US 27 / Nicholasville Road Alternatives Analysis

Summary of Findings and Conclusion

March 2014

Prepared for:

Lextran

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Abbreviations

AA	Alternatives Analysis
FTA	Federal Transit Administration
LAMPO	Lexington Area Metropolitan Planning Organization
LFUCG	Lexington-Fayette Urban County Government
LPA	Locally Preferred Alternative
KTC	Kentucky Transportation Center
LOS	Level of Service
ADT	Average Daily Traffic
AVL	Automatic Vehicle Location
TOD	Transit-Oriented Development
BRT	Bus Rapid Transit
DMU	Diesel Multiple Unit
EMU	Electrical Multiple Unit
LRT	Light Rail Transit
MTP	Metropolitan Transportation Plan
NS	Norfolk Southern
O&M	Operations and Maintenance
TIP	Transportation Improvement Plan
TSM	Transportation Systems Management
TSP	Transit Signal Priority
GIS	Geographic Information System
PE	Preliminary Engineering
CPI	Consumer Price Index

NTD	National Transit Database
STOPS	Simplified Trips on Project Software
TVM	Ticket Vending Machine
FTE	Full-Time Equivalent

1 Introduction

1.1 PROJECT BACKGROUND

The US 27/Nicholasville Road corridor is the busiest arterial corridor in the Lexington, Kentucky, urban area. From the recent developments in northern Jessamine County to the ongoing revitalization of downtown Lexington, the characteristics of the corridor greatly differ from end to end with varying high-intensity land uses. The transportation users of the corridor number between 21,000 and 77,700 vehicles per day, including buses operated by the Transit Authority of the Lexington-Fayette Urban County Government (Lextran). The corridor also carries bicycle and pedestrian traffic along several sections. With heavy usage on a capacity-constrained roadway, this study seeks to evaluate alternatives that may improve current operations along the US 27/Nicholasville Road corridor, focusing on transit options.

Lextran operates Lexington's public transportation system, providing service to residents of and visitors to Fayette County. Lextran was the designated recipient of a Federal Transit Administration (FTA) grant to conduct an Alternatives Analysis (AA) in Fayette County. Lextran conducted the study in coordination with the following agencies and jurisdictions:

- Lexington Area Metropolitan Planning Organization (LAMPO),
- Lexington-Fayette Urban County Government (LFUCG) Division of Planning and Division of Traffic Engineering,
- Kentucky Transportation Cabinet,
- City of Nicholasville, and
- Jessamine County.

The AA is part of LAMPO's Unified Planning Work Program for the Lexington area. The chosen Locally Preferred Alternative (LPA) will be integrated into LAMPO's Metropolitan Transportation Plan and other adopted small area plans that coordinate with the LFUCG's Comprehensive Plan. As the study area encompasses both Fayette and Jessamine Counties, the LPA must also conform to the Wilmore, Nicholasville, and Jessamine County Joint Comprehensive Plan.

1.2 STUDY AREA

The AA examined the need for and feasibility of transportation alternatives for the US 27/Nicholasville Road corridor. It concentrated on transit-based alternatives. The corridor is approximately 10 miles in length and runs from the Lextran Transit Center in downtown Lexington (Fayette County) southward to the intersection of Main Street and the US 27 bypass in Nicholasville (Jessamine County). The characteristics of the corridor change throughout its length, resulting in the division of the corridor into three distinct segments:

- **Segment 1: Downtown/University –** This segment begins at the Downtown Lextran Transit Center along Vine Street and includes two major catalysts: Downtown and the University of Kentucky (UK)/Chandler Hospital. It ends just past the Baptist Health Lexington (formerly Central Baptist Hospital) area where the corridor transitions to heavy retail/commercial development.
- **Segment 2: New Circle Road –** This segment has the highest traffic volume in the corridor, beginning at the Southland/Regency Drive commercial areas. It continues past the Lexington Green and Fayette Mall shopping areas and ends at the Fayette/Jessamine County line.
- **Segment 3: Jessamine County –** From the Jessamine/Fayette County line, this segment continues to a point just past the Brannon Road (KY 1980) shopping development. It includes the Kohl's/Sam's Club shopping area and ends at the intersection of US 27 and Main Street in Nicholasville.

Figure 1 shows the three segments of the corridor.

1.3 CORRIDOR CONDITIONS

The focus of this section is to briefly highly the corridor segments, including an overview of the existing conditions; depicting them graphically along the corridor to include:

- Current and forecast demographics,
- Current and future land use, and
- Transportation conditions within the study area.

The next section demonstrates in detail, how the study area is expected to change over the next 30 years and assess the implications of these changes on transportation demand and mobility.

Note: All subsequent tables and figures are from Parsons Brinckerhoff and/or its subconsultant Lord, Aeck, Sargent unless otherwise noted.

Figure 1: Corridor Segments

2 Existing Demographics, Land Use and Development

This chapter discusses the historical trends, existing conditions (including density maps), and future forecasts for population, households and employment in Fayette and Jessamine Counties. Table 1 summarizes the projected growth in population, number of households, and total employment in both counties.

Table 1: Population, Households and Employment Growth (2000 to 2030)

Fayette County	2000	2010	2020	2030	Change 2010 – 2030
Population	260,512	295,803	334,733	375,986	+27%
Households	108,288	123,043	141,152	159,883	+30%
Total Employment	208,950	218,312	239,944	257,939	+18%
Jessamine County					
Population	39,041	48,586	58,928	68,933	+42%
Households	13,867	17,642	22,184	26,618	+51%
Total Employment	19,307	22,756	26,535	30,288	+33%

2.1 POPULATION AND HOUSEHOLDS

2.1.1 Historical Trends

According to the Kentucky State Data Center, from 2000 to 2010, Fayette County experienced 14 percent growth in population and the number of households. Likewise, Jessamine County has experienced even higher growth, with a 24 percent increase in population and 27 percent increase in the number of households.

2.1.2 Household Density

Household density involves the combined number of single-family homes, duplexes, townhouses, and apartment complexes per square mile in the study area (Figure 2 through Figure 4).

As the figures show, there are higher household concentrations closer to the downtown area. In addition, there are numerous neighborhoods within the vicinity of the corridor; however, many of these are outside of the one half mile study area.

Figure 2: Household Density Map (Segment 1)

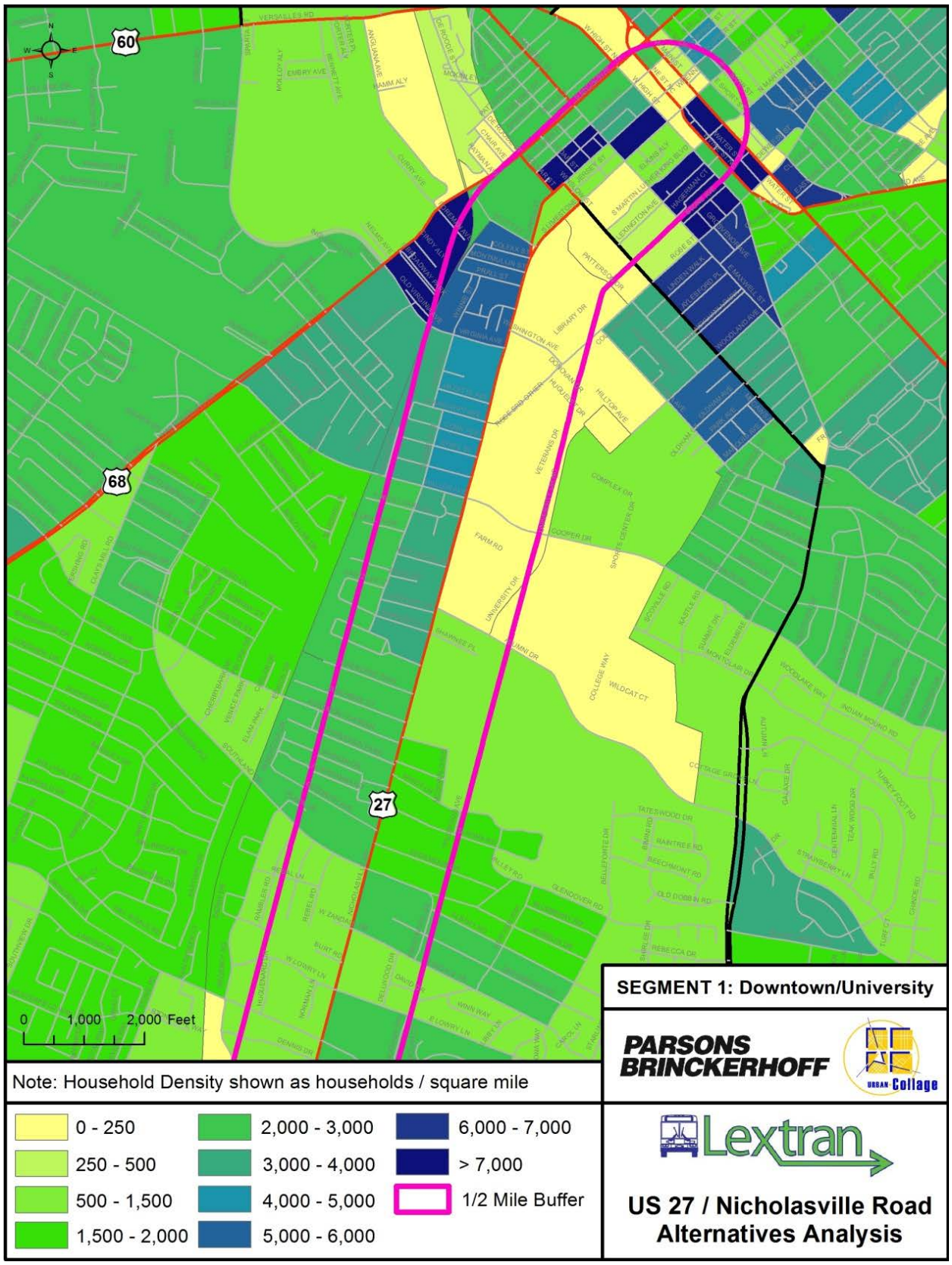


Figure 3: Household Density Map (Segment 2)

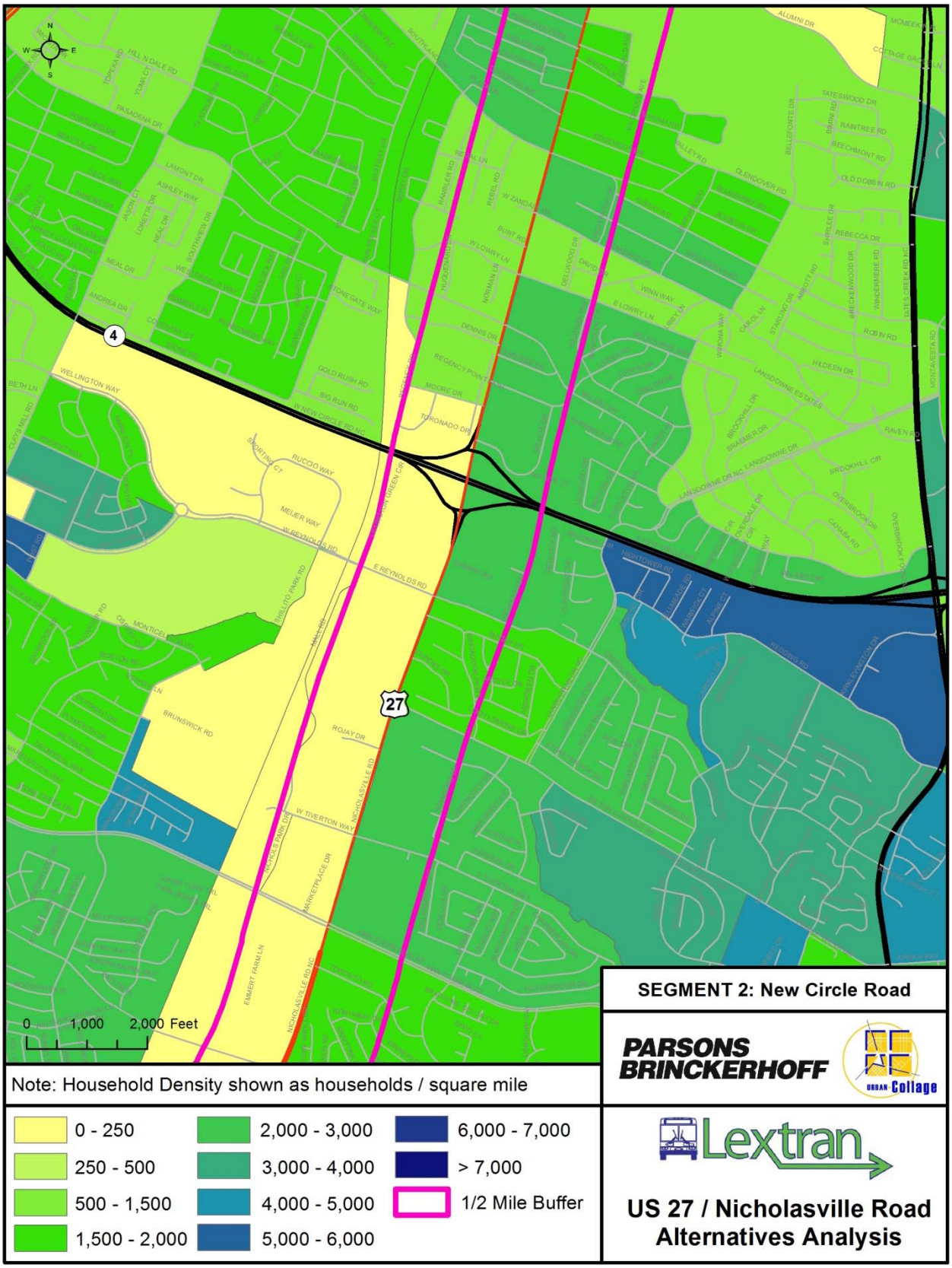
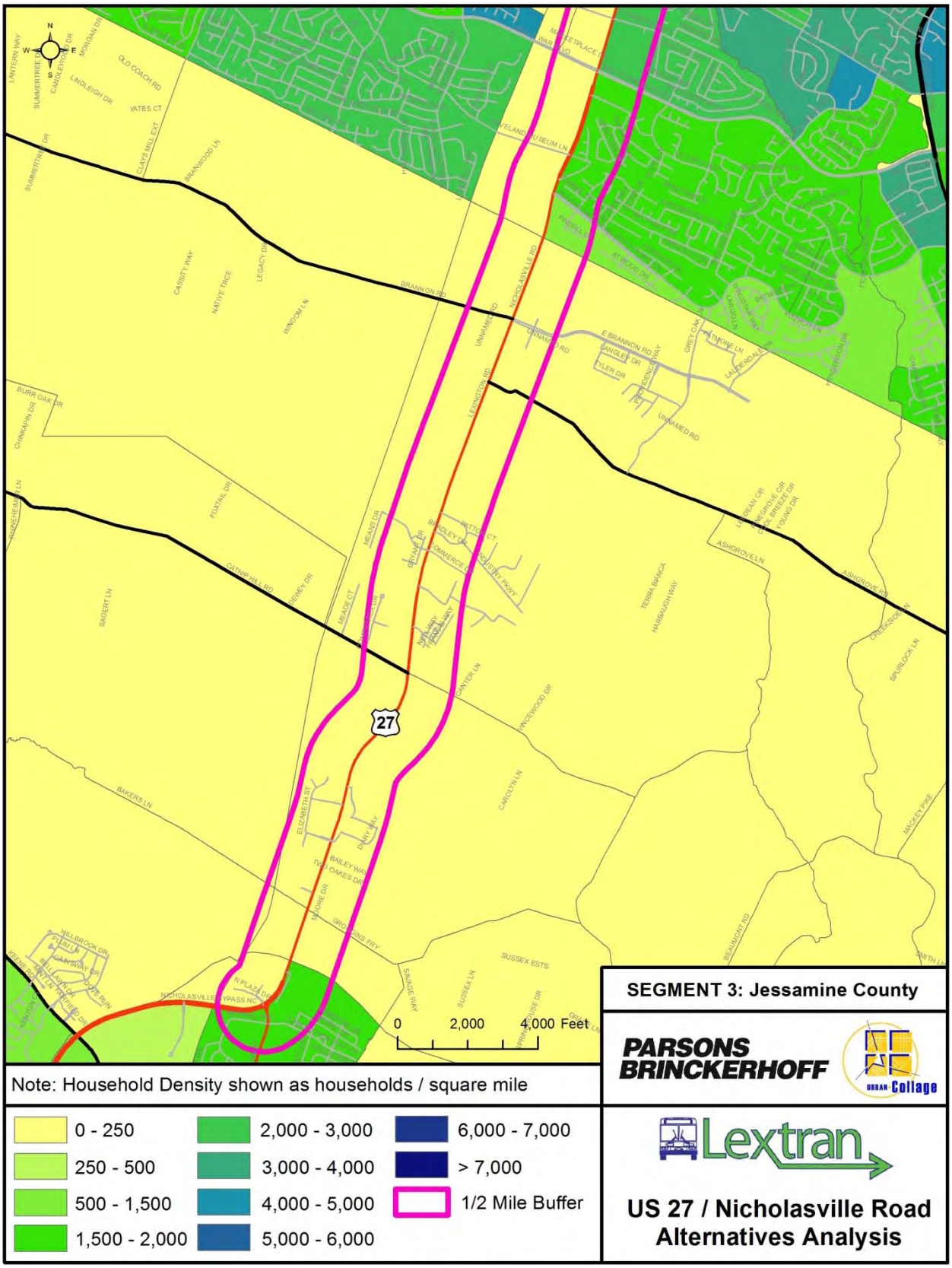


Figure 4: Household Density Map (Segment 3)



2.1.3 Forecasted Growth

The historical trend of growth from 2000 to 2010 is expected to continue in both counties out to 2030, as shown in Table 1 - Population, Households and Employment Growth (2000 to 2030). The Kentucky State Data Center indicates both counties are expected to grow in terms of population and households over the course of the next few decades. For this analysis, the horizon year of 2030 was examined. By 2030, the population of Fayette County is expected to grow to almost 376,000 residents, an increase of 27 percent from 2010. The number of households is expected to be 159,900, an increase of 30 percent.

Forecasted growth in Jessamine County will be even more dramatic, with an increase of 42 percent from 2010, resulting in almost 69,000 total residents. The number of households is expected to increase by 51 percent to more than 30,000.

2.2 EMPLOYMENT

Employment data presented in this document is based on Woods & Poole employment growth trends. (Woods & Poole is a private data provider that is often used to gather important employment and socio-economic information used by the transportation and planning profession.) As shown in Table 1, growth in Fayette County employment has been slower than for population and housing, with overall employment for ages 16 and over increasing by 4 percent between 2000 and 2010. In Jessamine County, employment is growing at a faster rate, but the rate is still behind population and households. Between 2000 and 2010, employment increased by 18 percent.

2.2.1 Employment Density

The calculation of employment density is similar to household density except that it takes into account all of the small businesses, office space, major retail centers, and major institutions, such as UK (administration and hospital) and Baptist Health Lexington, to determine where the largest numbers of workers are focused (Figure 5 through and Figure 7). Employment is shown as the number of employees per square mile.

As shown in the two figures, higher employment densities can be found along the corridor, with Fayette Mall, Lexington Green, and the two major hospitals having the greatest density in the study area.

2.2.2 Forecasted Growth

Both counties are expected to grow in terms of employment over the course of the next few decades. As shown in Table 1, the horizon year of 2030 was examined. By 2030, total employment in Fayette County is expected to grow to almost 258,000, an increase of 18 percent since 2010. Employment in Jessamine County is expected to grow at a faster pace to over 30,000 by 2030, an increase of 33 percent from 2010.

Figure 5: Employment Density (Segment 1)

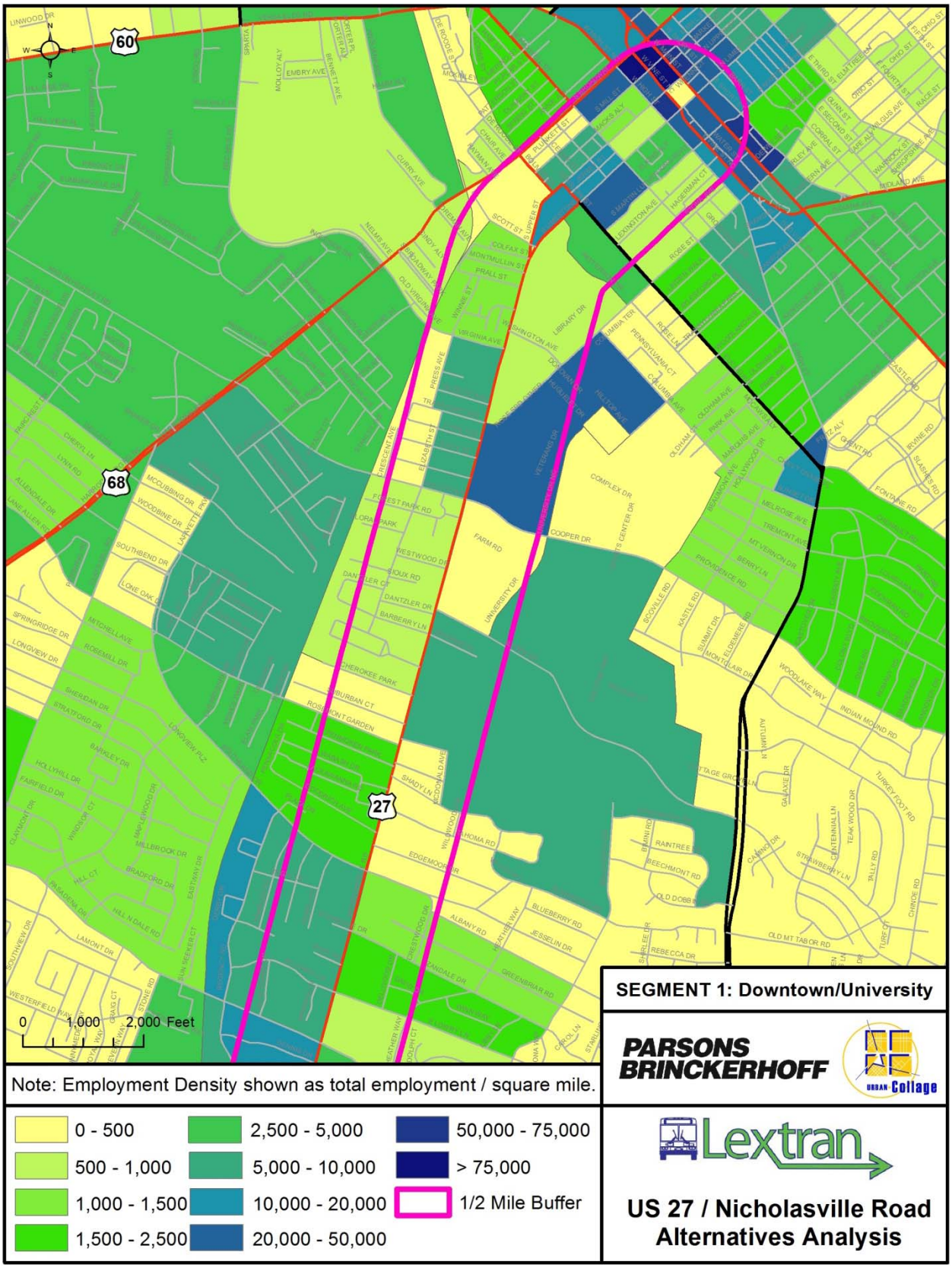


Figure 6: Employment Density (Segment 2)

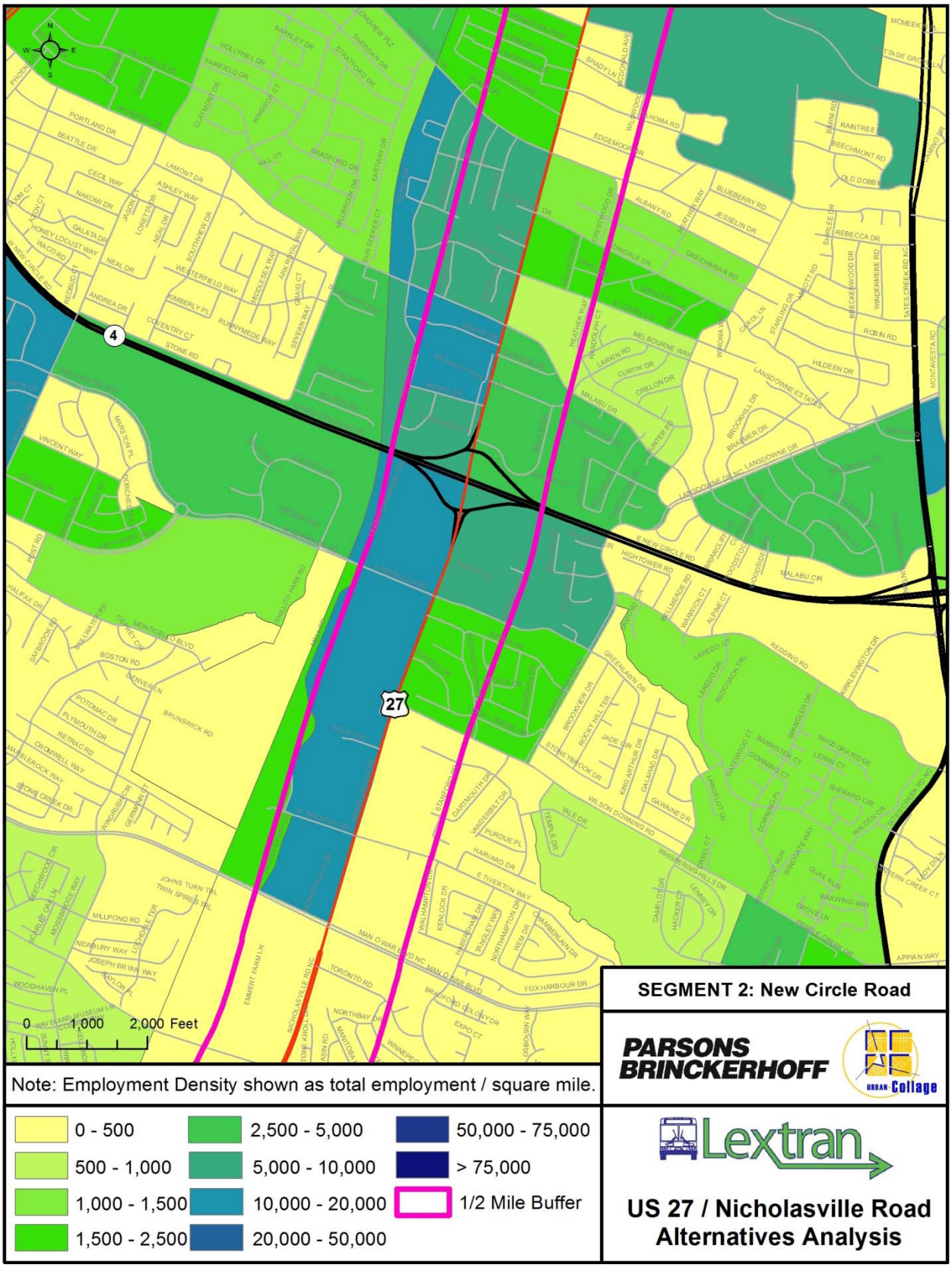
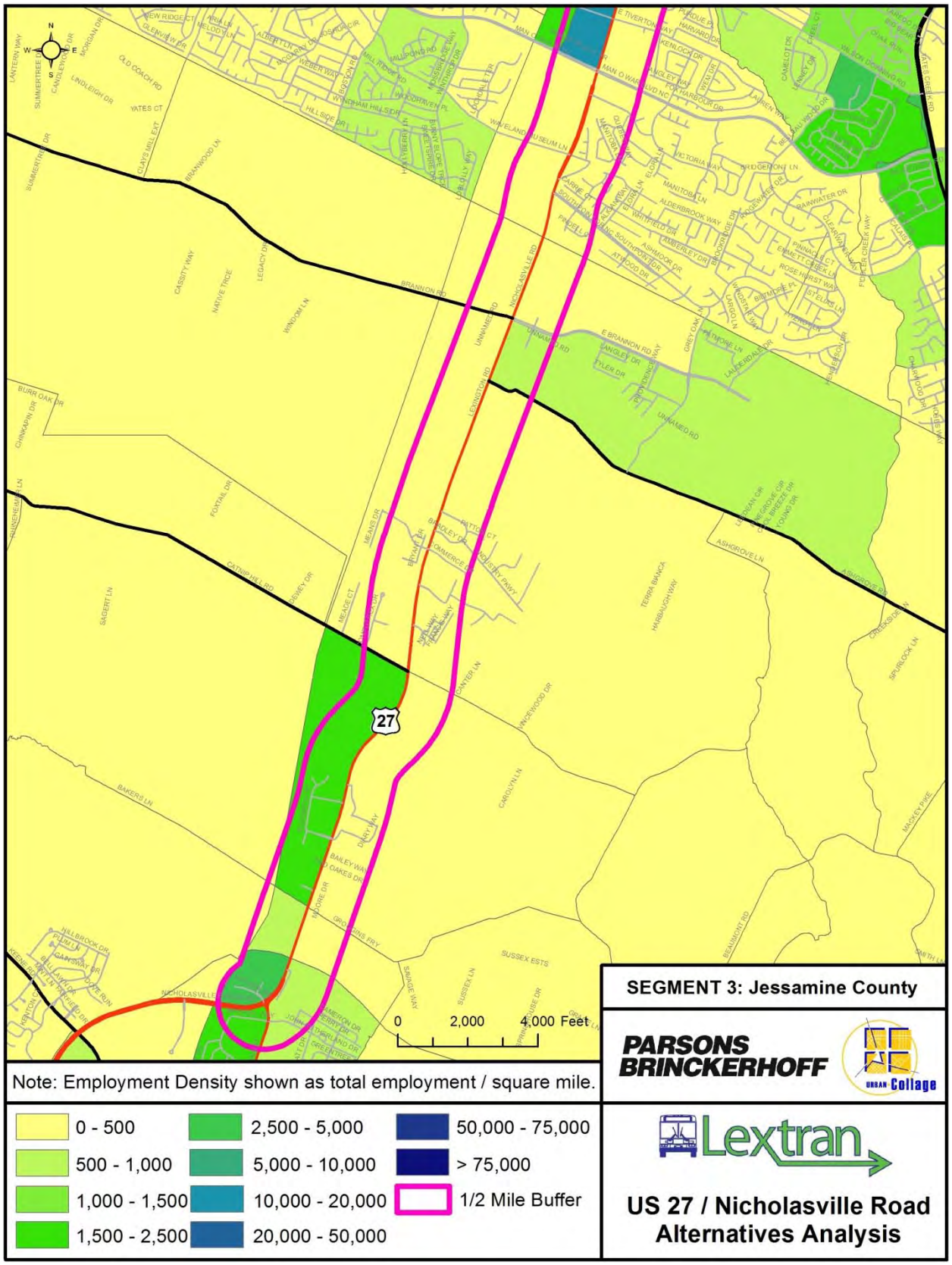


Figure 7: Employment Density (Segment 3)



2.3 EXISTING LAND USE

The US 27 corridor has a wide range of land uses with different mixes by segment. These include a dense mix of uses – large stretches of institutional and office, as well as clusters of commercial, and agricultural development. It is important to understand how land is currently used throughout the study area in order to make informed decisions on where future growth is likely, where development and redevelopment opportunities exist, both large and small, and if there are areas that could transition to other uses (particularly as they relate to transit). Fayette and Jessamine Counties have their own unique land use categories, and the land use analysis was based on consolidating existing county land uses into similar categories.

