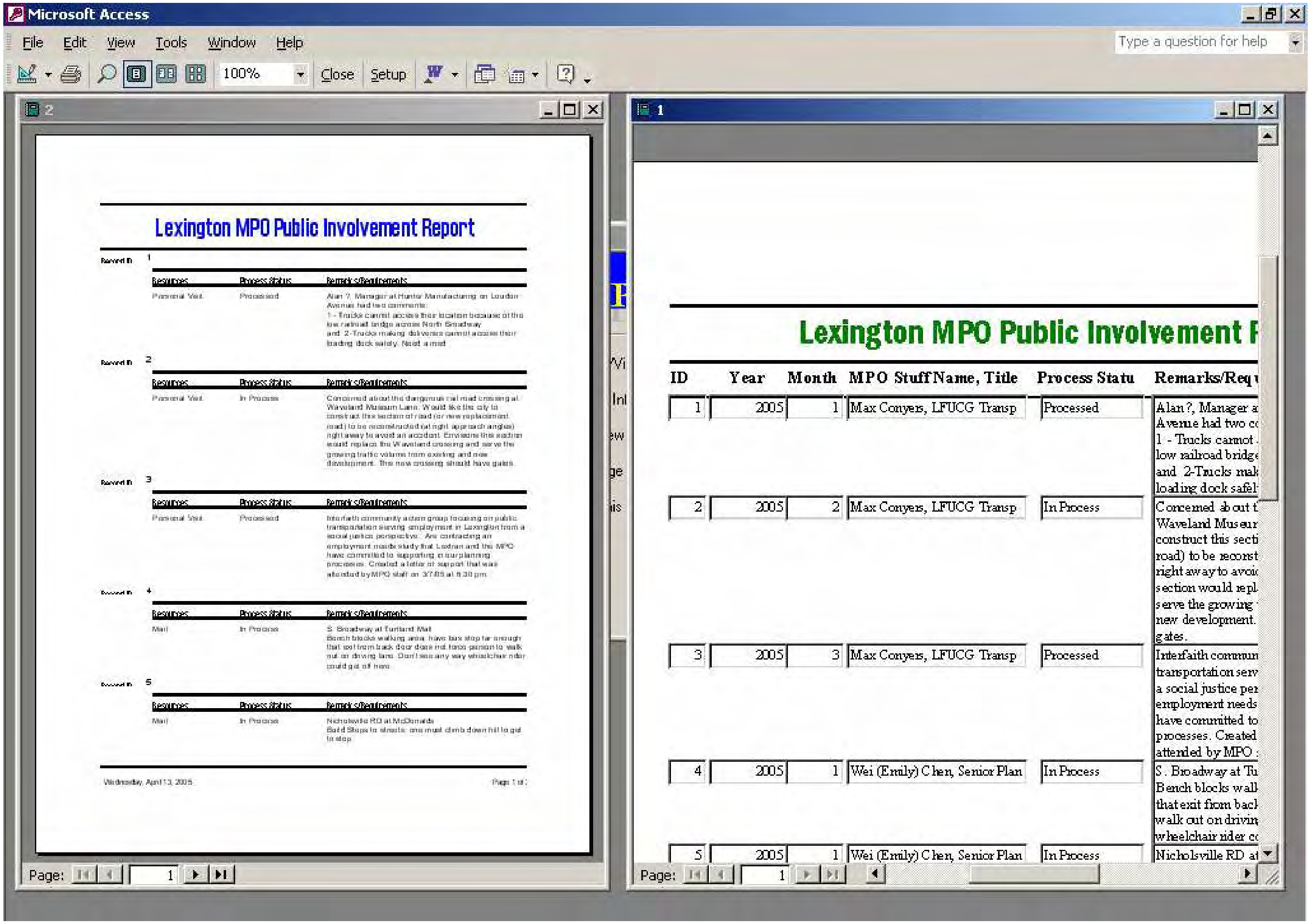


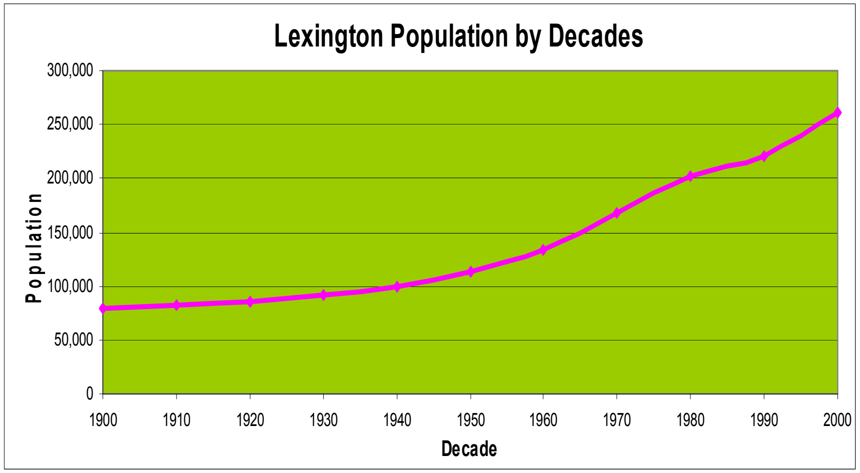
Figure 1-6 Lexington MPO Involvement Access-Database: Reports generated

Chapter 2 Long Range Transit Improvement Elements

Lexington Area is one of the fastest growing municipalities in USA. Forbes ranked Lexington ninth on a list of best places to start or create a business. Expansion Management Magazine ranked Lexington seventh on its list of best places to locate a business. According to U.S. Bureau of Census, the 1990-2000 population growth rate of Lexington is 18%, which is quite close to the 1950-1960's level (Figure 2-1).

In Fayette County, the total population and total employment are forecast to increase by 36 percent and 38 percent respectively over the 2004-2030 period. (projected by Lexington Area TransCAD Model, Bernardin, Lochmueller & Associates, Inc. 2004). It will be increasingly challenging to meet the demand for efficient and reliable transportation of both people and goods, enhance the area's quality of life, and foster economic development.

A convenient, efficient, and reliable public transit system, which attracts a significant amount of commuters, could play a crucial role in reducing traffic congestion and parking demand. It is estimated that increasing transit usage by one bus has the potential to reduce 25 cars on the streets (estimation based on a 30-passenger bus and average auto occupancy of 1.2 people). However,



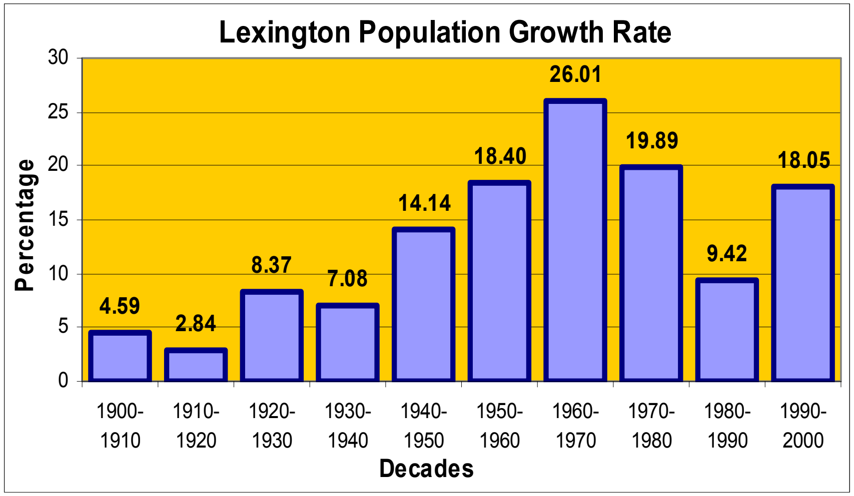


Figure 2-1 Lexington population and growth rate by decades

according to data extracted from Census Transportation Planning Package 2000 (CTPP 2000), the average daily bus ridership of Lexington Area is 1609, which composes only 1% of the daily commuters. If the current mode split trends continue, transit ridership would only increase by a small fraction by 2030. Transit would serve a trivial percentage of the future growth in travel demand and contribute little to congestion relief. Figure 2-2 shows the daily bus ridership of the year 2000 by TAZ, and Figure 2-3 shows the bus riders vs. total commuters of the year 2000 by TAZ.

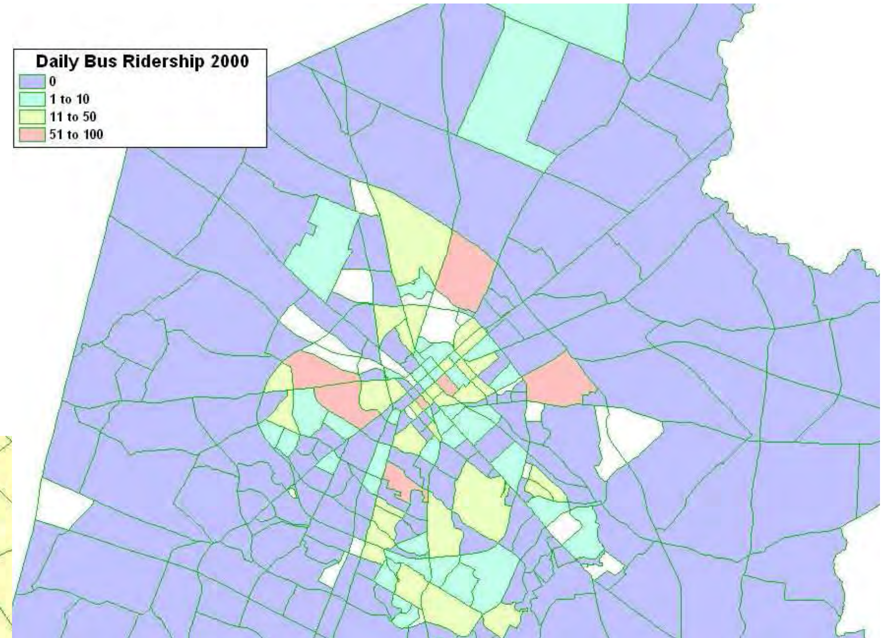


Figure 2-2 Daily bus ridership of the year 2000 by TAZ

Figure 2-3 Bus riders vs. total commuters of the year 2000 by TAZ

Transit system performance has to be improved in a variety of ways in order to attract potential customers and make public transit play a larger role in transportation. Seven categories of transit improvement elements are determined: transit route system design, transit level of service, fare system, bus stops, fleet age and conditions, specialized transit / paratransit service, and Bus Rapid Transit. They are presented in details in the following sections.

2.1 Transit route system design

2.1.1 Transit coverage design

The coverage of transit service should meet the following three requirements, and the transit service area is defined as a 0.5-mile radius around all bus routes:

First, employment areas with transit service needs, including commercial, industrial, professional service/ office, utilities / public facilities, and public education areas, should be covered by LexTran service. Figure 2-4 shows the land-use distribution of the employment areas of the year 2004 and a 0.5-mile buffer area of the current LexTran System. The buffer area was overlaid with the employment distribution layer, and the percentage of employment areas covered by LexTran service was calculated and listed in Table 2-1. The current LexTran service covers more than 90 percent of the commercial and professional service/ office areas, over 80 percent of the industrial areas, and over 70 percent of the utilities / public facilities and public education areas. In the next step of work, a regional-wide employer survey will be conducted to assess transit service demand as related to employment, which is an important factor to design the new LexTran route system.

Table 2-1 Percentage of employment areas covered by LexTran service 2004

Employment Areas	Percentage Covered by LexTran Service
Commercial	93%
Professional service/ office	98%
Industrial	89%
Utilities / Public Facilities	75%
Public Education	73%

Figure 2-4 Land-use distribution of the employment areas of the year 2004 and a 0.5-mile buffer area of the current LexTran System.

Second, all of the medium, high, and very high density residential areas should be covered by transit service; and at least 80 percent of the low density residential areas should be covered by transit service. Figure 2-5 shows the land-use distribution of the residential areas of the year 2004 and a 0.5-mile buffer area of the current LexTran System. The buffer area was overlaid with the residential distribution layer, and the percentage of residential areas covered by LexTran service was calculated and listed in Table 2-2. The current LexTran service covers more than 95 percent of the high and very high density residential areas, over 85 percent of the medium density residential areas, and over 60 percent of the low density residential areas. The improved LexTran route system should have more low and medium density residential areas with transit needs covered by LexTran service.

Table 2-2 Percentage of residential areas covered by LexTran Service 2004

Residential Areas	Percentage Covered by LexTran Service
Low Density Residential	62%
Medium Density Residential	87%
High Density Residential	95%
Very High Density Residential	96%

Figure 2-5 Land-use distribution of the residential areas of the year 2004 and a 0.5-mile buffer area of the current LexTran System.

Third, the mobility needs of transportation-disadvantaged populations, which generally indicate persons who do not have the means or ability to transport themselves, e.g. elderly, disabled, or economically disadvantaged, should be an important factor in transit route system design. Figures 2-6 to 2-8 visualize a 500-meter buffer area of the current LexTran route system and the distribution of no-vehicle households, people age 65 and above, and people age five and above with any disability by TAZ respectively. Table 2-3 shows the number of these three groups of people who live within the 500-meter buffer area of the current LexTran route system. A criterion to measure the effectiveness of a proposed route design is to see how much the alternative route system could increase service coverage for transportation-disadvantaged populations.

Table 2-3 The number of no-vehicle households, senior people, and disabled people served by LexTran

LexTran Route	Number of No-Vehicle Households	Number of Persons Age 65 and Above	Number of Persons Age 5 and Above With Any Disability
1	1834	2627	10773
2	2098	3846	13871
3	2028	2602	11305
4	2488	4374	17614
5	2079	3357	12407
6	1649	2957	10451
7	1112	1267	5826
31	467	531	2634
32	1081	26	304
33	1414	3385	10614
34	1317	3070	10956
35	1042	1235	4538

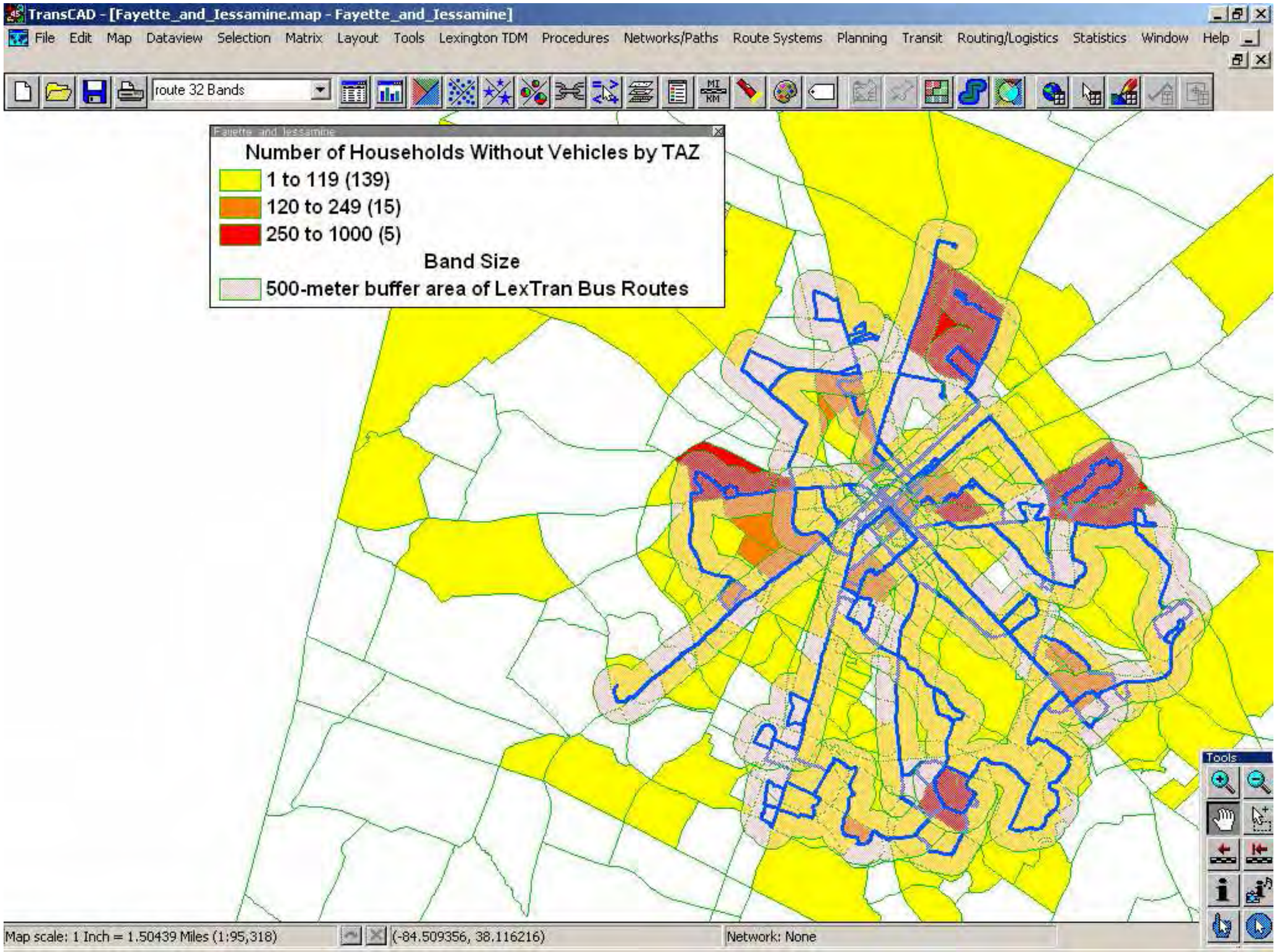


Figure 2-6 A 500-meter buffer area of the current LexTran route system and the distribution of no-vehicle households by TAZ

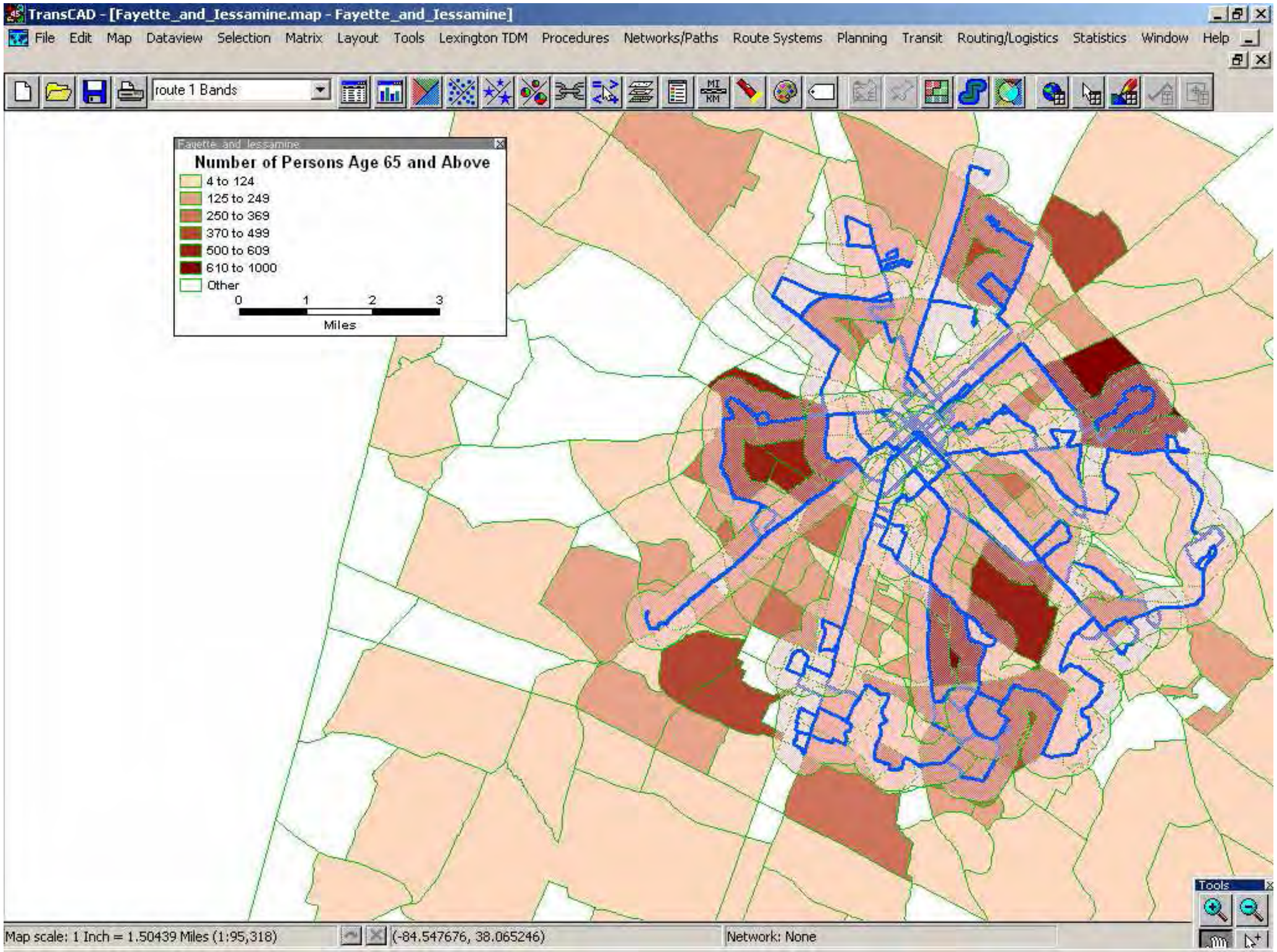


Figure 2-7 A 500-meter buffer area of the current LexTran route system and the distribution of people age 65 and above by TAZ

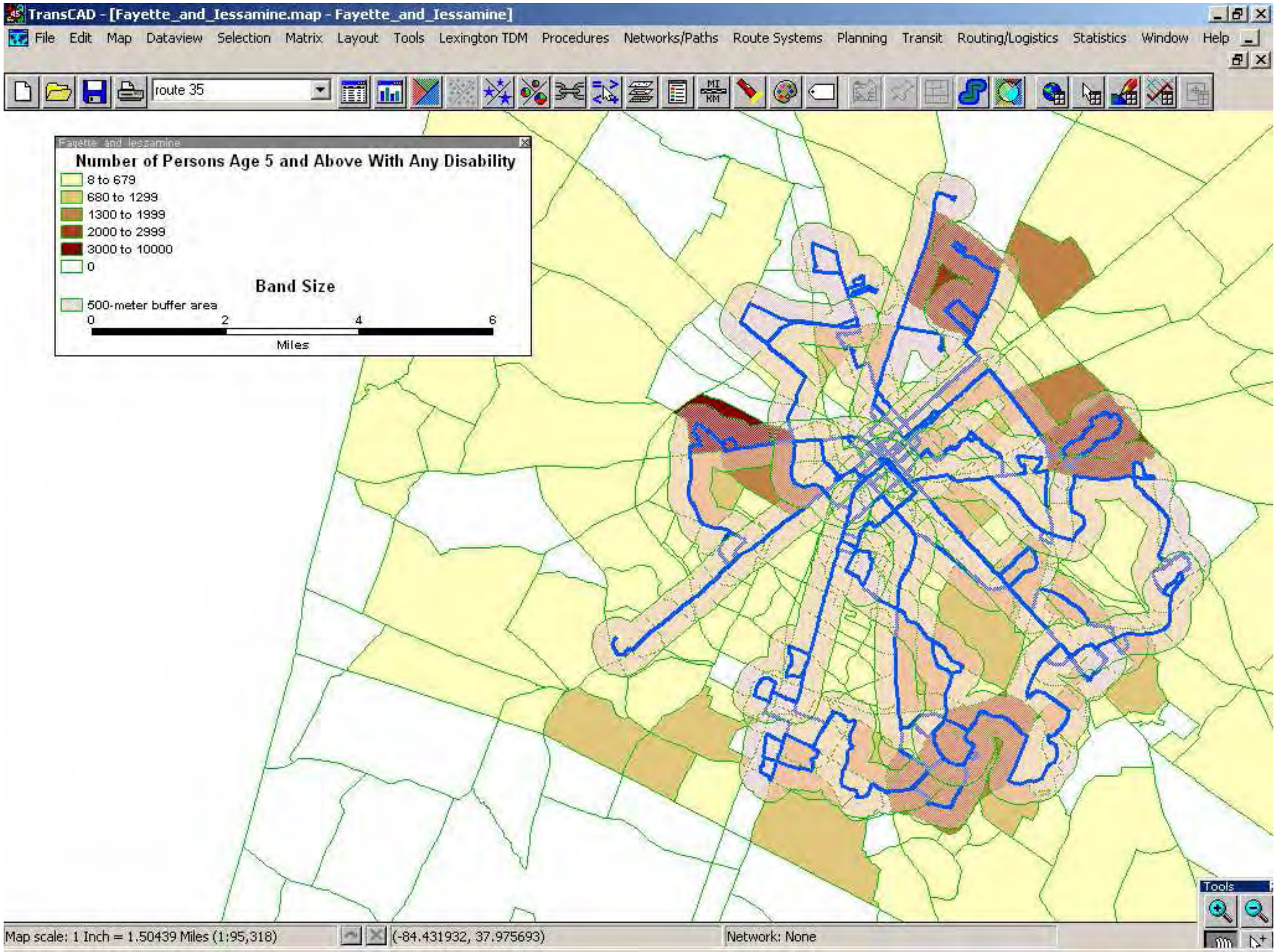


Figure 2-8 A 500-meter buffer area of the current LexTran route system and the distribution of people age five and above with any disability by TAZ

2.1.2 Transit connection design

Transit coverage design addresses the availability issues, while transit connection design focuses on enhancing accessibility, convenience, and efficiency. The current LexTran routes are laid out like the spokes of a wheel with a single transit center located at the central downtown area. Such layout may cause inconvenience for passengers who travel outside of the downtown area. For example, passengers who live in A, work in B, and shop in C would have to travel to the downtown transit center first and then take another route to the real destination (Figure 2-9). Even though all the three points are close to bus lines, the indirect services cause much inconvenience to passengers. A majority of residential and employment areas are located outside of the downtown areas and have been spreading with a dramatic trend outward especially toward the southern side of the city. Improving transit connection for these areas is an urgent need and will tremendously enhance transit system performance.

The guidelines for transit connection design are as below:

First, reduce indirect service and transfer times.
Transit connection design works to minimize indirect service and maximize efficiency by eliminating unnecessary transfers, limiting transfer wait times between routes whenever possible to 0 to 10 minutes, and minimizing walk distance between transfer points. Transfer times, transfer wait times, and transfer walk distance could be controlled through rerouting the existing system, adding new routes (e.g. New Circle Road and Man O' War BLVD bus circulators), and rescheduling. The Transit Model introduced in the next chapter will be used to test different designs to achieve the highest efficiency, and ensure that the average transfer times should be not more than 2, wait times not more than 10 minutes, and walk distance not more than 200 meters between transfer points.

Second, construct multi transit centers.
Transit centers facilitate transfers between different routes and between different modes of travel. Transit centers should be implemented at high-volume transfer locations, especially the areas that are designated for high-density commercial and / or mixed-use development. A well-designed transit center will feature passenger amenities and facilities, such as comfortable waiting lounge, real-time traveler information, sufficient parking, indoor/outdoor venting machines, food court, coffee shop, phone and magnetize booth, etc. It could be a key element to enhance the Transit Authority's public image and attract ridership.

Third, provide door-to-door connections to major public facilities, such as airports, health care facilities, educational facilities, supermarkets, shopping malls, parks, stadiums, museums, convention centers, fairgrounds, regional libraries, community complexes, and other public/government buildings.