The Existing Land Use Inventory, shown and discussed on the following pages, identifies 12 generalized land use categories: Commercial, Single-Family Residential, Duplex/Townhouse, Multi-Family Residential, Green Space/Recreation, Parking, Light Industrial/Warehouse, Heavy Industrial, Office, Religious and Education Institutions, Mixed Use, and Vacant.

The following sections describe the land use composition by segment.

2.3.1 Segment 1 – Downtown/University

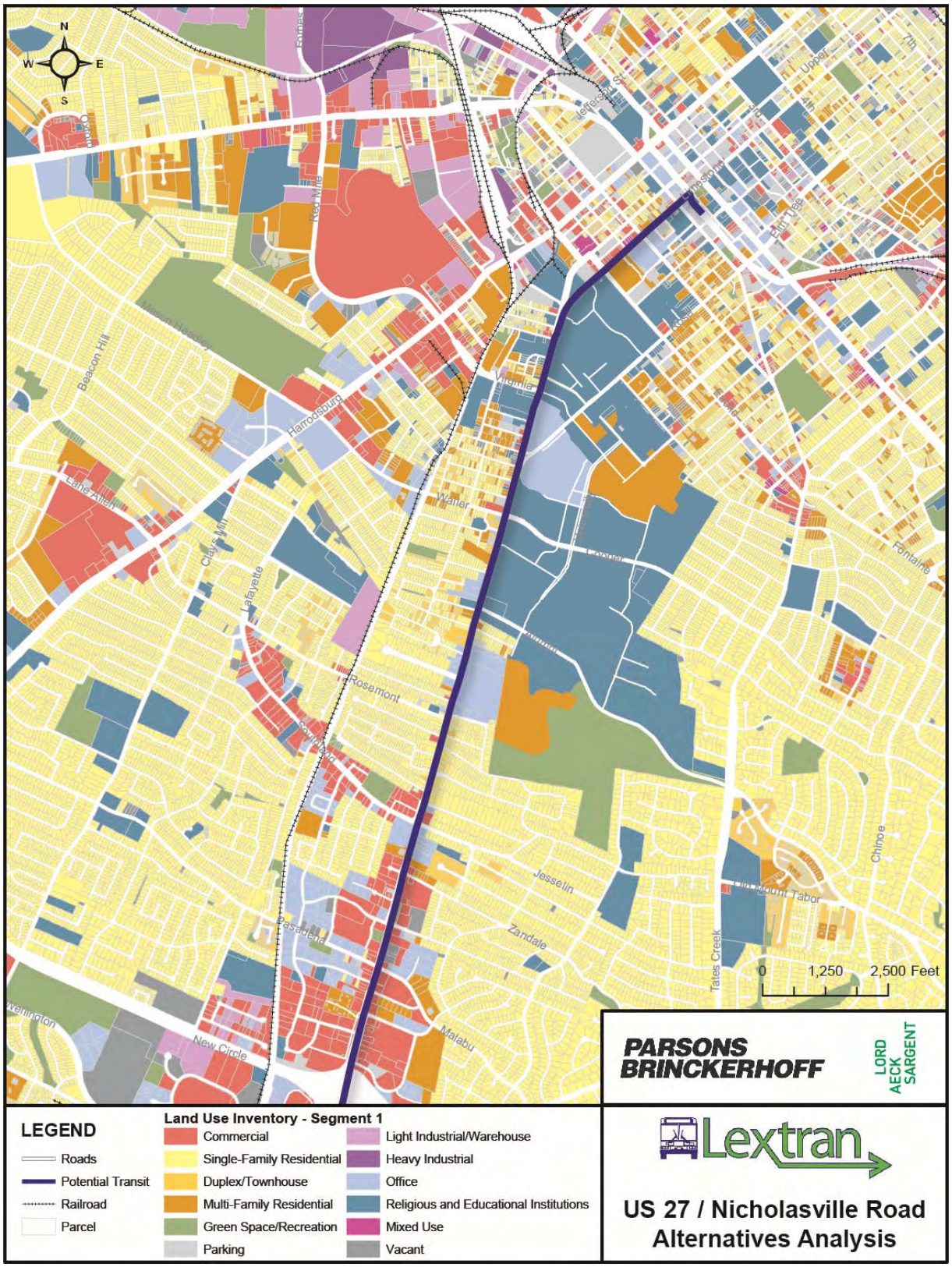
The Lexington terminus of the study corridor is the Lextran Transit Center (Figure 9), which is located adjacent to the downtown Central Business District. The transit center serves all but three of Lextran's regular and express bus routes: one of the two Colt Trolley lines, the bus to the Keeneland Race Course's Spring and Fall Meets, and the UK football shuttle.

The area between downtown and the main campus of UK features a mix of uses and building types including restaurants, bars, neighborhood shopping, single-family residential, apartment complexes, and interspersed office use (Figure 10).

There is a nearly 2-mile-long stretch of institutional and office uses (shown as light and dark blue) along the east side of Nicholasville Road, primarily represented by UK's Main Campus, UK Healthcare, and Baptist Health Lexington (Figure 11). The University of Kentucky, Lexington's largest employer, employs about 2,500 faculty and 9,000 staff members. There are approximately 28,000 students on campus. Many students are commuters who park in lots adjacent to Commonwealth Stadium. An additional 3,000 people work for UK Healthcare, where about 35,000 in-patients were seen in 2012. Baptist Health Lexington saw more than 33,000 emergency visits and 18,000 admissions in 2012.

Across Nicholasville Road from UK and intermittently on both sides of the road past Baptist Health Lexington are single-family residential neighborhoods (shown in yellow in Figure 6). Closer to the downtown area and nearer the campus, students reside in many of the single-family homes. Farther away from the campus, the neighborhoods have a more established, non-student residential composition (Figure 12). A few apartment complexes, small businesses, offices, and churches are interspersed through these neighborhoods.

Figure 8: Existing Land Use Inventory (Segment 1 – Downtown/University)



Sources: Fayette County 2005 Land Use Inventory and Jessamine County 2009 Comprehensive Plan

Figure 9: Lextran Transit Center

Figure 10: Typical Land Use near UK Campus

TOP – Mixed-Use Development on Limestone Street
BOTTOM – High-Density Residential near UK Campus (University Lofts)

Figure 11: Hospitals (Segment 1)

TOP LEFT – Baptist Health Lexington; TOP RIGHT – UK Main Campus; BOTTOM – UK Healthcare

Figure 12: Typical Housing (Segment 1)

TOP – Example of a High-Density Residential Apartment Complex near Southland Drive
BOTTOM – Example of a Single-Family Dwelling (Glendover Neighborhood)

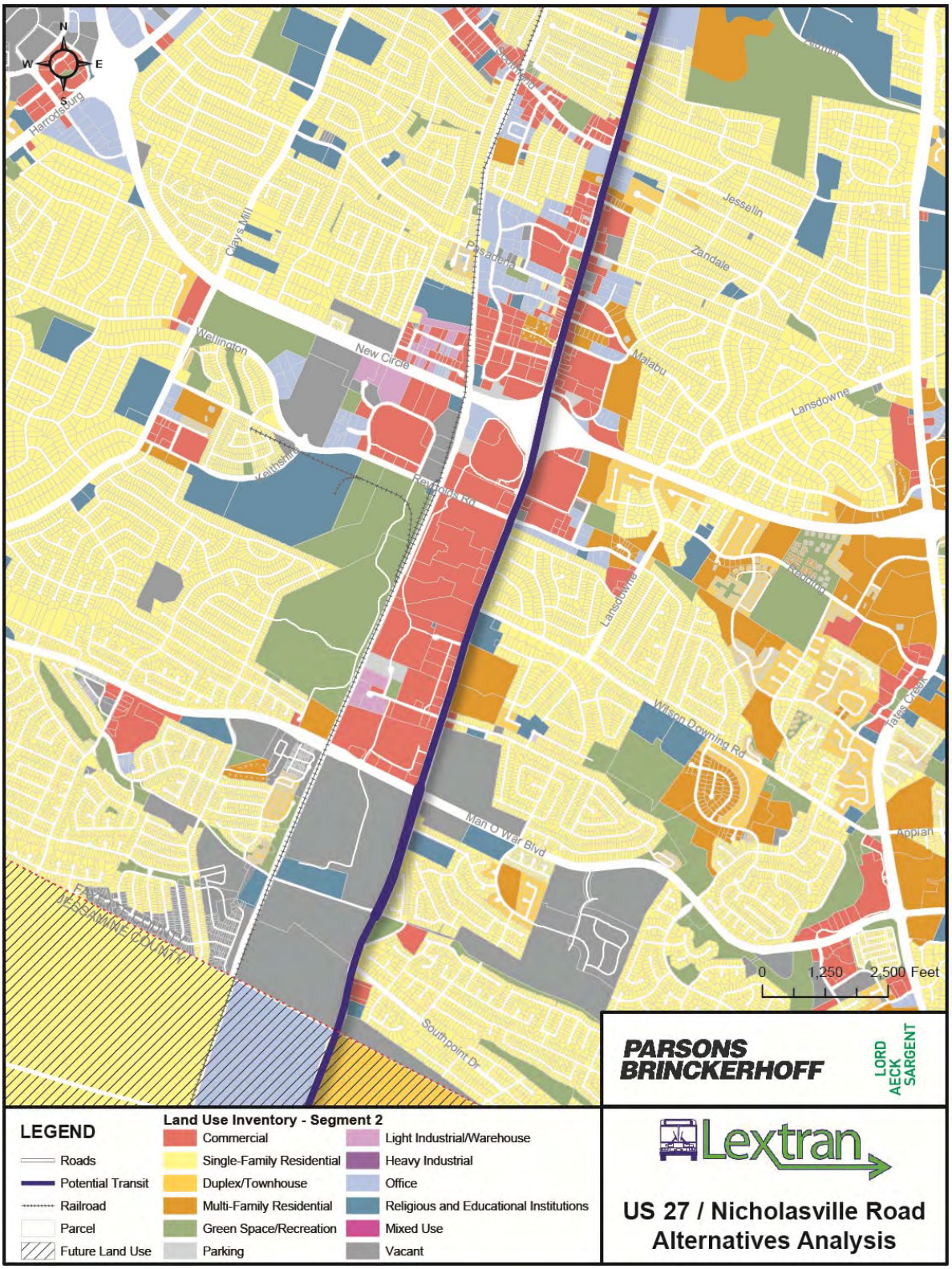
2.3.2 Segment 2 – Suburban Commercial Center

Between Southland Drive and New Circle Road, current land use consists primarily of low-density commercial (shown in red in Figure 13) interspersed with the occasional office building or apartment complex (shown as blue and orange, respectively). Land use surrounding the interchange of US 27/Nicholasville Road and New Circle Road and to the south consists of high-density commercial development, which includes strip malls, big box retail stores (i.e., Best Buy and Target), and large commercial centers (i.e., Lexington Green and Fayette Mall). This area is the region's largest and most popular shopping destination. The majority of these commercial enterprises are primarily auto-oriented with large setbacks and parking fronting the roadway.

The development pattern shifts at Lexington Green. Although Lexington Green remains car-oriented with a large parking lot, it has developed a complex of stores, restaurants, and a hotel that are encircled with pedestrian-friendly walkways. Other than the few apartment complexes noted above, the only residential area along this segment of Nicholasville Road comprises the single-family neighborhoods on the eastern side of the corridor of Brigadoon, Pickway Corner, and South Point. These features are highlighted in Figure 14.

In addition to the intense commercial development that characterizes Segment 2, there is nearly 265 acres of vacant land around Man O' War Boulevard on what are currently the Fritz Farm and the UK Agricultural Farm (Figure 13). Note: The northeast corner shown on the top right of the graphic outlined in green will be the Summit Development.

Figure 13: Existing Land Use Inventory (Segment 2)



Sources: Fayette County 2005 Land Use Inventory and Jessamine County 2009 Comprehensive Plan

Figure 14: Typical Commercial Development (Segment 2)

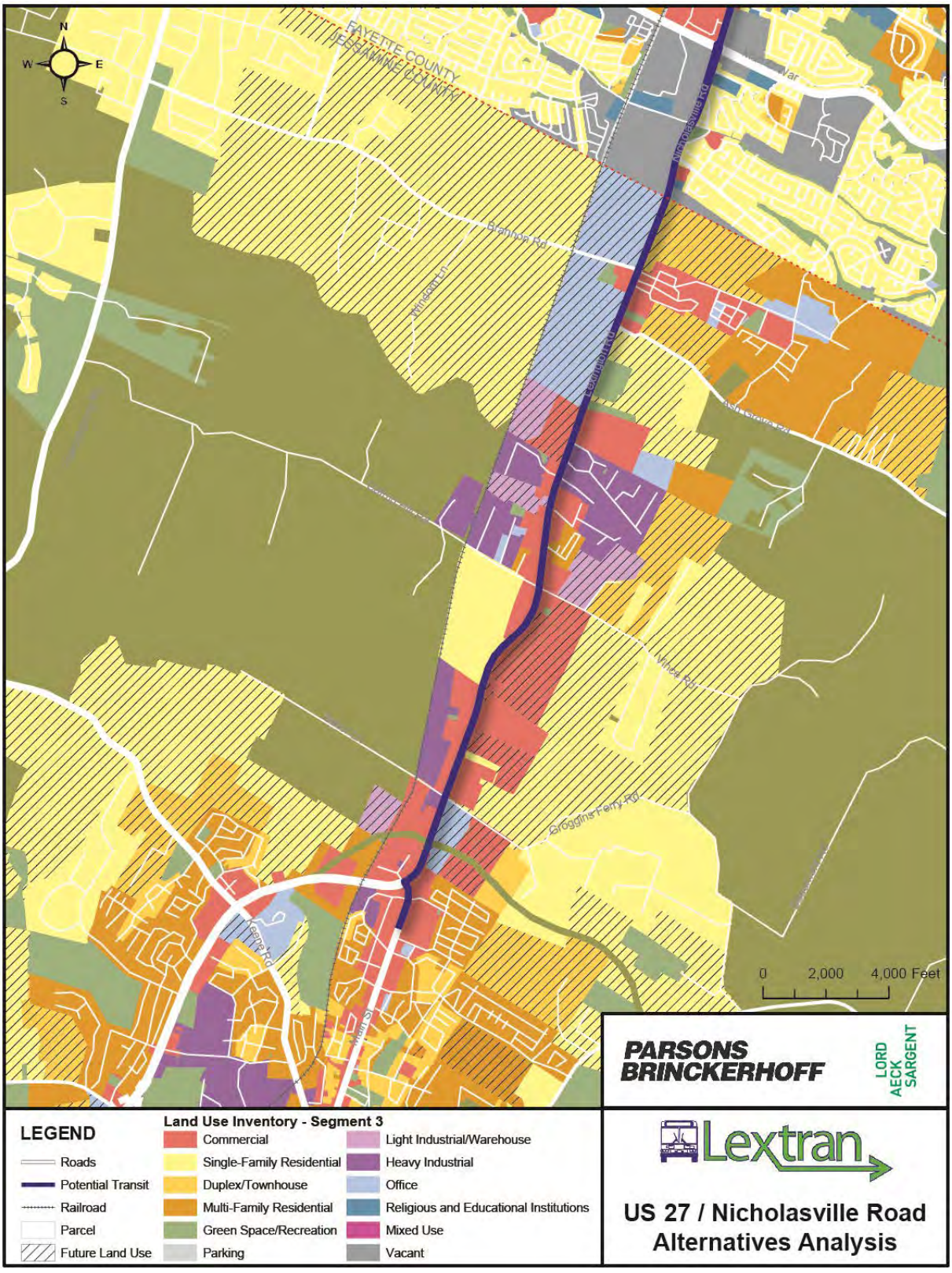
TOP LEFT – Lexington Green Commercial Center; TOP RIGHT – Multi-Family Residential on Nicholasville Road;
BOTTOM LEFT – Typical Strip Commercial along Nicholasville Road; BOTTOM RIGHT – Fayette Mall

Figure 15: Agricultural Land Zoned Vacant (Segment 2)

2.3.3 Segment 3 – Rural/Undeveloped

As the corridor approaches the Jessamine County line, land use becomes primarily agricultural with isolated concentrations of commercial, light industrial and residential land uses. There is a cluster of commercial uses at Brannon Crossing and further south is a commercial center built around Sam's Club and Kohl's. Directly across the road from Brannon Crossing (at Commerce Drive) and farther to the south at Catnip Hill Road are additional non-agricultural developments, including the Alltech Corporate Headquarters (Figure 17). Closer to downtown Nicholasville, land use adjacent to the corridor becomes a mix of commercial and multi-family residential. Jessamine County has a land use plan (future land use shown striped in Figure 16) that will further diversify adjacent land use through new office, light industrial, and commercial zoning along the full length of the corridor within the county.

Figure 16: Existing Land Use Inventory (Segment 3)



Sources: Fayette County 2005 Land Use Inventory and Jessamine County 2009 Comprehensive Plan

Figure 17: Typical New Development in Jessamine County (Segment 3)

LEFT – Brannon Crossing; RIGHT – Alltech Corporate Headquarters

2.4 LAND USE SUMMARY

Table 2 is a breakdown of the land use by type across the length of the corridor. Using a half-mile buffer along the study corridor, the total acreage of each land use was determined and the percentage mix extrapolated. Commercial and single-family residential each account for nearly a quarter of the entire study area. When combined, they account for more than all the other uses combined. Agricultural land use comprises less than 1 percent of the mix in Table 2; however, this is based on Jessamine County's use of future land use categories to promote development on what exists today as agricultural land.

Table 2: Study Area Land Use within a 1/2-Mile Buffer

Land Use	Total Acreage	Percentage
Total Commercial	1,260	26%
Total Single-Family Residential	1,106	23%
Total Religious and Educational Institutions	532	11%
Total Office	473	10%
Total Vacant	380	8%
Total Multi-Family Residential	355	7%
Total Green Space/Recreation	241	5%
Total Duplex/Townhouse	170	3%
Total Heavy Industrial	162	3%
Total Light Industrial/Warehouse	100	2%
Total Parking	96	2%
Total Agricultural	17	Less than 1%
Total Mixed Use	6	Less than 1%

3 Existing Transportation Network

The transportation network provides the means for which people get from place to place (i.e., home to school, work, shopping, etc.). The network serves destinations both within the surrounding area as well as through-travel with neither an origin nor a destination within the study area. This section describes the existing and planned transportation system within the study area.

3.1 HIGHWAYS

The roadway network in Lexington consists of a hub and spoke pattern with major arterials radiating from the downtown core. The network is ringed by one complete circle roadway and a secondary outer partial loop roadway. The interstate (I-64/I-75) runs in a northern/southern direction east of the city.

US 27 is one of the "spokes" of the system. It connects I-75 in the north, runs through downtown Lexington, and continues south to Jessamine County and the city of Nicholasville. Within the study area, it is primarily classified as an Urban Other Principal Arterial. A small portion between Nicholasville and the Fayette/Jessamine County line is classified as a Rural Principal Arterial. The number of lanes on US 27 varies throughout the corridor, increasing from two (at the one-way pair section near the University of Kentucky) to eight (near the Fayette Mall/New Circle Road shopping center area). Throughout its most heavily congested sections, center lanes are used as a reversible lane that corresponds with the peak traffic flow. The posted speed limit ranges from 55 mph in most of Jessamine County and slows to 35–45 mph through the rest of the corridor north to downtown. Some portions of US 27 are open-section with shoulders up to 10 feet wide, while others are closed-section with curb and gutter.

No major projects in the funded portion (2012 to 2014) of the Kentucky Transportation Cabinet's (KYTC) Six-Year Highway Plan affect the corridor. The only planned project in the immediate vicinity of the corridor is the East Nicholasville Bypass. This project directly ties into the southern portion of US 27. The Lexington Area Metropolitan Planning Organization's (LAMPO's) list of top 10 unfunded projects includes the widening of portions of US 27 to six lanes. In addition, the intersection of Nicholasville Road and Man O' War Boulevard was identified in LAMPO's Congestion Management Study as a possible location for an urban interchange due to the high volume of traffic at this location.

3.2 TRANSIT

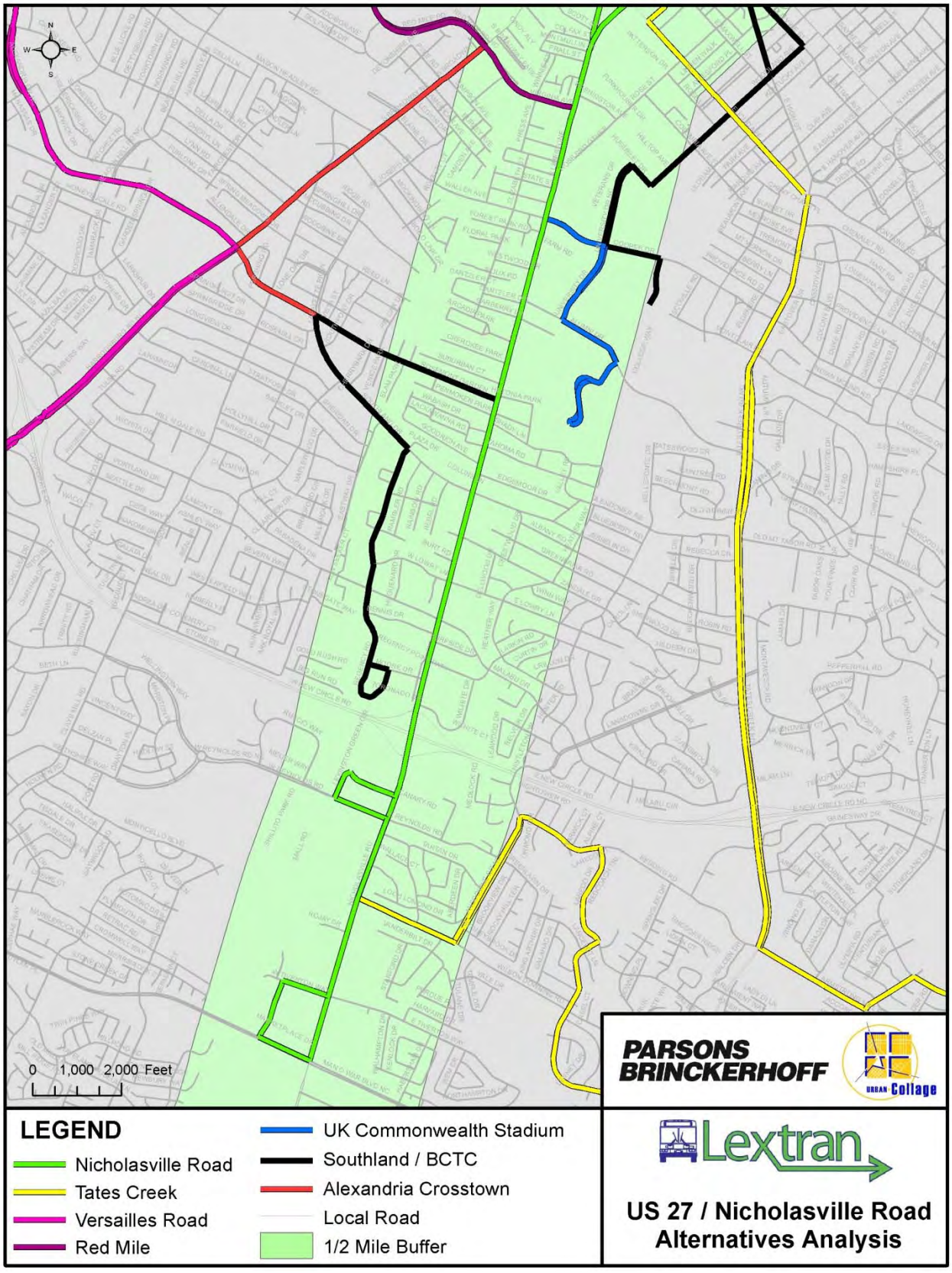
Lextran is the operator of the Lexington area's public transportation system. Lextran began operation in December 1973 and has grown to a fleet of 73 buses, providing service to the public as well as UK campus shuttle service. Service hours are 5:30 a.m. through 12:30 a.m. Regular bus fare is $1.00 and includes unlimited transfers during a one-way trip. Lextran also contracts a door-to-door paratransit service through the Red Cross WHEELS.

Figure 18 illustrates the routes operated within the area surrounding the Nicholasville Road (US 27) corridor, including the route along the study area corridor.

3.3 RAIL

There is no passenger rail service within the study area or in the city of Lexington. A freight rail line operated by Norfolk Southern runs parallel to US 27 just to the west of the study area. The rail line is primarily single-tracked, is a major north/south freight corridor through Kentucky, and has a steady flow of rail traffic daily, with at least one train per hour. Trains consist of mixed freight (freight cars of different types and shapes carrying different commodities), unit trains (freight cars of one type often carrying a single type of commodity) such as those for automobiles, and intermodal trains (flatcars on trailers and/or containers on flatcars). The rail corridor is also used by short-line operators including R.J. Corman Railroad Group.

Figure 18: Existing Lextran Routes



4 Transportation System Performance

4.1 HIGHWAY SYSTEM PERFORMANCE

Traffic volumes along the US 27 corridor range from 21,200 to 77,700 vehicles per day. The distribution of traffic volumes along the corridor is shown in Figure 19 based on traffic counts maintained by the KYTC.

A detailed analysis on traffic operations was not included as part of this project; however, specific intersections were evaluated as part of the alternative analysis screening process. A general analysis of the corridor operations was performed to provide an operational perspective with regard to vehicular traffic. Comparing daily service volumes based on the number of lanes and functional classification shows that the US 27 corridor operates at a level of service (LOS) E/F for most segments with one at LOS C and D respectively.

Table 3 shows the existing and future LOS (2030) along the corridor.

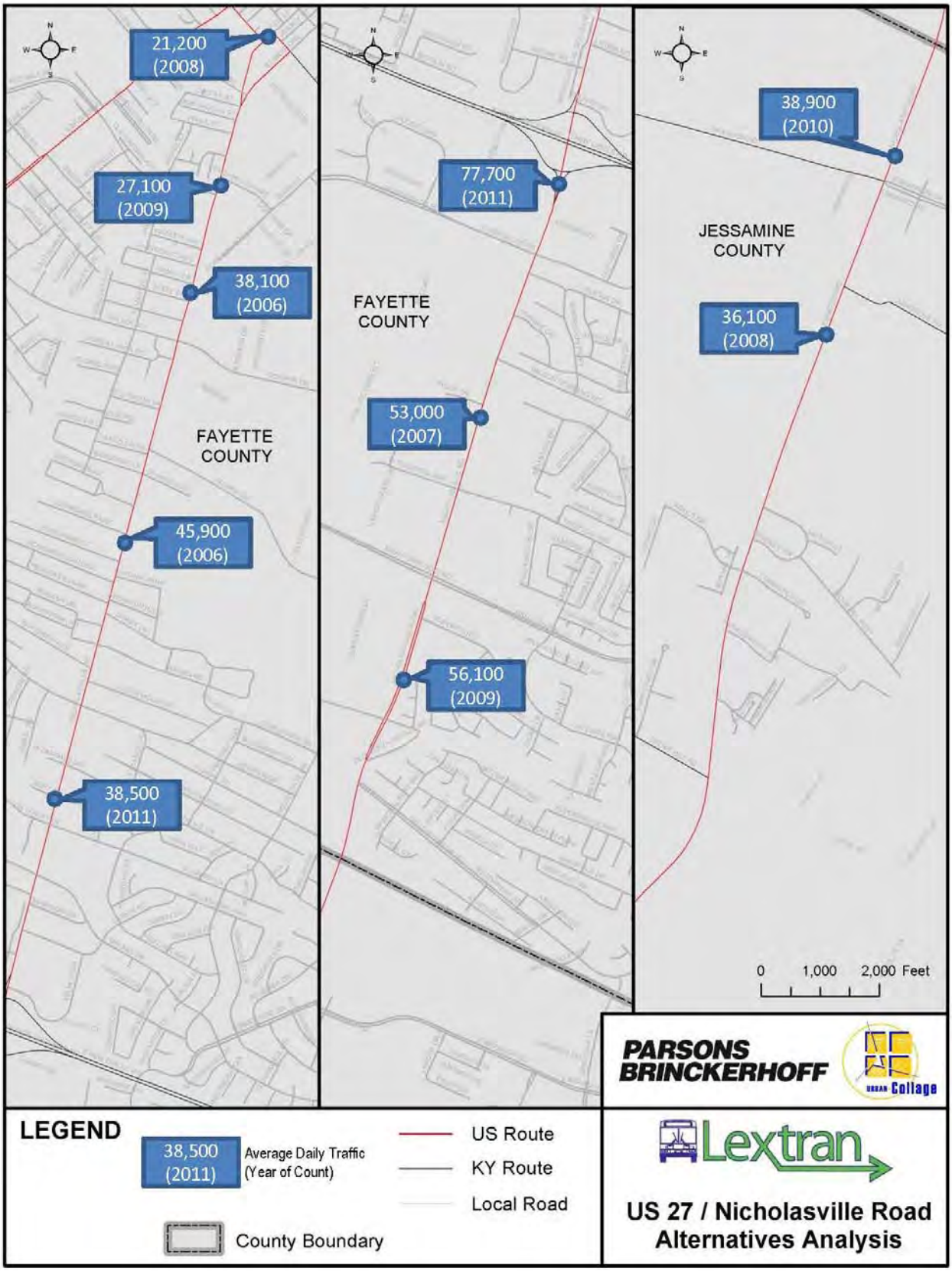
LOS is used to provide a rating scale for congestion and operations of a roadway. LOS A represents a free flowing facility with little time spent following another vehicle and plenty of opportunities for passing on a two-lane facility. Percent time following increases and opportunities to pass and travel speeds decrease with level of service down to LOS F which represents a congested roadway that is over capacity with no opportunities to pass and low travel speed.

Table 3: Existing and Future Levels of Service

Segment From	Segment To	Base ADT	LOS	Growth Rate	Future ADT	Future LOS
Scott Street	Bolivar	21,200	C	1.00%	26,400	D
Virginia Avenue	Scott Street	27,100	F	1.00%	33,400	F
Cooper Drive	Virginia Avenue	38,100	F	1.00%	48,400	F
Southland Drive	Cooper Drive	45,900	F	1.00%	58,300	F
New Circle Road	Southland Drive	38,500	D	1.00%	46,500	E
Reynolds Road	New Circle Road	77,700	F	1.00%	93,900	F
Man O War Blvd	Reynolds Road	53,000	E	1.00%	66,600	F
Jessamine County Line	Man O War Blvd	56,100	F	1.00%	69,100	F
KY 1980	Fayette County Line	38,900	F	1.00%	47,500	F
US 27X	KY 1980	36,100	F	1.00%	44,900	F

ADT = average daily traffic

Figure 19: US 27 Corridor Average Daily Traffic Volumes



4.2 CRASH ANALYSIS

According to the *US 27 Access Management Plan* (July 2012 produced by the Kentucky Transportation Cabinet (KYTC), "US 27 has been designated a safety corridor through all of the District 7 counties," which include Jessamine and Fayette Counties. There is dense development along the corridor with many uncontrolled access points. The use of restrictive medians was recommended in the Access Management Plan to reduce direct left turns.

KYTC provided crash data for the three-year period of January 1, 2009, to December 31, 2011. The location of individual crashes (classified by severity) is mapped in Figure 20.

Crash rates were computed for specific segments of each major study area highway using the methodology provided in the crash analysis report periodically published by the Kentucky Transportation Center (KTC).[1] The section crash rates are based on the number of crashes on a specified section, the ADT on the roadway, the time frame of analysis, and the length of the section. The crash rates are expressed in terms of crashes per 100 million vehicle-miles. A section's crash rate was then compared to a statewide critical crash rate[2] derived from critical crash rate tables for highway sections in the KTC crash report (Appendix D of KTC crash report). This comparison is expressed as a ratio of the section crash rate to the critical crash rate and is referred to as the critical crash rate factor. Sections with a critical crash rate factor greater than one indicate a safety concern.

The section crash rate is also compared directly to the statewide average crash rate presented in the KTC crash report. The statewide averages consider all crashes for a specified period that are listed in the Collision Report Analysis for Safer Highways database maintained by the Kentucky State Police and stratified by functional classification. Section rates that exceed the statewide average crash rate but not the critical crash rate may be problem areas, but they are not statistically proven to be higher crash areas. Therefore, this second comparison is used to identify a second tier of highway sections that may have crash problems and could be considered for safety improvements if warranted based on further analysis.

For the major roadways within the study area, all but one of the observed section crash rates exceed the critical crash rate for that roadway type. The critical crash rate factors range from 0.74 to 3.14. Table 4 shows the crash statistics for the segments analyzed and Figure 21 shows the segments on a map.

[1] *Analysis of Traffic Crash Data in Kentucky (2007 – 2011),* Research Report KTC-12-13/KSP2-11-1F Kentucky Transportation Center, 2012.

[2] The critical crash rate is the threshold above which an analyst can be statistically certain (at a 99.5 percent confidence level) that the section crash rate exceeds the average crash rate for a similar roadway and is not mistakenly shown as higher than the average due to randomly occurring crashes.

Figure 20: US 27 Corridor Crash Locations and Severity

Figure 21: US 27 Corridor Crash Rates

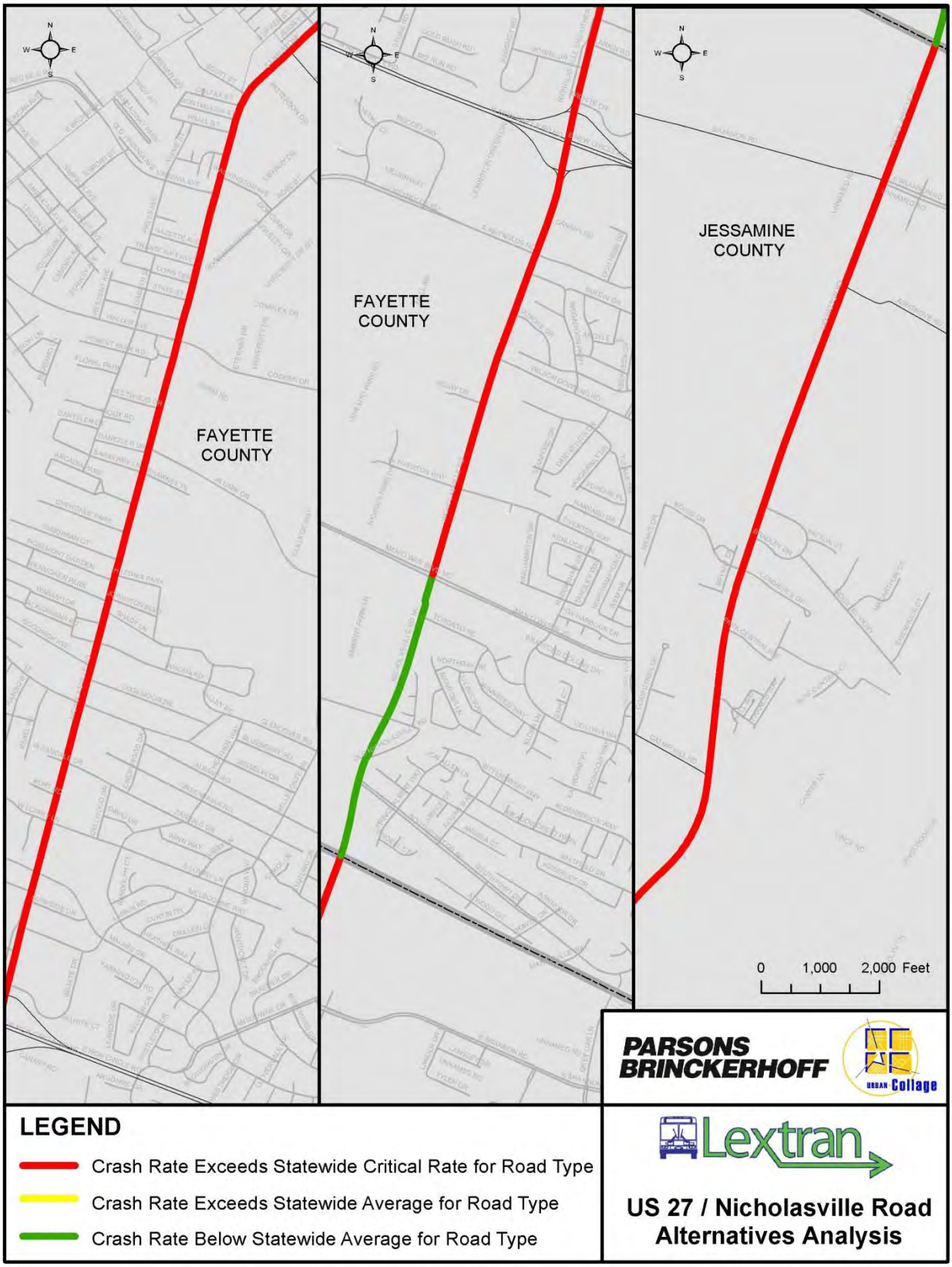


Table 4: US 27 Corridor Crash Rate Analysis – Segment

Section	Begin Milepoint	End Milepoint	Total Crashes	Average Daily Traffic	Section Length (miles)	Exposure "M" (100 or 1 MVM)	Statewide Average Crash Rate	Section Crash Rate	Statewide Critical Crash Rate	Critical Crash Rate Factor
1	10.827 (US 27X)	14.807 (KY 1980)	471	36,100	3.980	1.573	401	299	283	1.06
2	14.808 (KY 1980)	15.278 (Fayette Co. Line)	57	38,900	0.470	0.200	98	285	135	2.11
3	0.000 (Fayette Co. Line)	0.956 (Man-O-War Blvd)	224	56,100	0.956	0.587	401	381	513	0.74
4	0.957 (Man-O-War Blvd)	2.035 (Reynolds Rd)	543	53,000	1.078	0.626	401	868	511	1.70
5	2.036 (Reynolds Rd)	2.412 (New Circle Rd)	333	77,700	0.376	0.320	401	1041	531	1.96
6	2.413 (New Circle Rd)	3.531 (Southland Dr)	770	38,500	1.118	0.471	401	1634	520	3.14
7	3.532 (Southland Dr)	4.674 (Waller Ave)	490	45,900	1.142	0.574	401	854	514	1.66
8	4.675 (Waller Ave)	5.162 (Virginia Ave)	301	38,100	0.487	0.203	401	1481	552	2.68
9	5.163 (Virginia Ave)	5.498 (Scott St)	123	27,100	0.335	0.099	401	1237	569	2.17
10	5.967 (South Broadway)	6.435 (W. Vine St)	262	37,900	0.468	0.194	401	1349	552	2.44

Critical Crash Rate Factor >1, Section Crash Rate Exceeds Statewide Critical Rate (High Crash Rate Section)

Critical Crash Rate Factor <1, Section Crash Rate Exceeds Statewide Average Rate

Critical Crash Rate Factor <1, Section Crash Rate Lower Than Statewide Average Rate

The one-way street segments in downtown Lexington are very short in length and were therefore analyzed as spot locations. A spot location is defined as a section of highway 0.3 miles or less in length. The methodology used to calculate the spot crash rates is similar to that used for calculating the section crash rates with the exception that length is no longer a component used in the calculation. The crash rates at these "spots" were compared to the critical crash rates for similar facilities derived from critical spot crash rate tables in the KTC crash report (Appendix E in KTC crash report). All major intersections and areas with numerous crashes were evaluated. From this analysis, there are high crash spots on most roadways in the study area. Table 5 shows all of the spots that were evaluated. Both S. Limestone Street and S. Upper Street have spot rates that are higher than one.

Table 5: US 27 Corridor Crash Rate Analysis – Spot

Section	Begin Milepoint	End Milepoint	Total Crashes	Average Daily Traffic	Spot Crash Rate	Critical Crash Rate	Critical Crash Rate Factor
S Limestone St	5.499 (Scott St)	5.810 (Bolivar St)	22	21,200	0.95	1.65	0.57
S Limestone St	5.811 (Bolivar St)	5.966 (South Broadway)	19	4,250	4.08	2.29	1.78
S Upper St	5.457 (US 27 NB)	5.672 (Bolivar St)	47	16,500	2.60	1.34	1.94

Critical Crash Rate Factor >1, Spot Crash Rate Exceeds Critical Crash Rate (High Crash Rate Section)

Critical Crash Rate Factor <1, Spot Crash Rate Lower Than Statewide Average Rate

5 Existing Transit

5.1 RIDERSHIP

Lextran operates Route 5 Nicholasville Road directly on US 27. This route travels from the downtown transit center to the Wal-Mart in the southern part of the corridor. The route operates seven days a week with the following regular service for many time points (Figure 22**)**:

- Monday–Friday: 26 outbound trips and 27 inbound trips with 30-minute headways,
- Saturday: 23 outbound trips and 25 inbound trips with 60-minute headways, and
- Sunday: 13 outbound trips and 14 inbound trips with 70-minute headways.

Lextran also operates Route 23 Nicholasville Road Express. The route mirrors Route 5, but stops only at selected time points, including the downtown transit center, the Good Samaritan Hospital, Kentucky Clinic, Central Baptist Hospital and Wal-Mart. Route 23 only operates Monday through Friday with three inbound trips and three outbound trips. There is one outbound trip at 7 a.m. and two outbound trips at 4:30 p.m. and 5:30 p.m. There are four daily inbound trips: 6:30 and 7:30 a.m. and 5:00 and 6:00 p.m.

Routes 5 and 23 are shown in Figure 22 and Figure 23.

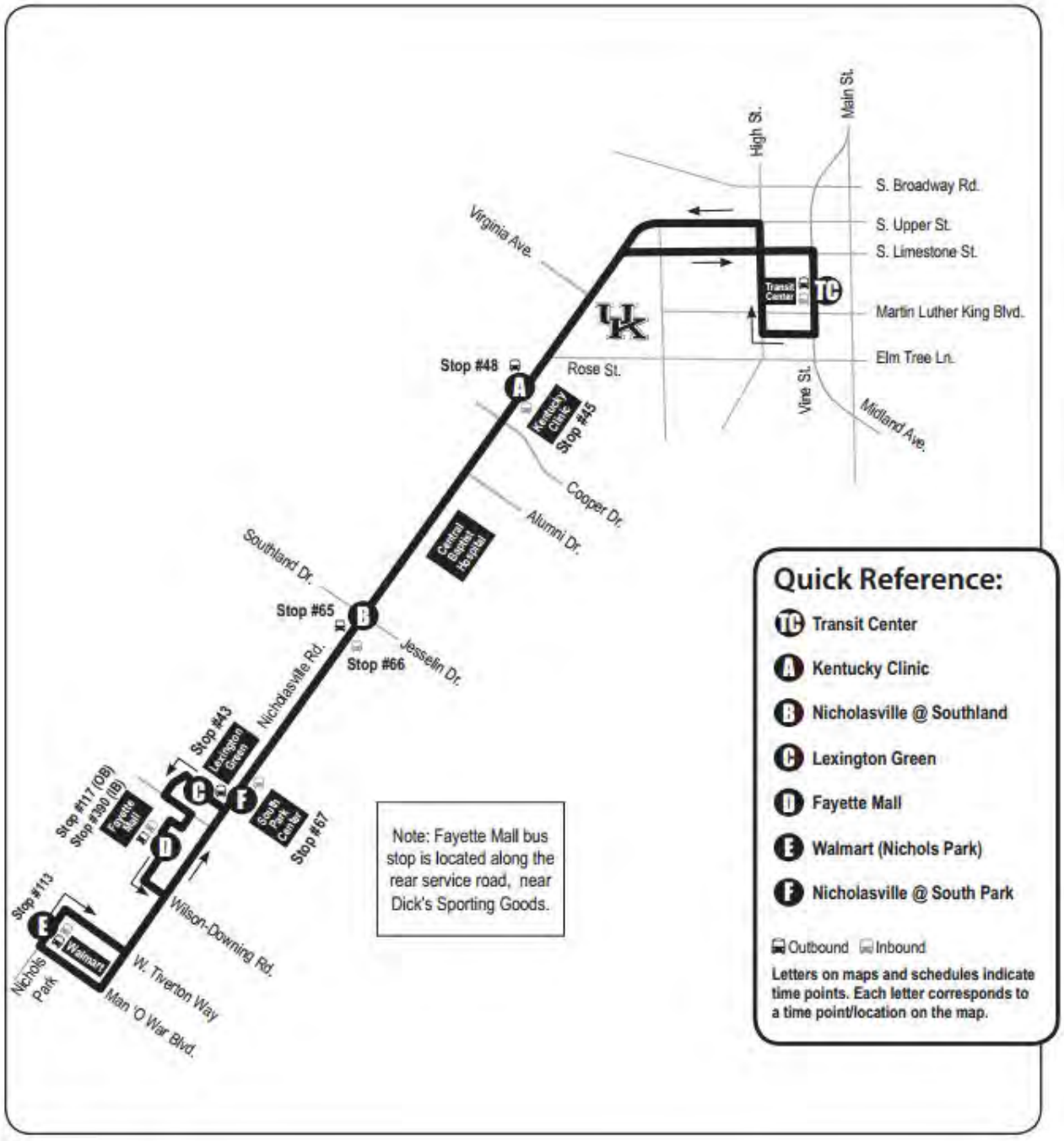
Daily ridership for both routes is about 1,365 (Lextran, October 2012).

The demand for transit in the region is a relatively small component of the overall trip making at the county level. According to the American Community Survey data for 2010, transit trips in Fayette County accounted for 1.58 percent of all work trips. Transit trip making for work is most prevalent for employees making $24,999 or less. In Jessamine County, transit barely registers as a travel mode because of the lack of service.

Examining the Fayette County portion of the US 27 corridor within the study area, the predominant mode of travel is still the single-occupant vehicle, but the transit share jumps (relative to the countywide transit share) to 3.38 percent. This data mirrors that of Lextran, as its Route 5 is typically in the top three in terms of numbers of daily riders for transit on a steady basis.

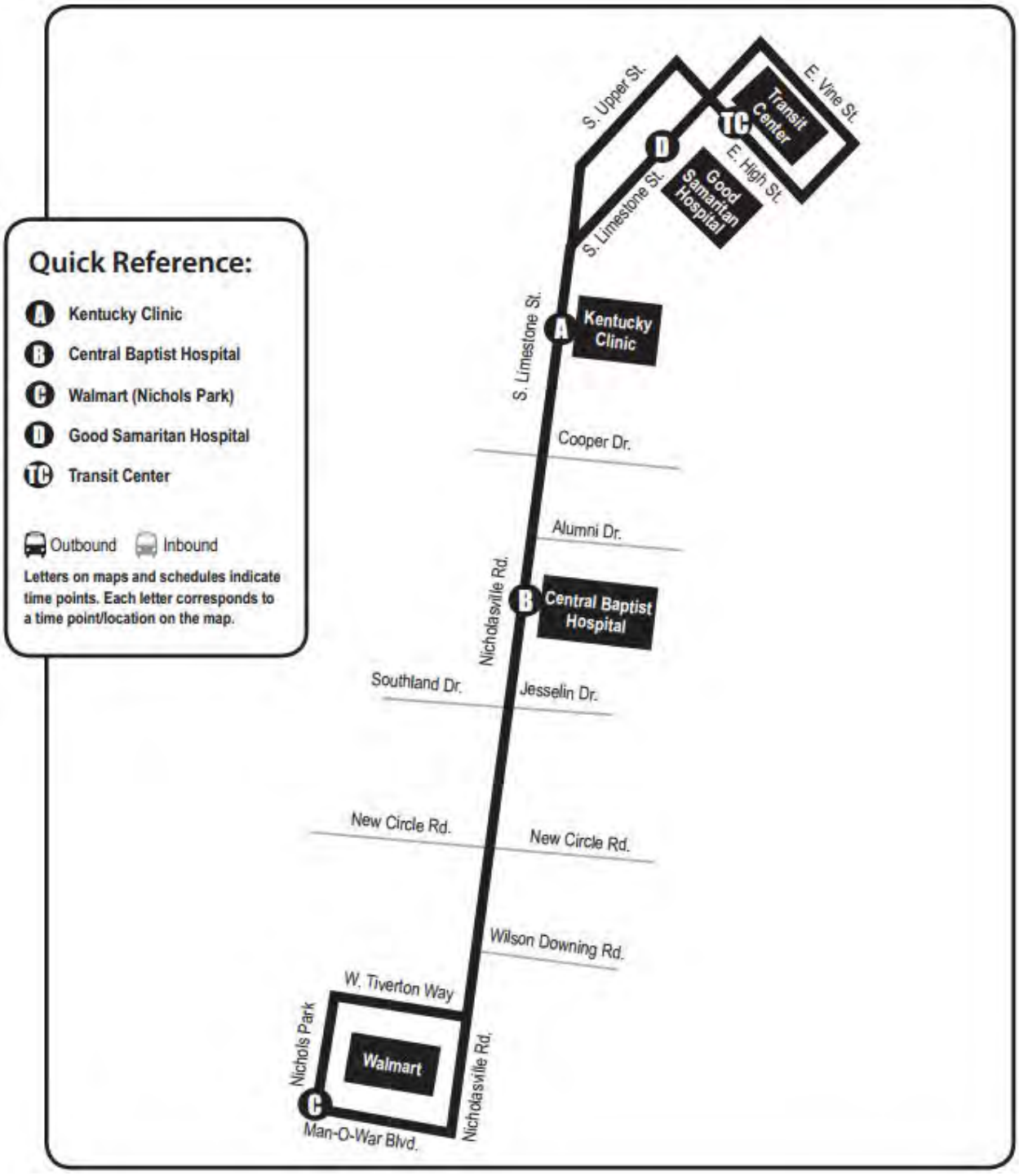
Table 6 shows income data by mode share with transit riders shown in red.

Figure 22: Route 5 (Nicholasville Road)



Source: http://lextran.com/routes/view/68/Nicholasville-Rd., accessed January 9, 2014

Figure 23: Route 23 (Nicholasville Road Express)



Source: http://lextran.com/routes/view/87/Nicholasville-Rd.-Express, accessed January 9, 2014.

Table 6: Travel Mode by Income

		Fayette	Jessamine
Car, truck, or van - drove alone	*Total*	*22,829*	*9,398*
	$1 to $14,999	6,235	2,131
	$15,000 to $24,999	2,836	1,467
	>$25,000	13,758	5,800
Car, truck, or van - carpooled	*Total*	*2,438*	*1,167*
	$1 to $14,999	952	299
	$15,000 to $24,999	370	149
	>$25,000	1,116	719
Public transportation (excluding taxicab)	*Total*	*554*	*1*
	$1 to $14,999	223	1
	$15,000 to $24,999	212	0
	>$25,000	119	0
Walked	*Total*	*3,297*	*155*
	$1 to $14,999	2,042	137
	$15,000 to $24,999	582	9
	>$25,000	673	9
Taxicab, motorcycle, bicycle, or other means	*Total*	*747*	*25*
	$1 to $14,999	330	0
	$15,000 to $24,999	185	12
	>$25,000	232	13
Worked at home	*Total*	*813*	*568*
	$1 to $14,999	249	152
	$15,000 to $24,999	76	33
	>$25,000	488	383
Total	**Total**	**30,678**	**11,314**
	$1 to $14,999	*10,031*	*2,720*
	$15,000 to $24,999	*4,261*	*1,670*
	>$25,000	*16,386*	*6,924*

Source: American Community Survey Data, Fayette and Jessamine County, 2013

5.2 TRANSIT TRAVEL TIME AND RELIABILITY

One of the defining characteristics of transit in any corridor or region is its ability to compete with the automobile and to provide reliable and efficient travel. This is especially true for potential passengers who have a travel choice but opt to use their own automobile, or carpool with a friend or relative, or take a non-motorized mode. Reliability and efficiency are also important to existing transit-dependent riders.