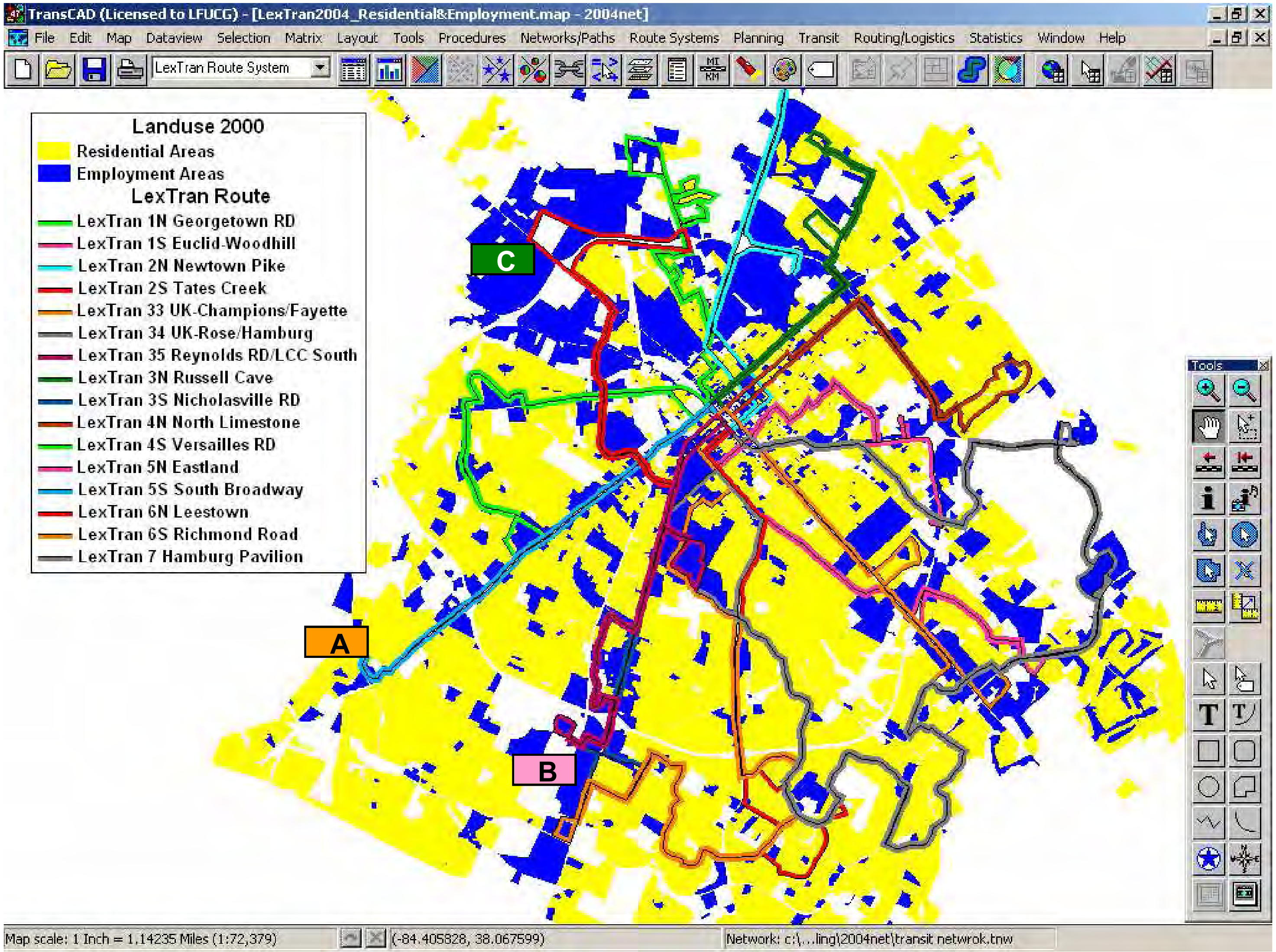


Figure 2-9 Distribution of the residential and employment areas 2004

2.2 Transit Level of Service

Transit Level of Service is measured through service hours, service frequency, travel time, and reliability:

2.2.1 Service hours and service frequency

The basic service hours should be 6:00 AM to midnight from Monday to Saturday, and 8:00 AM to 9:00 PM for Sunday/Holidays. The basic frequency of service should be 30 minutes during peak morning and afternoon periods and 60 minutes during off-peak periods. It is possible to extend service hours (earlier than 6:00 AM and later than 12:00 PM) and/or increase frequency (less than 30 minutes for peak hours and less than 60 minutes for off-peak hours). But a system-wide transit demand study should be conducted to validate the cost-effectiveness of the extension.

2.2.2 Travel time and reliability

To improve the competitiveness of public transit with the private automobile, it is important for operators to attempt to reduce travel time and improve reliability. The following strategies should be implemented to make transit service more efficient and reliable: straightening routes by eliminating unnecessary loops wherever possible; choosing faster and more efficient routes which allow shorter travel time; more direct services between major origins and destinations; implementing better integrated multimodal transit centers that facilitate transfers; and an easy to understand, repeating schedule (clock-headways).

2.3 Fare system

2.3.1 Fare structure

An optimum fare structure could encourage ridership on the one hand, and ensure revenue generation on the other hand. To encourage ridership, transit should be made cost competitive with the automobile for intra-regional travel; and to ensure revenue generation, it should be cost-effective so as to achieve positive cash-flow continuity in financial operations. The impacts of fare amount on transit ridership and revenue are far from straightforward. Fare decrease does not necessarily lead to ridership increase, and meanwhile, fare increase does not necessarily lead to revenue increase. The optimum fare structure can be established through a comprehensive analysis of the correlations between fare amount, ridership, and revenue. A multinomial logit model can be employed to estimate the potential relationships and establish the optimum fare structure.

It should be mentioned that the current fare structure of LexTran is based on a flat fare policy. With the expansion of service coverage, a zonal fare program (fare-by-distance) should be reasonably attempted. Additionally, specialized fare strategies, such as multi-ride tickets, seasonal tickets, region-wide transit passes, and concessionary passes (e.g. selling passes through public organizations, students and pensioners, private sector employers, and other government employers), could be implemented to encourage ridership, increase customer convenience, and open up opportunities to collaborate with other employer sectors.

2.3.2 Fare collection technology

The old fare-box system first installed in the 1970s has been reaching the end of their useful life and should be replaced by the new fare collection equipments. Among the modernized fare-collection technologies, “Smart Card” has been successfully applied to public transit environments throughout the world (Figures 2-10 and 2-11). Generally, there are two types of smart cards: contact and contactless smart cards. A contact smart card is the size of a conventional credit or debit card with a single embedded integrated circuit chip that contains just memory or memory plus a microprocessor. A contact smart card must be inserted into a card acceptor device where pins attached to the reader make "contact" with pads on the surface of the card to read and store information in the chip. In addition to the features and functions found in contact smart cards, contactless smart cards contain an embedded antenna instead of contact pads attached to the chip for reading and writing information contained in the chip's memory. Contactless cards do not have to be inserted into a card acceptor device. Instead, they need only be passed within range of a radio frequency acceptor to read and store information in the chip. Contactless smart card technology is the foundation for automatic fare collection (AFC) systems that meet customer requirements for quick entry and exit, ease of use, and convenience. (ID Wholesaler, http://www.idwholesaler.com/resources/technology.htm: “Technology Cards”)

“Smart Card” fare collection technology provides considerable benefits for transit customers and operators (Smart Card Alliance, http://www.smartcardalliance.org/: “Transit and Retail Payment: Opportunities for Collaboration and Convergence” and “Smart Card Talk”):

a. Improved customer convenience and operational efficiency
The smart card technology is an ideal platform to link multiple operating modes or multi-operator regional systems together, which accommodates the payment preferences of both frequent and occasional transit customers and makes public transit more convenient to consumers and more competitive with the automobile. A smart card can be used to pay for any mode of transportation (e.g., bus, train, plane, etc) and transfer between regional operators, which enables customers to use one fare card on multiple systems throughout the area and allows linked trips between transit and other travel modes. It can also be used to access parking lots or ramps, purchase time at coin-free parking meters, make drive-through toll payments and more.

b. Efficient multi-application payment card
A smart card-based payment system provides an easy-to-use payment alternative. Beyond simply replacing a ticket or token, smart cards can be issued with e-purse or stored-value applications, which allow commuters to purchase items from station vending machines, quick service restaurants or other locations that value fast and convenient consumer payment. They can also be combined with an identification card for effective cost-sharing partnerships between transit agencies, corporations and schools.

The smart card also provides an opportunity for transit operators to explore the potential partnerships with non-transit agencies, such as employers, financial industry, retailers, and other transportation service providers to allow payment for non-transit purchases and result in deployment of multi-application payment cards.

c. Automated data collection
Smart card-based fare collection technology provides transit operators with important information about the customers' behaviors. The data can be used for transit demand analysis and forecast, transit route design, transfer needs analysis and schedule coordination between routes, and boarding statistics and shelter deployment.

Figure 2-10 Smart cards and fare validators

Figure 2-11 Smart cards, ticket vending machines, and passenger information

2.4 Bus stops

The following sections summarize the guidelines for bus stop location and spacing, bus stop placement, bus stop zone design, bus shelter, and ADA related issues. A bus stop inventory should be established, and bus stops should be deployed and designed in accordance with the guidelines.

2.4.1 Bus stop location and spacing

Bus stops are the connection points of the route system, and they should be so located as to provide convenient accessibility to residential, commercial, mixed-use development, and other employment related areas as well as the transfer points between transit routes and between different modes of travel. Bus stops should be available to the following major public facilities, such as airports, health care facilities, educational facilities, supermarkets, shopping malls, parks, stadiums, museums, convention centers, fairgrounds, regional libraries, community complexes, and other public/government buildings.

According to Transit Cooperative Research Program (TCRP) Report 19, Guidelines for the Location and Design of Bus Stops, which is sponsored by Federal Transit Administration and conducted by Transportation Research Board, bus stop spacing has a major impact on overall travel time, and therefore, demand for transit. In general, the trade-off is between:

<u>Close stops (every block or 1/8 to 1/4 mile), short walk distances, but more frequent stops and a longer bus trip.</u>
Versus
<u>Stops farther apart, longer walk distances, but more infrequent stops, higher speeds, and therefore, shorter bus trips.</u>

Table 2-4 is the typical bus stop spacings used based on land-use type, which represent a composite of prevailing practices.

Table 2-4 The typical bus stop spacings by land-use type

Environment	Spacing Range	Typical Spacing
Central Core Areas of CBDs	300 to 1000 feet	600 feet
Urban Areas	500 to 1200 feet	750 feet
Suburban Areas	600 to 2500 feet	1000 feet
Rural Areas	650 to 2640 feet	1250 feet

2.4.2 Bus stop placement

According to TCRP, after ridership potential has been established, the most critical factors in bus stop placements are safety and avoidance of conflicts that would otherwise impede bus, car, or pedestrian flows. The following safety and operating elements require on-site evaluation in bus stop placement:

Safety elements:

- Passenger protection from passing traffic
- Access for people with disabilities
- All-weather surface to step from/to the bus
- Proximity to passenger crosswalks and curb ramps
- Proximity to major trip generators
- Convenient passenger transfers to routes with nearby stops
- Proximity of stop for the same route in the opposite direction
- Street lighting

Operating elements:

- Adequate curb space for the number of buses expected at the stop at one time
- Impact of the bus stop on adjacent properties
- On-street automobile parking and truck delivery zones
- Bus routing patterns (i.e., individual bus movements at an intersection)
- Directions (i.e., one-way) and widths of intersection streets
- Types of traffic signal controls (signal, stop, or yield)
- Volumes and turning movements of other traffic
- Width of sidewalks
- Pedestrian activity through intersections
- Proximity and traffic volumes of nearby driveways

There are three types of bus stop placements: far-side, near-side, and mid-block stops (see Figure 2-12). Table 2-5 presents a comparison of the advantages and disadvantages of each placement type.

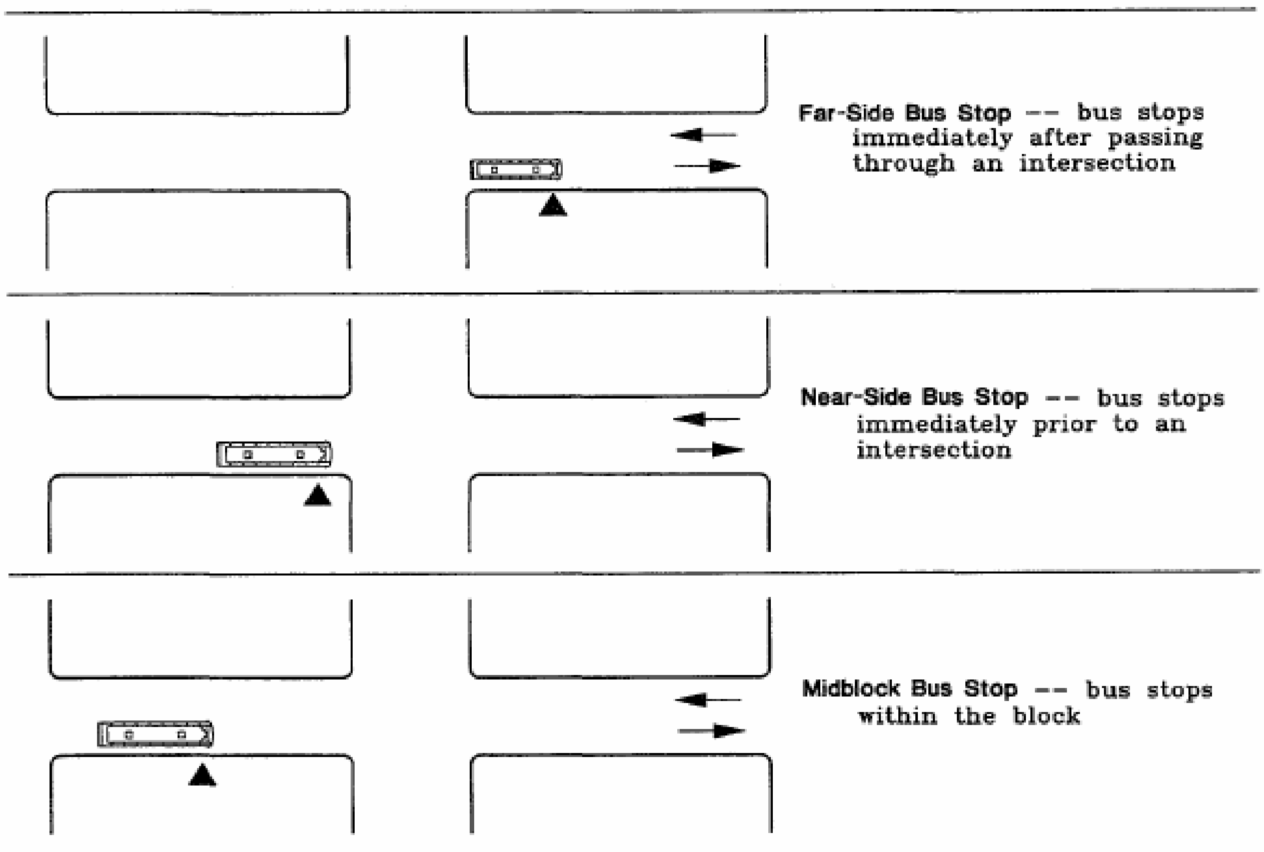


Figure 2-12 Three types of bus stop placements: far-side, near-side, and mid-block stops

Table 2-5 Comparative analysis of bus stop placement

	Advantages	disadvantages
Far-side stop	• Minimizes conflicts between right turning vehicles and buses • Provides additional right turn capacity by making curb lane available for traffic • Minimizes sight distance problems on approaches to intersection • Encourages pedestrians to cross behind the bus • Creates shorter deceleration distances for buses since the bus can use the intersection to deceleration • Results in bus drivers being able to take advantage of the gaps in traffic flow that are created at signalized intersections	• May result in the intersections being blocked during peak periods by stopping buses • May obscure sight distance for crossing vehicles • May increase sight distance problems for crossing pedestrians • Can cause a bus to stop far side after stopping for a red light, which interferes with both bus operations and all other traffic • May increase number of rear-end accidents since drivers do not expect buses to stop again after stopping at a red light • Can result in traffic queued into intersection when a bus is stopped in travel lane
Near-side stop	• Minimizes interferences when traffic is heavy on the far side of the intersection • Allows passengers to access buses closest to crosswalk • Results in the width of the intersection being available for the driver to pull away from curb • Eliminates the potential of double stopping • Allows passengers to board and alight while the bus is stopped at a red light • Provides driver with the opportunity to look for oncoming traffic, including other buses with potential passengers	• Increases conflicts with right-turning vehicles • May result in stopped buses obscuring curbside traffic control devices and crossing pedestrians • May cause sight distance to be obscured for cross vehicles stopped to the right of the bus • May block the through lane during peak period with queuing buses • Increases sight distance problems for crossing pedestrians
Mid-block stop	• Minimizes sight distance problems for vehicles and pedestrians • May result in passenger waiting areas experiencing less pedestrian congestion	• Requires additional distance for no-parking restrictions • Encourages patrons to cross street at mid-block (jaywalking) • Increases walking distance for patrons crossing at intersections

2.4.3 Bus stop zone design

According to TCRP, there are five types of bus stop zone design: curbside, bus bay (with acceleration and deceleration lanes), open bus bay (with acceleration lane), queue jumper bus bay, and nub (curb extension) (Figure 2-13).

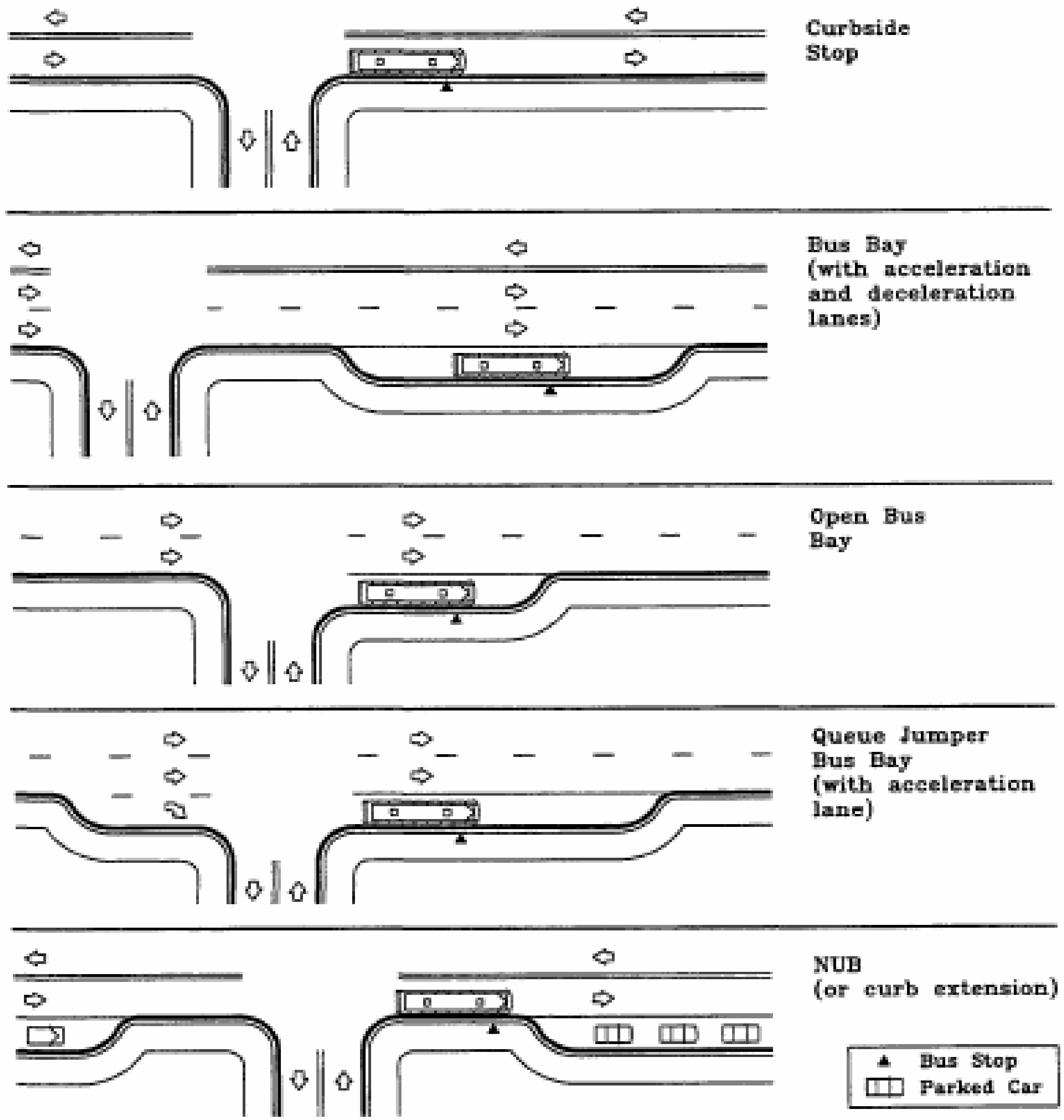


Figure 2-13 Five types of bus stop zone design: curbside, bus bay, open bus bay, queue jumper bus bay, and nub.

a. Curbside bus stop design

In general, lengths of bus stop zones for far-side and near-side stops are a minimum of 90 and 100 feet, respectively, and midblock stops are a minimum of 150 feet. Far-side stops after a turn typically have a minimum 90 foot zone, however, a longer zone will result in greater ease for a bus driver to position the bus. Bus stop zones are increased by 20 feet for articulated buses. Representative dimensions for bus stop zones are illustrated in Figure 2-14.

The number of bus-loading positions required at a given location depends on 1) the rate of bus arrivals and 2) passenger service time at the stop. Table 2-6 presents suggested bus stop capacity requirements based on a range of bus flow rates and passenger service times. The arrival rate is based on a Poisson (random) arrival rate and a 5 percent chance the bus zone capacity will be exceeded.

Table 2-6 Bus stop capacity requirements

Peak-Hour Bus Flow	Capacity Required (Bays) When Service Time at Stop Is				
	10 Seconds	20 Seconds	30 Seconds	40 Seconds	60 Seconds
15	1	1	1	1	1
30	1	1	1	1	2
45	1	1	2	2	2
60	1	1	2	2	3
75	1	2	2	3	3
90	1	2	2	3	4
105	1	2	3	3	4
120	1	2	3	3	5
150	2	3	3	4	5
180	2	3	4	5	6

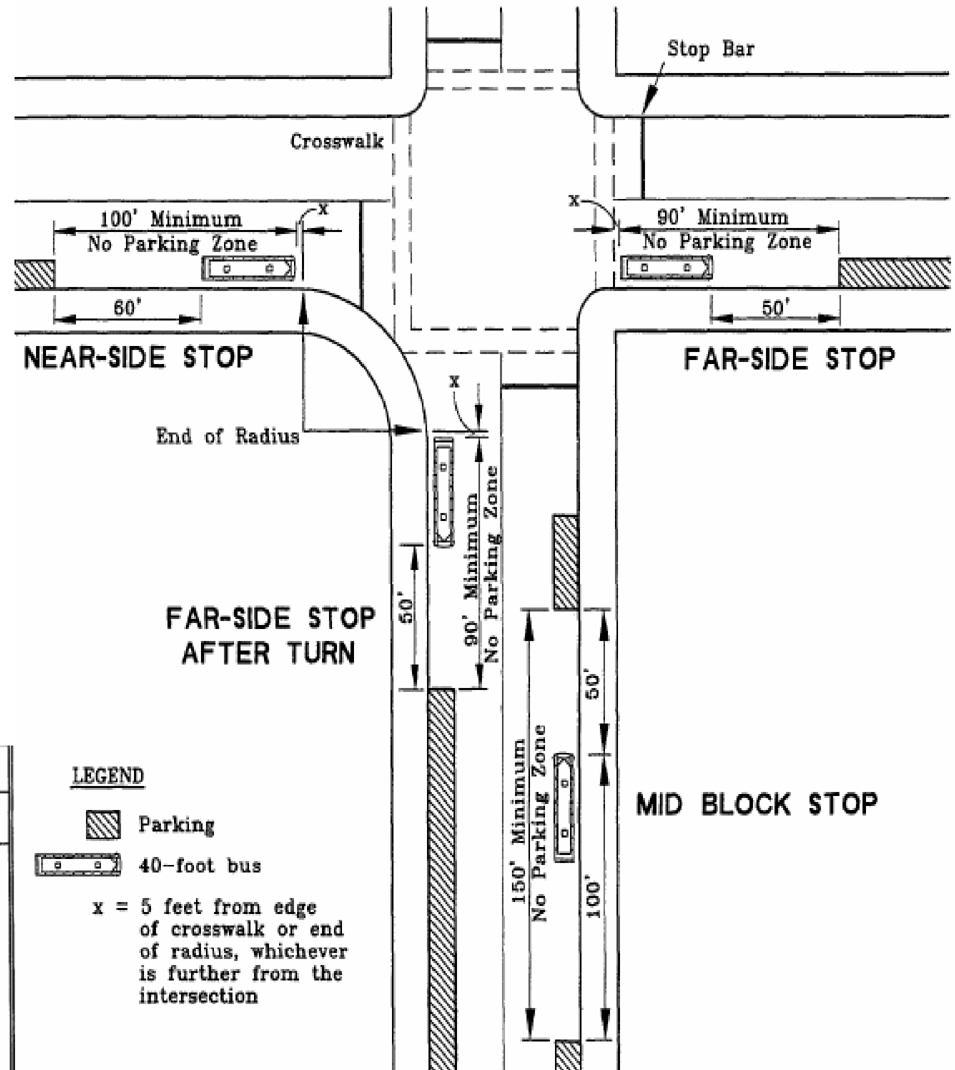


Figure 2-14 Bus stop zone design: curbside bus stop design

b. Bus bay

A bus bay allows through traffic to flow freely without the obstruction of stopped buses (Figure 2-15). Bus bays are provided primarily on high-volume or high-speed roadways, such as suburban arterial roads. Additionally, bus bays are frequently constructed in heavily congested downtown and shopping areas where large numbers of passengers may board and alight. Bus bays should be considered at a location when the following factors are present:

- Traffic in the curb lane exceeds 250 vehicles during the peak hour,
- Traffic speed is greater than 40 mph,
- Bus volumes are 10 or more per peak hour on the roadway,
- Passenger volumes exceed 20 to 40 boardings an hour,
- Average peak-period dwell time exceeds 30 seconds per bus,
- Buses are expected to layover at the end of a trip,
- Potential for auto/bus conflicts warrants separation of transit and passenger vehicles,
- History of repeated traffic and/or pedestrian accidents at stop location,
- Right-of-way width is adequate to construct the bay without adversely affecting sidewalk pedestrian movement,
- Sight distances (i.e., hills, curves) prevent traffic from stopping safely behind a stopped bus,
- A right-turn lane is used by buses as a queue jumper lane,
- Appropriate bus signal priority treatment exists at an intersection,
- Bus parking in the curb lane is prohibited, and
- Improvements, such as widening, are planned for a major roadway. (This provides the opportunity to include the bus bay as part of the reconstruction, resulting in a better-designed and less-costly bus bay.)

Evidence shows that bus drivers will not use a bus bay when traffic volumes exceed 1000 vehicles per hour per lane. Drivers explain that the heavy volumes make it extremely difficult to maneuver a bus out of a mid-block or near-side bay, and that the bus must wait an unacceptable period of time to re-enter the travel lane. Consideration should be given to these concerns when contemplating the design of a bay on a high-volume road. Using acceleration lanes, signal priority, or far-side (versus near-side or mid-block) placements are potential solutions. Following are some guidelines on where to locate bus bays (e.g., far side or near side):

- Far-side intersection placement is desirable (may vary with site conditions). Bus bays should be placed at signal-controlled intersections so that the signal can create gaps in traffic.

- Near-side bays should be avoided because of conflicts with right-turning vehicles, delays to transit service as buses attempt to re-enter the travel lane, and obstruction of traffic control devices and pedestrian activity.
- Mid-block bus bay locations are not desirable unless associated with key pedestrian access to major transit-oriented activity centers.