As observed in January of 2013, the existing Route 5 along US 27 operates in mixed traffic and is subject to the same congestion as the adjacent vehicular traffic. Typically, buses do not operate much above the posted speed limits. Their average travel speeds are often much lower than the adjacent traffic since the vehicles stop to board and / or alight passengers quite frequently and they have different braking and acceleration characteristics.

The comparative travel times for Route 5 from end to end (transit center to Wal-Mart at the Man O' War Boulevard intersection) are shown in Table 7 for a morning inbound and afternoon outbound trip.

Table 7: Comparative Travel Times

	AM Inbound (minutes)	PM Outbound (minutes)
Bus (Scheduled)	40	33
Bus (Observed)	31	35
Car	18	16

Source: Scheduled based on Lextran Time Table, Observed based on Parsons Brinckerhoff, both October 2013

The comparative travel times, at least for the observed one-day test, indicate that transit is slower for both trips when compared to the automobile. This is especially true for the outbound trip in the afternoon.

Regarding reliability, Lextran defines "on-time" bus arrivals as deviating no more than 7 minutes from the posted timepoint. Based on automatic vehicle location (AVL) data provided by Lextran for Route 5, 10 percent of the arrivals occurring from January 14 to January 18, 2013, were classified as "late." Most of the late arrivals occurred during the midday time period or the PM peak period. In terms of a geographic location, most of the arrivals that were late occurred at or near the shopping center areas.

6 Purpose and Need

The US 27 corridor is heavily traveled with a significant volume of "through" traffic in addition to local trips generated by development within the study area. US 27 is also a primary commuter corridor from Jessamine County and its cities of Wilmore and Nicholasville to jobs in Fayette County, especially downtown Lexington. This is a primary reason why the corridor was chosen for study by Lextran and the Lexington Area Metropolitan Planning Organization. Most of the study area has high traffic volumes and experiences crash rates that exceed statewide averages for similar types of facilities. Growth trends in population, households, and employment are expected to make trip making and the ensuing congestion worse in the decades to come.

The area is also growing and dynamic in terms of land use and development. This is especially true with regard to the potential for future development and / or redevelopment especially on underutilized parcels. Growth of Fayette County is somewhat constrained by the urban growth boundary, especially toward the south end of the corridor. The north end of the corridor is dominated by downtown development, UK, and hospitals. The mid-part of the corridor includes shopping and commercial destinations. Since Fayette County has an urban growth boundary and has seen much of the area within the growth boundary develop, much of the future growth in the corridor is likely to take place in Jessamine County. This is evident by the predicted population and employment growth rates.

Transit service is provided in the area and is used by a small but traditional market segment as indicated by transit mode share in the region and the demographics of riders as presented by the American Community Survey. Route 5 is one of the most heavily traveled routes in Lextran's system and can serve as a basis for the development of other high-capacity and / or high-frequency services.

The previous chapters detailing the various parts of the existing conditions regarding the corridor form the basis for this project's purpose and need, which is to identify cost-effective transit-oriented development (TOD) solutions to meet future demand for transit and to try and stem the growth of vehicular congestion along the US 27 corridor.

It is important to establish the purpose and need for a project during its early stages since it defines the reason(s) for doing the study and provides the basis for the development, evaluation, and comparison of all alternatives. There are three parts to a complete purpose and need statement:

- The purpose,
- The need, and
- Goals and objectives.

The purpose identifies the problem to be solved by the study, which is supported by the need. Goals and objectives are other elements of the study that go beyond the transportation transit

issues in the study and should be considered and addressed as part of a successful solution to the problem.

6.1 PURPOSE OF THE PROJECT

The purpose of a proposed transit investment along the US 27/Nicholasville Road corridor is to mitigate the growth of traffic congestion by offering a cost-effective and competitive transit alternative. To accomplish this, the transit alternative needs to increase the transit speed and reduce the travel time while also increasing travel time reliability. These will be achieved through improvements in transit system performance. The project should also present a viable alternative to single-occupancy vehicles for commuting and other trip types and purposes. In addition, the project should promote economic development and job growth along the corridor through transit-ready and TOD. The project should also maximize the potential to leverage public and private investments with the major stakeholders that exist along the corridor.

6.2 NEED FOR THE PROJECT

Needs for the project include the following:

- Need for improved mobility and reliability from downtown Lexington to Jessamine County,
- Need to ensure future economic vitality of the corridor by promoting congestion mitigation and mobility options,
- Need to make transit travel times and reliability of service competitive with the automobile,
- Need to provide better connectivity to key destinations and major regional employers (e.g., schools, hospitals, large retail centers), especially with a one-seat ride (i.e., trips that do not require a transfer),
- Need to provide better access to jobs, including the availability of reverse commute service, and
- Need to help spur economic development along the corridor through efficient and sustainable land use patterns.

6.3 GOALS AND OBJECTIVES

Project goals and objectives describe the desired outcomes of the transit investment, are based on the purpose and need, and consider regional priorities documented in local planning documents. The stakeholder groups identified for this project will review the project goals and objectives and use a set of agreed-upon guidelines and metrics to narrow the list of transit alternatives under consideration.

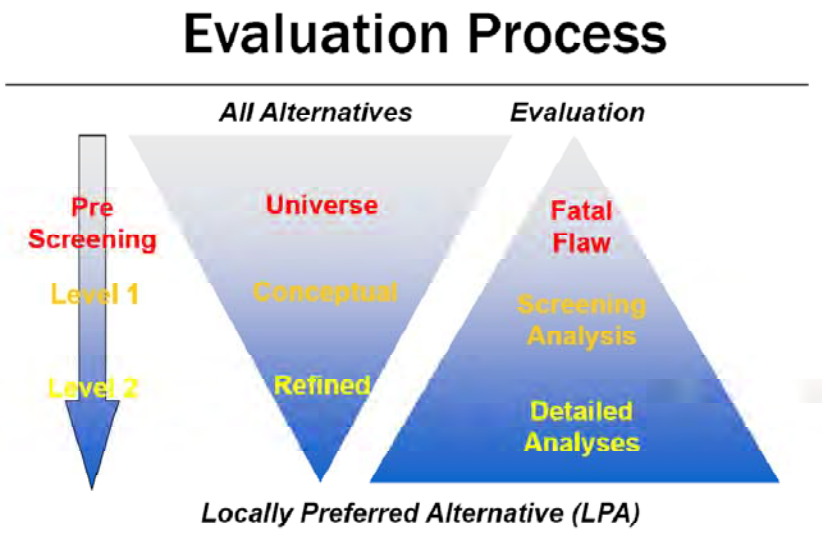
Goals and objectives for the project include the following:

- Identifying a cost-effective transit investment for implementation in the US 27 corridor,
- Providing a foundation for integrating land use decisions with transportation and transit investments, and
- Developing a dialogue to elevate the priority and status of transit within the Lexington area.

7 Preliminary Screening of Alternatives

This early screening stage of the study sought to identify the range of options for transit alternatives that may be carried forward for further analysis. This section details the pre-screening process through which measures such as cost effectiveness, feasibility, ridership or benefit / cost analysis were used to identify any "fatal flaws" that precluded certain alternatives from being carried forward into detailed analysis. Figure 24 depicts the evaluation process and how a pre-screening analysis fits into the project process.

Figure 24: Project Evaluation Process



7.1 PRE-SCREENING METHODOLOGY

7.1.1 Objectives

The intent of this section is to identify the most feasible options to carry forward for more in-depth analysis. The eventual selection of the Locally Preferred Alternative (LPA) hinges on identifying a mode and alignment that is right for the context of this project and the US 27 corridor. The LPA must be technically feasible, affordable, and fit within the project context, taking into account likely ridership, funding levels, and compatibility with the existing and future built environments. It must also fundamentally satisfy most of the elements of the project's purpose and especially the need elements. The needs are summarized below:

- Need for improved mobility and reliability from downtown Lexington to Jessamine County,
- Need to ensure future economic vitality of the corridor by promoting congestion mitigation and mobility options,
- Need to make transit travel times and reliability of service competitive with the automobile,

- Need to provide better connectivity to key destinations and major regional employers (e.g., schools, hospitals, large retail centers), especially with a one-seat ride (i.e., trips that do not require a transfer),
- Need to provide better access to jobs, including the availability of reverse commute service, and
- Need to help spur economic development along the corridor through efficient and sustainable land use patterns.

7.1.2 Screening Measures

For this analysis, the alternatives were examined in terms of the following:

- **Cost Effectiveness –** A measure of how much the alternative will cost in terms of capital construction versus the likely ridership, as well as the ability of Lextran or another entity to provide for future operations and maintenance (O&M) costs.
- **Feasibility –** A measure of how well the alternative can or will operate in the existing right-of-way or built new right-of-way during the near and long-term time horizons.
- **Supportability –** A measure of how well the alternative will be supported by project stakeholders and decision makers at the local, state and federal levels given the priorities and rules established for project development.

7.1.3 Alternatives Included in Initial Screening

The primary categories of alternatives for improving transit along the US 27/Nicholasville Road corridor include:

- No Build,
- Transportation Systems Management (TSM),
- Bus (express bus service and Bus Rapid Transit (BRT)), and
- Rail (Light Rail Transit (LRT), streetcar and commuter rail).

The following section describes the alternatives and the evaluation of them with respect to the screening measures.

7.1.4 Alternatives Definitions

<u>No Build Alternative</u>

This alternative serves as a baseline for comparison with other Build Alternatives. It includes no other capital-intensive projects than those already programmed into the region's Transportation Improvement Plan. An unfunded project in the Lexington Area Metropolitan Planning Organization long-range Metropolitan Transportation Plan that should be considered is the widening of the US 27/Nicholasville Road corridor in Jessamine County to six lanes (Project #8J). An additional project calls for the reconfiguration of the Man O' War Boulevard/Nicholasville Road interchange to a single point urban interchange (Project #23F).

Transportation System Management

The TSM Alternative serves as the lower-cost alternative that seeks to identify operational improvements that can make the existing corridor operate more efficiently within existing capacity constraints. This would include transit signal priority (TSP) at certain locations as well as bus turn outs or pull outs, and / or expanded service parameters such as more frequent service (shorter headways) and / or expanded hours of service. Specific TSM improvements for the transit mode were derived from stakeholder input based on known issues along the existing transit route, and are include the following:

- Improvements to pedestrian/bike connectivity along the corridor, and particularly in the vicinity of transit stops, and
- Improvements to amenities at transit stops including shelters, bike racks, and additional passenger information.

The TSM Alternative, along with the No Build Alternative, will be retained throughout the screening and alternatives review process. These alternatives serve as the baseline and low-cost options, respectively, and are required for a sound analysis.

Build Options

These options are the most cost intensive and seek to establish services that can operate in either mixed traffic or their own separate guideways. They include the purchase and operation of new and improved vehicles, major improvements to stations, and the construction of dedicated lanes and / or track for the vehicles to operate. The sub-options by mode are described below:

- BRT in mixed traffic,
- BRT in exclusive guideway,
- Streetcar,
- LRT, and
- Commuter rail (including electrical multiple unit (EMU) and diesel multiple unit (DMU) options.

The range of Build options considered in this study included BRT and the introduction of rail. BRT options involve either conventional buses operating with a standard 40-foot transit coach in mixed traffic or an improved BRT within an exclusive guideway or lane where only that vehicle is allowed. The use of exclusive lanes offers a better alternative from a travel time perspective than operations in mixed traffic because the vehicle is free from congestion and able to maintain top speed between stations. The drawbacks can be the additional cost/availability of right-of-way for a dedicated lane. The following section further describes the Build options.

Figure 25: Bus Rapid Transit in Mixed Traffic

(LEFT: Nashville; RIGHT: Kansas City)

BRT in mixed traffic is either a conventional 40-foot transit bus (such as in Kansas City) or a purpose-built vehicle (such as in Nashville) that offers a higher-performance transit alternative than a traditional bus. BRT in mixed traffic shares the lane with vehicular traffic on busy corridors. Low floors allow for easy boarding, including for passengers with disabilities. Multiple doors cut dwell times by speeding the boarding and alighting process, thereby helping to improve headways in high-travel corridors. These services and vehicles have their own unique branding and have some of the service amenities found on rail such as off-board fare collection, passenger information systems, and more comfortable vehicles and interiors.

Figure 26: BRT in Exclusive Guideway

(LEFT: Eugene; RIGHT: Cleveland)

BRT in a fixed guideway mimics several of the characteristics of rail while offering more flexibility to serve destinations with a vehicle that has rubber tires, low-floor design, high capacity, and passenger amenities. To the riding public, BRT in an exclusive guideway can look, feel, and perform like rail transit with service that is frequent and speedy. BRT stations designed with the unique characteristics of the community in mind often become neighborhood focal points and suggest the potential for transit-oriented development. BRT vehicles provide smooth, quiet comfort at average speeds of up to twice those of conventional buses or of buses in mixed traffic.

Figure 27: Streetcars

(LEFT: Seattle; RIGHT: Tacoma)

Streetcars are a form of an electric railway system that are able to operate single or multiple cars in mixed traffic or in a fixed guideway at ground level. Streetcars are smaller rail vehicles that can operate along narrower streets and have tighter turning capabilities than other rail vehicles that tend to be larger. They operate at the speeds of adjacent traffic. They are able to board and discharge passengers at station platforms or at street, track, or car-floor level and are normally powered by overhead electrical wires (catenaries) although some are emerging with batteries to store power and allow them to travel short distances "off the wire." Streetcars typically operate in an urban environment.

Figure 28: Light Rail Transit

(LEFT: Los Angeles; RIGHT: Sacramento)

Light rail transit is a form of an electric railway system that is able to operate single or multiple cars along fixed rights-of-way at ground level, on aerial structures, in subways or in streets. It tends to have higher operating speeds, larger vehicles, and greater passenger capacity than streetcars and is able to board and discharge passengers at station platforms or at street, track, or car-floor level. It is normally powered by overhead electrical wires (catenaries). LRT operates in both urban and suburban environments and covers longer distances than streetcars.

Figure 29: Commuter Rail

(LEF: Austin; RIGHT: Seattle)

Commuter rail is a form of railway transit that operates multiple cars that are either self-propelled in the case of a DMU or locomotive hauled with either diesel-electric propulsion or electric multiple unit (EMU) propulsion along fixed and exclusive rights-of-way. Most commuter rail lines operate on existing freight lines, often sharing them with freight rail. Commuter rail tends to have high operating speeds, large vehicles, and the greatest passenger capacity of rail options. Trains typically board and discharge passengers at high level station platforms. Commuter rail operates over long distances, typically from suburban areas into downtowns with total lines of roughly 20 or more miles.

7.2 PRE-SCREENING RESULTS

This pre-screening addresses four criteria with the intent to focus further analysis on those options that present a compelling business case for Lextran's investment.

- **Cost Effectiveness** – A measure of how much each alternative will cost in terms of capital construction versus the likely ridership, as well as the ability of Lextran or another entity to provide for future O&M costs.
- **Constructability** – A measure of the level of impact involved in implementing each alternative as a capital project.
- **Operations** – A measure of how well each alternative can function as an integral part of the corridor transportation network.
- **Supportability** – A measure of how well the alternative will be supported by project stakeholders and decision makers at the local, state and federal levels given the priorities and rules established for project development.

This section presents a discussion of these criteria and ranks each alternative as either "Good", "Fair", or "Poor", indicating a non-specific value judgment for how well each alternative compares with the others. Collectively, these rankings form the basis for recommending specific alternatives to be retained for further study as candidate improvements for the US 27 corridor. "Good" is the best at addressing or fulfilling each of the criteria, "Fair" satisfies the criteria marginally or is in the middle, while "Poor" does not satisfy the criteria.

7.2.1 Cost Effectiveness

Evaluating the cost effectiveness of a project must consider three basic elements of cost, **Capital Cost**, **Operations and Maintenance**, and **Revenue Generating Capacity,** which collectively define the total project life-cycle cost. Comparison of cost effectiveness measures among various alternatives for this pre-screening phase are based on the consultant's knowledge of projects at the national level and review of the National Transit Database and the Federal Transit Administration's (FTA) New Starts and Small Starts projects.

Capital Cost

Capital cost is the initial investment in planning, design, and construction. Table 8 presents typical costs for the Build options under consideration:

Table 8: Build Options – Capital Costs per Mile (in millions, 2013 dollars)

Mode	Low	High
Bus Rapid Transit – Mixed Traffic	$2.0	$3.0
Bus Rapid Transit – Exclusive Guideway	$5.0	$15.0
Streetcar/Light Rail Transit	$25.0	$50.0
Commuter Rail	$12.5	$25.0

The No Build Alternative is assumed to involve zero capital cost. Capital costs for a TSM Alternative would include localized improvements near bus stops, improvements to traffic control hardware, upgrades to transit vehicles, and yard and shop facilities. From comparable projects, TSM costs are estimated to be $250,000-$750,000 per mile for this project.

Operations and Maintenance Cost

Operations and maintenance costs address fuel, staffing, upkeep for the vehicles in service, the infrastructure on which they operate, as well as the stations that serve as interface between the transit service and other modes. Generally speaking, O&M costs are typically higher for rail modes than for bus systems. O&M costs under the No Build or TSM options would be comparable with that for existing services. Expansion of existing service to include more buses running on shorter headways would increase O&M proportionally with the number of vehicles in service.

Of all the build options under consideration, BRT in mixed traffic is the most affordable and is estimated to cost about $2M per year. BRT on an exclusive guideway is comparable to commuter rail (estimated $4M to $5M per year) due to the limited capacity of buses as compared to trains (i.e., more buses required to achieve the same capacity) and the comparable overhead of maintaining a dedicated roadway/railbed. The relative savings of operating commuter rail as compared to LRT or streetcar service is offset by the need to maintain separate and larger stations as well as a place to service and store the trainsets.

Streetcar and LRT systems are the most expensive to operate as they require service of the dedicated right-of-way, the catenary (overhead propulsion) system, and rail vehicles. O&M costs for streetcar and LRT are in the order of $8M to $10M per year (Table 9).

Table 9: Build Options – Annualized O&M Costs (in millions, 2013 dollars)

Mode	Low	High
Bus Rapid Transit – Mixed Traffic	$2.0	$3.0
Bus Rapid Transit – Exclusive Guideway	$4.0	$5.0
Streetcar/Light Rail Transit	$8.0	$10.0
Commuter Rail	$4.0	$5.0

Revenue Generating Capability

Federal funds are critical to making a project financially feasible and supportable at a local level. Therefore, the ability to recapture life-cycle cost of proposed improvements through federal investment and paid ridership is an important measure of project feasibility. For this study, the proposed expansion of Lextran's services along the US 27 corridor represent a fixed target with regards to the demand being served. As identified in the Existing Conditions section, the target ridership is well-defined and is not likely to change substantially between build alternatives, provided that a basic level of service capacity can be maintained. While certain services may provide improved level of service relative to other options, these differences would have a marginal effect on total ridership and thus not be helpful in leveraging federal investment.

An analysis of capital and O&M costs over an assumed 20-year life of the project yields the results shown in Table 10.

Table 10: Build Options – Life Cycle Costs (in millions, 2013 dollars)

Mode	Low	High	Mid	Cost Effectiveness
No Build	$20.00	$40.00	$30.00	Fair
Transportation System Management	$42.50	$65.00	$57.50	Good
Bus Rapid Transit – Mixed Traffic	$60.00	$85.00	$80.00	Good
Bus Rapid Transit – Exclusive Guideway	$130.00	$200.00	$240.00	Fair
Streetcar/Light Rail Transit	$410.00	$575.00	$680.00	Poor
Commuter Rail	$205.00	$287.50	$340.00	Fair

Bus options running on non-exclusive right-of-way are the least expensive options. Despite being the least costly of all options, the cost effectiveness measure for the No Build Alternative is listed as "Fair" since the existing service does not provide sufficient capacity to meet projected demand. There is some overlap between the cost envelopes of BRT on an exclusive guideway and commuter rail, although both would require ridership of approximately double what exists today to be competitive for federal funding. Streetcar and LRT are substantially more expensive than other alternatives, and are therefore ranked last in cost effectiveness.

7.2.2 Constructability

Issues affecting constructability include the extent of geometric improvements, right-of-way acquisition, and the corresponding impact on the surrounding built environment.

No Build, TSM, and bus alternatives in mixed traffic present few challenges in regards to constructability, as they do not require major physical changes within the public right-of-way. Therefore, constructability for these alternatives is ranked as "Good."

Rededication of existing traffic lanes to transit service is a possibility for BRT, LRT, and streetcar service. However, US 27 is already at or near capacity for much of the day with high traffic volumes and high crash locations along many segments. Thus, taking a lane for exclusive guideway transit operations is not feasible due to degraded traffic operations that would result. Mixed traffic operations for LRT and streetcar are not practical as the ability to have increased travel speeds and reliability would be severely compromised by being in mixed traffic.

Considering these limitations, running in the existing roadway for exclusive BRT, LRT, and streetcar alternatives does not appear to be a feasible alternative, which suggests that these alternatives could be built only on an exclusive guideway or trackage. However, right-of-way is a major constraint parallel to US 27. Residential setbacks along US 27 are 40 feet from the roadway edge, meaning a guideway or track system would encroach on residential yards and potentially require a significant number of condemnations as existing properties are rendered unusable. That much residential right-of-way would be difficult and costly to obtain; accordingly, constructability for the LRT and streetcar alternatives is ranked as "Poor." As for exclusive BRT, while the impacts would still be significant, it is conceivable that sufficient width exists to provide one lane of widening in each direction to accommodate a dedicated lane, so constructability for BRT in exclusive lanes is ranked as "Fair."

Commuter rail presents a different set of challenges related to the implementation of the existing Norfolk Southern (NS) rail corridor. The existing rail system is a single-track system in the southern half of the corridor, which would have to be widened to a double-track system to accommodate commuter trains and station operations while maintaining existing freight trains. Working with NS to obtain trackage rights, schedule adherence guarantees, and indemnity/insurance coverages would be difficult and costly for only a 10-mile system. Additional infrastructure would have to be built to provide connectivity between the rail stations and the bulk of the development along the US 27 corridor, up to one half mile to the east. The commuter rail system is accordingly ranked "Poor" in terms of constructability.

7.2.3 Operations

Operational feasibility is a measure of the ability to generate ridership and operate without significant impacts to existing traffic operations.

The No Build Alternative ranks as "Fair" due to the lack of improvement to existing conditions. However, bus service offers a great deal of flexibility to provide expanded transit capacity with a minimal impact to existing traffic operations. TSM, expanded bus service, and BRT options (either in mixed traffic or on dedicated lanes) offer "Good" potential in terms of operability.

Due to constructability limitations precluding operations in mixed traffic, LRT and streetcar modes would operate on parallel trackage. Gating of numerous intersections with cross streets

and the according interruption of normal access to residents and businesses fronting US 27 would represent a significant loss of utility and would likely generate significant opposition to the project. Operational feasibility for these alternatives is therefore ranked "Poor."

While commuter rail does not affect operations on US 27, the 10-mile system length of the line is shorter than what is normally operated for commuter rail. With a typical station spacing of 5 to 7 miles, the corridor is too short to have more than two or three stations, limiting potential ridership and accessibility. The separation of the rail line from US 27 (up to one half mile to the east) limits the usefulness of the system as an alternative means to access development along the highway. Commuter trains would operate along with existing mixed freight and unit trains coming about once every hour, and could potentially affect scheduling. Due to the limited benefits and logistical challenges of operating such a short commuter rail corridor, operations are ranked "Poor."

7.2.4 Supportability

This study acknowledges Lextran's need for improved transit service on the US 27 corridor, and while a No Build Alternative is always a possibility, it is recognized that this is not the ideal solution. Supportability for a No Build Alternative is therefore ranked as "Fair." TSM may not provide sufficient gains in the level of transit service to justify the costs; however, it has yet to be determined whether this is the case. Going forward, this alternative is deemed to have "Good" supportability provided that improvements in the service justify the additional investment.

As for the Build options, recently passed legislation (MAP-21) governs the process the FTA uses to assess potential transit projects for funding. As local transit projects compete for FTA funding on a national level, this funding process is becoming more competitive as more jurisdictions seek transit-based alternatives to improving person throughput in growing metropolitan areas. In judging the merit of transit projects, the FTA is not only sensitive to cost of operations, but also to the impacts of transit projects on the surrounding communities.

As this applies to Lextran operations on the US 27 corridor, the benefits gained in ridership and improved transit operations must justify the costs and associated impacts in order to be competitive, keeping in mind that Lextran would be responsible for funding 50 percent or more of the project's costs. This precludes more expensive options for which costs and impacts are out of scale with ridership and revenue generating capability. Therefore, the rail options are not competitive in context of the US 27 corridor and are accordingly ranked "Poor" in terms of supportability. Bus options are more realistic in terms of their ability to provide improved service at a lower cost and with much lower physical impacts than rail options. This follows the course of FTA guidance, which favors BRT projects for their flexibility and relative low cost of entry. Supportability for expanded bus and BRT options are ranked "Good."

Table 11 summarizes the screening for all modes and options under consideration.

Table 11: Pre-Screening Summary

Mode	Cost Effectiveness	Constructability	Operations	Supportability	Overall Ranking	Retained for Further Study
No Build	Fair	Good	Fair	Fair	Fair	✓
TSM	Good	Good	Good	Good	Good	✓
BRT – Mixed Traffic	Good	Good	Good	Good	Good	✓
BRT – Exclusive Guideway	Fair	Fair	Good	Good	Fair	✓
Streetcar/Light Rail Transit	Poor	Poor	Poor	Poor	Poor	
Commuter Rail	Fair	Poor	Poor	Poor	Poor	

Based upon this pre-screening analysis, the No Build (as a basis of comparison to the other build options) along with the TSM, and bus/BRT options are recommended to be retained for additional analysis. The rail options (streetcar, LRT and commuter rail) are not recommended for advancement for further analysis.

8 Evaluation Criteria and Methodology

This Evaluation Criteria and Methodology presents an overall framework and measures for screening the mode and alignment alternatives under consideration in this AA. The framework presented in this report is consistent with the Federal Transit Administration's (FTA) guidance for the evaluation of alternatives provided in the FTA's *Procedures and Technical Methods for Transit Project Planning*.[3]

The US 27/Nicholasville Road AA is intended to assist Lextran, LAMPO, and other stakeholders in deciding what transit investments to make within the study area in order to address the identified needs. The study process and conclusion will lead to the selection of a Locally Preferred Alternative (LPA), defined in terms of transit mode and general alignment. The intent is to select a LPA that will improve transit speeds and system reliability, increasing the competitiveness of transit for commuting and other trip-making purposes, while supporting regional goals for development, redevelopment, and sustainability.

An AA is typically of the federal process for seeking Section 5309 New Starts funding or Small Starts funding. Once an LPA is chosen, the next step in the federal process for New Starts is a request for FTA approval to enter the Preliminary Engineering (PE) phase. A second purpose of the AA is to develop the information needed to support federal decision-making should a request for PE approval be made.