Figure 2-15 Bus stop zone design: bus bay

c. Open bus bay

The open bus bay design is a variation of the bus bay design. In an open bus bay design, the bay is open to the upstream intersection (Figure 2-16). The bus driver has the pavement width of the upstream cross street available to decelerate and to move the bus from the travel lane into the bay. Advantages of this design include allowing the bus to move efficiently into the bay as well as allowing the bus to stop out of the flow of traffic. Re-entry difficulties are not eliminated; however, they are no more difficult than with the typical bus bay design. A disadvantage for pedestrians is that the pedestrian crossing distance at an intersection increases with an open bus bay design because the intersection width has been increased by the width of the bay.

Another alternative to the bus bay design is a partial open bus bay (or a partial sidewalk extension). This alternative allows buses to use the intersection approach in entering the bay and provides a partial sidewalk extension to reduce pedestrian street-crossing distance. It also prevents right-turning vehicles from using the bus bay for acceleration movements.

Figure 2-16 Bus stop zone design: open bus bay

d. Queue jumper bus bay

This design provides priority treatment for buses along arterial streets by allowing buses to bypass traffic queued at congested intersections (Figure 2-17). These bus stops consist of a near-side, right-turn lane and a far-side open bus bay. Buses are allowed to use the right-turn lane to bypass traffic congestion and proceed through the intersection. The right-turn lane could be signed “Right Turns Only—Buses Excepted.” Queue jumpers provide the double benefit of removing stopped buses from the traffic stream (to benefit general traffic operations) and guiding moving buses through congested intersections (to benefit bus operations).

According to the transit agencies that use queue jumper bus bays, these bays should be considered at arterial street intersections when the following factors are present:

- High-frequency bus routes have an average headway of 15 minutes or less;
- Traffic volumes exceed 250 vehicles per hour in the curb lane during the peak hour;
- The intersection operates at a level of service "D" or worse (see the Transportation Research Board's Highway Capacity Manual for techniques on evaluating the operations at an intersection);
- and Land acquisitions are feasible and costs are affordable.

An exclusive bus lane, in addition to the right-turn lane, should be considered when right-turn volumes exceed 400 vehicles per hour during the peak hour.

Figure 2-17 Bus stop zone design: queue jumper bus bay

e. Nub

Nubs are a section of sidewalk that extends from the curb of a parking lane to the edge of the through lane (Figure 2-18). Nubs have been used as traffic-calming techniques and as bus stops. When used as a bus stop, the buses stop in the traffic lane instead of weaving into the bus stop that is located in the parking lane—therefore, they operate similarly to curb-side bus stops. Nubs offer additional area for patrons to walk and wait for a bus and provide space for bus patron amenities, such as shelters and benches. Other names used for nubs include "curb extensions" and "bus bulbs."

Nubs reduce pedestrian crossing distances, create additional parking (compared with typical bus zones), and mitigate traffic conflicts between autos and buses merging back into the traffic stream. Nubs should be designed to allow for an adequate turning radius for right-turn vehicles. Nubs should be considered at sites with the following characteristics:

- High pedestrian activity,
- Crowded sidewalks,
- Reduced pedestrian crossing distances, and
- Bus stops in travel lanes.

Nubs have particular application along streets with lower traffic speeds and/or low traffic volumes where it would be acceptable to stop buses in the travel lane. Collector streets in neighborhoods and designated pedestrian districts are good candidates for this type of bus stop. Nubs should be designed to accommodate vehicle turning movements to and from side streets.

Figure 2-18 Bus stop zone design: nub

Table 2-7 summarizes the advantages and disadvantages of each of the bus stop zone designs.

Table 2-7 Comparative analysis of the five types of bus stop zone design

Type of design	Advantages	Disadvantages
Curbside	• Provides easy access for bus drivers and results in minimum delay to bus • Is simple in design and easy and inexpensive for a transit agency to install • Is easy to relocate	• Can cause traffic to queue behind stopped bus, thus causing traffic congestion • May cause drivers to make unsafe maneuvers when changing lanes in order to avoid a stopped bus
Bus bay	• Allows patrons to board and alight out of the travel lane • Provides a protected area away from moving vehicles for both the stopped bus and the bus patrons • Minimizes delay to through traffic	• May present problems to bus drivers when attempting to reenter traffic, especially during periods of high roadway volumes • Is expensive to install compared with curbside stops • Is difficult and expensive to relocate
Open bus bay	• Allows the bus to decelerate as it moves through the intersection • See bus bay advantages	• See bus bay disadvantages
Queue jumper bus bay	• Allows buses to bypass queues at a signal • See open bus bay advantage	• May cause delays to right-turning vehicles when a bus is at the start of the right turn lane • See bus bay disadvantages
Nub	• Removes fewer parking spaces for the bus stop • Decreases the walking distance (and time) for pedestrians crossing the street • Provides additional sidewalk area for bus patrons to wait • Results in minimal delay for bus	• Costs more to install compared with curbside stops • See curbside disadvantages

2.4.4 Bus shelter

LexTran is expected to progressively add more attractive and comfortable shelters throughout the system. According to TCRP, many criteria exist to determine shelter installation at a bus stop, while in most instances, the estimated number of passenger boardings has the greatest influence. Suggested boarding levels by area type used to decide where to install a shelter are as follows (these values represent a composite of prevailing practices):

Location	Boarding
Rural	10 boardings per day
Suburban	25 boardings per day
Urban	50 to 100 boardings per day

Other criteria used to evaluate the potential for inclusion of a shelter include

- number of transfers at a stop
- availability of space to construct shelters and waiting areas
- number of elderly or physically challenged individuals in the area
- proximity to major activity centers
- frequency of service
- adjacent land use compatibility

TCRP also gives the following guidelines for placing a bus stop shelter on a site (Figure 2-19):

- Bus stop shelters should not be placed in the 5-foot-by-8-foot wheelchair landing pad.
- General ADA mobility clearance guidelines should be followed around the shelter and between the shelter and other street furniture.
- Locating shelters directly on the sidewalk or overhanging a nearby sidewalk should be avoided because this may block or restrict general pedestrian traffic. A clearance of 3 feet should be maintained around the shelter and an adjacent sidewalk (more is preferred).
- To permit clear passage of the bus and its side mirror, a minimum distance of 2 feet should be maintained between the back-face of the curb and the roof or panels of the shelter. Greater distances are preferred to separate waiting passengers from nearby vehicular traffic.
- The shelter should be located as close as possible to the end of the bus stop zone so it is highly visible to approaching buses and passing traffic. The walking distance from the shelter to the bus is also reduced.

- Locating bus stop shelters in front of store windows should be avoided when possible so as not to interfere with advertisements and displays.
- When shelters are directly adjacent to a building, a 12-inch clear space should be preserved to permit trash removal or cleaning of the shelter.

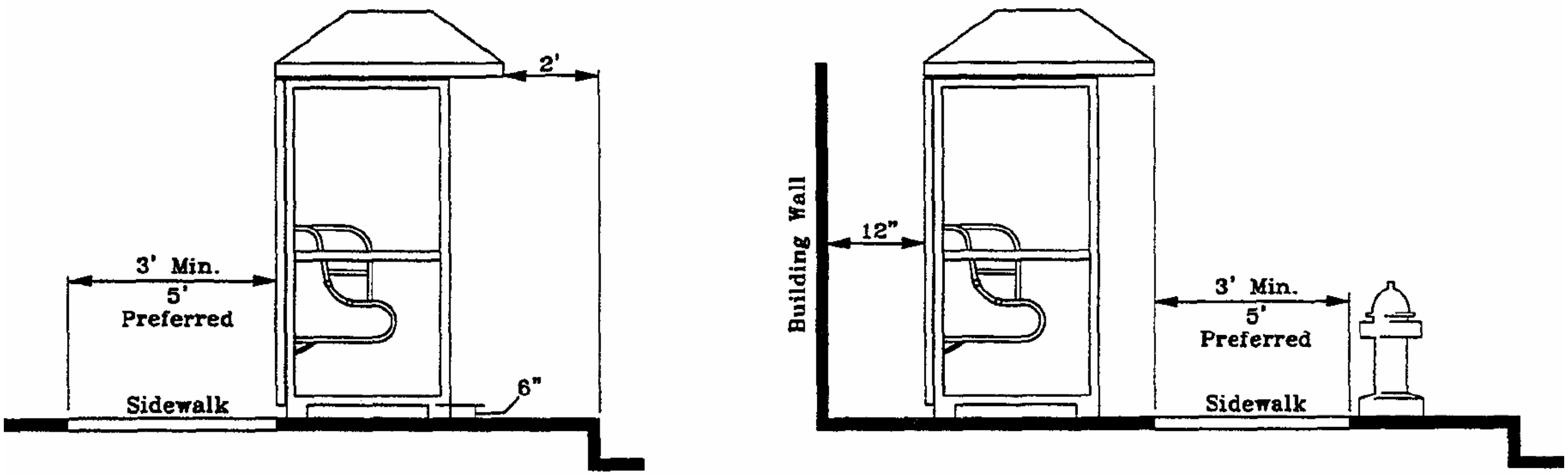


Figure 2-19 Shelter clearance guidelines

A letter from Gordon J. Linton, Administrator, Federal Transit Administration in the book "Art In Transit…Making it Happen" says that "*Transit services must be a positive force in neighborhoods if they are to be accepted. It is no surprise, then, that transit operators are increasingly concerned about the quality of the stations, bus stops, trains, and buses where people spend their time either waiting or riding. Artists can play a unique role in this search for quality… Artists can add value to mass transit's primary goal of building ridership. The FTA encourages agencies to pursue art and design excellence in their systems for these reasons.*" Well-designed bus shelters could make waiting more pleasant, and they may even become attractions of the cities' transit landscape (Figures 2-19 to 2-22).

San Francisco: The Stations are maintained by the adjacent university.

Mississippi Riverside Bus Shelter

Enhanced and modular station architecture, LA

Figure 2-20 Bus shelter designs (1)

Orlando's Lynx system has created super stops at major shopping malls.

Joe Tyler, University Drive, Tempe, AZ

Seattle/King County: 425 bus shelters are a welcome sight

Las Vegas, NV

Figure 2-21 Bus shelter designs (2)

Figure 2-22 Bus shelter designs (3): ITS-real-time passenger information

Environmental characteristics of each site should also be considered when placing a bus stop shelter, for example, in areas with few tall trees, bus shelters facing directly east or west may be uncomfortable in very hot climates; and sometimes a bus stop shelter should be so installed as to making the back of the shelter face the street to protect waiting passengers from splashing water or snow build-up. Furthermore, the following amenities could be installed at bus stops to provide comfort and convenience: benches, route and passenger information, vending machines, bicycle storage facilities, trash receptacles, lighting, and phone, etc.

In addition, an advertising-in-shelters program may be beneficial to both advertising agencies and transit operators. Advertising agencies could take advantage of the frequently observed and low cost advertising spaces at shelters; and transit operators could make them take the responsibilities of regular maintenance of the bus shelters and facilities (such as trash removal and interior lighting installation) under contract. The program must comply with local ordinances and regulations, which may hinder shelter installation in some communities.

2.4.5 ADA (Americans with Disabilities Act)

The Americans with Disabilities Act of 1990 (ADA) is broad legislation intended to make American society more accessible to people with disabilities. It consists of five sections or titles (employment, public services, public accommodations, telecommunications, and miscellaneous). Titles II and III (public services and public accommodations) affect bus stop planning, design, and construction. Although the definition of disability under the ADA is broad, bus stop placement and design most directly affect persons with mobility and visual impairments. According to TCRP, the basic principles for bus stop design and location to conform to ADA are as follows, which involve the general design considerations of obstacles, surfaces, signs, and telephones.

a. Obstacles

Examine all the paths planned from the alighting point at the bus stop to destinations off the bus stop premises. Determine whether any protrusions exist that might restrict wheelchair movements. If protrusions exist and they are higher than 27 inches or lower than 80 inches, a person with vision impairment may not be able to detect an obstacle (such as a phone kiosk) with a cane. A guide dog may not lead the person with the impairment out of the path. Although it may not be the transit agency's responsibility to address accessibility problems along the entire path, an obstacle anywhere along the path may make it inaccessible for some transit users with disabilities.

b. Surfaces

Surfaces must be stable, firm, and slip-resistant. Such provisions are beneficial for all transit users, but especially for those who have disabilities. Avoid abrupt changes in grade, and bevel those that cannot be eliminated. Any drop greater than 1/2 inch or surface grade steeper than 1:20 requires a ramp.

c. Signs

Signs providing route designations, bus numbers, destinations, and access information must be designed for use by transit riders with vision impairments. Specific guidelines are given for these signs in Section 4.30 of Accessibility Guidelines for Buildings and Facilities, Transportation Facilities and Transportation Vehicles. In some cases, two sets of signs may be needed to ensure visibility for most users and to assist users with sight limitations. Route maps or timetables are not required at the stop, though such information would be valuable to all passengers.

d. Telephones

Telephones at bus stops are not required under ADA, but if telephones are in place, they must not obstruct access to the facility and must be suitable for users with hearing impairments. At least one phone must be accessible for wheelchair users. Telephone directories must also be accessible. (Figure 2-23)

Figure 2-23 Emergency Telephone at bus shelters

Figure 2-24 illustrates a design approach to a bus stop with a shelter that would meet ADA requirements.

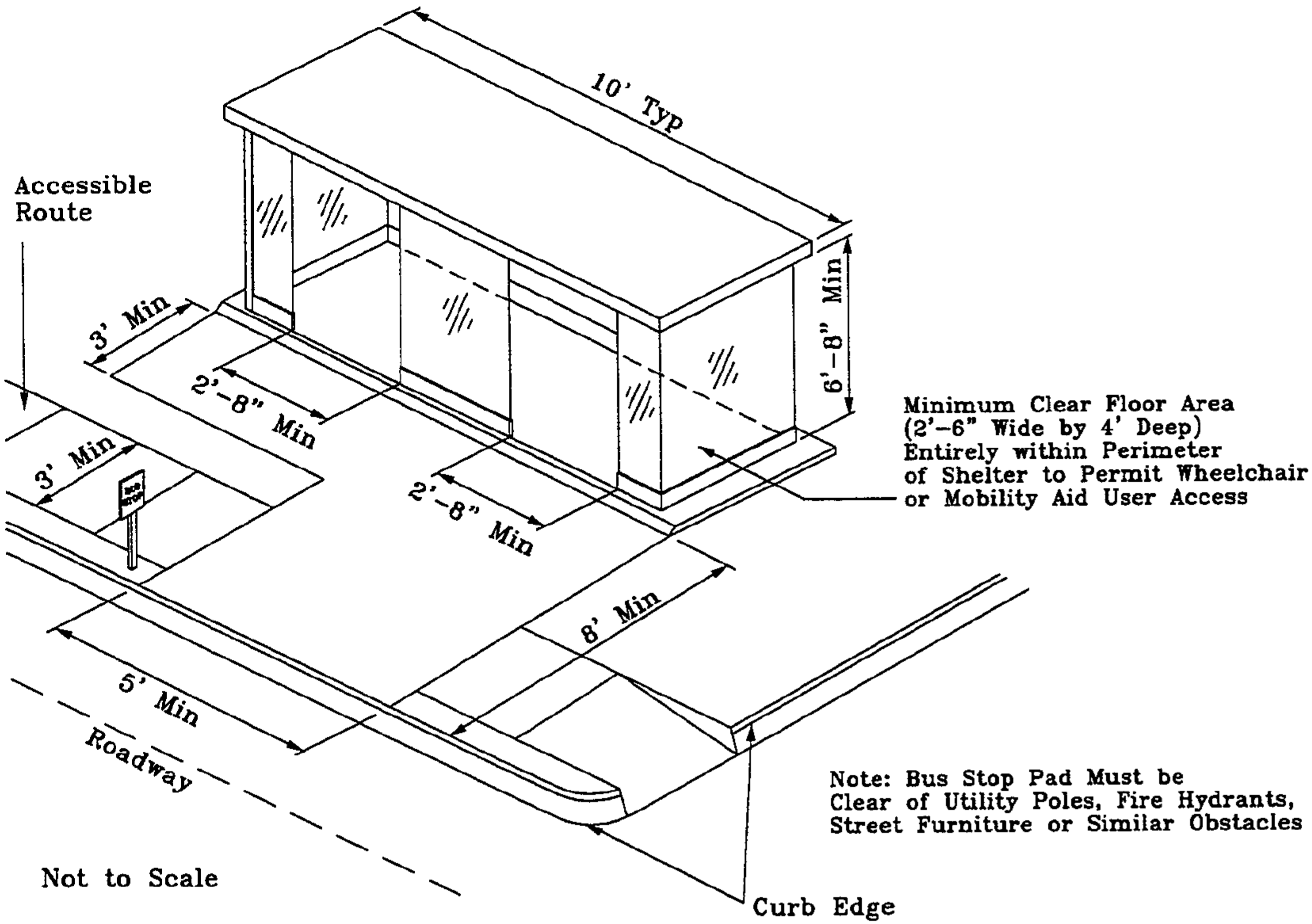


Figure 2-24 Shelter design example to meet ADA requirements (from TCRP)

2.5 Fleet age and conditions

Federal Transit Administration's latest recommended bus specifications suggest a desirable average bus fleet age of 12 years. LexTran is currently operating a fleet of 44 buses. As of January 2005, the average bus fleet age is only 3.12 years, and the very low fleet age is due to a fleet-update program implemented in the past two years. An average fleet age of 6 to 7 years has been set as the long-range goal for LexTran system.

Bus interior and operational conditions should be investigated routinely, and the investigation should be part of the regular maintenance process. Older vehicles lack of the necessary amenities such as comfortable seating, clean environments, and air conditioning should be renovated or replaced.

Presently, almost 100 percent of LexTran buses are equipped with the conventional wheelchair lifts. With the advanced features, the low-floor buses have been proved to be significantly more efficient than the conventional wheelchair lifts, and should be considered for the next generation of LexTran buses for high-volume fixed bus routes. The low-floor buses permit faster boarding and alighting and have been proved to be much easier to maintain than the conventional wheelchair lifts. Low Floor buses enable passengers with disabilities as well as the elderly and parents with small children, who might otherwise have difficulty boarding standard-floor buses, to have step-free access to fixed-route service. Bus passengers in wheelchairs are able to get on board or reach the sidewalk by using a ramp deployed from the floor of the bus. (Figure 2-25)

Figure 2-25 Low-floor buses with real-time passenger information

2.6 Specialized transit / paratransit service

Wheels Door-to-Door Service is a special needs, door-to-door transit service operated by LexTran in cooperation with the Bluegrass Area Chapter of the American Red Cross. The Wheels program has been created for the elderly and persons with some type of disability which prevents them from utilizing regular LexTran buses. Wheels offers wheelchair lift equipped mini-buses on a demand/response system providing door-to-door service. The program currently cost $1.60 per one-way trip. By integrating the paratransit service with the conventional service, both performance and costing efficiencies would increase as a result of minimizing duplication in transit service.

The paratransit service could be further extended, not only to accommodate the elderly and disabled people, but to meet the needs of mobility-limited residents of the rural areas. Extending conventional transit service to these areas would be financially difficult because of the sparsely located riders. The public transit needs of residents in these areas could be met through demand-responsive paratransit services. A demand projection and cost-effective analysis should be conducted for the rural paratransit program.

2.7 Bus Rapid Transit

According to Bus Rapid Transit - Implementation Guidelines, TCRP Report 90-Volume II, Bus Rapid Transit (BRT) is defined as: *"A flexible, high performance rapid transit mode that combines a variety of physical, operating and system elements into a permanently integrated system with a quality image and unique identity."* The concept of BRT has encompassed a wide variety of strategies, tools, and resources to give buses preferential treatment over other vehicles and make transit much more competitive with automobile.

This section introduces two BRT strategies: transit signal priority and transit priority lanes, they both attempt to minimize traffic signal delay and congestion delay. These strategies have been applied throughout the United States and around the world, and have been proved to be capable of significantly improving transit reliability and speed when applied properly.

2.7.1 Transit signal priority

According to Characteristics of Bus Rapid Transit for Decision-Making (CBRT) report by FTA, traffic signal priority is the idea of giving special treatment to transit vehicles at signalized intersections. Since transit vehicles can hold many people, giving priority to transit can potentially increase the person throughput of an intersection. (Figure 2-26)

There are two types of transit signal priority measures, the first one is a passive priority strategy seeks to favor roads with significant transit use in the area-wide traffic signal timing scheme. Timing coordinated signals at the average bus speed instead of the average vehicle speed can also favor transit vehicles. The second one is an active priority strategy involves detecting the presence of a transit vehicle and, depending on the system logic and the traffic situation then existing, giving the transit vehicle special treatment. The system can give an early green signal or hold a green signal that is already displaying. An active system must be able to both detect the presence of a bus and predict its arrival time at the intersection. A queue jump lane is a short stretch of bus lane combined with traffic signal priority. The idea is to enable buses to by-pass waiting queues of traffic and to cut out in front by getting an early green signal. (FTA, http://www.fta.dot.gov/2381_ENG_HTML.htm, Bus Rapid Transit/Reference Guides/Signal Priority)

Figure 2-26 Transit Signal Priority

2.7.2 Transit priority lanes

This section introduces three types of commonly used transit priority lanes: bus lanes, busways, and express bus routes. (FTA, http://www.fta.dot.gov/2381_ENG_HTML.htm, Bus Rapid Transit/Reference Guides/Bus Lanes, Busways, and Bus on Expressway)

a. Bus Lanes

A bus lane is a traffic lane reserved for the exclusive use of buses. There are three types of bus lanes: curbside bus lanes, median lanes, and contraflow lanes. Bus lanes are frequently in effect only during the peak hours in the peak direction (Figure 2-27).

Curbside bus lanes are the reserved lanes help buses pass congested streets, and are located against the curb (Figure 2-28). Bicyclists and right turners are usually permitted to use the bus lanes, and in a few cases, carpools are also allowed.

Figure 2-27 Bus lanes are frequently in effect only during the peak hours in the peak direction

Figure 2-28 Curbside bus lanes

Median Lanes are located in the median, usually of a wide boulevard. Median lanes are usually separated from general traffic lanes by a raised curb. Passenger platforms are usually on the right, and can be staggered to reduce the overall width needed (Figure 2-29).

Contraflow Lanes are a bus lanes in the opposite direction on what would otherwise be a one-way street. Contraflow lanes sometimes can provide more direct routing for buses when one-way street patterns create detours.

Figure 2-29 Median bus lanes

b. Busway
A busway is a special roadway designed for the exclusive use of buses (Figure 2-30). A busway can be in its own right-of-way, or in a railway or highway right-of-way. Short stretches of streets designated for exclusive bus use are sometimes also called busways. Some other authorized vehicles, such as emergency vehicles, passenger vans, and carpools, are also allowed to use busways, provided that such vehicles do not interfere with the operation of transit vehicles.

Figure 2-30 Miami's South Miami-Dade Busway, a bus-only roadway constructed in a disused rail right-of-way adjacent to an arterial.

c. Express bus routes
Express bus routes or bus on expressway express bus routes are often routed to highways or expressways. They are often designed for long-distance commuters: they often provide service in the peak only, seated passengers only, and a premium fare. Buses on expressways could use the bus-only lanes (Figure 2-31), they may also share high-occupancy vehicle (HOV) lanes with other vehicles with a minimum of either two or three occupants (Figure 2-32). Sometimes, the HOV lanes are reversible lanes taking advantage of imbalances between directions of flow by time of day.

Figure 2-31 Bus-only lanes on expressways

Figure 2-32 Buses and carpools bypass traffic congestion on expressways by using a contraflow HOV lane

Although the potential benefits from BRT applications appear to be promising, these enhancements may not be cost-effective at this time because of limited ridership and low bus frequencies. However, it has been projected that the total population, employment, and vehicle ownership in Lexington Area would increase by 25 percent, 26 percent, and 50 percent respectively over the 2004-2030 period. To control the deteriorating congestion, Lexington area would expect transit to serve a significant proportion of the future growth in travel demand. The BRT applications are likely to be economically-effective measures to alleviate congestion and ensure a high quality of life for Lexington Area in the next thirty years.

Chapter 3 Transit Demand Analysis and Transit Modeling

In these days of limited resources, it is obviously unrealistic to implement all the potential transit improvement factors determined in Chapter 2. To ensure that resources are efficiently and cost-effectively used to maximize system performance, **system-wide transit demand analysis and projection should be conducted and the effectiveness of alternative transit improvement plans should be compared**. This chapter presents transit demand analysis containing mode choice factors and transit **demand models as well as a TransCAD-based transit model.**

3.1 Transit demand analysis

Transit demand analysis has two major purposes: first, to estimate the potential demand for transit service, which is a major factor in determining the number of bus lines to implement and the coverage and connection design of the bus route system. And second, to provide information for congestion management. Transit demand analysis reveals the factors that have significant impacts on travelers' mode choice and these factors could be utilized to shift demand from automobiles to public transit. For example, previous mode usage studies show that a minor increase in parking charge could considerably increase bus ridership. For the areas with severe congestion parking charge might be increased to reduce vehicles and encourage bus riding. The next two segments will present the factors that affect travelers' choice of mode and the transit demand models.

3.1.1 Mode choice factors

According to U.S. DOT's User-Oriented Materials For UTPS, An Introduction to Urban Travel Demand Forecasting, 1977, the factors that affect travelers' choice of mode are grouped into three broad categories:

- characteristics of the traveler;
- characteristics of the trip; and
- characteristics of the transportation system.

The characteristics of the traveler include:

- family income level;
- car ownership;

- education level;
- family size;
- family's age distribution;
- type of dwelling;
- residential density; and
- distance from traveler's dwelling to the central business district.

Among the above characteristics of the traveler, family income and car ownership have been discovered to best explain mode choice behavior and have been used widely in developing mode usage relationships.

As to the characteristics of the trip, the most important factor that affects a traveler's choice of mode is trip purpose. There can be several common trip purposes, such as work trip, shopping trip, school trip, recreation trip, etc. A person who rides a bus to work every day might not want to take a bus to see a movie on a Friday night date. Some other factors like trip distance, the time of day, and the orientation of the trip within the urban area might also help to explain the reasons for choosing one mode over another.

The characteristics of the transportation system can summarized as follows:

- availability of bus routes;
- cost of travel, such as capital costs, insurance, maintenance, parking, oil, fare, etc.;
- travel time;
- safety
- reliability;
- comfortable, such as the availability of seating, proper temperature control, or shelters for bus passengers;
- travel information, if bus schedules and routes sound confusing to occasional riders, they may choose other modes.

Among the characteristics mentioned above, travel time and travel cost are the ones most widely used to represent the nature of the service provided by different transportation systems. Travel time is usually divided into two groups: riding time (the amount of time spent in the vehicle) and excess time (the amount of time spent outside the vehicle, such as walking, parking, waiting, transferring, etc.). Previous studies show that excess time affects choice of mode more than riding time does since people dislike the excess time involved in traveling much more than the riding time.

In summary, to estimate how people select public transit from the available alternatives involves consideration of the characteristics of the traveler, of the trip, and of the different modes available for use. It would be impractical to contain all the characteristics in a mode choice model. Planners must decide which characteristics to choose to represent the mode usage decisions. The choices are made following a thorough analysis of various combinations of characteristics. Table 3-1 lists the most commonly used characteristics for each group.

Table 3-1 Most commonly used mode choice factors

Characteristics of the traveler	Family income Car ownership
Characteristics of the trip	Trip purpose
Characteristics of the transportation system	Travel time Travel cost

3.1.2 Transit demand models

A variety of models have been developed to estimate transit demand. This section presents four widely used models: cross-classification table, multiple linear regression model, binary logit model, and multinomial logit model.

a. Cross-classification table

A cross-classification table can be developed between family income and car ownership based on empirical data (Table 3-2). The table can be used to forecast transit demand based on household characteristics.