8.1 DECISION-MAKING

The screening of alternatives is not only a technical process, as described in this methodology section, but is also part of a broader stakeholder/public involvement and decision-making process. The evaluation process is designed to inform those decision-makers by offering technical information at each decision point. Decisions on which alternatives to advance, and on which alternative to select, may reflect a broader set of considerations emanating from the public process.

8.2 EVALUATION FRAMEWORK

The evaluation framework to be used in the US 27/Nicholasville Road AA consists of a two-tiered screening process. Using a set of evaluation criteria derived from the Purpose and Need, and relatively "high level" analysis results, the Tier 1 Screening seeks to identify a shorter list of the most promising alternatives to be carried forward for more-detailed analysis and evaluation. The Tier 2 Screening results in the selection of a single LPA defined in terms of mode and general alignment. The project team conducted a "pre-screening" to identify the long list of alternatives from the infinite universe of alternatives that could be considered.

[3] http://www.fta.dot.gov/12304_2396.html

The alternatives to be carried into the Tier 1 Screening include:

- No Build Alternative,
- Transportation Systems Management (TSM) alternative representing the best that can be done to improve transit operations with low cost bus improvements, and
- Additional transit alternatives that would require a higher level of capital investment. These build investments include only bus-based options as the rail options were previously screened out as not feasible.

8.3 TIER 1 SCREENING

Tier 1 Screening evaluates each alignment and technology advanced from the pre-screening to assist the project team in determining a smaller set of the most promising transit alternatives. The Tier 1 Screening uses mostly qualitative and subjective measures, but may include quantitative data expressed in ranges if that data is available. Data for the screening stems largely from available demographic data, Geographic Information System (GIS) data, local planning studies and documents, field reconnaissance, and stakeholder and public feedback.

For each evaluation measure, the alignment and technology alternatives are rated on a scale of High, Medium, and Low, with the "High" rating representing the most promising alternative and "Low" representing the least promising. Again, if applicable in Tier 1, quantitative data is used instead of a qualitative ranking. A summary matrix of the data and ratings is provided for each measure by corridor segment. The poorest performers are recommended for elimination from further consideration as part of the AA.

8.4 TIER 2 SCREENING

Tier 2 Screening evaluates the shorter list of full corridor alternatives at a level of detail sufficient for local decision-makers to select an LPA. Tier 2 Screening relies on a pivot point model for forecasting ridership. Conceptual station locations are identified and a limited level of conceptual engineering is performed to provide a basis for capital cost estimating, O&M costs, estimating, and financial analyses, among others. More detailed environmental "fatal flaw" screening and impact studies are performed as well.

The outcome of the Tier 2 Screening is an LPA that could be advanced for more detailed environmental and engineering studies. Once the Tier 2 results are reviewed, there may be a desire to mix and match features of several alternatives to form a hybrid LPA. If this were to occur, additional analysis may need to be done to support a request for FTA approval to move that project into PE.

Table 12 summarizes the screening process.

Table 12: Summary of the Screening Process

Screen Level	Initial Screening (Universe of Alternatives)	Tier 1 Screening (Long List of Alternatives)	Tier 2 Screening (Short List of Alternatives)
Purpose	• Document alternatives considered and eliminated prior to the formal screening of alternatives • Eliminate fatally flawed alternatives from further consideration	• Identify suitability of each mode/alignment in the corridor • Develop a small set of the most promising transit alternatives	• Evaluate approximately 2 to 3 corridor alternatives in detail
Approach	• Document reasons why certain transit modes/technologies are not suitable for the corridor	• Conduct qualitative/quantitative evaluation of each alternative, and drop poorest performers	• Optimize so that each surviving full corridor alternative is the best representation of its particular technology • Conduct more qualitative and quantitative evaluation of full corridor alternatives
Evaluation Measures	• Is a mode or alignment clearly ill-suited to addressing the Purpose and Need in these corridors? • Does the alignment and/or mode have an obvious fatal flaw?	• See Table 13 through Table 17	• See Table 13 through Table 17
Outcome	• Shorter list of modes and alignments for Tier 1 Screening	• Most promising mode and alignment alternatives for more detailed Tier 2 Screening	• Locally Preferred Alternative

8.5 EVALUATION PERSPECTIVES

This section presents a discussion covering the different perspectives that can be applied to the evaluation of alternatives. While addressing the Purpose and Need is an important consideration, other perspectives should be considered as well. FTA guidance suggests that measures be organized in a fashion that focuses the evaluation on five primary perspectives:

- **Effectiveness** measures assess the extent to which the alternatives address the stated needs in the corridor. Suitable measures for evaluation are derived from the Purpose and Need.
- **Cost-effectiveness** measures assess the extent to which the costs of the alternatives, both capital and operating, are commensurate with their anticipated benefits.
- **Feasibility** measures assess the financial and technical feasibility of the alternatives. Financial measures assess the extent to which funding for the construction and operation of each alternative is considered to be readily available. Technical feasibility assesses potential engineering challenges or restrictions that could limit the viability of an alternative.

- **Impacts** measures assess the extent to which the alternatives could present potential human and/or natural environmental impacts, including traffic issues that could be fatal flaws or otherwise influence the selection of a preferred alternative.
- **Equity** measures assess the extent to which an alternative's costs and benefits are distributed fairly across different population groups.

8.6 GOALS, OBJECTIVES AND EVALUATION MEASURES

Project Goals and Objectives describe the desired outcomes of the transit investment that may result from the US 27/Nicholasville Road AA and provide a basis for defining evaluation measures to be used to narrow the transit alternatives under consideration. The articulated Goals and Objectives include:

- Identifying a cost-effective transit investment for implementation in the US 27 corridor,
- Providing a foundation for integrating land use decisions with transportation and transit investments, and
- Developing a dialogue to elevate the priority and status of transit within the Lexington area.

Table 13 through Table 17 lay out the specific evaluation measures related to the five evaluation perspectives outlined previously that span the Tier 1 and Tier 2 Screening. Where data is available, each alternative is screened against these measures.

Table 13: Effectiveness Measures

Goals	Objectives	Tier 1 Screening Measures	Tier 2 Screening Measures
Develop a transit alternative that enhances mobility and is competitive with the automobile.	• Reduce / improve transit travel times and speeds within study area. • Provide transit capacity needed to meet future travel demand.	• Directness of route (length of each alignment segment) • Average transit travel speed • Ability of alternative to meet expected demand	• End-to-end travel time • Average transit travel speed • Travel time between select origins and destinations • Number of passengers • Load factor at max load point
Improve transit service reliability within the study area.	• Improve on-time performance.	• Length of alignment in fixed guideway	• Vehicle miles in fixed guideway • Passenger miles in fixed guideway
Develop a transit alternative that enhances mobility for the reverse commute market and transit-dependent populations.	• Increase transit accessibility.	• Population and employment concentrations within ¼ mile of alignment	• Number of households within ½ mile of a transit station • Number of jobs within ½ mile of a transit station
Develop a transit system that supports local planning initiatives and land use strategies.	• Provide transit service that can support desired land use growth patterns.	• Number of existing or potential redevelopment sites directly served • Number of targeted key destinations and major employers directly served	• Qualitative assessment of consistency of proposed station locations with local plans and policies • Transit travel time from each key destination or major employer to downtown
Develop a transit system that improves connectivity between existing and emerging key destinations and major employers and redevelopment sites.	• Provide convenient and accessible transit service to existing and planned key destinations and major employers.		
Develop a transit system that spurs economic development through efficient and sustainable land use patterns	• Provide transit service that can enhance and encourage transit-supportive land use.	• Acres of potential redevelopment sites within ½ mile of a transit station	• Assessment of the development potential of sites within ½ mile of a transit station

Table 14: Cost-Effectiveness Measures

Evaluation Criteria	Tier 1 Screening Measures	Tier 2 Screening Measures
Capital & O&M Costs	Subjective assessment – High, Medium, Low	• Estimated total capital cost • Estimated annual operating cost
Transit Productivity		• Average 2035 daily boardings per route mile • Average 2035 daily boardings per revenue hour
Cost Effectiveness		• Cost per new passenger

Table 15: Feasibility Measures

Evaluation Criteria	Tier 1 Screening Measures	Tier 2 Screening Measures
Technical Feasibility	Subjective assessment of constructability, availability of right-of-way, etc.	Further review of feasibility questions that were not addressed in Tier 1
Financial Feasibility	Comparison of order-of-magnitude capital cost with the estimated funds available for local match/local funding (capital & operating) Potential to receive FTA funding	Assessment of availability/stability of potential funding sources to be used for funding capital and operating costs

Table 16: Impact Measures

Evaluation Criteria	Tier 1 Screening Measures	Tier 2 Screening Measures
Environmental Impacts	Subjective assessment of impacts/fatal flaws to human and natural environment	• Potential number of displacements • Neighborhood impacts • Section 4f/park impacts • Wetland, stream, and floodplain impacts • Visual and aesthetic impacts • Right-of-way impacts • Cultural/historic impacts
Traffic impacts	Subjective assessment of impacts/fatal flaws	• Change in regional vehicle miles traveled • Congestion and safety impacts on individual streets and within the corridor

Table 17: Equity Measures

Evaluation Criteria	Tier 1 Screening Measures	Tier 2 Screening Measures
Impacts on minority and low-income groups	• Transit-dependent population concentrations within 1/4 mile of alignments • Concentrations of service sector jobs within 1/4 mile of alignments	• Number of low-income households within ½ mile of a station • Proportion of riders from low-income groups in 2035 • Proportion of displacements that are within Environmental Justice census tracts

9 Alternatives Development and Definition

This section details the development of the alternatives and defines them for the Tier 1 Screening. The alternatives were developed to address the identified problems in the corridor and range from the No Build option to additional express bus services to build options covering BRT in mixed traffic and exclusive guideways.

The alternatives were developed by the consultant team and included a range of options. The goal was to create improved transit services in the corridor, reduce transit travel times, and ensure reliability of the schedule and do so in a cost-effective manner while promoting travel options and seeking to increase opportunities for transit-oriented development (TOD) and redevelopment. To that end, the alternatives (except for one) stay within or in close proximity to the existing right-of-way.

The alternatives provide high-capacity, higher-speed transit options and include a new park-and-ride lot in Jessamine County near Nicholasville. The BRT options use new purpose-built vehicles and identify new station locations. These locations will have amenities such as a shelter, lighting, seating, and next vehicle information among others.

The following sections detail the alternatives as set forth for evaluation in Tier 1.

9.1 NO BUILD ALTERNATIVE

This alternative includes no other improvements beyond the existing plans and projects in the existing Transportation Improvement Plan (TIP) and the Metropolitan Transportation Plan (MTP). For transit services, the alternative changes the stop at the Fayette Mall from the mall property to an on-road stop.

9.2 ALTERNATIVE 1 – ENHANCEMENTS OF EXPRESS BUS SERVICE (ROUTE 23)

This alternative would provide additional bus trips to the existing express service and extend it into Jessamine County/Nicholasville to a new park-and-ride lot. The alternative would add one additional morning trip and one additional afternoon trip (3 a.m. and 3 p.m. trips no respectively from the existing 2) for a total of six trips daily. This alternative would provide transit signal priority (TSP) at no more than five locations if feasible.

9.3 ALTERNATIVE 2 – ENHANCEMENTS OF ALL-DAY SERVICE (ROUTE 5)

This alternative would enhance the existing daily service in the corridor. It would reduce the peak-hour headways from 30 minutes to 15 minutes and from 60 minutes to 30 minutes for all

other times. The alternative would extend the service to the new Nicholasville park-and-ride lot and would provide transit signal priority (TSP) at no more than five locations, if feasible.

9.4 ALTERNATIVE 3 – MIXED TRAFFIC BRT FOR ALL-DAY SERVICE (REPLACING ROUTE 5)

This alternative would create a BRT service in mixed traffic by utilizing the right-most/curb lane. The alternative would seek to make this lane a Business Access Transit (BAT) lane, which would be used primarily by vehicles turning right into or right out of local business as well as BRT vehicles. The buses would be distinctively branded with purpose-built BRT buses operating on a 20 minute all-day headway and include amenities to appeal to new customers.

New stations would be developed at approximately 1-mile intervals at major destinations with lighted shelters, next bus information, and other passenger amenities, including off-board fare collection.

The following stations would be included:

- Transit Center,
- UK Campus (either Rose Street or Limestone and Upper),
- UK Healthcare,
- Baptist Health Lexington,
- Zandale,
- Fayette Mall,
- Ag Farm (long-term),
- Brannon Crossing,
- Kohl's/Sam's Club, and
- Nicholasville Park-and-Ride.

This alternative would also provide transit signal priority (TSP) at no more than five locations, if feasible.

9.5 ALTERNATIVE 4 – EXCLUSIVE LANE BRT (CURB RUNNING)

This alternative is similar to Alternative 3, but would create a separate and exclusive guideway for the operations of the BRT service. It would include all the parameters of Alternative 3, but would do so with curb-running BRT service.

9.6 ALTERNATIVE 5 – EXCLUSIVE LANE BRT (MEDIAN BRT)

This alternative is similar to Alternative 4 but would create a separate and exclusive guideway for the operations of the BRT service. It would include all the parameters of Alternative 3, but would do so with median-running BRT service.

9.7 ALTERNATIVE 6 – EXCLUSIVE LANE BRT (CURB RUNNING AND OFF-STREET – FAYETTE MALL)

This alternative is similar to Alternative 4 but would create a separate and exclusive guideway for the operations of the BRT service. It would include all the parameters of Alternative 3 but would do so with a curb-running BRT and portions of an off-US 27-running guideway largely behind Fayette Mall.

9.8 ALTERNATIVE 7 – EXCLUSIVE LANE BRT (CURB RUNNING AND OFF-STREET – ROSE STREET)

This alternative is similar to Alternative 4 but would create a separate and exclusive guideway for the operations of the BRT service. It would include all the parameters of Alternative 3 but would do so with a curb-running BRT and portions of an off-US 27-running guideway largely behind Fayette Mall and along Rose Street in a transit-like mall.

10 Level II Screening

10.1 OPERATIONS AND MAINTENANCE COSTS

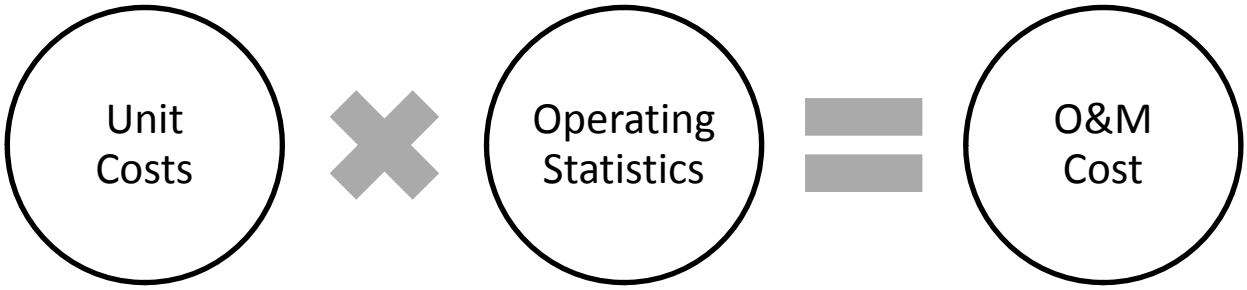
This section pertains to the operations and maintenance (O&M) costs and has three main sections that describe the steps in the methodology used to calculate the O&M costs. The first section describes how the Bus Rapid Transit (BRT) O&M cost model was developed. The second details the service statistics developed and used as cost drivers. The third shows the calculation of the O&M costs and discusses implications for the project.

All costs presented here are in 2013 dollars.

10.2 BUS RAPID TRANSIT COST MODEL

The BRT O&M costs for each alternative were estimated using a resource build-up model in which labor and materials costs were calculated as a function of supply variables. In basic terms, the model is a function of unit costs multiplied by expected units of the proposed service. This equation is shown in Figure 30.

Figure 30: Operations and Maintenance Cost Model Methodology



BRT O&M costs comprise two main cost sources: the operation of the bus service and costs for the additional infrastructure proposed for each alternative. For basic bus operations, bus maintenance, and agency administration costs, Lextran's existing bus O&M costs were used, as they are the most direct local sources of local transit O&M costs. Additional infrastructure costs were based on BRT maintenance practices at other transit agencies in the United States, but labor costs for this maintenance were based on Lextran's current agency costs. Eight variables were identified for the BRT cost model:

- **Cost per Revenue Hour** is the cost of operating a revenue hour of bus service and related to Lextran's vehicle operations cost.
- **Cost per Revenue Mile** is the cost of operating a revenue mile of bus service and related to Lextran's vehicle maintenance cost.

- **Cost per Peak Bus** is the cost per peak bus (the number of buses operated in maximum service) operated by Lextran and related to general administration cost of the agency.
- **Cost per Station for Maintenance** is the cost to maintain shelter, benches, and signage at each proposed BRT station.
- **Cost per Station for Utilities** is the cost for electricity to light each proposed BRT station.
- **Cost per Ticket Vending Machine (TVM)** is the cost to maintain a ticket vending machine proposed for each BRT station.
- **Cost per Guideway Mile** is the cost per guideway mile to maintain pavement associated with BRT lanes.
- **Cost per Revenue Hour for Security** is the cost per revenue hour for security/police presence along the BRT line.

10.2.1 Lextran Bus Cost Model

As noted above, the main source of costs is from Lextran's existing O&M costs. This section details how those unit costs were developed. Operating cost data for Lextran was taken from the National Transit Database (NTD) for FY 2011, the most recent year for which data is available. Each cost item was then assigned to a variable, through which the unit cost for this variable was derived.

Assignment of Expense Items to Key Driving Variables

Lextran's NTD cost information was assigned to the first three variables listed previously: revenue hours, revenue miles, or peak buses. Table 18 shows the assignment of the NTD data to the three variables.

Calculation of Unit Costs and Productivity Ratios

After assignment of the costs was completed, the next step was to calculate the supply unit costs and resource unit costs (Table 19). The base year model was calculated by dividing each line item cost by the base year supply units. Supply units were taken from Lextran's 2011 NTD submittal to ensure consistency with costs. Productivity ratios are defined as the ratio of resource variables to supply variables.

The methodology for calculating the productivity ratios was as follows:

- Determine a resource variable for each line item. In many cases, the resource variable may be the same as the supply unit variable.
- Calculate the resource to supply ratio for each line item.
- Determine the cost per resource unit.

Table 18: Assignment of Lextran FY 2011 O&M Costs to Variables

	Annual Expense	Assignment of Expense Items		
		Revenue Hours	Revenue Miles	Peak Vehicles
Vehicle Operations Labor				
Operator Salaries and Wages	$4,174,546	X		
Other Salaries and Wages	$696,043	X		
Fringe Benefits	$3,071,699	X		
Services	$32,889	X		
Vehicle Operations Materials and Supplies				
Fuel and Lubricants	$1,875,567		X	
Tires and Tubes	$60,800		X	
Other Materials/Supplies	$6,605		X	
Utilities	$0		X	
Casualty and Liability	$0		X	
Taxes	$208,309			X
Miscellaneous	$11,938			X
Expense Transfers	$0			X
Vehicle Maintenance Labor				
Other Salaries and Wages	$1,432,019		X	
Fringe Benefits	$908,391		X	
Services	$370,046		X	
Vehicle Maintenance Materials and Supplies				
Fuel and Lubricants	$65,631		X	
Tires and Tubes	$7,336		X	
Other Materials and Supplies	$979,636		X	
Utilities	$0		X	
Casualty & Liability	$192,574		X	
Taxes	$0			X
Miscellaneous	$9,293		X	
Expense Transfer	$0			X
Non-Vehicle Maintenance Labor				
Other Salaries and Wages	$102,268			X
Fringe Benefits	$43,244			X
Services	$238,577			X
Non-Vehicle Maintenance Materials and Supplies				
Fuel and Lubricants	$0			X
Tires and Tubes	$0			X
Other Materials and Supplies	$137,736			X
Utilities	$0			X
Casualty & Liability	$0		X	
Taxes	$0			X
Miscellaneous	$147			X
Expense Transfer	$0			X
General Administration				
Other Salaries and Wages	$537,407			X
Fringe Benefits	$284,364			X
Services	$568,665			X
Fuel and Lubricants	$0			X
Tires and Tubes	$0			X
Other Materials and Supplies	$135,340			X
Utilities	$223,484			X
Casualty and Liability	$453,707		X	
Taxes	$0			X
Miscellaneous Expense	$268,150			X
Expense Transfers	$0			X

Table 19: Lextran FY 2011 Resource and Supply Unit Costs

				Productivity Ratio						
	Annual Expense	Supply Variable	Supply Value	Resource Variable	Resource Value	Resource/ Supply	2011 Resource Unit Cost	2011 Supply Variable Unit Cost	Inflation*	2012 Supply Variable Unit Cost
Vehicle Operations Labor										
Operator Salaries and Wages	$4,174,546	Revenue Hours	188,728	Vehicle Operations Work Hours	265,521	1.4069	$15.72	$22.12	2.49%	$22.67
Other Salaries and Wages	$696,043	Revenue Hours	188,728	Vehicle Operations Work Hours	265,521	1.4069	$2.62	$3.69	2.49%	$3.78
Fringe Benefits	$3,071,699	Revenue Hours	188,728	Vehicle Operations Work Hours	265,521	1.4069	$11.57	$16.28	2.49%	$16.68
Services	$32,889	Revenue Hours	188,728	Revenue Hours	188,728	1.0000	$0.17	$0.17	2.49%	$0.18
Vehicle Operations Materials and Supplies										
Fuel and Lubricants	$1,875,567	Revenue Miles	2,305,754	Revenue Miles	2,305,754	1.0000	$0.81	$0.81	2.49%	$0.83
Tires and Tubes	$60,800	Revenue Miles	2,305,754	Revenue Miles	2,305,754	1.0000	$0.03	$0.03	2.49%	$0.03
Other Materials/Supplies	$6,605	Revenue Miles	2,305,754	Revenue Miles	2,305,754	1.0000	$0.0029	$0.00	2.49%	$0.00
Utilities	$0	Revenue Miles	2,305,754	Gallons diesel fuel	670,018	0.2906	$0.00	0	2.49%	$0.00
Casualty and Liability	$0	Revenue Miles	2,305,754	Revenue Miles	2,305,754	1.0000	$0.00	$0.00	2.49%	$0.00
Taxes	$208,309	Peak Vehicles	46	Peak Vehicles	46	1.0000	$4,528.46	$4,528.46	2.49%	$4,641.22
Miscellaneous	$11,938	Peak Vehicles	46	Peak Vehicles	46	1.0000	$259.52	$259.52	2.49%	$265.98
Expense Transfers	$0	Peak Vehicles	46	Peak Vehicles	46	1.0000	$0.00	$0.00	2.49%	$0.00
Vehicle Maintenance Labor										
Other Salaries and Wages	$1,432,019	Revenue Miles	2,305,754	Vehicle Maintenance Work Hours	72,384	0.0314	$19.78	$0.62	2.49%	$0.64
Fringe Benefits	$908,391	Revenue Miles	2,305,754	Vehicle Maintenance Work Hours	72,384	0.0314	$12.55	$0.39	2.49%	$0.40
Services	$370,046	Revenue Miles	2,305,754	Revenue Miles	2,305,754	1.0000	$0.16	$0.16	2.49%	$0.16
Vehicle Maintenance Materials and Supplies										
Fuel and Lubricants	$65,631	Revenue Miles	2,305,754	Revenue Miles	2,305,754	1.0000	$0.03	$0.03	2.49%	$0.03
Tires and Tubes	$7,336	Revenue Miles	2,305,754	Revenue Miles	2,305,754	1.0000	$0.00	$0.00	2.49%	$0.00
Other Materials and Supplies	$979,636	Revenue Miles	2,305,754	Revenue Miles	2,305,754	1.0000	$0.42	$0.42	2.49%	$0.44
Utilities	$0	Revenue Miles	2,305,754	Revenue Miles	2,305,754	1.0000	$0.00	$0.00	2.49%	$0.00
Casualty & Liability	$192,574	Revenue Miles	2,305,754	Revenue Miles	2,305,754	1.0000	$0.08	$0.08	2.49%	$0.09
Taxes	$0	Peak Vehicles	46	Peak Vehicles	46	1.0000	$0.00	$0.00	2.49%	$0.00
Miscellaneous	$9,293	Revenue Miles	2,305,754	Revenue Miles	2,305,754	1.0000	$0.00	$0.00	2.49%	$0.00
Expense Transfer	$0	Peak Vehicles	46	Peak Vehicles	46	1.0000	$0.00	$0.00	2.49%	$0.00
Non-Vehicle Maintenance Labor										
Other Salaries and Wages	$102,268	Peak Vehicles	46	Non Vehicle Maint Work Hours	6,059	131.7174	$16.88	$2,223.22	2.49%	$2,278.58
Fringe Benefits	$43,244	Peak Vehicles	46	Non Vehicle Maint Work Hours	6,059	131.7174	$7.14	$940.09	2.49%	$963.50
Services	$238,577	Peak Vehicles	46	Peak Vehicles	46	1.0000	$5,186.46	$5,186.46	2.49%	$5,315.60
Non-Vehicle Maintenance Materials and Supplies										
Fuel and Lubricants	$0	Peak Vehicles	46	Peak Vehicles	46	1.0000	$0.00	$0.00	2.49%	$0.00
Tires and Tubes	$0	Peak Vehicles	46	Peak Vehicles	46	1.0000	$0.00	$0.00	2.49%	$0.00
Other Materials and Supplies	$137,736	Peak Vehicles	46	Peak Vehicles	46	1.0000	$2,994.26	$2,994.26	2.49%	$3,068.82
Utilities	$0	Peak Vehicles	46	Peak Vehicles	46	1.0000	$0.00	$0.00	2.49%	$0.00
Casualty & Liability	$0	Revenue Miles	2,305,754	Revenue Miles	2,305,754	1.0000	$0.00	$0.00	2.49%	$0.00
Taxes	$0	Peak Vehicles	46	Peak Vehicles	46	1.0000	$0.00	$0.00	2.49%	$0.00
Miscellaneous	$147	Peak Vehicles	46	Peak Vehicles	46	1.0000	$3.20	$3.20	2.49%	$3.28
Expense Transfer	$0	Peak Vehicles	46	Peak Vehicles	46	1.0000	$0.00	$0.00	2.49%	$0.00
General Administration										
Other Salaries and Wages	$537,407	Peak Vehicles	46	General Administration Work Hours	24,724	537.4783	$21.74	$11,682.76	2.49%	$11,973.66
Fringe Benefits	$284,364	Peak Vehicles	46	General Administration Work Hours	24,724	537.4783	$11.50	$6,181.83	2.49%	$6,335.75
Services	$568,665	Peak Vehicles	46	Peak Vehicles	46	1.0000	$12,362.28	$12,362.28	2.49%	$12,670.10
Fuel and Lubricants	$0	Peak Vehicles	46	Peak Vehicles	46	1.0000	$0.00	$0.00	2.49%	$0.00
Tires and Tubes	$0	Peak Vehicles	46	Peak Vehicles	46	1.0000	$0.00	$0.00	2.49%	$0.00
Other Materials and Supplies	$135,340	Peak Vehicles	46	Peak Vehicles	46	1.0000	$2,942.17	$2,942.17	2.49%	$3,015.43
Utilities	$223,484	Peak Vehicles	46	Peak Vehicles	46	1.0000	$4,858.35	$4,858.35	2.49%	$4,979.32
Casualty and Liability	$453,707	Revenue Miles	2,305,754	Revenue Miles	2,305,754	1.0000	$0.20	$0.20	2.49%	$0.20
Taxes	$0	Peak Vehicles	46	Peak Vehicles	46	1.0000	$0.00	$0.00	2.49%	$0.00
Miscellaneous Expense	$268,150	Peak Vehicles	46	Peak Vehicles	46	1.0000	$5,829.35	$5,829.35	2.49%	$5,974.50
Expense Transfers	$0	Peak Vehicles	46	Peak Vehicles	46	1.0000	$0.00	$0.00	2.49%	$0.00

*Inflation is assumed to be constant for all categories at the 2012 CPI

After the cost per resource unit was calculated, it was checked to determine whether the number was reasonable. For example, the cost per work hour for vehicle operations labor was calculated as $15.72. This number was then multiplied by 2,080 work hours in a year to estimate the annual salary for a bus operator. In this case, Lextran paid an average operator salary of $32,698. Average salaries and wages for Lextran management were also reviewed for reasonableness. The estimated administration management wage was $21.74, which calculated to an average annual salary of $45,219.