Table 3-2 Transit trips produced per household

		Car ownership		
		0	1	2+
Household income	≤6	2.1	0.7	0.4
	6-9	1.3	0.4	0.3
	9-12	0.5	0.2	0.1
	12-15	0.2	0.1	0.0
	>15	0.1	0.0	0.0

b. Multiple linear regression model
A multiple linear regression model can be estimated for each trip purpose. A sample of the model is as follows:

$y = a + b_1x_1 + b_2x_2 \ldots + b_ix_i$

where,
y - the percentage of person trips by transit on a zone-to-zone basis;
a - constant value;
b_1 to b_i - the parameters that represent the mode choice factors, including
for characteristics of the traveler,
- average family income level in the origin zone,
- car ownership per household in the origin zone,
- residential density, the number of households per residential acre in the origin zone, and
- distances from the centroids of both the origin and destination zones to the central business district;

for characteristics of the trip,
- trip purpose, and
- distance between the centroids of the origin and destination zones;

for characteristics of the transportation system,
- transit accessibility, the ratio of transit line length to highway length in both origin and destination zones;
- parking cost in the destination zone;
- transit fare;
- ratio of transit travel time to auto travel time, where transit travel time is equal to the sum of riding time, transfer time, walk and wait time at the origin zone and walk time at the destination zone; and auto travel time is equal to the sum of driving time and terminal times at both the origin and destination zones. The terminal time is measured for each zone: at the destination zone looking for the parking place, walking from the parking place (or bus stop) to the actually destination and walking from the trip origin to the parking place (or bus stop).

c. Logistic regression model

The logistic regression model can be viewed as a non-linear transformation of the multiple linear regression model. A sample of the model is as follows, which estimates p, the probability that a tripmaker chooses public transit as travel mode.

$\ln[p/(1-p)] = a + b_1x_1 + b_2x_2 \ldots + b_ix_i$
or
$p = 1/[1 + \exp(-a - b_1x_1 - b_2x_2 \ldots - b_ix_i)]$

where:
p - the probability of a tripmaker using public transit mode;
a - constant value; and
b1 to bi - the parameters that represent the mode choice factors as defined in the segment b.

d. Multinomial Logit Model
The multinomial logit model is used to estimate the likelihood for a tripmaker to choose each of the available travel modes. The available travel modes could be 1=drive alone, 2=carpool, 3=public transit, and 4=other modes. A sample of the model is as follows:

$$P_{ij} = \frac{\exp(U_{ij})}{\sum_{j \in Y} \exp(U_{ij})}$$

where:
P_{ij} - the probability that travel mode j is chosen by tripmaker i;
Y_j – the mode choice set for tripmaker i , j=1, 2, and 3, and Y_1 =drive alone, Y_2=carpool, and Y_3=public transit;
U_{ij} is the utility value which combines the individual characteristics of tripmaker i and the attributes associated with travel mode j. U could be a function of the characteristics of the tripmaker, the trip, and the transportation system (such as $U = f(b_1x_1+b_2x_2 \ldots +b_ix_i)$).

The numerator of the equation is the exponential function of utility value of travel mode j for tripmaker i (U_{ij}), while the denominator is the sum of exponential utilities of all travel modes for tripmaker i. The probability of tripmaker i choosing travel mode j (P_{ij}) increases with the travel mode j's utility for tripmaker i (U_{ij}) and decreases with the utility of the other alternative modes.

3.2 The framework of transit modeling

After transit demand is estimated based on the methodologies presented in the previous section, transit system model is developed to determine transit supply – bus route system, fare structure, and service headways, etc. The transit system model is a TransCAD-based model, which is composed of three layers:

- Underlying street layer, which contains the network attributes including segment length, drive time, walk time, etc;
- Transit route system layer, which contains the route settings such as headway, capacity, fare amount, fare type (flat or zonal fare), transfer charge, and route-specific weighing factors (weights on travel time, transfer time, waiting time, and dwell time);
- Stop layer, which identifies the information about near node and fare zone, etc.

Figure 3-1 shows the TransCAD transit route system containing all the key routes currently in operation. *(note: the model is still under development, the stop layer is not available yet.)*

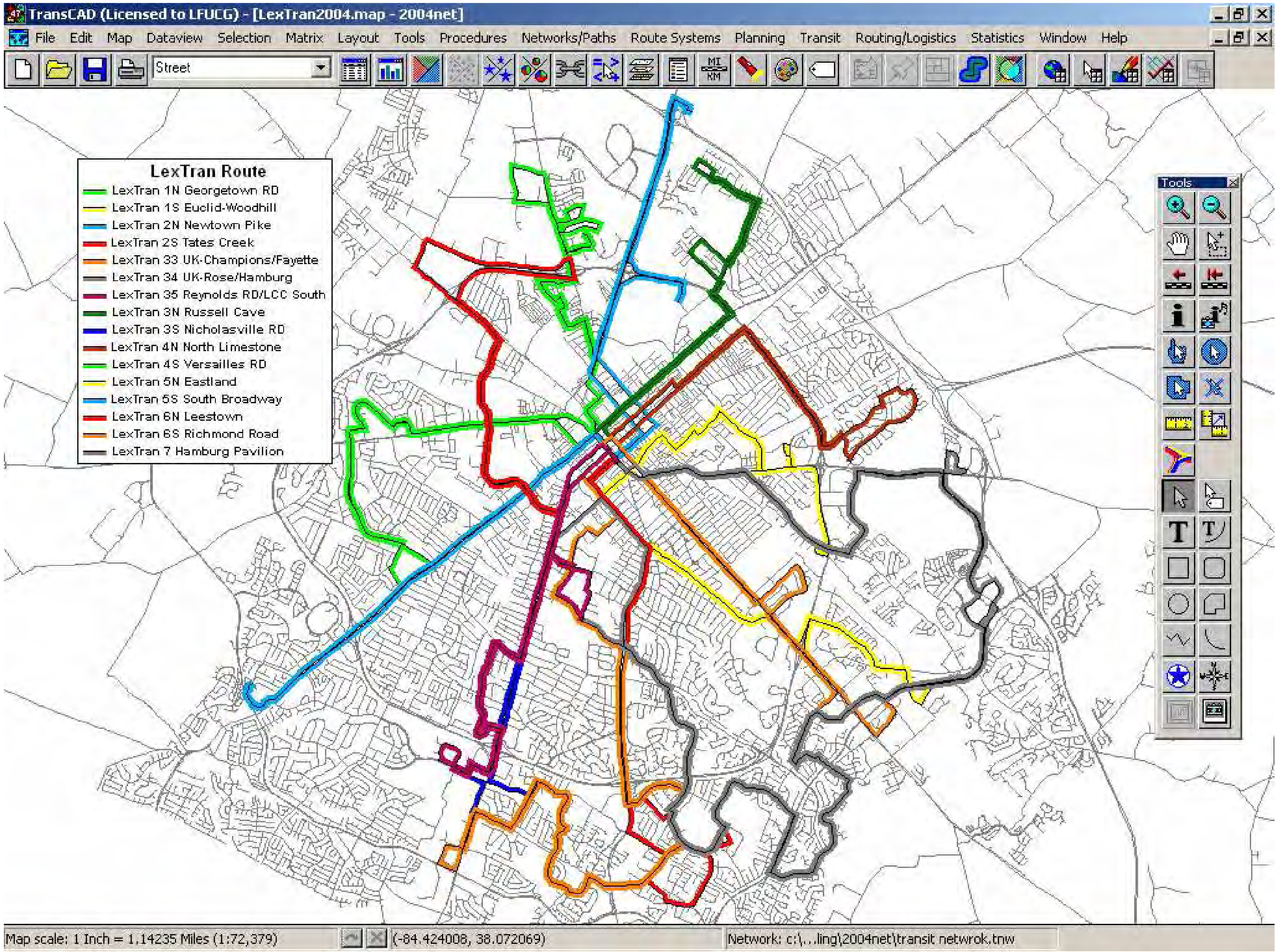


Figure 3-1 TransCAD transit route system

Other settings of the model include dwell time, layover time, value of time, and restrictions such as maximum trip cost (in monetary units), maximum transfer time, maximum number of transfers, maximum travel time, and maximum waiting time, etc. The settings should be corresponding to the scenarios being simulated. For example, to simulate a scenario where passengers are not willing to wait, the waiting time weight should be set a large value; similarly, the transfer time weight could be set a higher value and the maximum transfer time be set a smaller value when designing a route system with less transfer time; and the value of time parameter could be set a large value when simulating a scenario where time cost is more important than fare cost. All these settings could be different by route to simulate their different situations, or they could be set a global value. Figure 3-2 presents the basic model procedure.

The input data can be classified into three groups:

- Transit route system that defines bus routes and stops;
- Transit network that contains complete settings about fare structure (regular fare amount, fare type, and transfer charge) and transit travel time (headway, in-vehicle-travel-time (IVTT), walking time, waiting time, transfer time, dwell time, layover time, etc); and
- O-D passenger demand matrix with stop-to-stop demand.

The input data are processed by Transit Assignment Model which employs Stochastic User Equilibrium Assignment (SUE) method. In practice, SUE transit assignment produces assignment results that appear to be the most reasonable and realistic. The model output is as follows (Figure 3-3):

- Transit Flows Table, containing ridership for each route segment between each pair of stops along that segment (the field of “FLOW”); the milepost at the beginning and end of each route segment (the fields of “FROM_MP” and “TO_MP”); IVTT (the field of “BaseIVTT”), Cost (the field of “Cost”), etc.
- Boarding Counts Table, containing the number of riders boarding and alighting at every transit stop (the fields of “ON” and “OFF”).
- Skim Matrix Table, the matrix of skimmed network attribute presenting any transit network attribute between each OD pair such as travel time, generalized costs, the number of transfers, IVTT, etc.
- Total Transit Flows Table, containing the aggregate ridership data for each transit corridor with combined information for all routes sharing a single right-of-way (the field of “FLOW”). Figure 3-4 visualizes the total transit flow for each transit corridor.

The TransCAD transit model will be employed to perform three major functions:

- Test alternative transit route designs - configure the proposed routes in Transit Route System, run the model and compare system performance;
- Determine the impacts of changes in fare structure and headway, etc. - change Transit Network Settings, run the model and compare system performance;
- Forecast long range transit level of service - assign the projected OD passenger demand to both the existing and the improved Transit Route System and Transit Network Settings, and compare system performance.

Based on model output, a benefit / cost analysis will be conducted for each of the proposed plan and the recommended plan will be the alternative with the highest benefit / cost ratio.

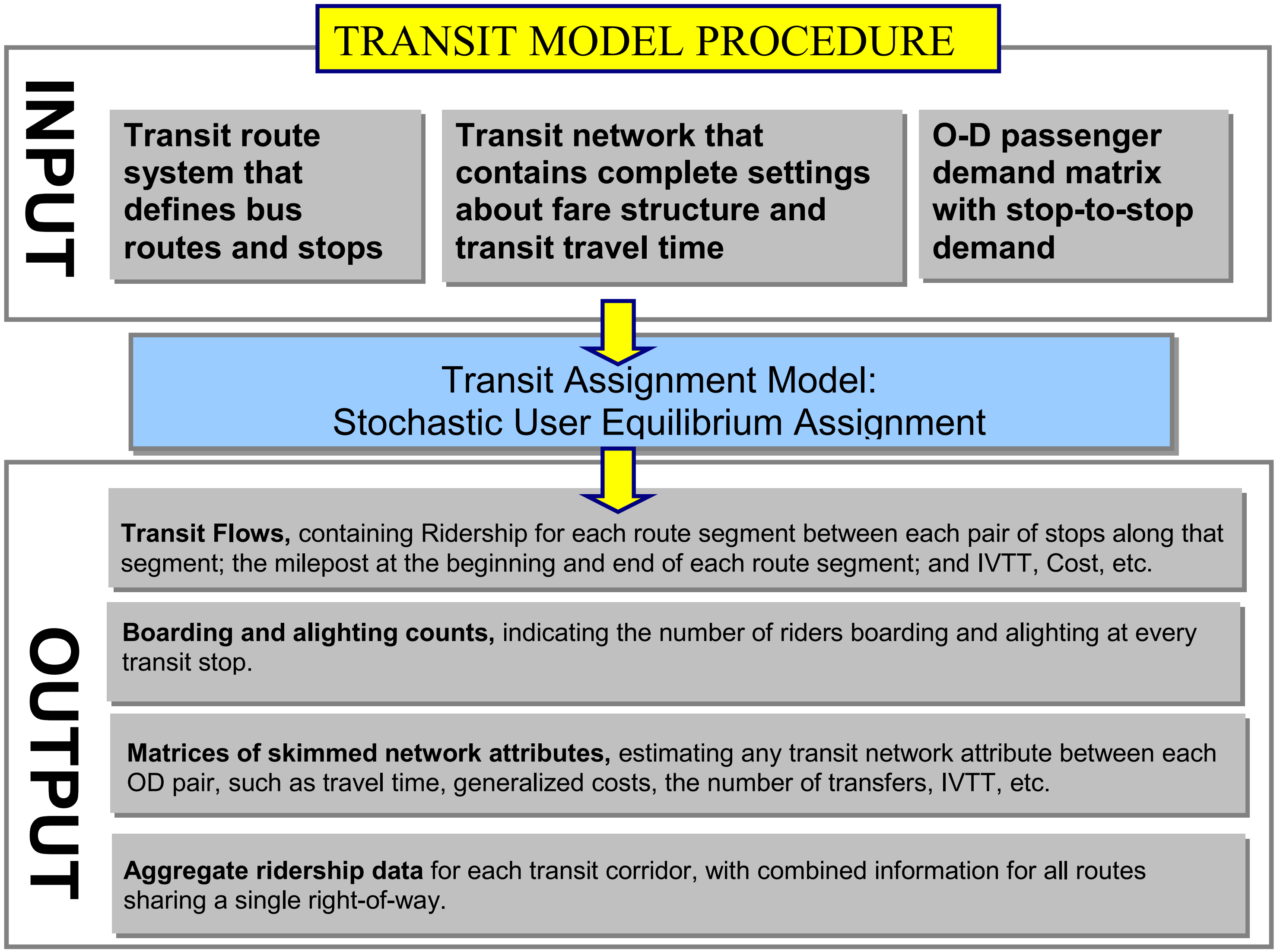
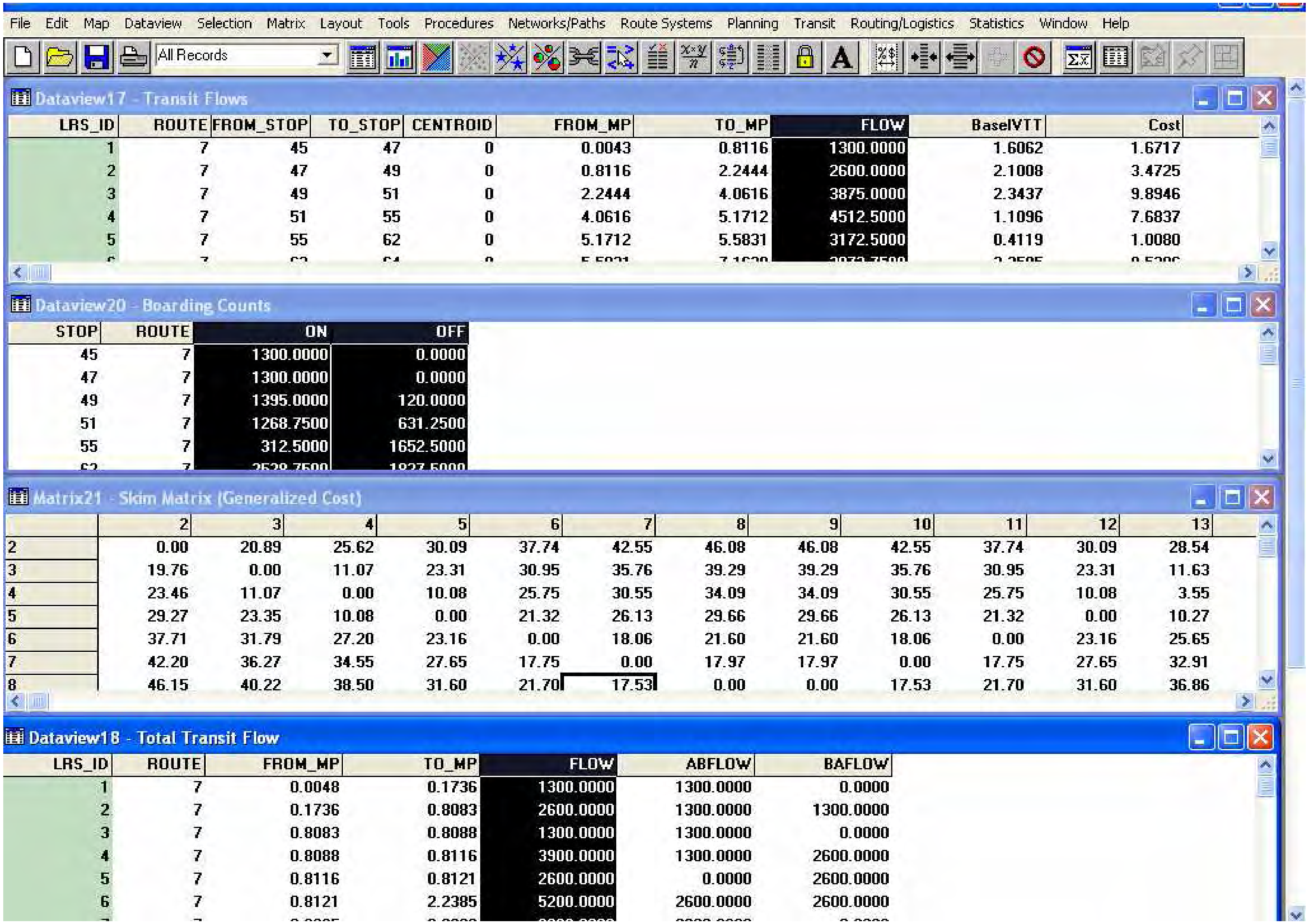


Figure 3-2 TransCAD-based transit model procedure



Dataview17 - Transit Flows

LRS_ID	ROUTE	FROM_STOP	TO_STOP	CENTROID	FROM_MP	TO_MP	FLOW	BaseIVTT	Cost
1	7	45	47	0	0.0043	0.8116	1300.0000	1.6062	1.6717
2	7	47	49	0	0.8116	2.2444	2600.0000	2.1008	3.4725
3	7	49	51	0	2.2444	4.0616	3875.0000	2.3437	9.8946
4	7	51	55	0	4.0616	5.1712	4512.5000	1.1096	7.6837
5	7	55	62	0	5.1712	5.5831	3172.5000	0.4119	1.0080

Dataview20 - Boarding Counts

STOP	ROUTE	ON	OFF
45	7	1300.0000	0.0000
47	7	1300.0000	0.0000
49	7	1395.0000	120.0000
51	7	1268.7500	631.2500
55	7	312.5000	1652.5000

Matrix21 - Skim Matrix (Generalized Cost)

	2	3	4	5	6	7	8	9	10	11	12	13
2	0.00	20.89	25.62	30.09	37.74	42.55	46.08	46.08	42.55	37.74	30.09	28.54
3	19.76	0.00	11.07	23.31	30.95	35.76	39.29	39.29	35.76	30.95	23.31	11.63
4	23.46	11.07	0.00	10.08	25.75	30.55	34.09	34.09	30.55	25.75	10.08	3.55
5	29.27	23.35	10.08	0.00	21.32	26.13	29.66	29.66	26.13	21.32	0.00	10.27
6	37.71	31.79	27.20	23.16	0.00	18.06	21.60	21.60	18.06	0.00	23.16	25.65
7	42.20	36.27	34.55	27.65	17.75	0.00	17.97	17.97	0.00	17.75	27.65	32.91
8	46.15	40.22	38.50	31.60	21.70	17.53	0.00	0.00	17.53	21.70	31.60	36.86

Dataview18 - Total Transit Flow

LRS_ID	ROUTE	FROM_MP	TO_MP	FLOW	ABFLOW	BAFLOW
1	7	0.0048	0.1736	1300.0000	1300.0000	0.0000
2	7	0.1736	0.8083	2600.0000	1300.0000	1300.0000
3	7	0.8083	0.8088	1300.0000	1300.0000	0.0000
4	7	0.8088	0.8116	3900.0000	1300.0000	2600.0000
5	7	0.8116	0.8121	2600.0000	0.0000	2600.0000
6	7	0.8121	2.2385	5200.0000	2600.0000	2600.0000

Figure 3-3 TransCAD transit model output

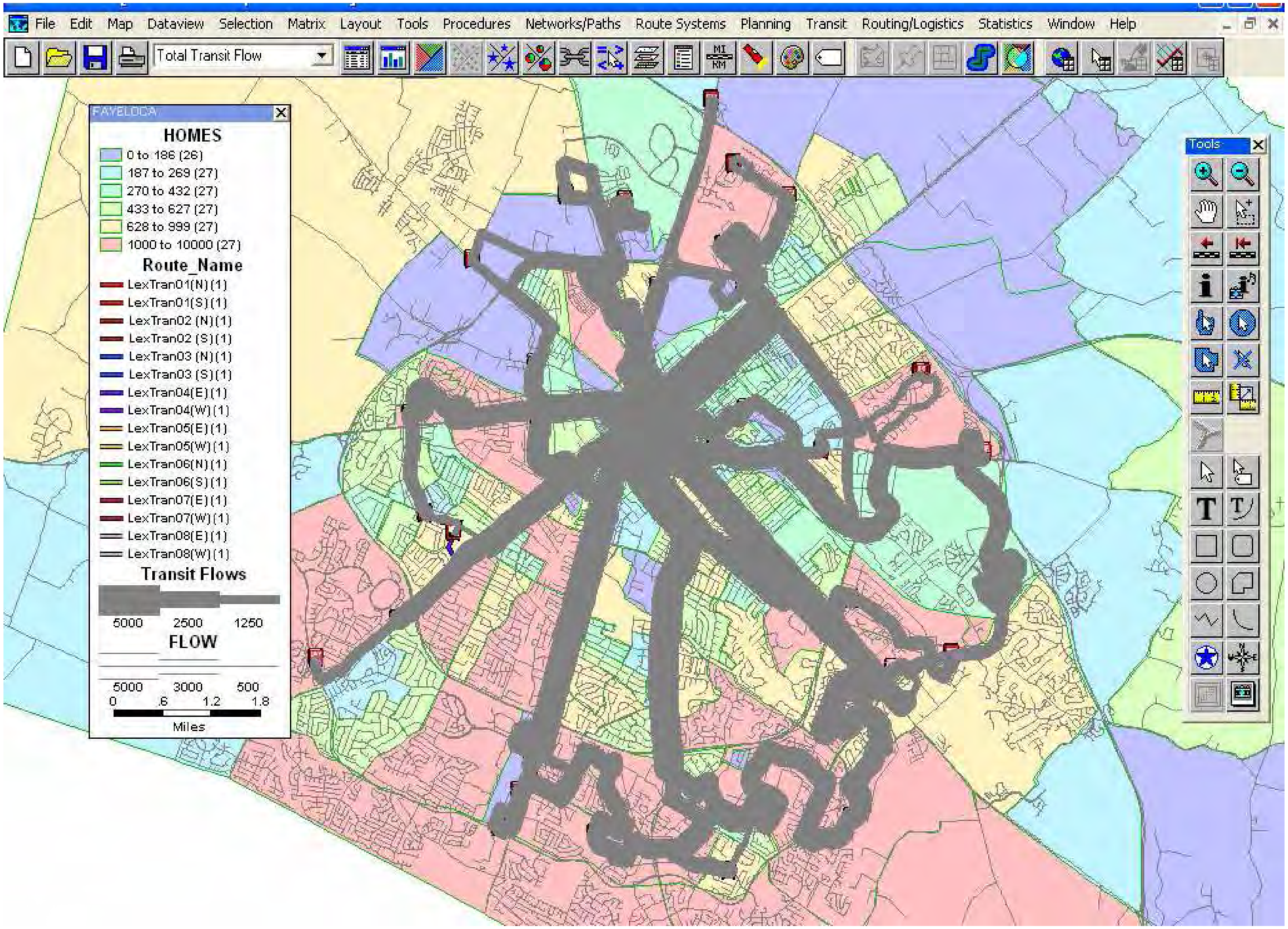


Figure 3-4 The estimated total transit flow for each transit route

Chapter 4 Projects Summary and Cost Projections

4.1 Short-range plan

4.1.1 Improvement plan to the existing LexTran routes

The following improvement strategies are recommended to the existing LexTran routes based on a comprehensive analysis of public requirements, route performance evaluation, and transit demand estimation:

Route 1S – Euclid/Woodhill

- This route should operate every 60 minutes on Sundays from about 5:45 a.m. to 8:45 p.m.
- Its headways should be improved to 30 minutes on weekdays. Initially, the 30-minute weekday peak service should be restored. Then these headways should also be provided during the mid-day.
- It should operate to about 11:45 p.m. on weekdays and Saturdays.
- In these last three trips (9:20, 10:20, and 11:20 p.m.), the route should be combined with Route 6S – Richmond Road and a combination route be operated. Exhibit V-6 shows the proposed alignment of this route.
- Its headways should be improved to 30 minutes on Saturdays from about 10:00 a.m. to 5:00 p.m. However, this route should be placed in a second priority category for routes proposed for these headway improvements.

Route 1N – Georgetown

- This route should operate on Sundays from about 5:45 a.m. to 8:45 p.m. every 60 minutes.
- Its headways should be improved to 30 minutes on weekdays. Initially, the 30-minute peak service should be restored. Then these headways should also be provided during the mid-day.
- Its headways should be improved to 30 minutes on Saturdays from about 10:00 a.m. to 5:00 p.m. However, this route should be placed in a second priority category for routes proposed for these headway improvements.
- It should operate to about 11:45 p.m. on weekdays and Saturdays.

- In these last three trips (9:20, 10:20, and 11:20 p.m.), the route should be combined with Route 6N – Leestown Road and a combination route be operated. During these trips, the Whipple Court, Oakwood, and Redwood deviations should not be run. Exhibit V-7 shows the proposed alignment of this route.

Route 2S - Tates Creek

- This route should be combined with Route 33 and be extended to Nicholasville Road. It should also be interlined with Route 3 - Nicholasville Road at the WalMart on Nicholasville Road.
- This route should operate on Sundays from about 5:45 a.m. to 8:45 p.m. every 60 minutes and should end at Centre Parkway.
- Its headways should be improved to 30 minutes on weekdays during both the peak and mid-day periods. Its headways should be improved to 30 minutes on Saturdays from about 10:00 a.m. to 5:00 p.m.
- However, this route should be placed in a second priority category for routes proposed for these headway improvements.
- Its headways should be improved to 30 minutes on Saturdays from about 10:00 a.m. to 5:00 p.m.
- It should operate to about 11:45 p.m. on weekdays and Saturdays.
- In these last three trips (9:20, 10:20, and 11:20 p.m.), the route should end at Centre Parkway and not continue to Nicholasville Road as proposed during the weekdays and Saturdays.

Route 2N - Newtown Pike

- This route should operate on Sundays from about 5:45 a.m. to 8:45 p.m. every 60 minutes.
- Its headways should be improved to 30 minutes on weekdays. Initially, the 30-minute peak service should be restored. Then these headways should also be provided during the mid-day.
- Its headways should be improved to 30 minutes on Saturdays from about 10:00 a.m. to 5:00 p.m.
- It should operate to about 11:45 p.m. on weekdays and Saturdays.
- In these last three trips (9:20, 10:20, and 11:20 p.m.), the route should be combined with Route 3N – Broadway/Russell Cave and a combination route be operated. Exhibit V-9 shows the proposed alignment of this route.

Route 3S - Nicholasville Road

- In order to improve its schedule adherence, the Landsdowne Street deviation should be eliminated from Route 3 - Nicholasville Road and be served by the proposed realignment of Route 2 – Tates Creek. It should also be interlined with Route 2 - Tates Creek at the WalMart on Nicholasville Road. Exhibit V-10 shows the proposed alignment.

- This route should operate on Sundays from about 5:45 a.m. to 8:45 p.m. every 60 minutes and should end at Centre Parkway.
- Its headways should be improved to 30 minutes on weekdays during both the peak and mid-day periods. Its headways should be improved to 30 minutes on Saturdays from about 10:00 a.m. to 5:00 p.m.
- Its headways should be improved to 30 minutes on Saturdays from about 10:00 a.m. to 5:00 p.m.
- It should operate to about 11:45 p.m. on weekdays and Saturdays.

Route 3N - Broadway/Russell Cave

- This route should operate on Sundays from about 5:45 a.m. to 8:45 p.m. every 60 minutes.
- Its headways should be improved to 30 minutes on weekdays. Initially, the 30-minute peak service should be restored. Then these headways should also be provided during the mid-day.
- Its headways should be improved to 30 minutes on Saturdays from about 10:00 a.m. to 5:00 p.m.
- It should operate to about 11:45 p.m. on weekdays and Saturdays.
- In these last three trips (9:20, 10:20, and 11:20 p.m.), the route should be combined with Route 2N – Newtown Road and a combination route be operated. Exhibit V-11 shows the proposed alignment of this route.

Route 4S - Versailles Road

- This route should operate on Sundays from about 5:45 a.m. to 8:45 p.m. every 60 minutes.
- Its headways should be improved to 30 minutes on weekdays. Initially, the 30-minute peak service should be restored. Then these headways should also be provided during the mid-day.
- Its headways should be improved to 30 minutes on Saturdays from about 10:00 a.m. to 5:00 p.m.
- It should operate to about 11:45 p.m. on weekdays and Saturdays.
- In these last three trips (9:20, 10:20, and 11:20 p.m.), the route should be combined with Route 5S – South Broadway/Harrodsburg Road and a combination route be operated. Exhibit V-12 shows the proposed alignment of this route.
- Extend this route to Nicholasville Road. The proposed alignment is shown in Exhibit V-13.

Route 4N - North Limestone

- This route should operate on Sundays from about 5:45 a.m. to 8:45 p.m. every 60 minutes.
- Its headways should be improved to 30 minutes on weekdays. Initially, the 30-minute peak service should be restored. Then these headways should also be provided during the mid-day.
- Its headways should be improved to 30 minutes on Saturdays from about 10:00 a.m. to 5:00 p.m.
- It should operate to about 11:45 p.m. on weekdays and Saturdays.
- In these last three trips (9:20, 10:20, and 11:20 p.m.), the route should be combined with Route 5N – Eastland and a combination route be operated. Exhibit V-14 shows the proposed alignment of this route.

Route 5S - South Broadway/Harrodsburg Road

- This route should operate on Sundays from about 5:45 a.m. to 8:45 p.m. every 60 minutes.
- Its headways should be improved to 30 minutes on weekdays. Initially, the 30-minute peak service should be restored. Then these headways should also be provided during the mid-day.
- Its headways should be improved to 30 minutes on Saturdays from about 10:00 a.m. to 5:00 p.m. However, this route should be placed in a second priority category for routes proposed for these headway improvements.
- It should operate to about 11:45 p.m. on weekdays and Saturdays.
- In these last three trips (9:20, 10:20, and 11:20 p.m.), the route should be combined with Route 4S - Versailles Road and a combination route be operated. Exhibit V-15 shows the proposed alignment of this route.

Route 5N - Eastland

- This route should operate on Sundays from about 5:45 a.m. to 8:45 p.m. every 60 minutes.
- Its headways should be improved to 30 minutes on weekdays. Initially, the 30-minute peak service should be restored. Then these headways should also be provided during the mid-day.
- Its headways should be improved to 30 minutes on Saturdays from about 10:00 a.m. to 5:00 p.m.
- It should operate to about 11:45 p.m. on weekdays and Saturdays.
- In these last three trips (9:20, 10:20, and 11:20 p.m.), the route should be combined with Route 4N – North Limestone and a combination route be operated. Exhibit V-16 shows the proposed alignment of this route.

Route 6S – Richmond Road

- This route should operate on Sundays from about 5:45 a.m. to 8:45 p.m. every 60 minutes.
- Its headways should be improved to 30 minutes on weekdays during the peak hours.

- Its headways should be improved to 30 minutes on Saturdays from about 10:00 a.m. to 5:00 p.m. However, this route should be placed in a second priority category for routes proposed for these headway improvements.
- It should operate to about 11:45 p.m. on weekdays and Saturdays.
- In these last three trips (9:20, 10:20, and 11:20 p.m.), the route should be combined with Route 1S – Euclid/Woodhill and a combination route be operated. Exhibit V-17 shows the proposed alignment of this route.

Route 6N – Leestown Road

- This route should operate on Sundays from about 5:45 a.m. to 8:45 p.m. every 60 minutes.
- Its headways should be improved to 30 minutes on weekdays during the peak hours.
- It should operate to about 11:45 p.m. on weekdays and Saturdays.
- In these last three trips (9:20, 10:20, and 11:20 p.m.), the route should be combined with Route 1N – Georgetown Road and a combination route be operated. Exhibit V-18 shows the proposed alignment of this route.

Route 7 – Hamburg Pavilion

- This route should operate on Sundays from about 5:45 a.m. to 8:45 p.m. every 60 minutes.
- Its headways should be improved to 30 minutes on weekdays during the peak hours.
- It should operate to about 11:45 p.m. on weekdays and Saturdays.

Route 9 – UK Stadium

- LexTran should continue to closely monitor passenger loads on Route 9 – UK Stadium. Additional trips should be added to the mornings, i.e. 7:30 a.m. or 7:35 a.m., and other times as needed.

Route 31 – True Blue Express

- This route should be eliminated during the summer semester break similar to most University campus bus service.
- After a fare is charged, LexTran should continue to closely monitor passenger loads on Route 31 – True Blue Express. If additional growth occurs, then trippers should be added or headways improved to ten minutes at peak times.

Route 32 – UK/Downtown Express

- LexTran should review the downtown alignment of this route and make sure that emerging markets for this route are being served.

Route 33 – UK/Fayette Mall

- Route 33 should be combined with Route 2 – Tates Creek.

Route 34

- Route 34 should be modified to operate only the portion between Hamburg Pavilion and Centre Parkway. The recommended alignment is shown in Exhibit V-19. In the longer term, this route should incorporate a demand response route deviation feature to increase its service area. This is further described later in the report in the Community Circulators section.

Route 35 – UK/Nicholasville Road

- Restructure this route so that it provides more extensive circulation in the Nicholasville Road area. It would operate between LCC at Commonwealth Stadium and Man O' War Boulevard. Exhibit V-20 shows the proposed alignment.
- In the longer term, this route should incorporate a demand response route deviation feature to increase its service area.

4.1.2 New routes and services

The following new routes and services are recommended:

Community Circulator

Community circulator routes that incorporate a demand response feature are proposed in several locations throughout the LexTran service area. These routes will deviate from their route to pick-up or drop-off passengers in response to a telephoned or personal request. Because of this feature, they can provide coverage to a much greater area than fixed routes. But they also must operate in lower density/lower demand areas. Since this is new type of service for LexTran, a new calltaking/scheduling/dispatching function will need to be created. Some additional training for drivers and other LexTran staff will also be needed. The following circulators are proposed:

Nicholasville Road - This community circulator would be designed to connect nearby residential areas with commercial centers and other trip destinations in the vicinity of Nicholasville Road. It would operate as a fixed route between Commonwealth Stadium and Man O' War Boulevard and then serve nearby residential areas on-demand. Exhibit V-21 shows the proposed alignment with the areas eligible for on-demand service. This replaces Route 35.

Hamburg Pavilion/Centre Parkway - This community circulator would function not only as a local feeder, bringing passengers to transfer locations, but also as a crosstown route connecting destinations located at the edge of the LexTran service area. It would operate between Hamburg Pavilion and Centre Parkway as depicted in Exhibit V-22, with on-demand service coverage areas as shown. This will replace the current Route 34.

Paris Pike/New Circle - This will fill a gap in the service coverage area. It would operate mostly on Paris Pike, North Broadway and New Circle Road to Creative Drive. There are several locations where passengers would be able to transfer to other routes. These include New Circle at WalMart, at North Broadway, at Eastland Parkway, and at Creative Drive. The areas for on-demand deviations include residential areas north of New Circle Road between Russell Cave and Eastland Parkway.

Specialized Services

Employment Connectors - These would be special trippers designed to complement fixed route service. The times and location of these trippers would be determined through ongoing communication with specific employers. One target area would be the Lexington International Airport and Keeneland Racetrack.

Senior Citizen Transportation - Similar to Employment Connectors, these would be special trippers designed to serve the special needs of senior citizens. Any trip purpose could be served including shopping, medical, and personal business.

4.1.3 Summary of the recommended LexTran system

Table 4-1 shows a summary profile of the LexTran system with all COA improvements fully implemented. Revenue hours would increase to 517.7 on weekdays and 310.0 on Saturdays from 320.0 and 192.4 respectively. Sunday revenue hours would total 193.2. The weekday peak vehicle requirement would increase to 41 over the current 24. Improved headways and extended hours and days of service comprise the majority of the service improvements. Several Saturday and weekday peak headways improvements were identified as second priority. This was done to add

a certain amount of flexibility to the implementation plan in the event that operating costs are higher than projected or revenues are not as high as projected.

Table 4-1 Proposed route summary profile

Route	Service Span			Frequency				
	Weekday	Sat.	Sun.	PK	MD	Eve.	Sat.	Sun.
1S - Euclid/Woodhill	5:45a-11:44p	5:45a-11:44p	5:49a-8:45p	30	30	60	30	60
1N - Georgetown Road	5:49a-11:45p	5:45a-11:49p	5:45a-8:44p	30	30	60	30	60
2S - Tates Creek	5:30a-11:39p	5:49a-11:39p	5:49a-8:41p	30	30	60	30	60
2N - Newtown Pike	5:57a-12:10a	5:57a-12:10a	5:57a-8:47p	30	30	60	30	60
3S - Nicholasville Road	5:39a-11:44p	5:44a-11:44p	5:44a-8:44p	30	30	60	30	60
3N - Broadway/Russell Cave	5:45a-11:47p	5:45a-11:47p	5:45a-8:47p	30	30	60	30	60
4S - Versailles Road	5:26a-12:10a	5:38a-12:10a	5:46a-8:45p	30	30	60	30	60
4N - North Limestone	5:47a-11:47p	5:47a-11:47p	5:47a-8:43p	30	30	60	30	60
5S - South Broadway/Harrodsburg Rd.	6:01a-11:46p	6:01a-11:46p	6:01a-8:39p	30	30	60	30	60
5N - Eastland	5:53a-12:10a	5:53a-12:10a	5:53a-8:44p	30	30	60	30	60
6S - Richmond Road	5:51a-12:10a	5:51a-12:10a	5:51a-8:40p	30	60	60	60	60
6N - Leestown Road	5:55a-12:10a	5:55a-12:10a	5:55a-8:47p	30	60	60	60	60
7 - Hamburg Pavilion	5:51a-12:10a	5:45a-12:10p	5:45a-8:47p	60	60	60	60	60
9 - Stadium/Greg Page	6:30a-6:30p	--	--	5	5	--	--	--
31 - UK/True Blue Express	6:50a-6:15p	--	--	20	20	--	--	--
32 - UK/Downtown Express	6:55a-6:09p	--	--	20	20	--	--	--
New - Centre Parkway/Hamburg Pav. C	7:14a-10:09p	--	--	60	60	60	--	--
New - Nicholasville Road C	6:50a-6:10p	--	--	60	60	--	--	--
New - Paris Pike/New Circle C	7:02a-6:15p	--	--	60	60	--	--	--

Table 4-1 Proposed route summary profile (Cont'd)

Route	Revenue Hours			Revenue Miles			Vehicle Required				
	Wday	Sat.	Sun.	Wday	Sat.	Sun.	PK	MD	Eve.	Sat.	Sun.
1S - Euclid/Woodhill	27.5	23.8	14.8	333	288	179	2	2	0.5	2	1
1N - Georgetown Road	28.2	24.4	14.9	344	298	182	2	2	0.5	2	1
2S - Tates Creek	44.5	39.3	14.8	654	578	218	4	4	1	2	1
2N - Newtown Pike	27.5	24.4	14.8	327	290	176	2	2	0.5	2	1
3S - Nicholasville Road	30.2	25.4	15	323	272	161	2	2	1	2	1
3N - Broadway/Russell Cave	28.2	24.4	15	304	263	162	2	2	0.5	2	1
4S - Versailles Road	55.5	24.1	15	699	304	189	4	4	0.5	2	1
4N - North Limestone	27.5	24.4	14.9	305	271	165	2	2	0.5	2	1
5S - South Broadway/Harrodsburg Rd.	26.1	24.1	14.6	282	260	158	2	2	0.5	2	1
5N - Eastland	27.8	24.4	14.8	259	227	138	2	2	0.5	2	1
6S - Richmond Road	21.3	16.8	14.8	224	177	156	2	1	0.5	1	1
6N - Leestown Road	22.8	16.2	14.9	294	209	192	2	1	0.5	1	1
7 - Hamburg Pavilion	15.9	18.3	14.9	257	296	241	1	1	1	1	1
9 - Stadium/Greg Page	63.5	--	--	416	--	--	6	6	--	--	--
31 - UK/True Blue Express	11.5	--	--	125	--	--	1	1	--	--	--
32 - UK/Downtown Express	11.2	--	--	96.8	--	--	1	1	--	--	--
New - Centre Parkway/Hamburg Pav. C	14.9	--	--	240	--	--	1	1	1	--	--
New - Nicholasville Road C	22.4	--	--	360	--	--	2	2	--	--	--
New - Paris Pike/New Circle C	11.2	--	--	142	--	--	1	1	--	--	--
TOTAL	517.7	310	193.2	5,842.8	3,731.7	2,315	41	39	9	23	13

4.2 Projects implementation and cost projections

Service improvement projects are made possible through the passing of a dedicated funding levy in November 2004 by the Fayette County voters. Recommendations are designed with this additional funding included. The implementation plan is based on the timing of when this funding will become available to LexTran, and when driver run picks are done. All proposed near term service improvements are scheduled for implementation by August 2006.

Table 4-2 shows when each group of improvements is scheduled for implementation. This includes estimates of additional peak vehicles, driver full-time equivalents (FTEs), and operating costs using an average LexTran incremental cost of $55.08 per platform hour. In March 2005, Sunday service will be restored for Routes 1 through 7. This was eliminated in July 2004 as an action to reduce costs. In May 2005, Routes 2 – Tates Creek is restructured and operates every 30 minutes during the weekday daytime. Route 3 - Nicholasville Road will also run every 30 minutes during the weekday daytime periods. In addition, service hours on routes 1 through 7 will be extended to about 11:50 p.m. in May 2005; routes 31 and 32 would no longer run in the summers; and routes 34 and 35 will be restructured. In January 2006, weekday peak period 30-minute headways will be restored on routes 1 through 7. This will be followed by implementing 30-minute headways all day on weekdays and Saturdays on routes 1 through 5 in May 2006. Also in May 2006, Route 4 – Versailles Road will be extended to Nicholasville Road. The final group of service improvements involves service innovation. As a result of requests from the community, LexTran wanted to test the feasibility of more flexible services, possibly using smaller vehicles. In August 2006, community circulators and other special services will be started for senior citizens and employers, including the Keeneland Race Track and Lexington International Airport.

LexTran operating costs are projected to grow assuming a four (4) percent annual inflation factor. Capital costs are based on the current capital plan, with additional vehicles included to address increased peak period requirements. Also, a major renovation of the LexTran operations/maintenance facility is planned. The projections of operating and capital expenditures for FY 2006 – 2010 are presented in Table 4-3.

As to personnel and staffing, full implementation of the recommendations will require LexTran to increase staffing levels in several areas. There will be an estimated forty six (46) additional vehicle operators needed by August 2006. This will bring with it at least an additional two street supervisors.

LexTran will also need to increase its maintenance staff in response to the planned increase in its fleet size. With implementation of COA recommendations, an additional eighteen (18) peak period vehicles will be needed. This will bring the peak vehicle requirement to forty-two (42), which will raise the recommended fleet size to fifty (50). According to a study conducted by the Ohio Department of Transportation2, an average of 6.5 vehicles per mechanic is the norm for the type of vehicle used by LexTran. This will increase the number of mechanics to at least seven (7), up from six (6). In order to improve the ratio of mechanics to maintenance bays, three additional maintenance bays should be constructed.

Table 4-2 LexTran service expansion plan phased implementation

Improvement	Peak Buses Added	Added Operators (FTEs)	Platform Hours/Day	Annual Operating Days	Annual Platform Hours	Total Annual Cost
Service Restoration I - March 2005						
1 Restore Sunday (6a-9p)						
-Route 1	-		30.8	52	1,599	
-Route 2	-		30.8	52	1,603	
-Route 3	-		31.2	52	1,620	
-Route 4	-		30.7	52	1,598	
-Route 5	-		30.5	52	1,586	
-Route 6	-		30.8	52	1,603	
-Route 7	-		12.5	52	652	
Subtotal		5.7	197.3		10,261	$ 565,194
Service Restoration II - May 2005						
2 Restructure Routes 2 & 3						
-Combine 2 and 33 (wk day)						
-Weekday daytime 30-minute service (2 & 3)						
Subtotal	3	4.7	33.4	255	8,521	$ 469,350
3 Eliminate Route 31 and 32 Summers/Breaks	-	-0.9	-23.7	65	-1,538	$ (84,731)
4 Realign Routes 34 and 35	-	-	-	-	-	$ -
Subtotal	3	3.9	9.8		6,983	$ 384,619
5 Evenings to 11:50p						
-Route 1-6 Combination	-		6.7	255	1,709	
-Route 2N-3N Combination	-		3.0	255	765	
-Route 2S	-		3.0	255	765	
-Route 3S	-		3.0	255	765	
-Route 4-5	-		6.2	255	1,581	
Subtotal		3.1	21.9		5,585	$ 307,594

Table 4-2 LexTran service expansion plan phased implementation (Cont'd)

Service Restoration III - January 2006							
6 Weekday Peak (7-9a,2-6p) to 30 minutes							
-Route 1	2		14.3	255	3,642		
-Route 2N	1		8.8	255	2,231		
-Route 3N	1		8.8	255	2,253		
-Route 4	2		14.3	255	3,655		
-Route 5	2		14.4	255	3,664		
-Route 6	2		14.3	255	3,655		
-Route 7			0.0	255	0		
Subtotal	10	10.6	74.9		19,100	$	1,052,000
Total Service Restoration Phase	**13**	**23**	**130.2**		**41,928**	**$**	**2,309,408**
Service Expansion - May 2006							
7 Weekday All Day (6a-6p) to 30 minutes							
-Route 1			9.2	255	2,346		
-Route 2N			4.6	255	1,177		
-Route 3N			4.6	255	1,177		
-Route 4			9.2	255	2,346		
-Route 5			9.2	255	2,346		
Subtotal	0	5.2	36.8		9,393	$	517,339
8 Saturday (10a-5p) to 30 minutes							
-Route 1			15.9	52	825		
-Route 2S & 3S			15.9	52	825		
-Route 2N			7.9	52	409		
-Route 3N			7.9	52	409		
-Route 4			8.9	52	464		
-Route 5			15.9	52	825		
Subtotal	0	2.1	72.3		3,757	$	206,936
9 Ext. Rt. 4 to Fayette Mall (wk day and sat)	2	4.7	27.3	307	8,391	$	462,195
Total Service Expansion Phase Improvements	**2**	**12**			**21,541**	**$**	**1,186,469**
Service Innovation - August 2006							
10 Community Circulators							
-north - Paris Pike area	1	1.8	12.5	255	3,188	$	175,568
-southeast - modify 34	0	-0.2	-1.5	255	-370	$	(20,366)
-Fayette Mall Shuttle - modify route 35	1	1.8	12.5	255	3,188	$	175,568
Subtotal	2	3.3	23.6		6,005	$	330,769
11 Airport/Keeneland					1,000	$	55,080
12 Senior Citizen Service	0	5.7	40.0	255	10,200	$	561,816
13 Employment Connectors	0	2.1	15.0	255	3,825	$	210,681
Total Service Innovation Phase Improvements	**2**	**11**			**21,030**	**$**	**1,158,346**
Total Annual Costs of Service Plan After Full Implementation	**17**	**46**			**84,499**	**$**	**4,654,223**

Table 4-3 LexTran operating and capital expenditures for FY 2006 - 2010

Operating Expenditures						
Current Service	**FY2005(May and June)**	**FY2006**	**FY2007**	**FY2008**	**FY2009**	**FY2010**
Oper Wages & Fringes	486,094	3,033,228	3,154,560	3,280,740	3,411,972	3,548,448
Oper Other	90,868	567,024	589,704	613,296	637,824	663,336
Maint Wages & Fringes	140,730	878,148	913,272	949,812	987,804	1,027,308
Maint Other	77,444	483,252	502,584	522,684	543,588	565,332
Admin Wages & Fringes	76,764	479,016	498,168	518,100	538,824	560,376
Admin Other	226,916	1,415,952	1,472,592	1,531,500	1,592,760	1,656,468
CMAQ Adv	51,666	0	0	0	0	0
Community Relations	0	360,000	360,000	360,000	360,000	360,000
Wheels	233,334	1,455,996	1,514,244	1,574,808	1,637,796	1,703,316
Subtotal	1,383,816	8,672,616	9,005,124	9,350,940	9,710,568	10,084,584
Added Service	**FY2005(May and June)**	**FY2006**	**FY2007**	**FY2008**	**FY2009**	**FY2010**
1 - Sundays	94,200	587,796	611,316	635,772	661,200	687,648
2 - 2/3/33 Restructure	64,104	400,008	416,004	432,648	449,952	467,952
3 - Elim. 31/32 Breaks	0	0	0	0	0	0
4 - Realign 34 & 35	0	0	0	0	0	0
5 - Evenings	51,266	319,896	332,688	345,996	359,844	374,232
6 - Weekday Peak	0	547,038	1,137,840	1,183,356	1,230,696	1,279,920
7 - Weekday Mid-day	0	89,672	559,548	581,940	605,208	629,424
8 - Saturday Mid-day	0	35,868	223,824	232,776	242,088	251,772
9 - Extend Route 4	0	80,114	499,908	519,912	540,708	562,332
10 - Community Circ.	0	0	327,943	372,072	386,952	402,432
11 - Airport/Keeneland	0	0	54,615	61,956	64,440	67,008
12 - Senior Citizen Spec.	0	0	557,018	631,968	657,240	683,532
13 - Employment Connector	0	0	208,879	236,988	246,468	256,320
Subtotal	209,570	2,060,392	4,929,583	5,235,384	5,444,796	5,662,572
Admin Costs	12,500	160,416	249,996	260,004	270,396	281,220
Total Operating Expenditures	1,605,886	10,893,424	14,184,703	14,846,328	15,425,760	16,028,376

Table 4-3 LexTran operating and capital expenditures for FY 2006 - 2010 (Cont'd)

Capital Outlays						
	FY2005(May and June)	FY2006	FY2007	FY2008	FY2009	FY2010
Facility Rehab		5,400,000	108,000	108,000	108,000	108,000
Revenue Vehicles						1,608,556
Equipment		143,000	751,200	412,920	350,000	350,000
Bus Shelters			70,000		70,000	70,000
Cont./Admin.		606,230	337,424	323,457	335,049	443,970
Total Capital Outlays		6,149,230	1,266,624	844,377	863,049	2,580,526
Total Operating and Captial Expenditures	**1,605,886**	**17,042,654**	**15,451,327**	**15,690,705**	**16,288,809**	**18,608,902**

A Life-Cycle model (refer to Chapter 5, 5.1 for details) is employed to project the operating and capital expenditures for FY 2011 through FY 2030 based on the amounts for FY 2006 – 2010, and the results are presented in Figure 4-1 and Table 4-4.

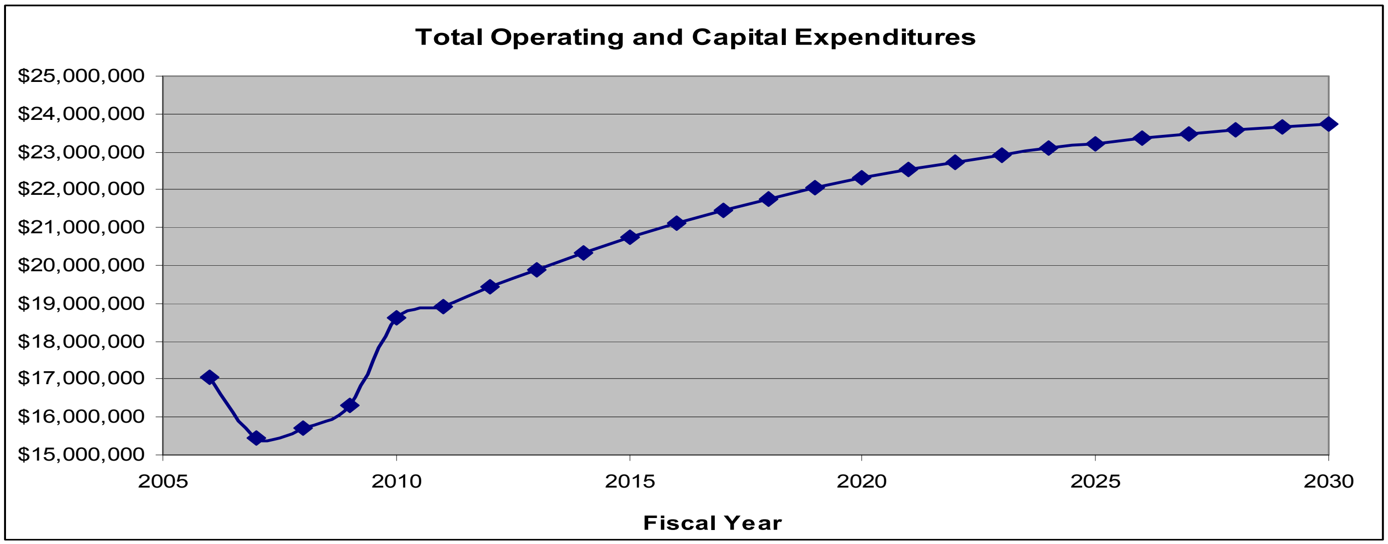


Figure 4-1 LexTran total operating and capital expenditures for FY 2006 through FY 2030

Table 4-4 LexTran operating and capital expenditures for FY 2006 through FY 2030

Fiscal Year	2006	2007	2008	2009	2010
Total Operating Expenditures	$10,893,424	$14,184,703	$14,846,328	$15,425,760	$16,028,376
Total Capital Outlays	$6,149,230	$1,266,624	$844,377	$863,049	$2,580,526
Total Expenditures	$17,042,654.00	$15,451,327.00	$15,690,705.00	$16,288,809.00	$18,608,902.00
Fiscal Year	2011	2012	2013	2014	2015
Total Operating Expenditures	$16,570,353	$17,083,036	$17,560,279	$18,002,042	$18,408,838
Total Capital Outlays	$2,340,761	$2,340,761	$2,340,761	$2,340,761	$2,340,761
Total Expenditures	$18,911,114.48	$19,423,796.83	$19,901,040.56	$20,342,803.38	$20,749,599.06
Fiscal Year	2016	2017	2018	2019	2020
Total Operating Expenditures	$18,781,642	$19,121,795	$19,430,915	$19,710,809	$19,963,407
Total Capital Outlays	$2,340,761	$2,340,761	$2,340,761	$2,340,761	$2,340,761
Total Expenditures	$21,122,402.84	$21,462,556.23	$21,771,675.95	$22,051,570.68	$22,304,167.77
Fiscal Year	2021	2022	2023	2024	2025
Total Operating Expenditures	$20,190,690	$20,394,648	$20,577,235	$20,740,337	$20,885,754
Total Capital Outlays	$2,340,761	$2,340,761	$2,340,761	$2,340,761	$2,340,761
Total Expenditures	$22,531,450.92	$22,735,409.04	$22,917,995.71	$23,081,098.31	$23,226,515.67
Fiscal Year	2026	2027	2028	2029	2030
Total Operating Expenditures	$21,015,182	$21,130,201	$21,232,278	$21,322,759	$21,402,877
Total Capital Outlays	$2,340,761	$2,340,761	$2,340,761	$2,340,761	$2,340,761
Total Expenditures	$23,355,942.94	$23,470,962.44	$23,573,039.26	$23,663,520.62	$23,743,638.02

4.3 Long-term options

A series of longer-term service improvements were identified through public involvement activities and a review of land use/population projections provided by the MPO. Funding has not yet been identified for these services and could be implemented only if additional revenue becomes available.