Based on proposed changes to the mode, the productivity ratios within the cost model are sometimes adjusted to account for changes to a specific line item cost. For this Lextran bus O&M cost model, the productivity ratios were not modified (i.e., it was assumed that the productivity of the future local bus system essentially would remain the same as that of the existing local bus system).

Apply Inflation

Since the Lextran cost data is from 2011, inflation was applied to the line item costs to calculate costs in 2012 dollars.[4] The inflation rate applied to line items was based on the annual increase in the Consumer Price Index (CPI) for the Cincinnati metropolitan area (the nearest metro area monitored by the Bureau of Labor Statistics) between the annual 2011 and annual 2012 CPI, which was 2.49 percent.

Calculation of Local Bus Unit Costs

The supply unit costs were then calculated by summing the individual line item costs for their respective supply unit. The supply unit costs (in 2012 dollars) for Lextran bus operations are as follows:

- $2.83 x number of annual 40-foot bus revenue vehicle miles
- $43.31 x number of annual vehicle revenue hours
- $61,486 x number of buses operated during maximum service

10.2.2 Additional Infrastructure Costs

Since each BRT alternative includes additional infrastructure, this cost model includes unit costs for infrastructure maintenance. These unit costs are based on BRT maintenance practices in Minneapolis, Minnesota, but the actual labor costs are those reported by Lextran unless otherwise noted. Based on the defined alternatives, the following costs to operate and maintain infrastructure are expected for each of the BRT alternatives:

- Larger station installations, including shelters, benches, and signs that must be cleaned and repaired on a regular basis,
- Utility cost for lighting at each station,
- Ticket vending machines at each station that must be stocked and repaired by a technician,
- A police/security presence to monitor each BRT station along each alternative, and
- For some alternatives, exclusive guideway pavement that must be kept in a state of good repair and TSP.

[4] At the time of this report, 2011 cost data was the most recent available.

Unit costs were developed for each of these infrastructure items.

Station Maintenance

In Minneapolis, BRT station maintenance was estimated to require approximately 0.025 workers (denoted here as full-time equivalents, or FTEs) per station. This equates to one full-time worker required to maintain 40 BRT stations. Lextran reports an average maintenance worker salary of $34,528, which equates to an annual cost of $863 per station. With an additional $500 annually in materials and supplies, the cost per station for maintenance is estimated to be $1,400 per station.

Station Utilities

In Kansas City, the annual electricity cost required to operate each of Kansas City Area Transportation Authority's Metro Area Express stations is estimated at $1,000 per year per station. This cost includes station lighting and electricity for distinctive pylon markers located at each station. The US 27/Nicholasville BRT alternatives would have lighting but not lit pylon markers, so the station utility cost was revised to approximately $750 per station.

Ticket Vending Machine Maintenance

In Minneapolis, TVM maintenance was estimated to require approximately 0.05 FTEs per station, or one FTE for every 20 stations. Lextran reports an average technician salary of $50,981, or an annual cost of $2,549 per station. With an additional $500 annually in materials and supplies, the cost per station for TVMs is estimated to be $3,100 per station.

Transit Signal Priority Equipment

Transit Signal Priority (TSP) equipment is expected to be maintained by LFUCG, and therefore no cost is considered here.

Security

In Minneapolis, security was estimated to require approximately 0.000122 FTEs per revenue hour of service, or one FTE for every 8,197 revenue hours of service. Lextran reports an average security salary of $62,400, or a cost of $7.61 per revenue hour of service for security.

Guideway Maintenance

The cost to maintain roadway pavement assumes that either Lextran maintains the pavement for exclusive BRT lanes themselves or contracts with another government agency to maintain the pavement. The cost was reported as $5,045 per lane mile by the KYTC.[5] In general, this cost is assumed to include snow plowing, salting, street sweeping, and pothole repair, as necessary. There is some variability in this cost, depending on the use of asphalt or concrete pavement, and this statewide average includes both kinds of pavement.

[5] Reported in a 2010 report on pavement maintenance costs by the Wisconsin DOT, which included a survey of various DOTs around the United States

The supply unit costs (in 2012 dollars) for BRT infrastructure maintenance are as follows:

- $1,400 x number of BRT stations for maintenance
- $750 x number of BRT stations for utilities
- $3,100 x number of TVMs for maintenance
- $7.61 x number of revenue hours operated for security
- $5,045 x number of guideway lane miles for pavement maintenance

10.3 SERVICE STATISTIC CALCULATION

Service statistics are an important part of the O&M cost equation because they drive the individual unit costs used to determine the final O&M cost. The service statistics are derived from two sources. The first source is Lextran operating statistics, which are the revenue miles, revenue hours, and peak buses required to increase the service frequency of each alternative. The second source is infrastructure statistics, which are the number of stations, TVMs, guideway miles, etc. All assumptions used to determine service statistics are listed in Appendix A.

10.3.1 Operating Statistics

Operating statistics were calculated for seven alternate services as well as existing services:

- Existing Route 23,
- Existing Route 5,
- Alternative 1 – Enhanced Express Bus on Route 23,
- Alternative 2 – Enhanced All-Day Service on Route 5,
- Alternative 3 – Mixed-Traffic BRT replacing Route 5,
- Alternative 4 – BRT replacing Route 5 (dedicated east-west right-of-way),
- Alternative 5 – BRT replacing Route 5 (dedicated single-sided right-of-way),
- Alternative 6 – BRT replacing Route 5 (dedicated offset route via Fayette Mall), and
- Alternative 7 – BRT replacing Route 5 (dedicated offset route via Rose Street).

Since service already exists on Nicholasville Road in the form of Lextran Routes 5 and 23, the operating statistics for each alternative represent the incremental increase in hours, miles, and peak buses represented by the addition of the BRT service *minus* the reduction in hours, miles, and peak buses represented by the reduction in existing service.

The operating statistics were calculated by using the frequency, hours of operation, and travel speed to determine the number of driver blocks and bus trips required to maintain the frequency. This information was then used to determine the number of daily and annual revenue hours and miles for the service. The peak-vehicle statistic was directly related to the number of driver blocks required to maintain the peak-period frequency. Table 20 shows the operating statistics summary for each alternative. Note that the operating statistics for Alternatives 4 through 7 are the same. Since each of these is proposed to operate on exclusive right-of-way, the operating statistics for each of them is essentially the same.

Table 20: Operating Statistics Summary

	Annual Revenue Hours	Annual Revenue Miles	Peak Vehicles
Existing Route 23	758	8,721	3
Existing Route 5	10,681	102,312	3
Alternative 1 – Enhanced Express Bus on Route 23	3,273	44,625	4
Alternative 2 – Enhanced All-Day Service on Route 5	32,948	355,286	11
Alternative 3 – Mixed-Traffic BRT replacing Route 5	31,570	374,411	8
Alternative 4 – BRT replacing Route 5 (dedicated east-west right-of-way)	14,234	323,491	3
Alternative 5 – BRT replacing Route 5 (dedicated single-sided right-of-way)	14,234	323,491	3
Alternative 6 – BRT replacing Route 5 (dedicated offset route via Fayette Mall)	14,629	332,477	3
Alternative 7 – BRT replacing Route 5 (dedicated offset route via Rose Street)	14,234	323,491	3

10.3.2 Infrastructure Statistics

As noted in the introduction, infrastructure statistics (Table 21) are based on the alternative as defined.

Table 21: Infrastructure Statistics Summary

O&M Calculation	TVMs	BRT Stations for Maintenance	BRT Stations for Utilities	Guideway Lane Miles
Alternative 1 – Enhanced Express Bus on Route 23	0	18	18	0
Alternative 2 – Enhanced All-Day Service on Route 5	18	18	18	0
Alternative 3 – Mixed-Traffic BRT replacing Route 5	18	18	18	0
Alternative 4 – BRT replacing Route 5 (dedicated east-west right-of-way)	18	18	18	21.61
Alternative 5 – BRT replacing Route 5 (dedicated single-sided right-of-way)	9	9	9	21.61
Alternative 6 – BRT replacing Route 5 (dedicated offset route via Fayette Mall)	18	18	18	22.13
Alternative 7 – BRT replacing Route 5 (dedicated offset route via Rose Street)	18	18	18	21.52

10.4 O&M COST ESTIMATE BY ALTERNATIVE

Once unit costs are developed, the calculation of O&M costs is a simple multiplication of unit costs by the supply units. Table 22 details the cost summary by alternative.

Table 22: O&M Calculations by Alternative

O&M Calculation	Revenue Hours	Revenue Miles	Peak Buses	TVMs	Station Maintenance	Station Utilities	Guide-way Miles	Security Cost per Revenue Hour	O&M Cost (in FY2012 millions)
Alternative 1 – Enhanced Express Bus on Route 23	2,514	35,904	1	0	17	17	0	$3,273	$0.33
Alternative 2 – Enhanced All-Day Service on Route 5	22,267	252,974	8	17	17	17	0	$32,948	$2.51
Alternative 3 – Mixed-Traffic BRT replacing Route 5	20,889	272,099	5	17	17	17	0	$31,570	$2.31
Alternative 4 – BRT replacing Route 5 (dedicated east-west right-of-way)	3,552	221,179	0	17	17	17	21.61	$14,234	$1.09
Alternative 5 – BRT replacing Route 5 (dedicated single-sided right-of-way)	3,552	221,179	0	9	9	9	21.61	$14,234	$1.04
Alternative 6 – BRT replacing Route 5 (dedicated offset route via Fayette Mall)	3,948	230,165	0	17	17	17	22.13	$14,629	$1.13
Alternative 7 – BRT replacing Route 5 (dedicated offset route via Rose Street)	3,552	221,179	0	17	17	17	21.52	$14,234	$1.09

The results show that Alternative 1 would have the lowest incremental O&M cost at $330,000 since it would include the addition of only a small number of express trips on the US 27/Nicholasville corridor each day. The other alternatives would include the cost of all-day weekday service on the corridor; however, Alternatives 2 and 3 would cost more than twice the O&M cost of Alternatives 4 - 7. The reason is that Alternatives 2 and 3 would operate in mixed traffic and would be subject to traffic delays, which would reduce travel speed. The lower travel speed would require more revenue hours and peak vehicles than those alternatives that would operate faster on an exclusive guideway. Alternatives 2 and 3 may compensate for their higher O&M cost by having a lower capital cost.

10.4.1 Level II Methodology and Results

The Level II Screening for the alternatives concentrated on measures related to the following:

- Effectiveness,
- Cost-effectiveness,
- Feasibility,
- Impacts, and
- Equity.

Each alternative was evaluated according to the above measures. A summary matrix is also provided, highlighting how each alternative would perform relative to each measure and providing depth to the measures by using one or more quantitative criteria to aid in differentiating one alternative from another. The following discussions highlight some of the major differences and specific measures that differentiate the alternatives.

<u>No Build</u>

The No Build Alternative would retain the existing bus service along US 27/Nicholasville Road at the existing service levels. In terms of the measures, this alternative would continue to meet the existing demands of passengers while providing a limited opportunity to be a catalyst for economic development. It would connect key destinations including:

- Downtown transit center,
- UK campus,
- UK Hospital/Healthcare,
- Arboretum/Stadium,
- Baptist Health Lexington,
- Southland Drive area,
- Zandale/Regency Road Shopping Center,
- Lexington Green,
- Fayette Mall/Fayette Place, and
- Planned Summit Development.

The No Build Alternative would not have a direct connection to either Jessamine County or Nicholasville since the current Lextran route does not cross the county line. This alternative also would not have additional capital costs or operating costs and would continue to attract roughly 1,300 passengers daily.

The route can continue to be easily implemented and would have no impacts, providing needed connections and mobility for existing passengers including those who are transit-dependent. It would maintain the existing travel times as observed from the schedule and during the field

observations, which are 40 minutes inbound and 33 minutes outbound from the schedule and 31 minutes inbound and 35 minutes outbound from field observations. The discrepancy in the observed versus scheduled travel-time is due to the need to build the effects of variable road congestion on the service into the schedule.

Table 23: No Build Alternatives Analysis

Service Improvements	Cost	Feasibility	Impacts	Equity	Travel-Time Improvement	Recommendation
NONE	LOW	HIGH	LOW	AVERAGE	NONE	PASS to Level III

Alternative 1

Alternative 1 would expand the existing express service along US 27/Nicholasville Road, taking the route into Jessamine County to a terminus at the new park-and-ride lot in Nicholasville. The alternative would offer limited-stop service with new trips in the morning inbound (4 trips) and afternoon for outbound (4 trips).

In terms of the measures, Alternative 1 would continue to meet the existing express passenger demands while providing a limited-stop service supplementing the existing fixed-route service. It would have limited opportunity to be a catalyst for economic development since it has few trips. It would connect existing key stops per the existing route.

Alternative 1 would have a direct connection to Jessamine County and Nicholasville. It would have additional capital costs to purchase land for and develop the new park-and-ride lot as well as pay for two new 40-foot express buses at a total cost of approximately $2.1M. Additional operating costs would be incurred to run the expanded service at an annual cost of approximately $0.33M.

The express service is estimated to attract 300 daily riders. It can easily be implemented provided there is some contribution to offset operating expenses from Jessamine County and Nicholasville. It would have no incremental impacts and provide expanded connections and mobility for existing passengers including those who are transit-dependent. As with the No Build Alternative, this new express bus route would not realize any travel-time savings.

Table 24: Alternative 1 Analysis

Service Improvements	Cost	Feasibility	Impacts	Equity	Travel-Time Improvement	Recommendation
MEDIUM	LOW	HIGH	LOW	HIGH	MEDIUM	No Further Consideration – Implemented in January 2014

Alternative 2

This alternative would retain the existing bus service along US 27/Nicholasville Road but would expand and provide additional service. This would include dropping the existing peak-hour headways from 30 minutes to 15 minutes and dropping the existing off-peak headways from 60 minutes to 30 minutes.

In terms of the measures, Alternative 2 would continue to meet the existing demands of passengers while providing more service to accommodate growth. It has some opportunity to be a catalyst for economic development. The alternative would connect the following key destinations:

- Downtown transit center,
- UK campus,
- UK Hospital/Healthcare,
- Arboretum/stadium,
- Baptist Health Lexington,
- Southland Drive area,
- Zandale/Regency Road Shopping Center,
- Lexington Green,
- Fayette Mall/Fayette Place, and
- Planned Summit Development.

Alternative 2 would not have a direct connection to Jessamine County as it would be an enhancement and extension of the existing Route 5. It also would require some additional capital costs for four new buses (approximately $1.6 to $2.0M), would have additional operating costs of $2.51M, and would continue to attract 1,560 passengers daily based on a pivot point model from the existing ridership, an increase of 20 percent over existing ridership. This alternative can continue to be easily implemented and would have no impacts to the existing environment, especially since it would require no new right-of-way except for the new terminal park-and-ride lot. It would provide needed connections to many destinations and would enhance mobility for existing passengers including those who are transit-dependent.

Alternative 2 would realize some travel-time savings from the existing route of 9.1 minutes for the PM inbound trip and 1 minute for the PM outbound trip as projected for 2040. (Note: The focus is on the PM trips since they tend to see the most congestion and delay as noted from field observations.)

Table 25: Alternative 2 Analysis

Service Improvements	Cost	Feasibility	Impacts	Equity	Travel-Time Improvement	Recommendation
MEDIUM	**LOW**	**HIGH**	**LOW**	**AVERAGE**	**MEDIUM**	**No Further Consideration**

Alternative 3

Alternative 3 would establish BRT service in the existing right-most travel lane. It would consist of nine new BRT stations and the existing transit center. New stations would include the following (starting in downtown and proceeding south):

- Transit Center,
- UK Campus (either Rose Street or Limestone/Upper),
- UK Healthcare,
- Baptist Health Lexington,
- Zandale,
- Fayette Mall,
- UK Ag Farm (long-term) at Nicholasville Road/Man O War,
- Brannon Crossing,
- Kohl's/Sam's Club, and
- Nicholasville Park-n-Ride.

The BRT would operate with approximately 1-mile station spacing from 6 a.m. to 6 p.m. on a 20-minute headway. The regular Route 5 would still operate, but its stops would be consolidated, and it would operate on a 30-40 minute headway offset with the BRT. This alternative would also expand the service to Nicholasville, taking the route to a new terminal park-and-ride lot. It would offer limited-stop service with service all day and in both directions.

In terms of the measures, Alternative 3 would continue to meet the existing express passenger demands while providing a limited-stop service. It would have some opportunity to be a catalyst for economic development since it would construct new permanent stations with enhanced transit amenities (shelters with canopies, seating, lighting, trash cans, emergency call boxes, etc.). It would connect the following key destinations:

- Downtown transit center,
- UK campus,
- UK Hospital/Healthcare,
- Arboretum/stadium,
- Baptist Health Lexington,
- Southland Drive area,
- Zandale/Regency Road Shopping Center,
- Lexington Green,
- Fayette Mall/Fayette Place,
- Planned Summit Development,
- Brannon Crossing, and
- Northern part of Nicholasville.

Alternative 3 would have a direct connection to Jessamine County and Nicholasville. It would have both additional capital costs to purchase new BRT vehicles, construct stations, and acquire land for and to develop the new park-and-ride lot in Nicholasville. Total capital costs are estimated at $10M. It would also have approximately $2.3M in additional operating costs per year.

Since it is a mixed-traffic alternative and the buses would travel in an existing travel lane, Alternative 3 can easily be implemented, provided there is some contribution to offset operating expenses from Jessamine County and Nicholasville. It would have no incremental impacts and would provide expanded connections and mobility for existing passengers including those who are transit-dependent. It may also have the ability to attract new passengers. Ridership estimates using the Federal Transit Administration's (FTA's) Simplified Trips on Project Software (STOPS) model predict 1,700 riders. Travel-time savings for this alternative are estimated to be 9.6 minutes for the inbound trip and 6.2 minutes for the outbound trip.

Table 26: Alternative 3 Analysis

Service Improvements	Cost	Feasibility	Impacts	Equity	Travel-Time Improvement	Recommendation
MEDIUM	LOW	HIGH	LOW	AVERAGE	MEDIUM	PASS to Level III

Alternative 4

Alternative 4 would establish BRT service in an existing curb lane, dedicating it to exclusive use of the BRT vehicles. It would consist of 14 new inline BRT stations as well as the existing transit center. Because the inline stations would be on the curbs, two would be provided at each location on either side of the roadway, except for the transit center and the new terminus at the park-and-ride lot near Nicholasville. New stations would include all the amenities identified for Alternative 3.

The BRT would operate with approximately 1-mile station spacing from 6 a.m. to 6 p.m. on a 20-minute headway. The regular Route 5 would still be operated, but its stops would be consolidated, and it would operate on a 30–40 minute headway, offset with the BRT. This alternative would also expand the service to Nicholasville, taking the route to a new terminal park-and-ride lot. It would offer limited-stop service with service all day and in both directions.

In terms of the measures, Alternative 4 would continue to meet the existing express passenger demands while providing a limited-stop service. It would have some opportunity to be a catalyst for economic development since it would construct new permanent stations with enhanced transit amenities (shelters with canopies, seating, lighting, trash cans, emergency call boxes, etc.). It would connect to the following key destinations:

- Downtown transit center,
- UK campus,
- UK Hospital/Healthcare,
- Arboretum/stadium,
- Baptist Health Lexington,
- Southland Drive area,
- Zandale/Regency Road Shopping Center,
- Lexington Green,
- Fayette Mall/Fayette Place,
- Planned Summit Development,
- Brannon Crossing, and
- Northern part of Nicholasville.

Alternative 4 would have additional capital costs to purchase new BRT vehicles, construct stations, and acquire land for the development of the new park-and-ride lot in Nicholasville. Total capital costs are estimated at $97.8M for construction of 14 new inline stations and construction of the guideway. It would also have approximately $1.10M in additional operating costs per year. Since it would be an exclusive guideway and the buses would travel in their own lane, the alternative would require the acquisition of additional right-of-way for the guideway, which would have utility relocation(s) impacts.

Alternative 4 would have some incremental impacts due to being closer to existing residences and commercial establishment. It would provide expanded connections and mobility for existing passengers including those who are transit-dependent. It may also have the ability to attract

new passengers. Ridership estimates using the STOPS model predict 1,700 riders. Travel-time savings for this alternative are estimated to be 16.1 minutes for the inbound trip and 26.2 minutes for the outbound trip.

Table 27: Alternative 4 Analysis

Service Improvements	Cost	Feasibility	Impacts	Equity	Travel-Time Improvement	Recommendation
HIGH	HIGH	MEDIUM	HIGH	AVERAGE	HIGH	No Further Consideration

Alternative 5

This curb running BRT alternative would establish BRT service in an existing curb lane, but would operate both inbound and outbound service on one side (more than likely the west side curb), operating in a dedicated lane with BRT vehicles. It would consist of nine new BRT stations as well as the existing transit center. New stations would include all the amenities for Alternatives 3 and 4.

The BRT would operate with approximately 1-mile station spacing from 6 a.m. to 6 p.m. on a 20-minute headway. The regular Route 5 would still be operated, but its stops would be consolidated, and it would operate on a 30 to 40-minute headway, offset with the BRT. This alternative would also expand the service to Nicholasville, taking the route to a new terminus at the new park-and-ride lot. It would offer limited-stop service with service all day and in both directions.

In terms of the measures, Alternative 5 would continue to meet the existing express passenger demands while providing a limited-stop service. It would have some opportunity to be a catalyst for economic development since it would construct new permanent stations with enhanced transit amenities (shelters with canopies, seating, lighting, trash cans, emergency call boxes, etc.). It would connect the following key destinations:

- Downtown transit center,
- UK campus,
- UK Hospital/Healthcare,
- Arboretum/stadium,
- Baptist Health Lexington,
- Southland Drive area,
- Zandale/Regency Road Shopping Center,
- Lexington Green,
- Fayette Mall/Fayette Place,
- Planned Summit Development,
- Brannon Crossing, and
- Northern part of Nicholasville.

Alternative 5 would have a direct connection to Jessamine County and Nicholasville. It would have additional capital costs to purchase new BRT vehicles, construct stations, and acquire land for developing the new park-and-ride lot in Nicholasville. Total capital costs are estimated at $86.5M for construction of seven new inline stations and construction of the guideway. It would also have approximately $1.0M in additional operating costs per year. Since it is an exclusive guideway alternative and the buses would travel in their own lane, it would require the

acquisition of additional right-of-way for the guideway, which would have utility relocation(s) impacts.

Alternative 5 would have some incremental impacts due to being closer to existing residences and commercial establishment. It would provide expanded connections and mobility for existing passengers including those who are transit-dependent. It may also have the ability to attract new passengers. Ridership estimates using the STOPS model predict 1,700 riders. Travel-time savings for this alternative are estimated to be 16.1 minutes for the inbound trip and 26.2 minutes for the outbound trip.

Table 28: Alternative 5 Analysis

Service Improvements	Cost	Feasibility	Impacts	Equity	Travel-Time Improvement	Recommendation
HIGH	HIGH	LOW	HIGH	AVERAGE	HIGH	No Further Consideration

Alternative 6

This BRT alternative would be a hybrid of Alternative 5, running along one curb in both directions. It would also have sections that would be off US 27/Nicholasville Road and would utilize property along the back side of Fayette Mall, but in an exclusive guideway.

New stations would include all the amenities for Alternatives 3, 4, and 5. The BRT would operate with approximately 1-mile station spacing from 6 a.m. to 6 p.m. on a 20-minute headway. The regular Route 5 would still be operated, but its stops would be consolidated and it would operate on a 30–40 minute headway, offset with the BRT. This alternative would also expand the service to Nicholasville taking the route to a new terminus at the new park-and-ride lot. It would offer limited-stop service with service all day and in both directions.

In terms of the measures, Alternative 6 would continue to meet the existing express passenger demands while providing a limited-stop service. It would have some opportunity to be a catalyst for economic development since it would construct new permanent stations with enhanced transit amenities (shelters with canopies, seating, lighting, trash cans, emergency call boxes, etc.).

It would connect the following existing key destinations:

- Downtown transit center,
- UK campus,
- UK Hospital/Healthcare,
- Arboretum/Stadium,
- Baptist Health Lexington,
- The Southland Drive area,
- Zandale/Regency Road Shopping Center,
- Lexington Green,
- Fayette Mall/Fayette Place,
- Planned Summit Development,
- Brannon Crossing, and
- Northern part of Nicholasville.

Alternative 6 would have a direct connection to Jessamine County and Nicholasville. It would have additional capital costs to purchase new BRT vehicles, construct stations, and acquire land for and develop the new park-and-ride lot in Nicholasville. Total capital costs are estimated at $105.3M for construction of new inline stations and construction of the guideway. It would also have approximately $1.1M in additional operating costs per year. Since it is an exclusive guideway alternative and the buses would travel in their own lane, it would require the acquisition of additional right-of-way for the guideway, which would have utility relocation(s) impacts.

Alternative 6 would have the most incremental impacts due to being closer to existing residences and commercial establishments, including acquiring property from Fayette Mall. It would provide expanded connections and mobility for existing passengers including those who are transit-dependent. It may also have the ability to attract new passengers. Ridership estimates using the STOPS model predict 1,700 riders. Travel-time savings for this alternative are estimated to be 17.9 minutes for the inbound trip and 32.3 minutes for the outbound trip.

Table 29: Alternative 6 Analysis

Service Improvements	Cost	Feasibility	Impacts	Equity	Travel-Time Improvement	Recommendation
HIGH	HIGH	LOW	HIGH	AVERAGE	HIGH	No Further Consideration

Alternative 7

This BRT alternative would be a hybrid of Alternative 6, running along one curb in both directions. It would also have sections that would be off US 27/Nicholasville Road and would utilize property along Rose Street running in a non-dedicated “transit mall” like environment. It would consist of the same BRT stations as Alternative 4. A UK campus station would be along Rose Street. New stations would include all the amenities identified for Alternatives 3, 4, and 5.

The BRT would operate with approximately 1-mile station spacing from 6 a.m. to 6 p.m. on a 20-minute headway. The regular Route 5 would still be operated, but its stops would be consolidated and it would operate on a 30–40 minute headway, offset with the BRT. This alternative would also expand the service to Nicholasville taking the route to a new terminus at the new park-and-ride lot in Nicholasville. It would offer limited-stop service with service all day and in both directions.