Additional community circulators

Northwest/Leestown Road

This route would provide service to an area experiencing some residential growth in recent years. It would operate on West Main Street and Leestown Road to the Masterson Station Drive area north of Alexandria Drive. The most convenient location for transfers is the downtown transit center. It therefore would also function as a radial route that would incorporate a route deviation feature and run every 60 minutes.

South/Man O' War Boulevard

This route would be based at a future hub located in the Fayette Mall area and serve growing residential areas located south of Man O' War Boulevard in the vicinity of Nicholasville Road. Its potential service area would extend from Boston Road to Tates Creek Road. It is envisioned to function as route deviation service and operate every 60 minutes.

New routes

Express Bus Service

The following locations are suggested for consideration for new commuter express service to downtown Lexington and the University of Kentucky:

- Nicholasville;
- Georgetown;
- Paris;
- Versailles;
- Winchester.

Downtown Trolley Service

There were a number of requests to reinstitute downtown circulator service using a rubber wheeled trolley replica bus. With additional housing being built in the downtown area, demand for this type of service will likely increase in the

future. It is recommended that this service be provided in combination with the Route 32 – UK/Downtown Express in order to provide a frequent connection between these two areas.

Chapter 5 Financial Forecast

This chapter documents a forecast of transit funds expected to be available to implement the recommended programs and infrastructure improvements in Lexington Area from now until the year 2030. The projections will be used as the control totals in the Transit Model presented in Chapter 3 to design and compare the alternative transit system improvement plans. FY 2005 allocations are used as the basis of forecasting funding. All funding references are denoted in present-day, uninflated dollars.

In the following sections, each category of federal funding (FTA 5307, FTA 5309, FTA 5310, and CMAQ) and local funding (local tax levy, passenger fares, and LFUCG assistance) are described and analyzed, and a forecast for FY 2006 through FY 2030 are completed.

5.1 Section 5307 Urbanized Area Formula Program

This category is granted to urbanized areas and states for eligible capital and/or preventive maintenance activities. The eligible activities include planning, engineering design and evaluation of transit projects and other technical transportation-related studies; capital investments in bus and bus-related activities such as replacement of buses, overhaul of buses, rebuilding of buses, crime prevention and security equipment and construction of maintenance and passenger facilities; and capital investments in new and existing fixed guideway systems including rolling stock, overhaul and rebuilding of vehicles, track, signals, communications, and computer hardware and software. All preventive maintenance and some Americans With Disabilities Act complementary paratransit service are considered capital costs. It should be mentioned that TEA-21 no longer funds operating expenses for urbanized areas with populations of 200,000 or more. However, Congress has expanded the definition of "capital" to include preventive maintenance. This change in definition was coupled with an increase in capital funding which more than offset the loss in operating revenue. In addition, one percent of the funding apportioned to each such urbanized area must be used for transit enhancement activities such as historic preservation, landscaping, public art, pedestrian access, bicycle access, or access for the disabled.

For areas with populations of 200,000 and more, the funding is apportioned on the basis of a multi-tiered statutory formula. The formula is based on a combination of population and population density, bus revenue vehicle miles, bus passenger miles, and fixed guideway revenue vehicle miles as well as fixed guideway route miles.

One of the best methods to project a financial growth related to population, the level of deployment, or use of the mode (vehicle/passenger miles) is the Life-Cycle model. The basic concept of the model is that any socioeconomic activity has a life cycle which can be divided into three or four phases, including a birthing phase, a growth-development phase, a mature phase, and perhaps a declining phase. The model uses the following three-parameter logistic function, which is an S-curve (status vs. time), to identify the periods of life cycle.

$S(t) = K/[1+\exp(-b(t- t_0)]$
where:
S(t) is the status measure, (e.g. Funding, Population, or Vehicle/Passenger-km traveled)
t is time (usually in years),
t_0 is the inflection time (year in which 1/2 K is achieved),
K is saturation status level,
b is a coefficient.

Regression method is employed to estimate K, t_0, and b based on the "observed" values for FY 2003 to FY 2010. Figure 5-1 displays the projected FTA Section 5307 funds for FY 2006 through FY 2030 as well as the "observed" values for FY 2003 to FY 2010. The "observed" values for FYs 2003, 2004, and 2005 are from Federal Register. To generate a larger sample size and take a better control of forecasting, FY 2006 is assumed to increase by 3% and FYs 2007 to 2010 are assumed to increase by 2.7%. The regression output is summarized as below. Table 5-1 lists the actual funding for FY 2005 and the projected values for FY 2006 through FY 2030. Approximately $102,801,082 in Section 5307 funding is forecast to be available for Lexington area between FY 2006 and FY 2030 (Table 5-2).

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.990089
R Square	0.980277
Adjusted R Square	0.976989
Standard Error	0.031436
Observations	8

Variable	Value
K =	5,000,000
t_0=	1998.331985
b=	0.083765125

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-167.391	9.73295	-17.1983	2.47E-06	-191.206	-143.575	-191.206	-143.575
X Variable 1	0.083765	0.004851	17.26864	2.42E-06	0.071896	0.095634	0.071896	0.095634

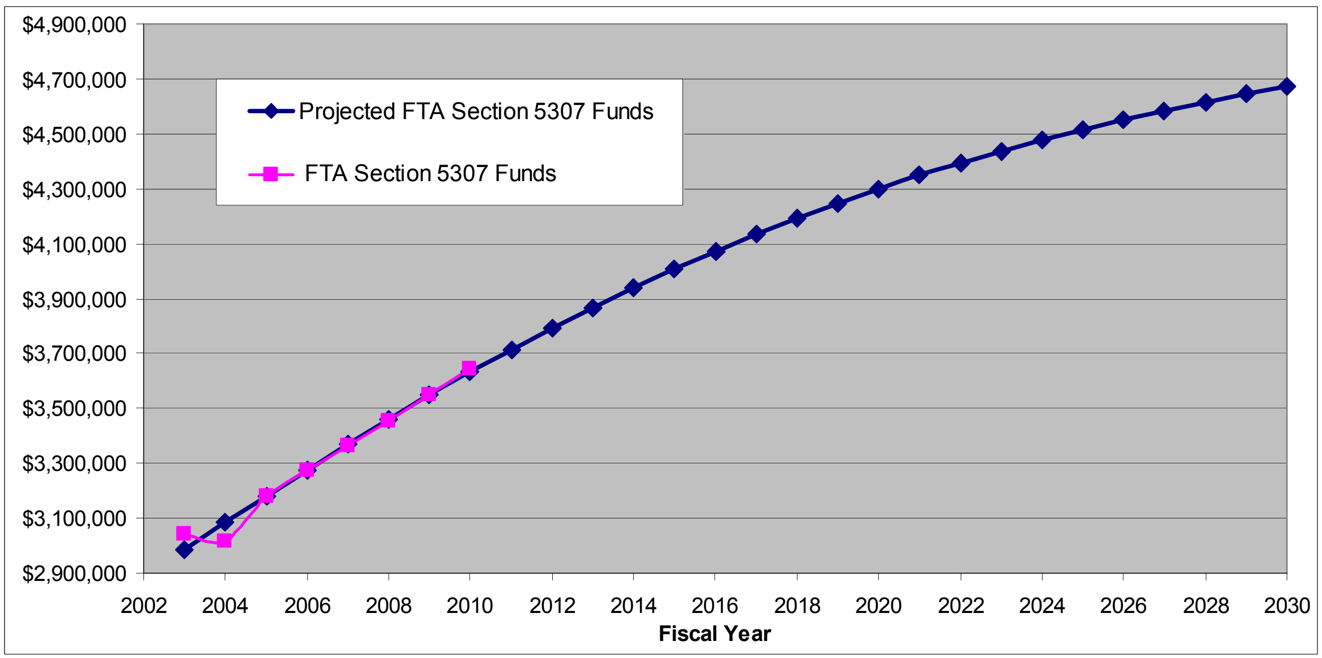


Figure 5-1 FTA Section 5307 funding projection

5.2 Section 5309 Capital Investment Programs

This category is funded under Capital Investment Grants, and it provides funds for large projects that can not be funded from a transit agency's formula apportionment. Grants may be made to assist in financing bus and bus-related capital projects that will benefit the country's transit systems. The eligible activities include acquisition of buses for fleet and service expansion, bus maintenance and administrative facilities, transfer facilities, bus malls, transportation centers, intermodal terminals, park-and-ride stations, acquisition of replacement vehicles, bus rebuilds, bus preventive maintenance, passenger amenities such as passenger shelters and bus stop signs, accessory and miscellaneous equipment such as mobile radio units, supervisory vehicles, fareboxes, computers, shop and garage equipment, and costs incurred in arranging innovative financing for eligible projects.

The grants are allocated at the discretion of the Secretary although Congress fully earmarks all available funding. There was no Section 5309 funding programmed to Lexington Area in FY2005. The average funding amount for FY 2002, FY2003, and FY2004 is $1,175,101, which is used as the benchmark and applied to each fiscal year from 2006 to 2030 with no annual increase forecast. Approximately $29,377,517 in Section 5309 discretionary funding is forecast to be available for Lexington Area between FY 2006 and FY 2030 (Table 5-2).

5.3 Section 5310 Elderly and Persons with Disabilities Formula Program

This category is used to fund transportation services to meet the special needs of the elderly and persons with disabilities. Most funds in this category are used to purchase vehicles, but acquisition of transportation services under contract, lease or other arrangements and state program administration are also eligible expenses. Eligible equipment includes small buses and vans, with or without wheelchair accessibility options, computer equipment and radio base stations.

As the direct receipt of the funding, the Bluegrass Area Chapter of the American Red Cross is in cooperation with LexTran to operate the Wheels Door-to-Door Service. This service has been created for persons who have some type of disability which prevents them from utilizing regular LexTran buses. Wheels offers wheelchair lift equipped mini-buses on a demand/response system providing door-to-door service.

The funds are allocated by a formula that considers the number of elderly individuals and individuals with disabilities in each State. Assuming the elderly and disabled populations have the same growth rate as the general population, the

funding could be projected according to the growth tendency of the general population. The Life-Cycle model is again employed to forecast the population growth, and US census data from 1950 to 2000 are used as the "observations" to estimate the three parameters K, t_0, and b of the logistic function $S(t) = K/[1+\exp(-b(t-t_0))]$. The regression output is summarized as below. Figure 5-2 displays the projected population for Lexington area for the years 1950 through 2030 (the values displayed are the projected data). It is noted that the projected population for the year 2030 (342,378) by the Life-Cycle model is very close to the estimation of a recently completed study by Bernardin, Lochmueller & Associates (BLA). In BLA's study, the total population of Fayette County is estimated to be 343,320 persons in the year of 2030.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.996819
R Square	0.993648
Adjusted R Square	0.99206
Standard Error	0.047612
Observations	6

Variable	Value
K =	446256.46
t0=	0.028469655
b=	1988.10664

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-56.6007	2.247922	-25.1791	1.48E-05	-62.842	-50.3595	-62.842	-50.3595
X Variable 1	0.02847	0.001138	25.01406	1.52E-05	0.02531	0.03163	0.02531	0.03163

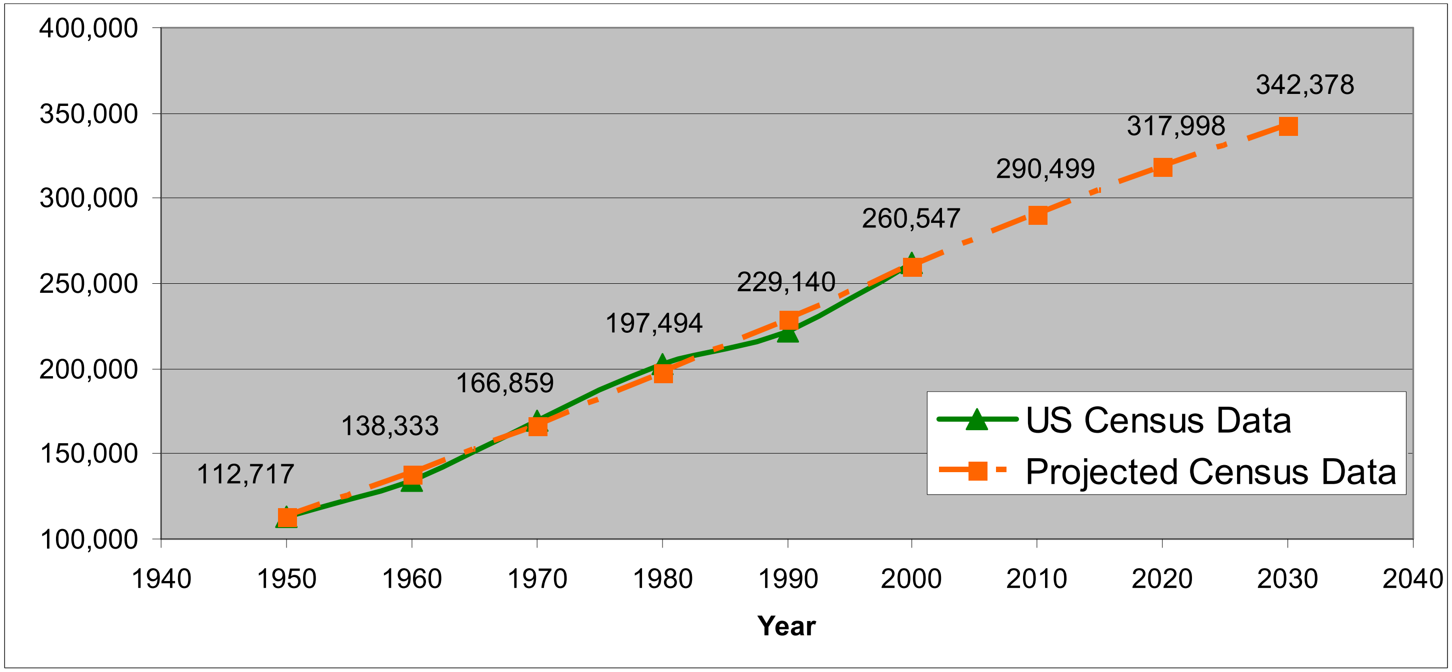


Figure 5-2 Population projection

The projections for the years 2010, 2020, and 2030 as well as the population for the year 2005 are used as the control points, and the growth rate between each pair of control points is assumed to be constant. FY 2005 FTA Section 5310 funding $250,000 is used as the benchmark, and it is projected to each fiscal year from 2006 to 2030 according to the population growth rates (Figure 5-3 and Table 5-1). Approximately $7,080,592 in Section 5310 funding is forecast to be available for Lexington area between FY2006 and FY2030 (Table 5-2).

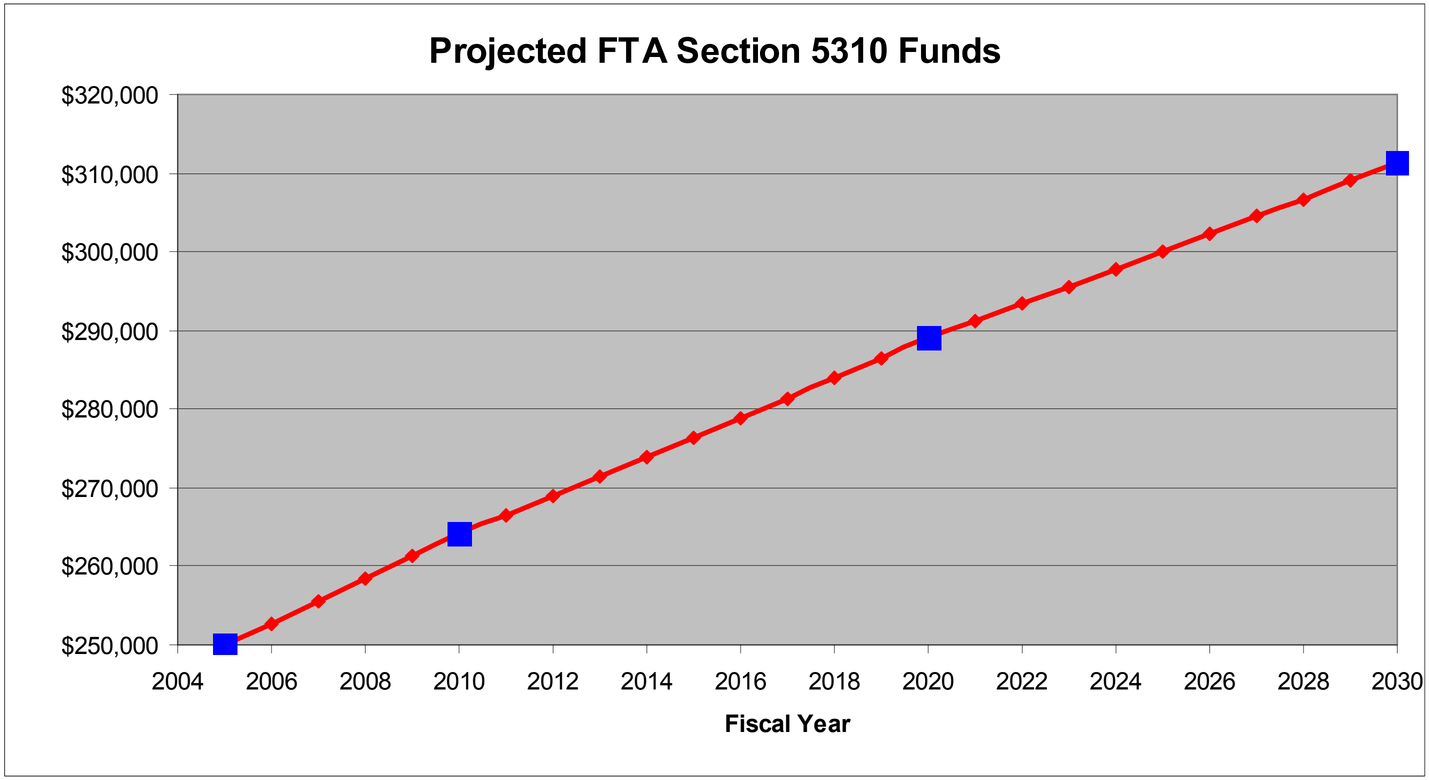


Figure 5-3 FTA Section 5310 funding projection

5.4 Congestion Mitigation and Air Quality (CMAQ) Improvement Program

The CMAQ program is one source of funds for the purposes of reducing congestion and improving air quality. In 1990, Congress amended the Clean Air Act (CAA) to bolster America's efforts to attain the National Ambient Air Quality Standards (NAAQS). The amendments required further reductions in the amount of permissible tailpipe emissions, initiated more stringent control measures in areas that still failed to attain the NAAQS (nonattainment areas), and provided for a stronger, more rigorous linkage between transportation and air quality planning. The CMAQ program, jointly administered by the FHWA and the Federal Transit Administration (FTA), was reauthorized in 1998 under the Transportation Equity Act for the 21st Century (TEA-21).

On November 15, 1990, Fayette and Scott Counties together were designated by the United States Environmental Protection Agency (USEPA) as a "non-attainment" air quality district for the pollutant ozone because of violations of National Ambient Air Quality Standards (NAAQS) in the period 1987-1989. Based on the severity of violations, the area was designated as “marginal” non-attainment. In 1995, the Kentucky Environmental and Public Protection Cabinet’s Division for Air Quality submitted a re-designation request for the area due to consistent monitoring of attainment data, and the area was re-designated to "attainment" but required to maintain standards by showing conformity to the State Implementation Plan (SIP). In 2004, the KY Division for Air Quality (DAQ) completed the quality assurances of the Particulate Matter (PM) 2.5 monitor readings averages from the years 2002 – 2004. These monitor averages places Fayette County in attainment for the PM 2.5 standard. Therefore, the DAQ has recommended that the EPA issue a final designation of attainment for the PM 2.5 air quality standard. A finding of attainment would remove the requirement for PM 2.5 air quality conformity process for Lexington Area MPO. The EPA is expected to issue the final PM 2.5 determination for Fayette County in April 2005.

Once the final designation of attainment is completed, there would be no more CMAQ funding programmed to the area after FY2006. The CMAQ funding for FY2006 is assumed to remain at the same level of FY2005 ($2,006,374).

5.5 Local Property Tax levy

A property tax levy was approved to support LexTran by the voters of Fayette County, Kentucky in November, 2004. The tax levy is expected to generate six cents per $100 of assessed property value annually. The Life-Cycle model is used again for forecasting analysis purposes, and the property tax statistics for FY 2002, FY 2003, and FY 2004 are used as the “observations” to estimate the three parameters K, t_0, and b of the logistic function $S(t) = K/[1+\exp(-b(t-t_0))]$. The regression output is summarized as below. Figure 5-4 displays the projected property tax for FY 2002 through FY 2030. The tax levy for LexTran is derived from the projected property tax using the following formula (Table 5-3):

$$\text{Property Tax Levy for LexTran} = 0.06 \times (\text{Projected Property Taxes} / \text{Property Tax Rate})/100$$

Figure 5-5 displays the projection of the property tax levy for LexTran for FY 2006 through FY 2030. The levy for FY 2006 is significantly less than the sequential years because the levy will be effective by November, 2005 and there are four months in FY 2006 (July, August, September, and October, 2005) having no LexTran tax levy. Approximately

$321,986,199 local property tax levy is forecast to be available for supporting LexTran between FY2006 and FY2030 (Table 5-2).

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.999998
R Square	0.999995
Adjusted R Square	0.99999
Standard Error	0.000575
Observations	3

Variable	Value
K =	230000000
t0=	0.182663109
b=	1998.853457

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-365.117	0.813828	-448.641	0.001419	-375.457	-354.776	-375.457	-354.776
X Variable 1	0.182663	0.000406	449.5721	0.001416	0.177501	0.187826	0.177501	0.187826

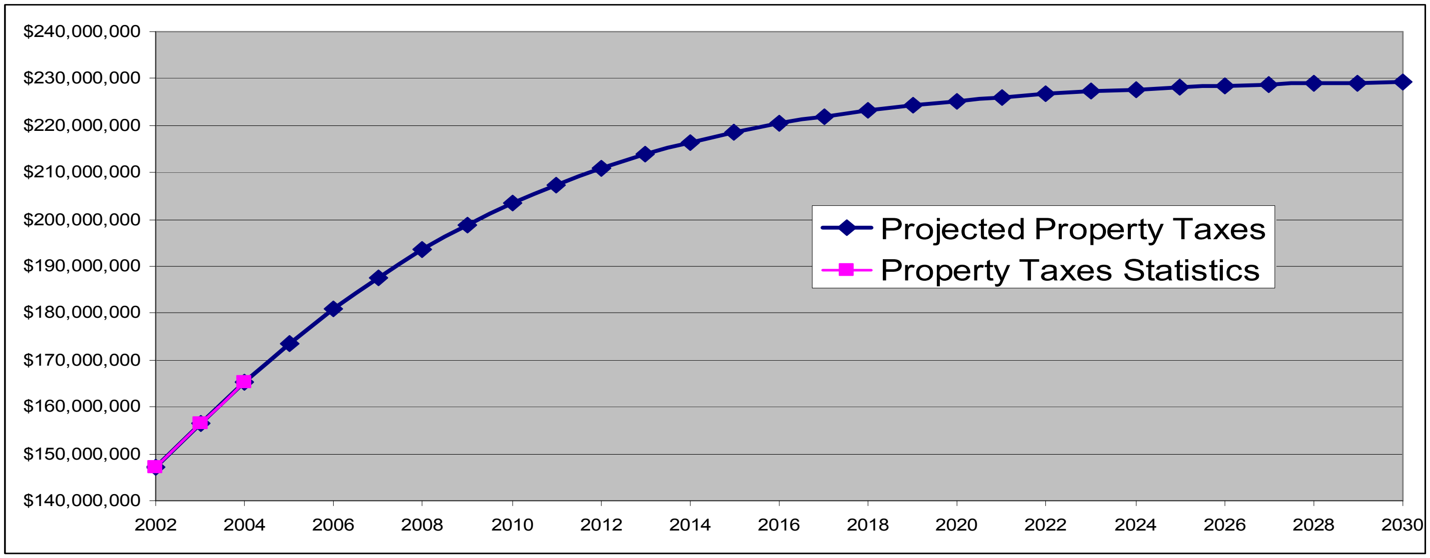


Figure 5-4 Local property tax projection

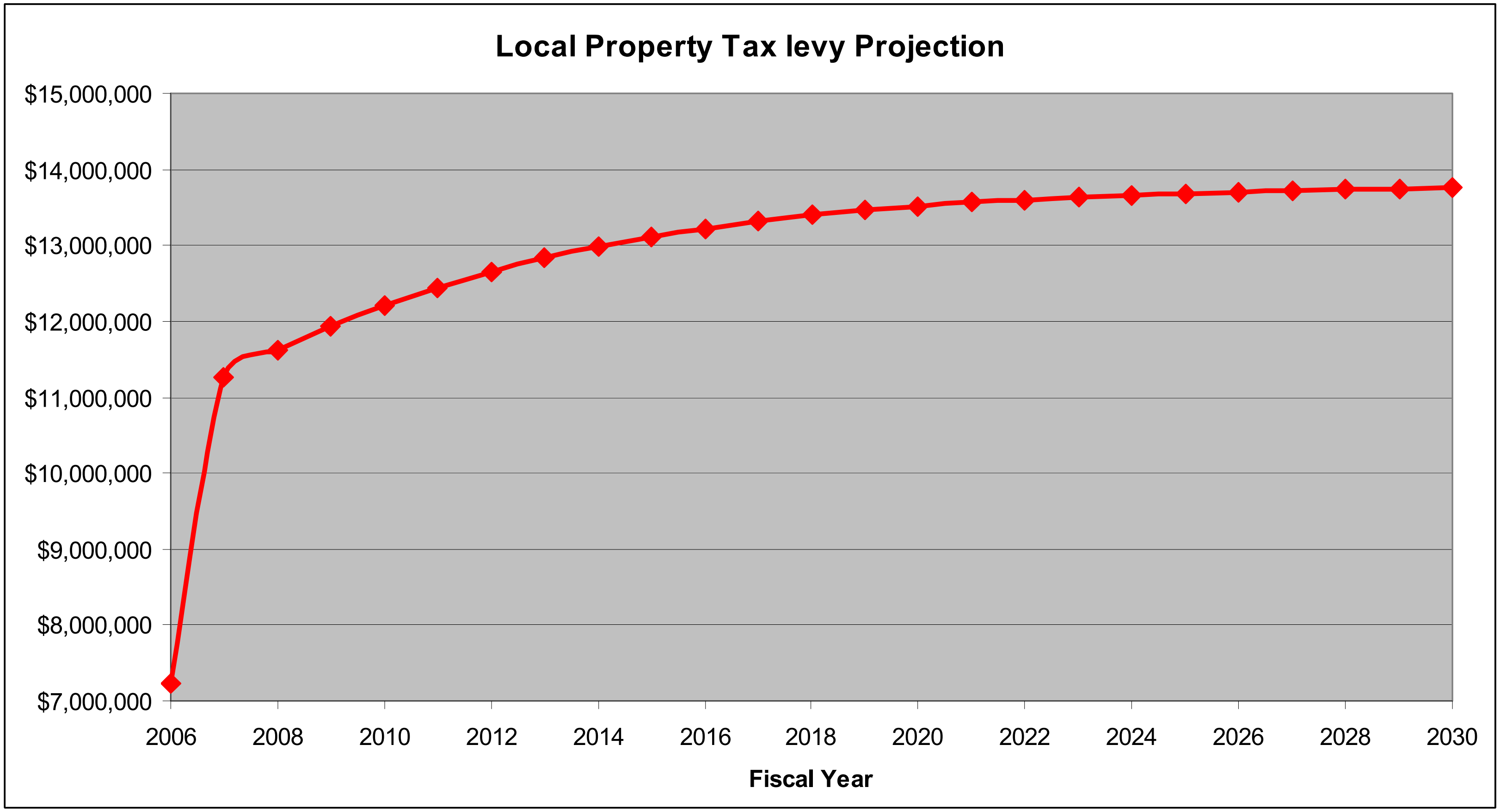


Figure 5-5 Local property tax levy for LexTran projection

5.6 Passenger Fare Revenue

Passenger fare revenue is associated with local population, bus revenue vehicle miles, bus passenger miles, and bus level of service. Although transit service improvements would be expected to generate more ridership, no study has been conducted for Lexington area to quantify the relationship between ridership and service improvements. For financial forecasting analysis purposes, passenger fare revenue is projected according to the growth tendency of the general population assuming the current mode split trends continue. FY 2005 passenger fare revenue $628,447 is used as the benchmark, and it is projected to each fiscal year from 2006 to 2030 according to the population growth rates (Figure 5-6 and Table 5-1). Approximately $17,799,107 passenger fare revenue is forecast to be generated between FY2006 and FY2030 (Table 5-2). It should be noted that this is a conservative projection without counting the impacts of potential service improvements.

5.7 LFUCG Assistance

LFUCG provided $3 million financial assistance to LexTran in FY2005. The funding will not be available after FY2005 because of the approval of local property tax levy for LexTran.

Figures 5-7 and 5-8 display the financial resources for FY 2006 and FY 2030 respectively. Figure 5-9 displays the financial forecast for FY 2006 through FY 2030.

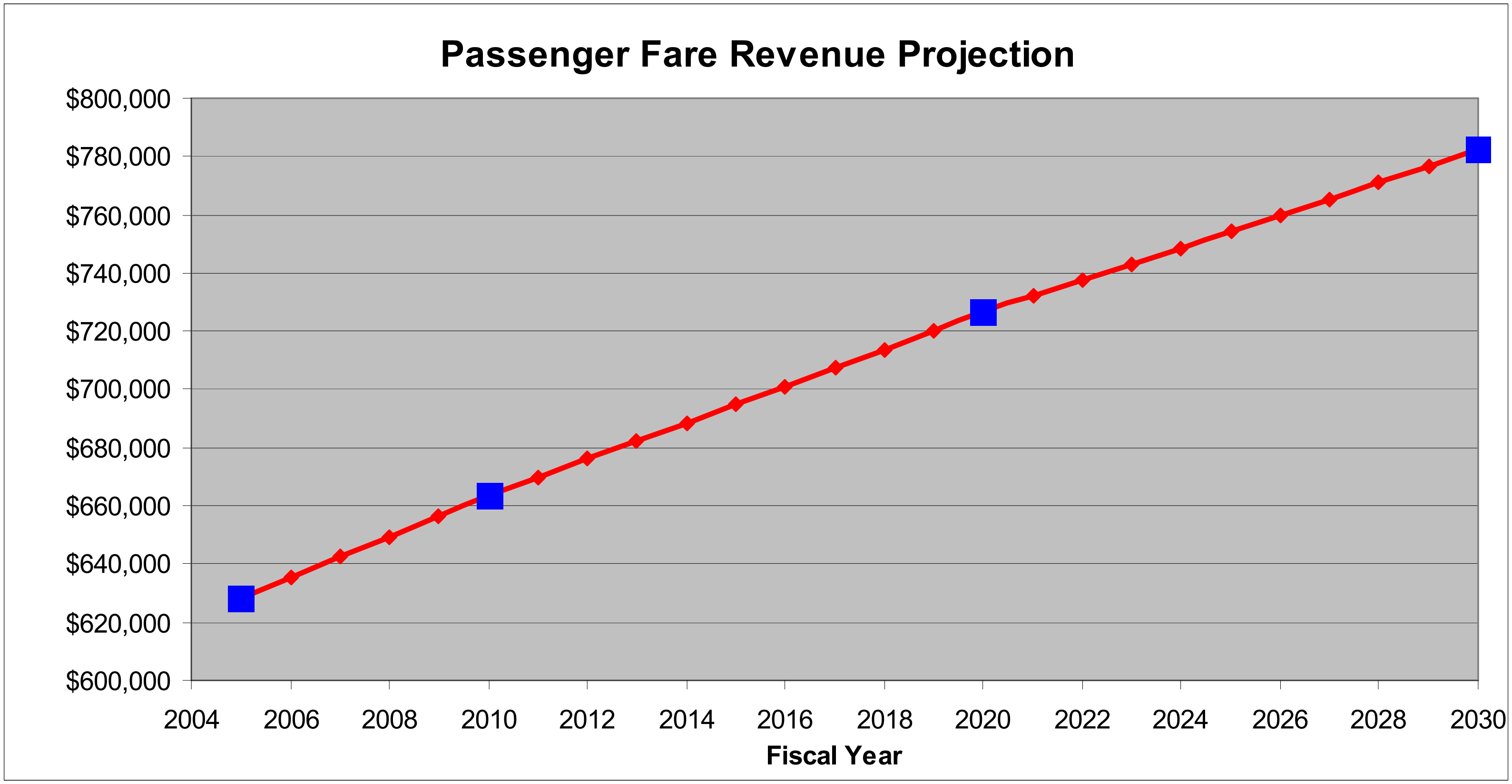


Figure 5-6 Passenger fare revenue projection

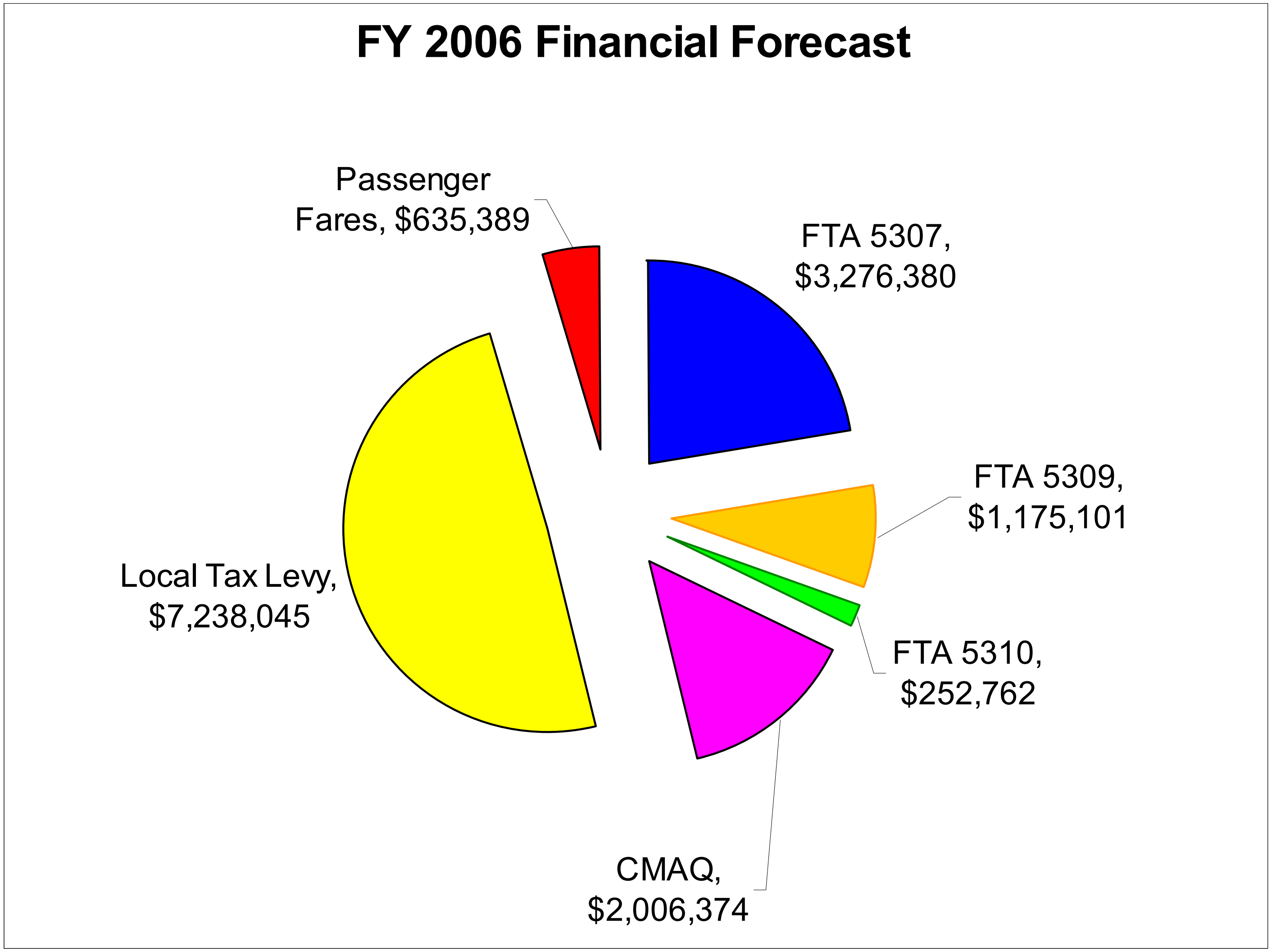


Figure 5-7 FY 2006 financial forecast

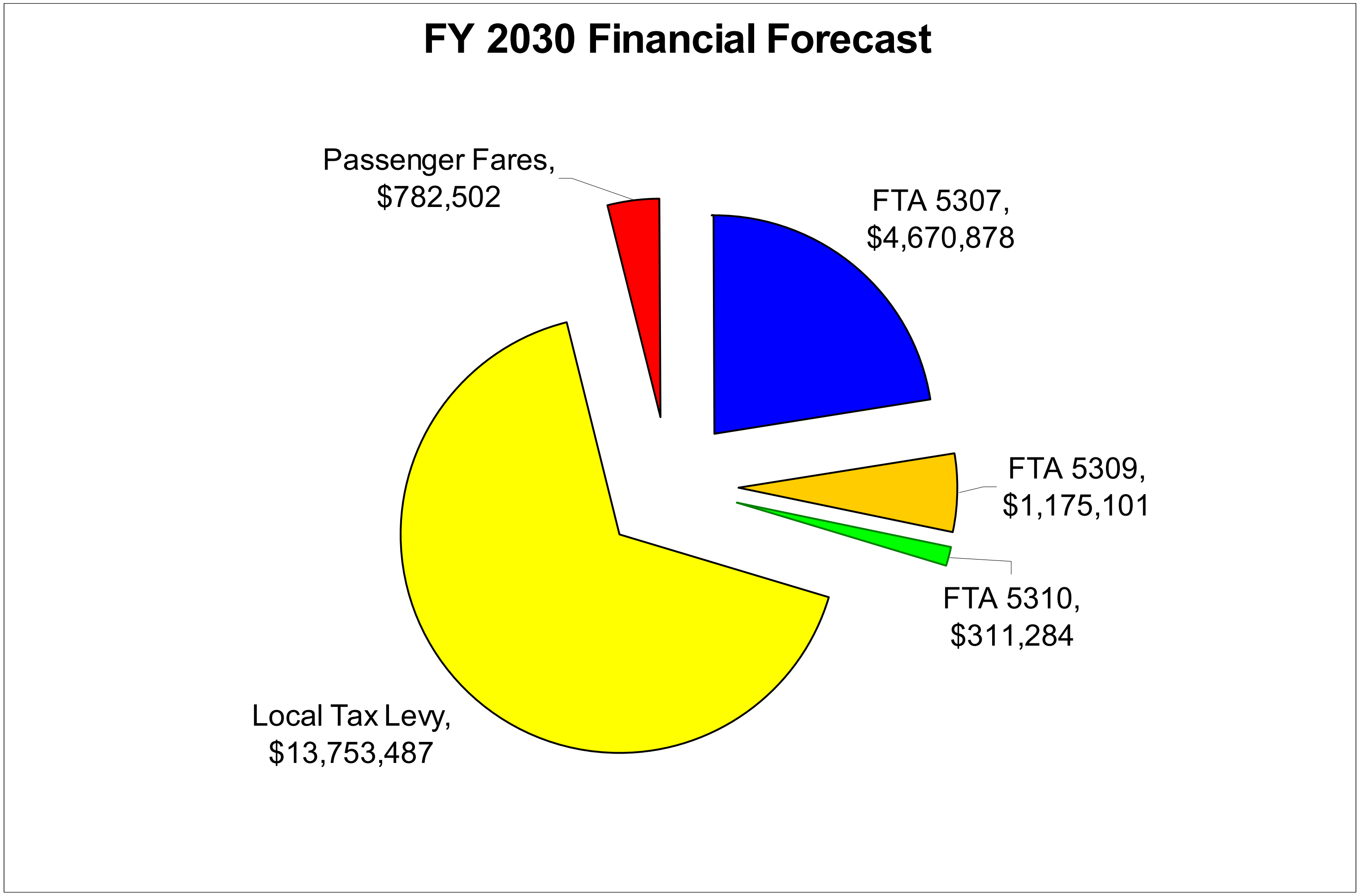


Figure 5-8 FY 2030 financial forecast

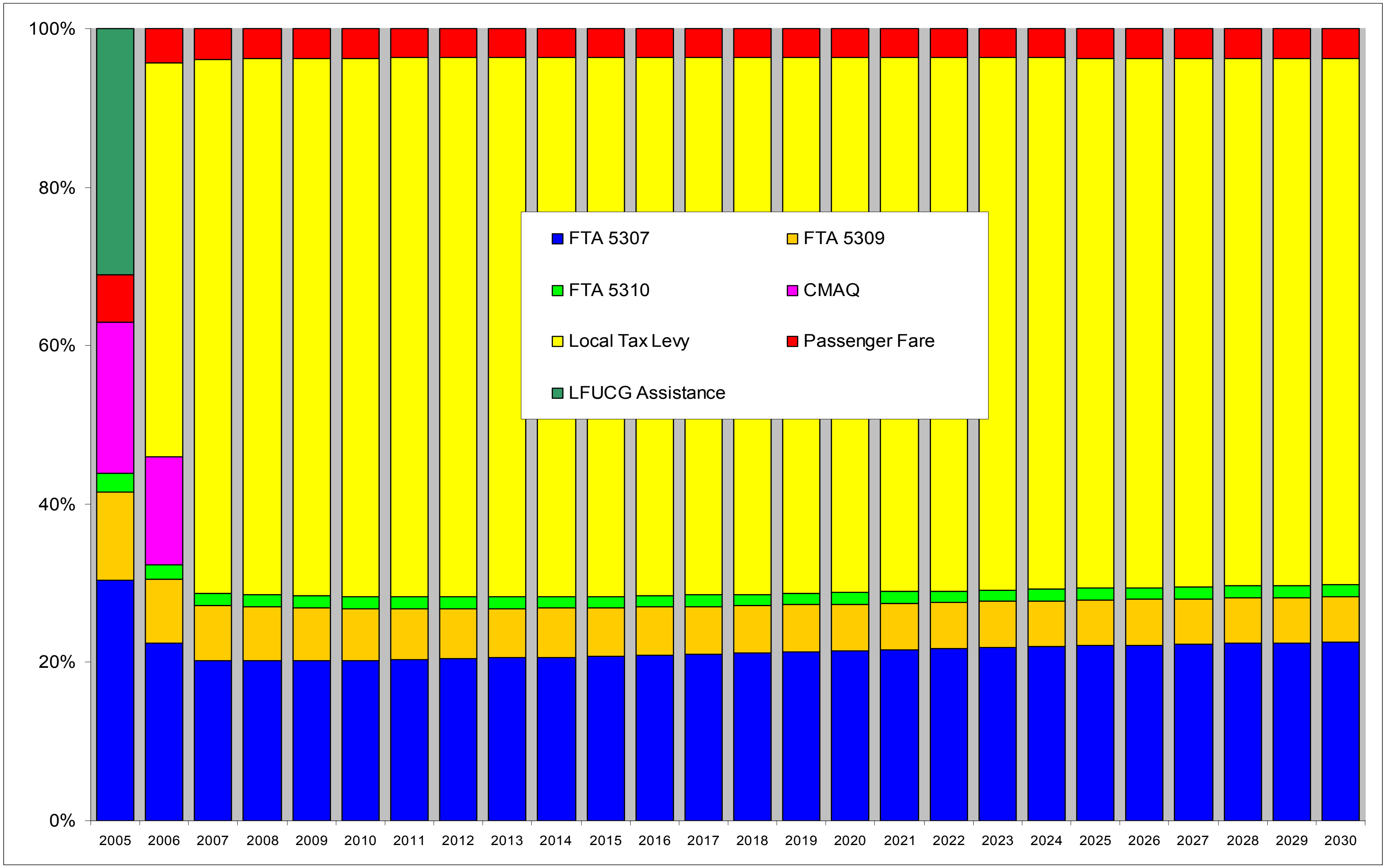


Figure 5-9 Financial forecast for FY 2006 through FY 2030

Table 5-1 Financial forecast for FY 2006 through FY 2030

Financial Resources	2005	2006	2007	2008	2009	2010	2011	2012
FTA 5307	$3,181,188	$3,276,380	$3,369,719	$3,460,380	$3,548,170	$3,632,933	$3,714,540	$3,792,893
FTA 5309	$1,175,101	$1,175,101	$1,175,101	$1,175,101	$1,175,101	$1,175,101	$1,175,101	$1,175,101
FTA 5310	$250,000	$252,762	$255,554	$258,377	$261,231	$264,117	$266,516	$268,938
CMAQ	$2,006,374	$2,006,374	–	–	–	–	–	–
Local Tax Levy	–	$7,238,045	$11,257,886	$11,615,100	$11,930,455	$12,206,537	$12,446,475	$12,653,677
Passenger Fares	$628,447	$635,389	$642,408	$649,504	$656,679	$663,933	$669,965	$676,052
LFUCG Assistance	$3,254,020	–	–	–	–	–	–	–
Total	$10,495,130	$14,584,050	$16,700,668	$17,158,461	$17,571,636	$17,942,620	$18,272,597	$18,566,661

Financial Resources	2013	2014	2015	2016	2017	2018	2019	2020	2021
FTA 5307	$3,867,927	$3,939,600	$4,007,900	$4,072,835	$4,134,439	$4,192,760	$4,247,867	$4,299,840	$4,348,772
FTA 5309	$1,175,101	$1,175,101	$1,175,101	$1,175,101	$1,175,101	$1,175,101	$1,175,101	$1,175,101	$1,175,101
FTA 5310	$271,381	$273,847	$276,335	$278,845	$281,379	$283,935	$286,515	$289,118	$291,262
CMAQ	–	–	–	–	–	–	–	–	–
Local Tax Levy	$12,831,628	$12,983,736	$13,113,230	$13,223,094	$13,316,031	$13,394,456	$13,460,496	$13,516,011	$13,562,607
Passenger Fares	$682,194	$688,393	$694,647	$700,958	$707,327	$713,753	$720,238	$726,782	$732,170
LFUCG Assistance	–	–	–	–	–	–	–	–	–
Total	$18,828,231	$19,060,676	$19,267,212	$19,450,834	$19,614,276	$19,760,005	$19,890,217	$20,006,851	$20,109,912

Financial Resources	2022	2023	2024	2025	2026	2027	2028	2029	2030
FTA 5307	$4,394,766	$4,437,931	$4,478,383	$4,516,241	$4,551,627	$4,584,662	$4,615,469	$4,644,168	$4,670,878
FTA 5309	$1,175,101	$1,175,101	$1,175,101	$1,175,101	$1,175,101	$1,175,101	$1,175,101	$1,175,101	$1,175,101
FTA 5310	$293,421	$295,597	$297,789	$299,996	$302,221	$304,462	$306,719	$308,993	$311,284
CMAQ	–	–	–	–	–	–	–	–	–
Local Tax Levy	$13,601,671	$13,634,385	$13,661,757	$13,684,644	$13,703,769	$13,719,741	$13,733,076	$13,744,203	$13,753,487
Passenger Fares	$737,599	$743,068	$748,577	$754,128	$759,719	$765,352	$771,026	$776,743	$782,502
LFUCG Assistance	–	–	–	–	–	–	–	–	–
Total	$20,202,558	$20,286,081	$20,361,607	$20,430,110	$20,492,436	$20,549,318	$20,601,391	$20,649,209	$20,693,253

Table 5-2 Financial forecast summary FY 2006 - FY 2030

Financial Forecast Summary FY 2006 - FY 2030	
FTA 5307	$102,801,082
FTA 5309	$29,377,517
FTA 5310	$7,080,592
CMAQ	$2,006,374
Local Tax Levy	$321,986,199
Passenger Fares	$17,799,107
Total	$481,050,870

Table 5-3 Property tax levy for LexTran projection

Fiscal Year	Property Tax Statistics	Projected Property Taxes $S(t) = K/[1+\exp(-b(t-t_0))]$	Property Tax Levy for LexTran = 0.06 *(Projected Property Taxes / Property Tax Rate)/100
2002	147,155,408	147,167,841	--
2003	156,605,935	156,582,487	--
2004	165,385,905	165,396,803	--
2005		173,534,503	--
2006		180,951,127	7,238,045 (eight months)
2007		187,631,435	11,257,886
2008		193,585,002	11,615,100
2009		198,840,912	11,930,455
2010		203,442,288	12,206,537
2011		207,441,253	12,446,475
2012		210,894,617	12,653,677
2013		213,860,459	12,831,628
2014		216,395,596	12,983,736
2015		218,553,836	13,113,230
2016		220,384,901	13,223,094
2017		221,933,857	13,316,031
2018		223,240,935	13,394,456
2019		224,341,608	13,460,496
2020		225,266,843	13,516,011
2021		226,043,456	13,562,607
2022		226,694,513	13,601,671
2023		227,239,745	13,634,385
2024		227,695,957	13,661,757
2025		228,077,404	13,684,644
2026		228,396,146	13,703,769
2027		228,662,354	13,719,741
2028		228,884,593	13,733,076
2029		229,070,058	13,744,203
2030		229,224,790	13,753,487

Appendix A Public input form I: the general questions about LexTran

Lexington Area MPO · Public Information / Input She

Lexington Area MPO · Public Information / Input Sheet

Help us design a better bus system!!

Bus Service Coverage

Would you please tell us the names / locations of the facilities (such as airports, hospitals, and schools, etc) and the residential, commercial, industrial, institutional, and other employment areas, where bus service is limited, inconvenient, or unavailable? We will improve bus service in these areas.

Service Frequency and Service Hours

Would you please tell us your:

- desirable frequencies of service for the peak and base periods, daytime and evening, and weekday and weekend;
- desirable hours of service for weekday and weekend;
- desirable hours of special service to schools, shopping centers, industry and institutions, etc?

Level of Service

Would you please tell us if:

- there are other routes for bus travel in your neighborhood which would be more efficient and would allow shorter travel times;
- the places you frequent (your home, workplace, or shopping, etc) are not within acceptable walking distances to a bus stop;
- you usually have to transfer more than two times for travel within the urban area;
- we need to provide special service to transportation-disadvantaged people, e.g. elderly and/or disabled?

Fleet Age and Conditions

Are you satisfied with the interior and/or operational conditions of our LexTran buses? Which buses (Route #) should be renovated or replaced?

Transit Center Safety

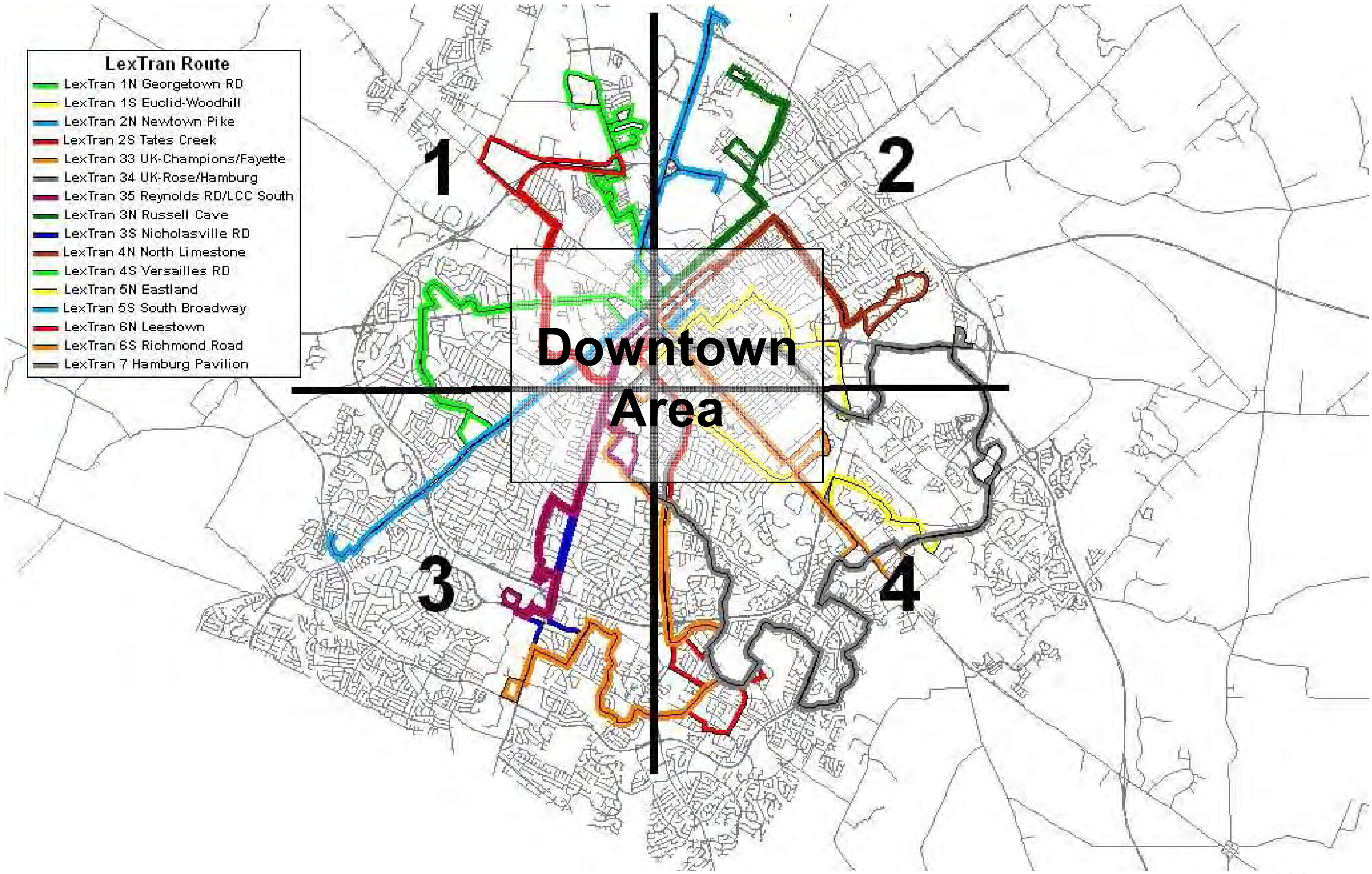
Safety improvement focus group will begin discussions in February 2005 in order to improve the safety of pedestrians crossing Vine St. in front of the Transit Center between Limestone St and Quality St. Public opinions are essential to good decision-making. Please tell us your suggestions about the pedestrian safety issue.