In terms of the measures, this alternative would continue to meet the existing express passenger demands while providing a limited-stop service. It would have some opportunity to be a catalyst for economic development since it would construct new permanent stations with enhanced transit amenities (shelters with canopies, seating, lighting, trash cans, emergency call boxes, etc.). It would connect the following key destinations:

- Downtown transit center,
- UK campus,
- UK Hospital/Healthcare,
- Arboretum/Stadium,
- Baptist Health Lexington,
- Southland Drive area,

- Zandale/Regency Road Shopping Center,
- Lexington Green,
- Fayette Mall/Fayette Place,
- Planned Summit Development,
- Brannon Crossing, and
- Northern part of Nicholasville.

Alternative 7 would have a direct connection to Jessamine County and Nicholasville. It would have additional capital costs to purchase new BRT vehicles, construct stations, and acquire land for developing the new park-and-ride lot in Nicholasville. Total capital costs are estimated at $95.2M for construction of new inline stations and construction of the guideway. It would also have approximately $1.13M in additional operating costs per year. Since it is an exclusive guideway alternative and the buses would travel in their own lane, it would require the acquisition of additional right-of-way for the guideway, which would have utility relocation(s) impacts.

Alternative 7 would have some incremental impacts due to being closer to existing residences and commercial establishments. It would provide expanded connections and mobility for existing passengers including those who are transit-dependent. It may also have the ability to attract new passengers. Ridership estimates using the STOPS model predict 1,700 riders. Travel-time savings for this alternative are estimated to be 16.8 minutes for the inbound trip and 28.4 minutes for the outbound trip.

Table 30: Alternative 7 Analysis

Service Improvements	Cost	Feasibility	Impacts	Equity	Travel-Time Improvement	Recommendation
HIGH	HIGH	LOW	HIGH	AVERAGE	HIGH	No Further Consideration

10.4.2 Summary

The all-day service enhancements under Alternative 2 would have a low capital cost but would come with increased O&M costs that are not commensurate with increases in ridership. These enhancements would offer little in terms of being a catalyst for economic development and/or redevelopment. Therefore, Alternative 2 is being recommended for elimination from further study.

The BRT alternatives in an exclusive guideway (Alternatives 4–7), while having the ability to be a catalyst for economic development and redevelopment and having a high quality of transit service capable of attracting riders, come with a large capital cost because of the new construction that would be required. They would also require substantial new rights-of-way for the fixed guideway and stations, which would have utility relocation impacts. The ridership levels from the STOPS model are also lower than what is typically expected for similar systems at the same cost level in other projects across the U.S. despite the predicted future travel-time savings. The STOPS model predicts roughly 1,700 passengers daily, a 30 percent increase over existing levels for the BRT alternatives. Because the STOPS model cannot predict student

or special-event generator ridership, the estimate of 1,700 riders is probably low; actual ridership of the corridor could likely be more on the order of 2,000 riders per day.

Due to the high capital costs, the relatively low gains in ridership, the likelihood of public resistance to construction impacts, and the relatively low competitiveness of such a project to secure FTA support and funding, Alternatives 5, 6, and 7 are recommended for elimination. Regarding Alternative 1, Lextran has recently signed agreements to initiate expanded express bus service to Jessamine County; therefore, Alternative 1 is also eliminated from further study as it is already being implemented.

Alternatives retained for detailed study and refinement include the **No Build** (only as a benchmark) and **Alternative 3 – Mixed-Traffic BRT for All-Day Service (Replacing Route 5)**.

11 LPA IDENTIFICATION AND REFINEMENT

11.1 LOCALLY PREFERRED ALTERNATIVE (LPA)

As detailed in the Level II Screening section, Alternative 3 Mixed Traffic BRT emerged as the preferred build alternative from the analysis. As a build alternative, it was determined to be the alternative that would provide the most benefits to the system with respect to the projected ridership and cost implications when compared to the No Build Alternative. As a result, Alternative 3 is being recommended as the Locally Preferred Alternative (LPA).

As the following sections describe, the LPA concept was further defined and refined based on feedback from local stakeholders, the consultant team, field observations, and discussions with Lextran. This includes the Business-Access Transit (BAT) Lane concept envisioned for US 27/Nicholasville Road corridor.

11.1.1 LPA Concept – Business Access Transit Lanes

Where exclusive lanes would be infeasible due to heavy traffic or unwarranted based on projected transit ridership, the existing curbside lane could be re-designated as a Business Access Transit (BAT) Lane. Most streets and arterials are lined with dozens or hundreds of curb cuts that allow motorists and delivery vehicles access to adjacent businesses, housing and other activities. Along multi-lane arterials like US 27/Nicholasville Road, most through traffic typically avoids use of the curb lane because of frequent right-turn entrance / exit activity. Thus, BAT Lanes are designed to encourage more through-motorists to stay out of the curb lane. They also encourage motorists who have entered the roadway from an adjacent business or residence to move out of the BAT Lane as quickly as possible. With fewer vehicles in the curb lane, the opportunity to operate BRT service with less traffic interference and therefore greater speeds exists. BRT buses are not necessarily required to operate only in BAT Lanes. If it is advantageous for the bus to travel between stations in an adjacent lane that may be moving faster than the BAT Lane at any given time, the operator is not constrained from doing so.

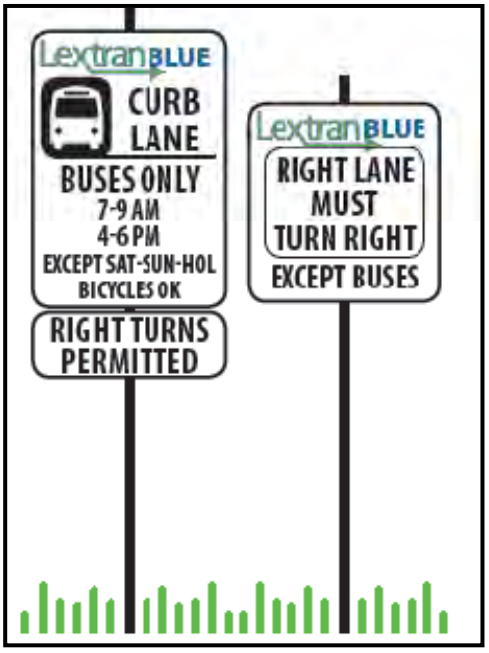
Figure 31: BAT Lane Concept

Source: Snohomish Washington

BAT Lanes can also be designated through signage that restricts their use for buses and vehicles making right turns. Signage is typically mounted overhead on signal and sign standards, although signs mounted on poles along the curb can be used as well. Lanes can

also be designated using pavement markings although these are less effective due to limited visibility, degradation due to wear and tear and the elements, snow and ice accumulation in the winter, and the effects of salt and other snow and ice-melt treatments. BAT Lanes are not typically enforced by transit agencies or local law enforcement personnel because of the expenses associated with enforcement, the difficulty of identifying who may be using the BAT Lane as a through lane, and the presence of driver(s) who may be new to the arterial. A public education program is often recommended to alert the community and commuters of their function and operation. The use of BAT Lanes is a relatively recent BRT treatment and thus improvements in travel speeds have not yet been fully documented. However, BAT Lanes are being used and considered by an increasing number of systems across the U.S. While BAT Lanes have the potential to improve travel speeds, they also help maintain schedule reliability and on-time performance and provide a visible indication, or marker, for the BRT line itself.

Figure 32: BAT Lane Signage Concept



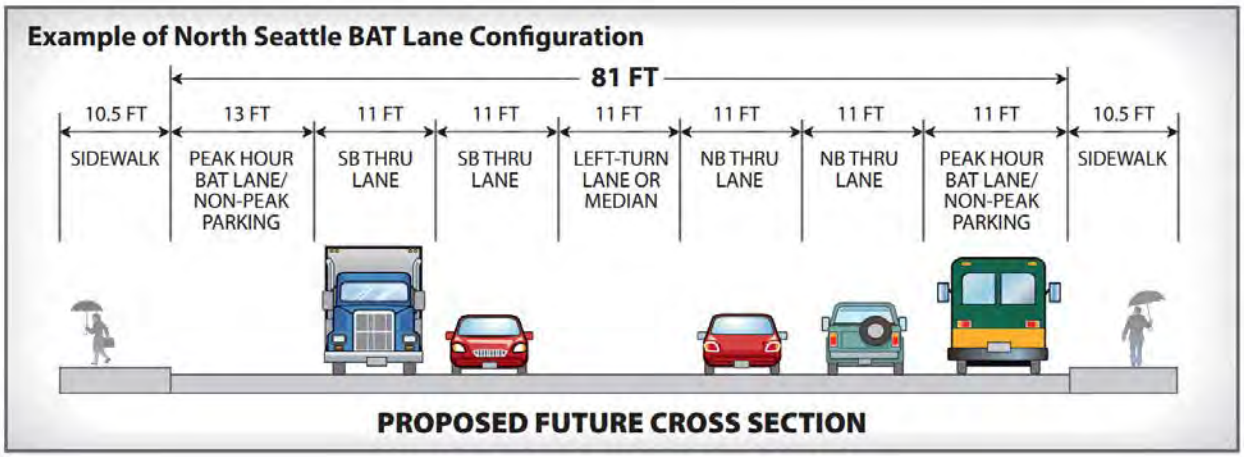
The BAT Lane would be appropriate for most of the US 27 corridor; however, in the segment between Southland Drive (to the south) and the UK campus, the BAT Lane concept most likely would not be appropriate due to the reversible lanes that exist on the corridor. Most likely, this would be truly a mixed-lane BRT with the lane restriction signage removed from this section.

BAT Lanes, when employed with other BRT service characteristics, would be most successful. For the Lextran LPA, the following features would be part of the BAT Lane LPA:

- Limited stops,
- Unique branding and marketing,
- Real time bus information,
- Station stop amenities (lighting, benches/seating, bike parking, enclosed shelter, trash can, police/emergency call button), and
- Partnerships with local and regional partners (UK, UK Healthcare, Baptist Health Lexington, malls and other employers/landowners).

North Seattle, Washington, is a pioneer in using BAT Lanes for transit, and the cross section shown on the following page is similar to how they would work along US 27/Nicholasville Road. Figure 33 shows how this concept was implemented in the North Seattle area.

Figure 33: BAT Lane Concept Cross Section (North Seattle)



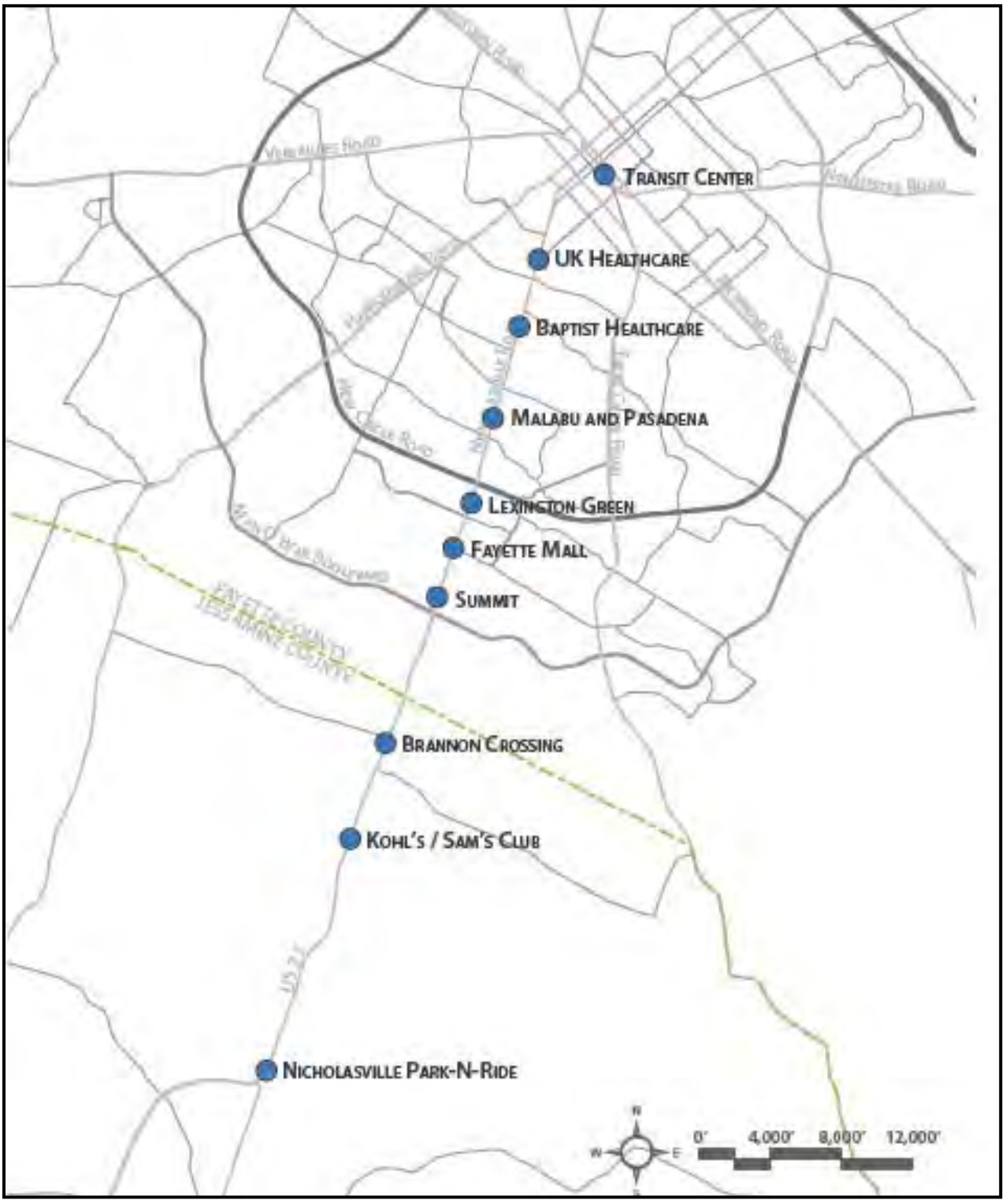
Source: North Seattle, Washington

Mixed Traffic BRT Stops

The LPA envisions a limited number of inbound and outbound stops with service running from a new terminus at the new park-and-ride location in Nicholasville to the existing downtown Transit Center. The service would consist of nine new BRT stations and the existing transit center. Based on field observations and discussions with various stakeholders, the new stations would include (starting in downtown and going south):

- Transit Center,
- UK Healthcare,
- Baptist Health Lexington,
- Malabu and Pasadena,
- Lexington Green,
- Fayette Mall,
- Planned Summit Development,
- Brannon Crossing,
- Kohl's/Sam's Club, and
- Nicholasville Park-and-Ride.

Figure 34: LPA Station Map



11.2 LPA OPERATIONS AND SERVICE SPAN

The BRT line would operate with approximately 1-mile station spacing from 6 a.m. to 6 p.m. on a 20-minute headway weekdays. There would be no planned BRT service on the weekends. The regular Route 5 would still be operated, but its stops would be consolidated to quarter mile spacing with no BRT station overlaps. It would operate every 30–40 minutes, offset with the BRT service. Weekend service would only be provided by the Route 5 with a 40-minute headway. The existing express service would also be discontinued.

The result would effectively expand the service offered to Nicholasville and would create a terminus at the new park-and-ride lot. It would offer limited stop service throughout the day and in both directions. The LPA would continue to meet the existing express passenger demands. It would have some opportunity to be a catalyst for economic development near planned stations since it would construct new permanent stations with a large range of enhanced transit amenities (shelters with canopies, seating, lighting, trash cans, emergency call boxes, etc.). It would connect to the following key destinations, either by a station or within walking distance:

- Downtown transit center,
- UK campus,
- UK Hospital/Healthcare,
- Arboretum/Stadium,
- Baptist Health Lexington,
- Southland Drive Area,
- Regency Road Shopping Center,
- Lexington Green,
- Fayette Mall/Fayette Place,
- Planned Summit Development,
- Brannon Crossing, and
- North part of Nicholasville.

As it is a mixed-traffic alternative and the buses would travel in an existing travel lane, the LPA could be implemented easily, provided there is some contribution to offset operating expenses from Jessamine County and Nicholasville. The LPA would have no incremental impacts and would provide expanded connections and mobility for existing passengers including those who are transit-dependent. It may also have the ability to attract new passengers. Ridership estimates using the STOPS model predict 1,700 riders on an average weekday. When college students and special event trips are accounted for, that number could increase to 2,100/weekday. Travel time savings for the LPA are estimated to be 9.6 minutes for the inbound trip and 6.2 minutes for the outbound trip.

11.3 BUS RAPID TRANSIT VEHICLE PRIORITY TREATMENTS

BRT vehicles need to get through intersections and past congested spots as quickly as possible to maintain a reliable operating speed and adhere to the schedule. Improvements to travel time through increased operating speed and increased reliability are designed to translate into increased ridership. In the case of US 27, even a modest doubling of speed to get closer to the signed 45 mph in the corridor would be a major improvement. This can be achieved only through Transit Signal Priority (TSP) and/or queue jump lanes, as described below.

11.3.1 Transit Signal Priority (TSP)

Through the use of GPS technology, TSP provides a time-savings advantage for BRT buses with a minimal impact on overall traffic flows along the BRT alignment and cross streets. TSP allows buses that are late or behind schedule to bypass red-light stop conditions.

TSP involves equipping BRT vehicles with special radio/GPS emitters. The emitter sends speed, heading, and position information to a control center that is updated each second. The data sent by the emitter is received by a radio/GPS receiver, which is located near the signalized intersection. If the vehicle is approaching while the signal is green, the detector prompts a sequence within the controller that provides for additional green time to get the vehicle through the intersection. This allows all vehicles in parallel lanes to clear the intersection as well.

If the BRT vehicle is approaching the intersection on a red signal, the traffic signal phases for the side streets revert to minimum cycle times to allow a green signal for the approaching vehicle as soon as feasibly possible in the timing sequence. While TSP helps buses maintain a reliable schedule, it maintains signal coordination along the corridor. Figure 35 depicts TSP options, either Red Truncation or Green Extension.

11.3.2 Queue Jumpers

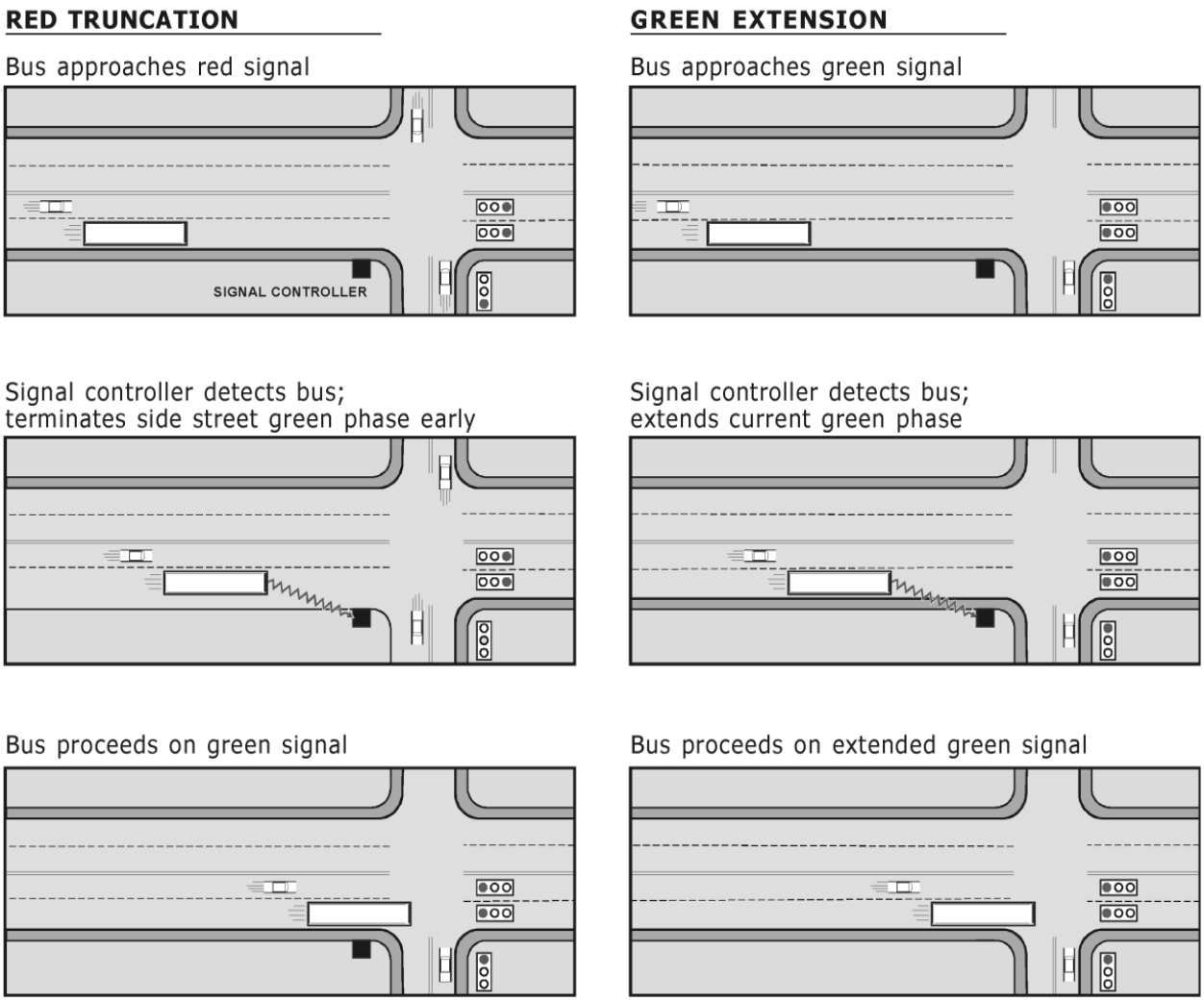
Queue jumpers take TSP a step further by providing a short stretch of exclusive lane as a BRT bus approaches an intersection. Queue jumpers can be located at key intersections, allowing the BRT bus to receive a green indication at the traffic signal while other vehicles remain at a stop condition at the same intersection, thus giving the bus priority in the queue. In addition to providing a short stretch of exclusive travel lane approaching the intersection, a queue jumper can also include a similar stretch of restricted lane on the opposite side of the intersection to "receive" the bus before it pulls back into a general travel lane.

In order to differentiate between the signal indications for the normal traffic signal phases and the queue jumper signal phase, a two-lens LRT-type signal indication can be used as the signal indication in the BRT queue jumper lane. Both the "go" and "stop" indications are white, preventing any possible confusion for motorists in the travel lanes parallel to the queue jumper lane. Additionally, a "Bus Signal"-type sign is displayed at the intersection adjacent to the BRT signal indication to further differentiate them from the usual signal indications.

A queue jumper can also be designed as part of a right-turn only lane, with the right-turn lane receiving signal phase priority before traffic is allowed to proceed straight through an intersection. This approach works best when the volume of right-turn traffic is able to clear the intersection during a single green light "go" phase.

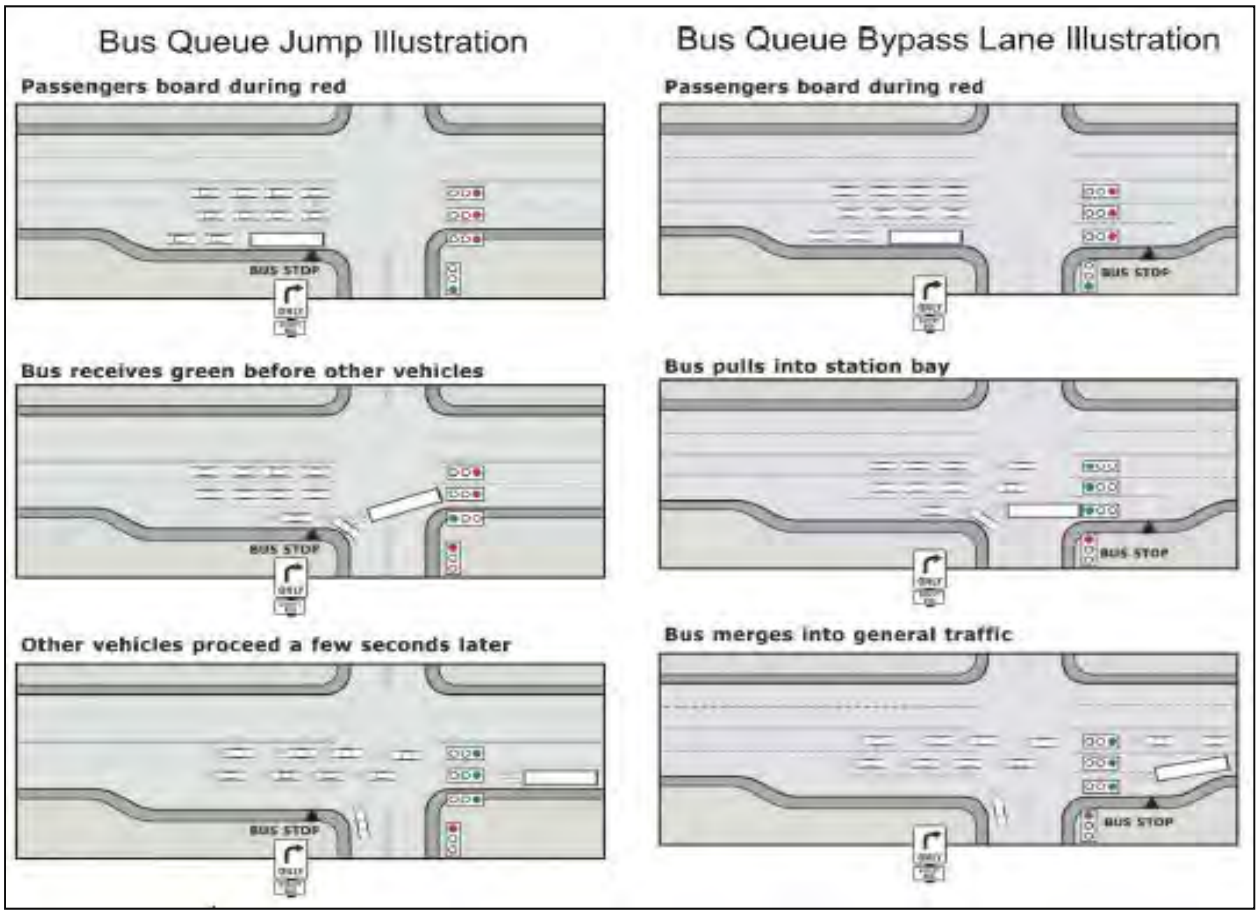
Queue jumper lanes typically involve reconstruction of an intersection, although striping may be sufficient if there is sufficient shoulder width available to provide for the exclusive bus lane on one or both sides of the intersection. Figure 36 depicts queue jump lanes.

Figure 35: TSP Examples



Source: Adapted from *Transit Capacity and Quality of Service Manual*, TCRP Report 118, dated 2007

Figure 36: Queue Jump Examples



Source: Adapted from *Transit Capacity and Quality of Service Manual*, TCRP Report 118, dated 2007

11.3.3 Applicability to US 27/Nicholasville Road

TSP is feasible only when traffic volumes are low enough on adjacent side streets to warrant priority. Figure 37 and Figure 38 show available capacity in the AM and PM peak period and that priority is possible only on a limited number of intersections. Those intersections shown in green appear to be ideal for TSP. Those shown in yellow are on the margins and need further study and discussion with the LFUCG Division of Traffic. Those shown in red are not candidates for TSP due to high volumes.

11.4 LPA COSTS

Costs for the BAT Lane service are broken into two segments:

- **Capital costs** are associated with any new vehicles, construction of the stations, their amenities and access to them (sidewalk, bike paths, etc.), as well as the new park-and-ride lot in Nicholasville.
- **Operations and maintenance (O&M) costs** are associated with the ongoing operation of the new service.