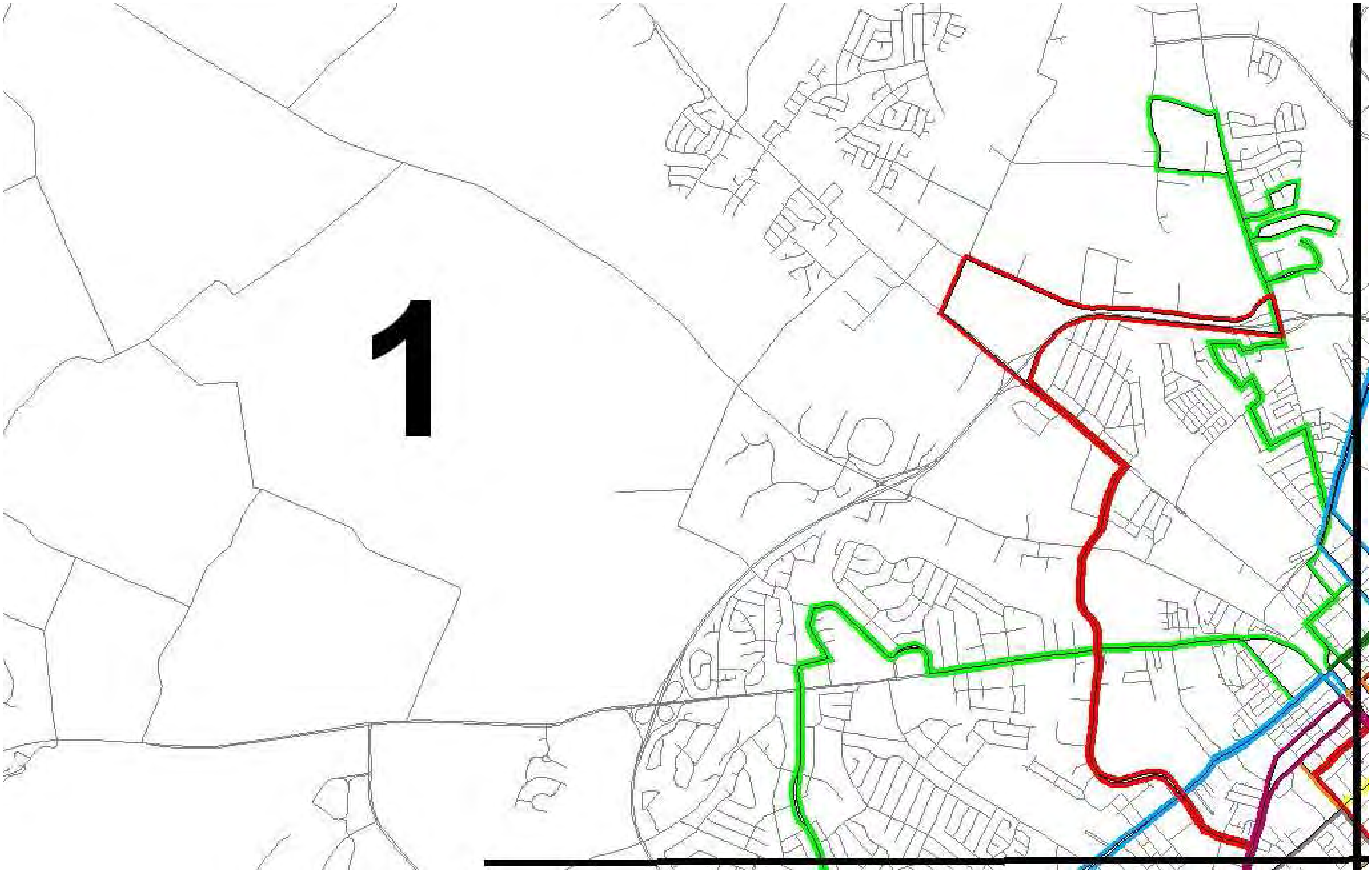
Appendix B Public input form II: bus stops and bus shelters

PUBLIC INFORMATION / INPUT SHEET	
The integration of bus stop with crosswalk and sidewalk	Your Advice
Would you please identify the names of the streets where the placement and/or design of their bus stop zones cause discomfort, inconvenience, or even danger to passengers, pedestrians or cyclists? FYI: a recently completed study on pedestrian accidents found that approximately 2 percent of pedestrian accidents in urban areas and 3 percent in rural areas are related to bus stops. These accidents are mainly caused by 1) The placement of the bus stops (pedestrians stepped into the street in front of a stopped bus and were struck by vehicles moving in the adjacent lane); such accidents can be reduced by relocating the bus stop from the near side of an intersection to the far side, thus encouraging the pedestrians to cross the street from behind the bus instead of in front of it. 2) Lighting. 3) Pavement conditions in the curb lane (especially for elder and disable people).	
The pavement conditions of bus stops	Your Advice
Would you please identify the names of the streets where the pavement conditions of their bus stop zones cause discomfort, inconvenience, or even danger to passengers (especially considering wheelchair riders), pedestrians or cyclists?	
Location of pedestrian crosswalks	Your Advice
A minimum clearance distance of 5 feet between a pedestrian crosswalk and the front or rear of a bus stop is desirable. Would you please identify the names of the streets where this requirement is not met?	
Bicycle lanes and thoroughfares	Your Advice
When a bike lane and a bus stop are both present, the operators need to be able to see cyclists in both directions while approaching the stop. Sufficient sight distance for cyclists to stop safely upon encountering a stopped bus is also needed. Would you please identify the names of the streets where this requirement is not met?	
Bikes on buses	Your Advice
Do you think if we need more bicycle racks attached to the buses, and do you think if it is necessary to have improved on-vehicle bus storage programs?	
Other issues	Your Advice

Appendix C Public input form III: new service requirements

The Lexington urban area is divided into zones 1 to 4 and downtown area, a map for each area is provided, and we would like to have you identify on the maps the locations of new bus service you need most.

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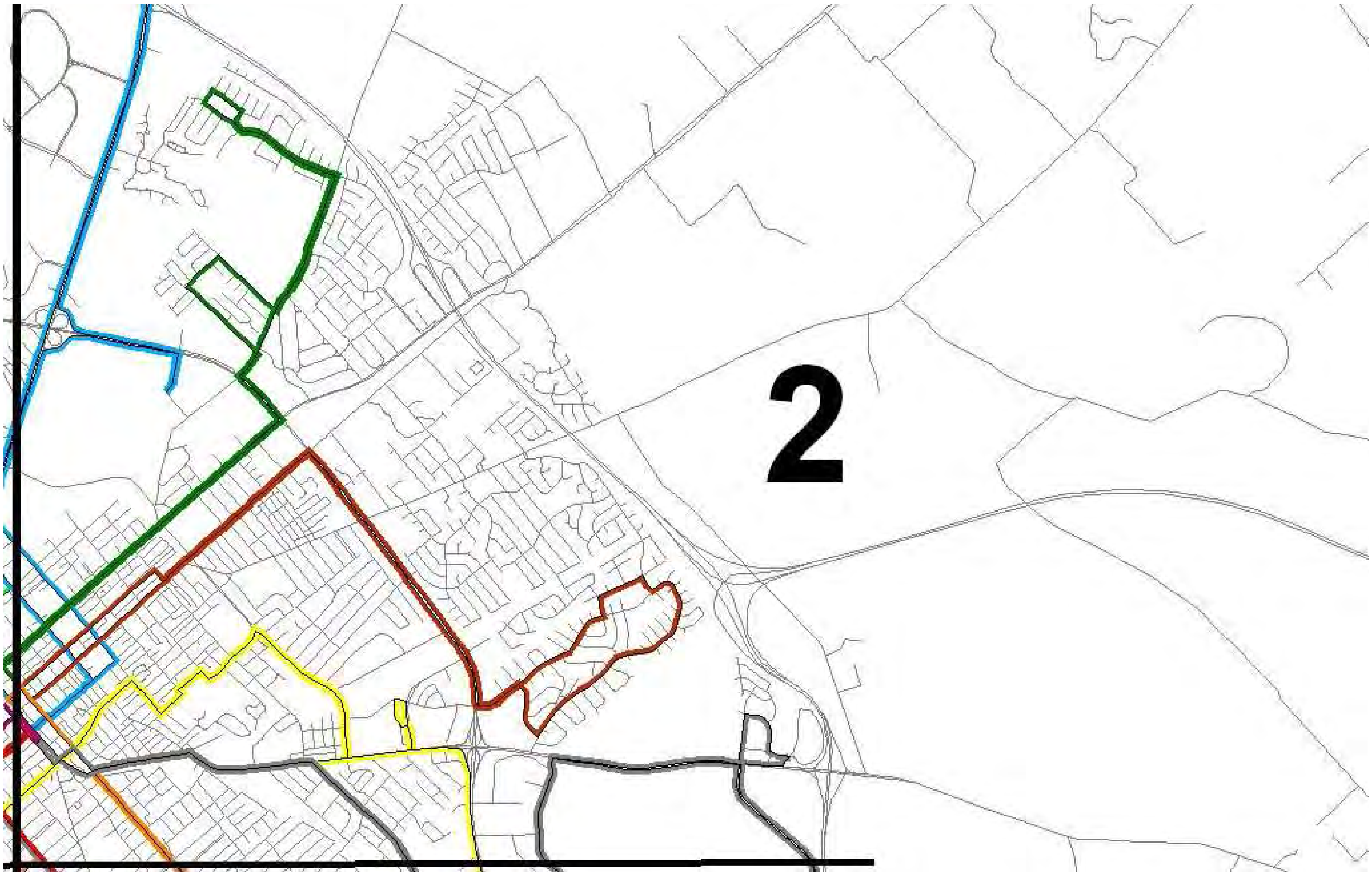
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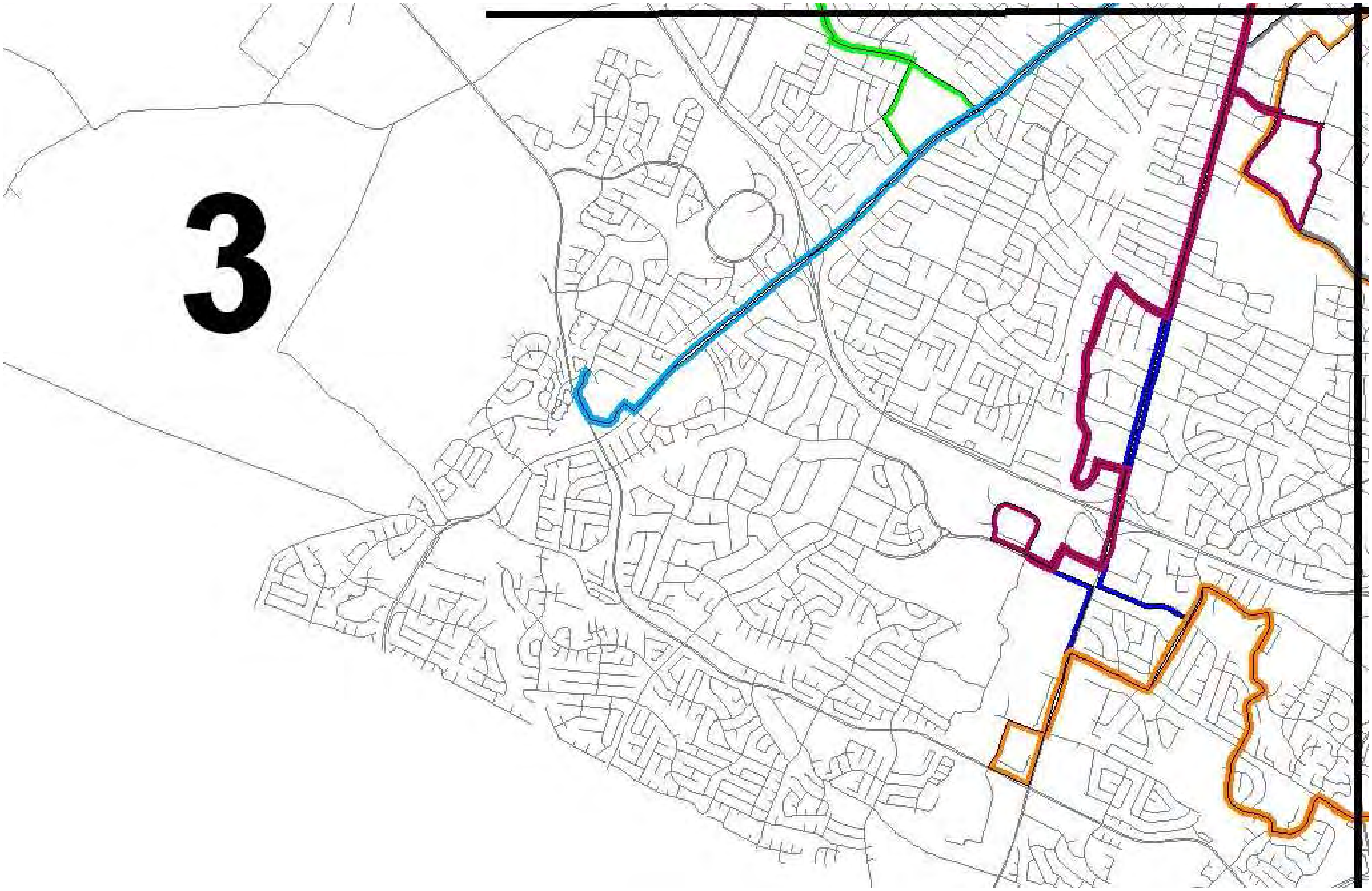
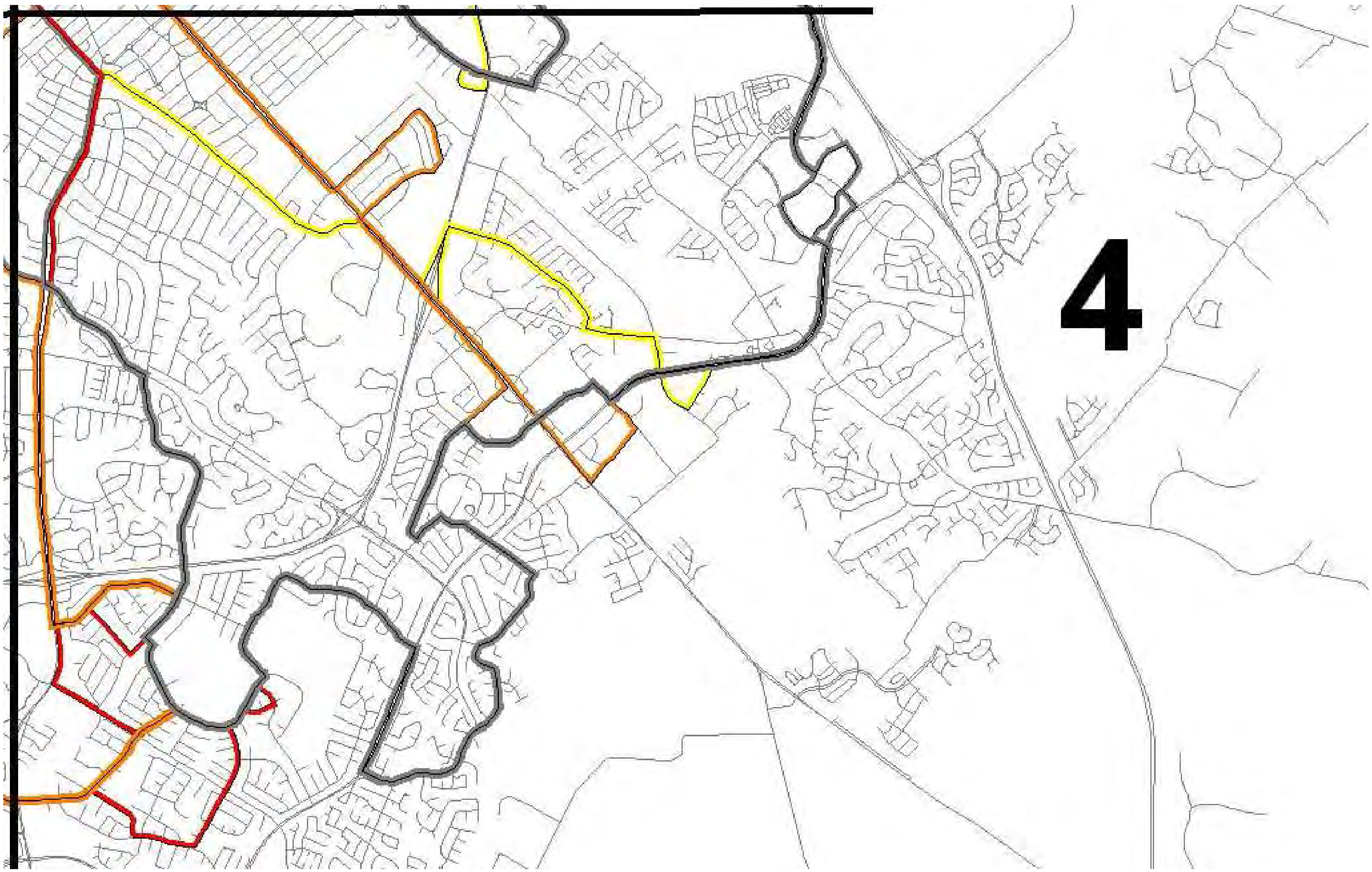

3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Downtown Area

Appendix D February 1st, 2005 Public meeting flyer

Transportation
In Your Community

Talk directly with Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) officials!

This public meeting is sponsored by the U.S. Dept. of Transportation and part of a review that will make sure that the Lexington Area Metropolitan Planning Organization is complying with federal regulations.

When: February 1st, 2005 7:00 pm – 8:30 pm
Where: Joseph-Beth Booksellers on the Top Floor in Lexington Green Shopping Center, off Nicholasville Rd.

LEXINGTON AREA METROPOLITAN PLANNING ORGANIZATION

Win one of two $25 Joseph-Beth Gift Cards!

Donated by Wilbur Smith Associates

(*Must be present to win*)

Sample Topics

- Transit Improvements:
  Where to place bus shelters?
- Roadway Improvements:
  Starshoot Pkwy. Bridge connecting Hamburg and Liberty Rd.?
- Congestion Relief:
  Reversible lanes on other major roads?
- Pedestrian and Bicycle:
  Add sidewalks and bike lanes to Southland Dr.?

What are your ideas?

Contact Bernadette Dupont (FHWA) at (502) 223-6729 for more information. Reasonable accommodations will be made for people with disabilities, call 48 hours prior to meeting date at (859) 258-3160. Spanish, Chinese and Turkish Translators will be present.

Appendix E Stakeholder survey

Interviewee 1	Comments
Lexington-Fayette Urban County Government (LFUCG) Economic Development Director **Date** September 8, 2004	The Director stated that the current public perception that ridership on LexTran was very low limited LexTran's ability to garner public support. It was thought that by using neighborhood circulators LexTran would be able to increase ridership and would be able to better serve the "pockets of need." The perceived weaknesses and limiting factors of LexTran included: perception of empty buses; past management; one television advertisement may have left the impression that LexTran service was just for the UK community; funding; and layout of the city. Improvements that he thought would help LexTran included: restore the service that was cut; bring back the downtown trolley; public education on taxes and benefits; and public Relations program to include publishing and advertising of monthly ridership numbers.
Interviewee 2	**Comments**
LFUCG Chief of Staff **Date** September 9, 2004	The Chief of Staff stated hat LexTran suffered from a public perception that the system is ill managed, provides poor service, and has low ridership. He thought a public promotion campaign would greatly improve that image along with a move to smaller buses so the non-riding public could see "full" buses. Since the mayor is promoting downtown Lexington, LexTran should attempt to work to enhance the downtown revitalization. One suggestion was to add bus stops and routes that served all parts of downtown through a trolley or circulator through the area.
Interviewee 3	**Comments**
LFUCG Assistant to Chief of Staff **Date** September 9, 2004	The Assistant is a daily rider of LexTran service. She stated the largest factor affecting riders was the move to one-hour headways from 30 minutes. This causes small errand trips that should last only 30 minutes or so to last up to two (2) hours possibly three (3) if an appointment runs late or you miss a bus. Also the loss of the Sunday service has impacted the riders. Another concern was the "holding" of buses at the transit center that delays trips. She was concerned about the lack of support for transit funding among some of the people who ride her bus on a daily basis. She stated that some felt they were already taxed for the service and paid a fare so why should they support a new tax.
Interviewee 4	**Comments**
Lexington Hotel Association **Date** September 7, 2004	The Vice President of the Lexington Hotel Association thought that LexTran provides a valuable connection between where people live and the employment location. Subsided transit passes were offered to hotel employees. When Sunday service was eliminated, the transit riders were unable to get to work. In order to avoid losing the employees and ensuring coverage of all work tasks, the hotel uses their shuttle van to transport these employees to work and back on Sundays. He felt that with proper funding, LexTran could restore the Sunday service and increase the frequency of service.
Interviewee 5	**Comments**
Fayette County School District **Date** September 7, 2004	The District's Transportation Supervisor stated that the Fayette County School District includes 54 schools and encompasses an area of 281 square miles. Most students attend school within their enrollment zone. But the District offers several magnet school programs and there are about 500 that participate in this. It also administers a No Child Left Behind program that also causes students to travel outside their enrollment zone. The District also transports special education students using thirty five (35) accessible buses. Local field trips are commonly made by groups of students to the Singletary Center, the Opera House and the Children's Museum. It was felt by the Transportation Supervisor that LexTran bus routes currently do not operate close enough to schools to have a significant impact on transportation needs.

Interviewee 6	Comments
LexTran Wheels **Date** September 8, 2004	The American Red Cross provides ADA Complementary Paratransit service under contract to LexTran. The Manager of Wheels, along with the rest of the staff, are employees of the American Red Cross. About sixty (60) percent of ARC revenues are through the LexTran contract. ARC also provides transportation to Title III and Medicaid funded clients through contracts with other agencies. ARC vehicles are purchased using FTA section 5310 funding, and in a few instances, LexTran provides local match. Most Wheels passengers reserve trips about one day in advance. Same day trips are taken if space is available. A self-certification process is used to determine eligibility where a doctor's or social worker's statement is accepted. In some areas Wheels service exceeds ADA requirements. Wheels provide Service throughout Fayette County and it does not use the ¾ mile from bus route limit to determine eligibility.
Interviewee 7	**Comments**
University of Kentucky Student Body President **Date** September 8, 2004	The Student Body President thought thatstudents who would most take advantage of LexTran service are those who are living off-campus. There are clusters of apartments that are predominantly rented by UK students near the campus that need some kind of shuttle service. It was also suggested that LexTran make efforts to become more visible on-campus through bus stop signage, kiosks, and other materials to improve its image to UK students.
Interviewee 8	**Comments**
LexLinc **Date** September 8, 2004	LexLinc was organized to coordinate government and social services and identify community needs. Four staff members were interviewed at the LexLinc offices. It was felt that it is critical that the proposed LexTran levy is passed for the sake of workers and other people who rely on bus service. Several suggestions were made regarding how to gain further input for the COA. For example, LexLinc staff works with neighborhood representatives in their Empowerment projects, and it was suggested that someone from LexTran attend one of these meetings.
Interviewee 9	**Comments**
Downtown Development Authority **Date** September 9, 2004	There are a number of housing developments already built or being planned for the downtown area. There are 200 housing units currently under construction and another 500 being designed. Therefore it was felt that there should be good transit connections between downtown and the University of Kentucky and Transylvania University campuses. Late evening service should be provided on Fridays and Saturdays between downtown Lexington and the University of Kentucky campus, particularly the south end of the campus. It was also suggested that more bus stops be provided downtown and a traffic light be placed mid-block at the transit center to help with bus and pedestrian circulation. In addition, there should be a stop in front of Good Samaritan Hospital.
Interviewee 10	**Comments**
LFUCG Human Rights Commission **Date** September 9, 2004	The Human Rights Commission Executive Director recognizes the reliance that many people have on LexTran bus service to travel to work. The Commission addresses employment-related human rights issues on a regular basis, and is familiar with many of those who have transportation challenges.
Interviewee 11	**Comments**
Administrator, LFUCG **Date** September 9, 2004	The Administrator recognizes the need for LexTran to have a dedicated local funding source. There needs to be good connections between neighborhood areas in Lexington with employment centers. There should also be connections to the Keeneland Race Track and the Lexington Airport. LexTran should also be available to provide shuttle service for special events including University of Kentucky football and basketball

	games.
Interviewee 12	**Comments**
LFUCG Community Development Department	It was recommended that, if LexTran was able to improve service, it should restore bus service on Sundays. It should be more responsive to the transportation needs of youth by better serving middle and high schools. In addition, LexTran route should have better frequencies and serve all parts of the urban service area.
Date	
September 9, 2004	
Interviewee 13	**Comments**
Lexington Convention and Visitors Bureau	The Convention and Visitors Bureau recognizes the important role that LexTran plays in the employment of workers in the hotels and restaurants in the Lexington area. Many service industry workers rely on the bus service to get to and from work on a daily basis. Reference was made to the Bluegrass Hospitality Association for more information.
Date	
September 10, 2004	
Interviewee 14	**Comments**
LFUCG Housing Authority	Many Housing Authority tenets rely on bus service for the majority of their transportation needs. It is therefore very important that LexTran serves each of the Housing Authority's complexes. The Deputy Director agreed to organize an additional meeting with managers of housing complexes to gain more information on what service improvements are needed.
Date	
September 10, 2004	
Interviewee 15	**Comments**
Kentucky Cabinet for Family Services	Suggestions were made on how best to improve LexTran services. These included operating evenings and weekends, improving route frequencies from every 60 minutes to 30 or better. Another suggestion was made regarding if the proposed LexTran tax levy fails, could another one be put on the ballot at a lower rate. It was also indicated that the current fare is high for many of the clients that they work with.
Date	
September 10, 2004	
Interviewee 16	**Comments**
Greater Lexington Chamber of Commerce, Inc.	The Chamber President indicated that there are about 1,850 business members of the Chamber of Commerce. Information on employment levels for each of the members was provided to the consultant conducting the interview. Additional employment information can be provided as needed. The President also agreed to e-mail information on the affect of the LexTran Levy vote on bus service to its members.
Date	
September 10, 2004	
Interviewee 17	**Comments**
Community Action Council	The Community Action Council personnel were familiar with the LexTran system. Community Action Council was supportive of transit and believed the system to be very important in providing access to jobs and health care. The personnel present for the meeting thought the strengths of LexTran were the transit center being the main transfer point and the low cost to riders. The personnel expressed concern for the lack of Sunday service and the low frequency of service especially during peak hours. The lack of routes to the Rogers Road/Parkside area is a consistent issue raised by parents that the Community Action Council works with. People that live in the area must walk under the interstate to Haggard Lane in order to catch a bus. There are no sidewalks in the area and the walk is unsafe.
Date	
September 7, 2004	

	The Community Action Council stated the most important improvements that LexTran should make in their bus service are: ♦ Ensure that areas with transit need are covered. ♦ Restore Sunday service. ♦ Increase frequency. ♦ Work to build community support. ♦ Develop partnerships and improve communication with local service agencies.
Interviewee 18	**Comments**
Comprehensive Care Center **Date** September 8, 2004	The Comprehensive Care Center Administrator was familiar with the LexTran system. The administrator felt that LexTran suffered from poor public relations due to management and labor problems that existed a few years back. The administrator felt that LexTran had begun improvements by adding new buses but that LexTran needs to continue to improve their image by demonstrating adequacy of management. The biggest concern involving bus routes was the limited service and possibility of cutting the Tates Creek route that would affect approximately fifty (50) Comprehensive Care Center clients that live in apartments in the area and rely on LexTran to get to work.
Interviewee 19	**Comments**
United Way **Date** September 7, 2004	The President of the United Way would like to see the frequency of routes increased in the short term and for the long term a marketing effort to attract "choice" riders and expand service to outside of the county. The President also felt that LexTran has done a good job of improving their image in the past year. Other improvements the President wanted to see included: bilingual schedules; special event service; increased in the number of routes; and the return of downtown trolley service.
Interviewee 20	**Comments**
The National Conference for Community and Justice (NCCJ) **Date** September 8, 2004	The Executive Director stated LexTran has made improvements by bringing on the current management company that has the experience, depth and knowledge to effectively run LexTran. It was also thought that the addition of the new buses had a positive affect on the public perception of LexTran. It was stated that the biggest factor limiting LexTran was funding. When asked if the proposed levy were to pass she offered a three-phase approach that Lextran should take to improve service. This includes the following: Phase One ♦ Continue buying new vehicles; ♦ Improve Training for drivers; ♦ Increase frequency; ♦ Extend the current LexTran boundaries. Phase Two ♦ Marketing plan to attract non-transit riders; ♦ Improve safety and reliability; ♦ Smoother route connections; ♦ Target employers. Phase Three (20 years or so away) ♦ Bigger hubs located around the area; ♦ Light rail; ♦ Train service between major cities.