The LPA would have a direct connection to Jessamine County and Nicholasville via a newly located park-and-ride lot. The LPA includes additional capital costs to construct stations and provide amenities at them. Costs to acquire land to develop the new park-and-ride lot in Nicholasville have not been calculated. The LPA would also require improved pedestrian and bicycle access at each station and at major cross streets. Total capital costs are estimated at $2,782,000 in 2013 dollars, exclusive of needed right-of-way and utilities. The LPA would also have approximately $2,310,000 in operating costs per year. This operating cost is based on typical station sizes, their amenities, etc., as depicted in Figure 39 and summarized in Table 31. Some of this operating cost could be reduced with cutback in the existing route's service. Typically, if an agency overlays a premium type service on a regular route, the regular route is cut back in terms of the number and location of stops, the headways and span of service. The exact specifics in this case have not been determined as that is usually a more in-depth process than what is done for an AA study. It is estimated that the reduction on the regular Route #5 may save close to half of the operating costs, or approximately $1M.

11.5 LPA IMPACTS

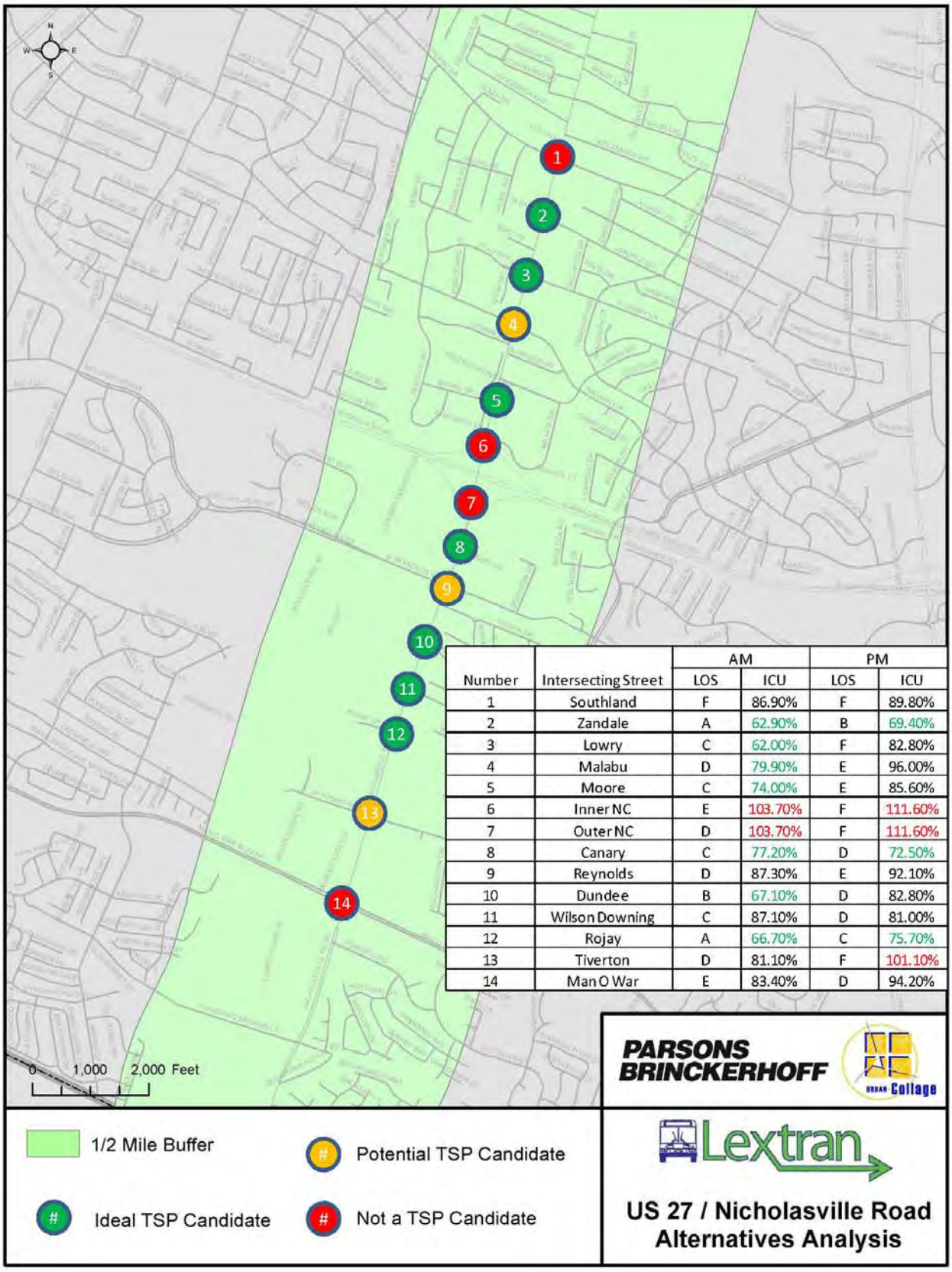
As the service primarily runs in the existing travel lanes, no new right-of-way is needed for the running or service area. Some new right-of-way may be needed for the new stations and to build sidewalks and paths to enhance adjacent pedestrian and bicycle access.

Other impacts to the human and natural environments are expected to be low or very negligible if they are present at all. There are few if any anticipated negative noise impacts and virtually no negative air quality impacts.

11.6 COMPATIBILITY WITH PLANS AND PROGRAM

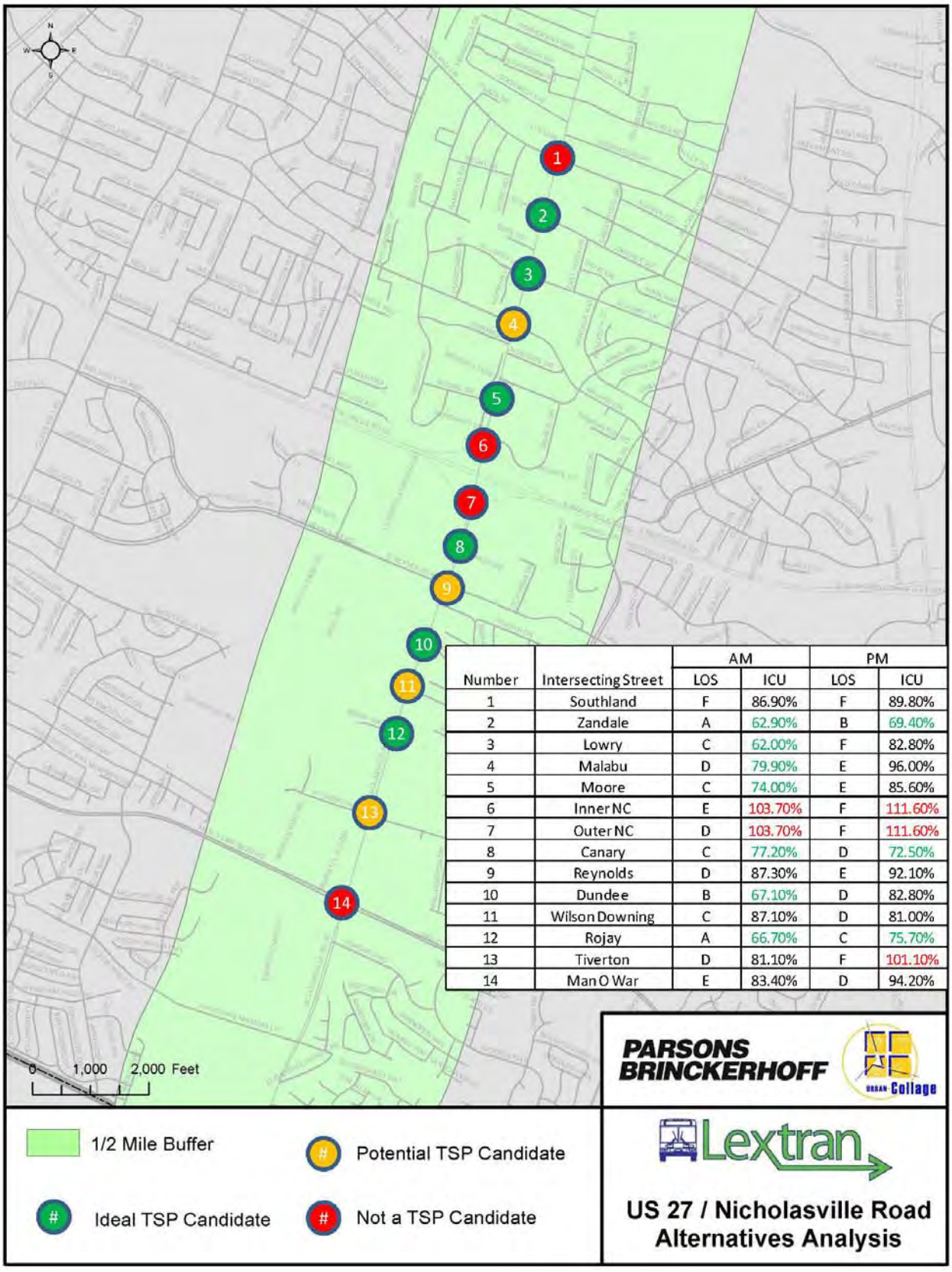
The Nicholasville Road/US 27 corridor is currently identified as a high capacity transit corridor in the Comprehensive Plan of LFUCG. The LAMPO Metropolitan Transportation Plan also identifies this as a corridor of importance with regard to their overall program of moving people rather than vehicles. As such, the BRT/BAT lane concept is highly compatible and complementary to the existing planning efforts within the corridor and the region.

Figure 37: Candidate Intersections for TSP (AM)



Number	Intersecting Street	AM		PM	
		LOS	ICU	LOS	ICU
1	Southland	F	86.90%	F	89.80%
2	Zandale	A	62.90%	B	69.40%
3	Lowry	C	62.00%	F	82.80%
4	Malabu	D	79.90%	E	96.00%
5	Moore	C	74.00%	E	85.60%
6	Inner NC	E	103.70%	F	111.60%
7	Outer NC	D	103.70%	F	111.60%
8	Canary	C	77.20%	D	72.50%
9	Reynolds	D	87.30%	E	92.10%
10	Dundee	B	67.10%	D	82.80%
11	Wilson Downing	C	87.10%	D	81.00%
12	Rojay	A	66.70%	C	75.70%
13	Tiverton	D	81.10%	F	101.10%
14	Man O War	E	83.40%	D	94.20%

Figure 38: Candidate Intersections for TSP (PM)



Number	Intersecting Street	AM		PM	
		LOS	ICU	LOS	ICU
1	Southland	F	86.90%	F	89.80%
2	Zandale	A	62.90%	B	69.40%
3	Lowry	C	62.00%	F	82.80%
4	Malabu	D	79.90%	E	96.00%
5	Moore	C	74.00%	E	85.60%
6	Inner NC	E	103.70%	F	111.60%
7	Outer NC	D	103.70%	F	111.60%
8	Canary	C	77.20%	D	72.50%
9	Reynolds	D	87.30%	E	92.10%
10	Dundee	B	67.10%	D	82.80%
11	Wilson Downing	C	87.10%	D	81.00%
12	Rojay	A	66.70%	C	75.70%
13	Tiverton	D	81.10%	F	101.10%
14	Man O War	E	83.40%	D	94.20%

1. Figure 39: Typical BRT Station

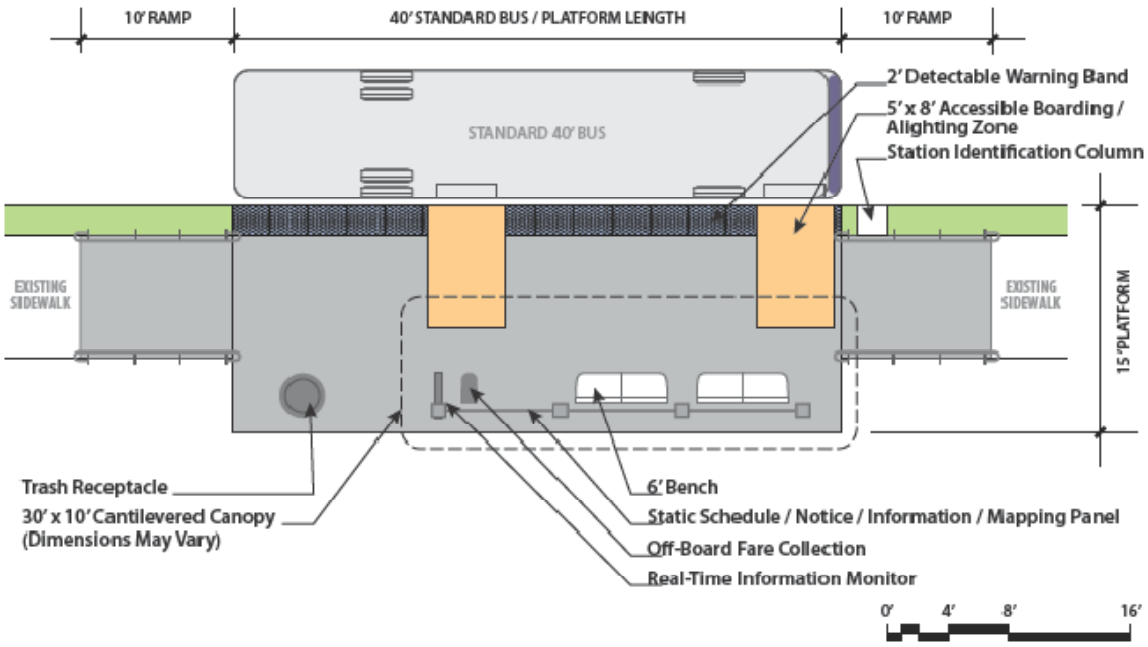


Table 31: LPA Estimated Capital Costs (2013 dollars)

1 park and ride lot	50 spaces	$3,500 per space	50	$ 175,000.00
	4 shelters	$25,000 per shelter	4	$ 100,000.00
	lighting / landscaping, etc.	lump sum	1	$ 50,000.00
16 in line stations	16 shelters	$25,000 per shelter	16	$ 400,000.00
	bike & ped upgrades	$50,000 per site	14	$ 700,000.00
	lighting / landscaping, etc.	$10,000 per site	14	$ 140,000.00
	TSP (5 locations only)	$20,000 per site	5	$ 100,000.00
	Queue jumps (3 locations only)	$50,000 per site	3	$ 150,000.00
1 upgrades to transit center	improved signage	lump sum	1	$ 10,000.00
	improved seating	lump sum	1	$ 15,000.00
	signal @ Beck Alley	lump sum	1	$ 300,000.00
				$ 2,140,000.00
	Contingency	20%		$ 428,000.00
	Design	10%		$ 214,000.00
			Total	$ 2,782,000.00

12 Economic Development

12.1 POTENTIAL FOR DEVELOPMENT

One of the critical points of success for transit to thrive along the US 27 corridor will be for economic development to follow hand-in-hand with transit. A highly-effective transit system requires ridership, and ridership comes from a dense mix of uses in close proximity to the corridor. Currently, the corridor is a mix of low-density commercial with some areas of increased intensity between New Circle Road and Man O' War Boulevard, low-density residential (mostly single family), major institutions (i.e., UK, UK Healthcare, Baptist Health Lexington), and agricultural land. Scattered throughout the corridor are areas for potential development or redevelopment, ranging from greenfields in Jessamine County to the redevelopment or repositioning of existing commercial land.

Overall, this corridor represents one of the best opportunities for development / redevelopment because of the location of jobs in retail and services and overall, as well as the number of residents and households. The following lists the population, households and employment that are within one half mile of the corridor for each county:

Fayette County (2010):

- Population: 28,660 (total 2010 population is 295,803 so this is 9.7% of the total population in the county)
- Households: 11,732 (total 2010 households is 123,043 so this is 9.5% of the total households in the county)
- Retail Employment: 26,271 (total 2010 retail employment is 82,058 so this is 32.0% of the total retail employment in the county)
- Service Employment: 10,809 (total 2010 service employment is 55,107 so this is 19.6% of the total service employment in the county)
- Total Employment: 37,080 (total 2010 total employment is 158,141 so this is 23.0% of the total employment in the county)

Jessamine County (2010):

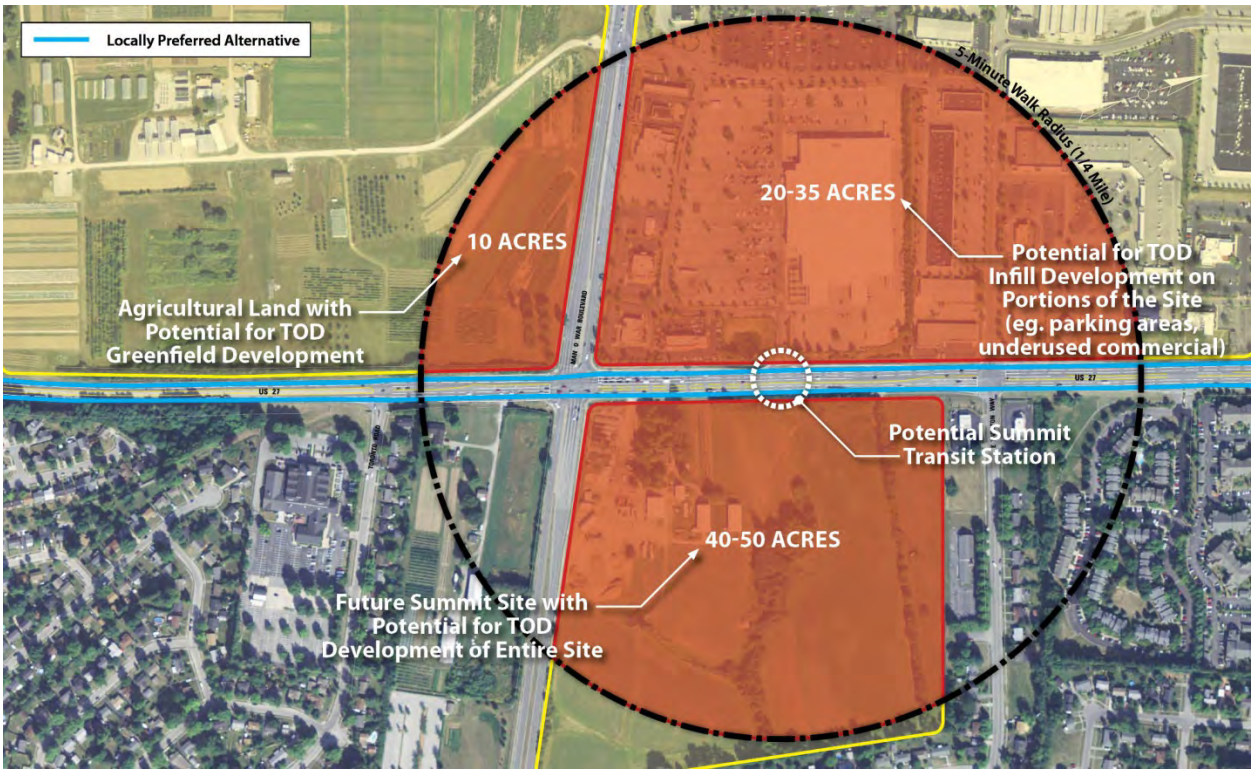
- Population: 3,073 (total 2010 population is 48,586 so this is 6.3% of the total population in the county)
- Households: 1,194 (total 2010 households is 17,642 so this is 6.8% of the total household in the county)
- Retail Employment: 1,491 (total 2010 retail employment is 8,275 so this is 18.0% of the total retail employment in the county)
- Service Employment: 955 (total 2010 service employment is 3,384 so this is 28.2% of the total service employment in the county)
- Total Employment: 2,446 (total 2010 total employment is 15,033 so this is 16.3% of the total employment in the county)

Note: Retail and service employment is measured because these sectors tend to have one of the highest concentrations of employment by those who ride transit. As is detailed by the data above, the corridor is one of the best suited for transit in both counties. Thus, potential stations along the US 27 LPA route were located to:

- Gather the highest concentration of riders from existing major trip generators and destinations, such as major employers, healthcare centers, shopping destinations, residential concentrations and the UK Campus, and
- Be within close proximity to parcels of land that could be developed or redeveloped into higher density, mixed-use transit-oriented development.

The following is a brief outline of potential opportunities for transit-oriented development around each of the proposed stations. The potential for development or redevelopment occurring based on increased transit service is typically measured as property located within a comfortable 5-minute walk of a potential station, which is about a quarter mile radius. As is shown in Figure 41, areas of opportunity for development or redevelopment exist all along the corridor (shown in yellow on the diagram), but it is the areas within a quarter mile radius (shown in red) that were looked at independently by station. It should be noted and strongly stressed that these are rough assumptions on physical capacities for redevelopment, not necessarily market-based. Other opportunities exist for development to occur along the corridor and may lead to the addition of other transit stops in the future.

Figure 40: Opportunities for Development / Redevelopment Analysis



Areas shown in the yellow outline indicate areas of potential opportunity for development/redevelopment that exist along the corridor. The areas in red show the areas of opportunity that could become transit-oriented development related to a particular station that is within a 5-minute walk (quarter mile).

- Nicholasville Park-and-Ride: Numerous opportunities exist near the proposed transit stop including the potential development of somewhere between 50 and 100 acres of agricultural land within the immediate area, as well as the repositioning of over 5 to 10 acres of existing commercial property that could occur near the intersection of Nicholasville's Main Street and US 27.
- Kohl's / Sam's Club: The traditional commercial center anchored by Kohl's and Sam's Club, which equals 10 to 20 acres within the quarter mile radius, and the underused commercial/industrial park across the street (with almost 30 to 60 acres within a 5-minute walk of the potential transit stop) can be considered for transit-oriented repositioning or redevelopment. In addition, the surrounding agricultural land could provide 20 to 30 acres in potential greenfield opportunity for development.
- Brannon Crossing: Brannon Crossing could increase the density of its 20 to 30 acres of traditional commercial layout of large setbacks and large parking areas by repositioning and redeveloping portions of the site. The surrounding 60 to 70 acres of agricultural lands could also be considered for potential greenfield development.

- Summit: Through the cooperation of the proposed Summit developers the new mixed-use commercial venture at the corner of US 27 and Man O' War Boulevard should be optimized for the use of transit riders, with nearly 40 of the 50 acres reachable in a five-minute walk. In addition, the property across the street, anchored by Wal-Mart and Lowes could add another 20 to 35 acres of potential redevelopment with some repositioning of the stores and parking. On top of that, the agricultural land in the southwest corner of the intersection, with almost 10 acres of potential greenfield development within the quarter mile radius, would be considered an area of opportunity.
- Fayette Mall: The mall is one of the areas of greatest opportunity, easily achieved by filling in some of the 25 to 40 acres that make up the bulk of parking and small, disconnected satellite buildings that surround the mall with liner retail stores, while creating clear and vibrant pedestrian connections from the transit stop to the Mall.
- Lexington Green: Similar to Fayette Mall, the areas of greatest opportunity are in repositioning some of the existing commercial on either side of Nicholasville Road to be oriented around the transit station, while densifying what is today an overabundance of parking surrounding several already successful commercial sites. This could provide approximately 40 to 70 acres of redevelopment opportunity.
- Malabu and Pasadena: The opportunities for development around this station mostly could include a series of minor modifications that could redevelop existing traditional commercial into more transit-oriented development. With these small changes, somewhere between 10 and 20 acres could be better positioned to provide more transit opportunities.
- Baptist Health Lexington: This transit station is less about transit-oriented development and more about providing access to a major employer/medical destination.
- UK Healthcare: Similar to Baptist Healthcare, this transit station is focused on providing access to a major employer/medical destination, as well as getting UK students and faculty to the southern end of campus.
- Transit Center: As the major terminus of the Lextran routing service, this station is primarily focused on the transfer of riders to other transit lines, or getting people Downtown. There are a few opportunities for redevelopment at this station including the area directly above the Transit Center (between 1 and 2 acres adjacent to and within the Transit Center).

For the entire corridor the successful introduction of BRT could have the potential to transform somewhere between 340 and 540 acres into highly-effective transit-oriented development (TOD), 140 to 210 acres of greenfield development, and 200 to 330 acres of redevelopment of existing property. Again, the acreages shown are based on a series of assumptions such as proximity to a proposed transit stop, the existing types of land use, occupancy, age and condition of the property, location relative to other major trip generators, etc. The creation of transit-oriented development in these locations will also require the ability of a developer(s) to create a favorable climate for that type of development by taking steps such as increasing the density around the transit stop, gathering together enough property to make a relevant development, enhancing the pedestrian and bicycle access, and clustering parking in structured parking or shared use facilities. The vast majority of these steps cannot be taken under current

zoning regulations, and therefore many of these moves will need to be supported through special zoning codes and with the support of local government agencies.

12.2 TRANSIT PREMIUM

Although the overall study of transit investment's role on property values is fairly new, studies indicate that there is a direct correlation to increased values. This increase is known as a "transit premium". The number of parcels that have direct access to enhanced transit are finite, and households or businesses that value that accessibility will pay more for those properties. This also means that parcels that were previously considered less attractive due to their location and proximity to a busy road may now adjust their image and re-enter the market as potential parcels for TOD.

The data that exists varies from anecdotal to highly scientific and shows a wide fluctuation in the numbers shown for the increase in property value based on proximity to transit, ranging from a small percentage to almost 50 percent increases in value. Although it is not yet possible to get a firm grasp on specifics in both these new trends in transportation and a new model of TOD, the evidence points to marked increases in property values and inclination of developers to invest in areas adjacent to enhanced transit, especially within the quarter to half mile radius of stations. The perception that the infrastructure (i.e., shelters, signage, etc.) for BRT is more permanent than a traditional bus service does attract developers. [6]

The photo simulation photos that follow show potential before and after pictures of the area on the west side of US 27 near Fayette Mall and depict TOD in-fill development adjacent to a new BRT station.

[6] Kaplowitz, William. "Bus Rapid Transit: A Powerful Real Estate Development Tool", Urban and Regional Planning Economic Development Handbook, December 2005.

Figure 41: Fayette Mall Area before Transit-Oriented Development

Figure 42: Fayette Mall Area after Transit-Oriented Development

13 NEXT STEPS/PROJECT IMPLEMENTATION

The next steps for project implementation with regard to the LPA in the US 27/Nicholasville Road corridor includes ongoing discussions with various stakeholders including the City (Planning, Traffic, etc.), LAMPO, UK Facilities, UK Healthcare, Baptist Health Lexington, local developers and landowners, the City of Nicholasville, Jessamine County, and KYTC. Other activities include further planning, engineering and environmental clearance for the LPA, especially the infrastructure improvements along the route, at the inline stations, and the terminal park-and-ride station.

In late 2013, the Lextran Board was briefed on the LPA concept. While supportive, the Board recognized that Lextran must complete some fundamental projects before the LPA can be implemented. Those projects include planning, design and construction of the consolidated Lextran administration and maintenance facility as well as completing the Comprehensive Operational Analysis (COA). Both of these tasks are fundamental to the core of Lextran's operations and are key to continuing its day-to-day operations. The new administration and maintenance facility will streamline operations and provide a needed facility for decades to come. Likewise, the COA will explore new ways of operating transit in Lexington and reassess the need(s) for higher-quality transit services, including BRT service in the US 27 corridor and other corridors. In the eyes of the Board, both should be completed prior to the next phases of the implementation of this LPA.

13.1 LOCAL COORDINATION

In the meantime, there are some logical coordination activities and next steps that are needed and could take place. These other local coordination activities include but are not limited to the following with a proposed timeline:

2014

- Form a consortium group of agency leaders to identify and cultivate local project champions. This would include elected officials and agency staff outside of Lextran. These individuals can collectively be the voice of the project.
- Monitor and integrate the new Nicholasville Express service.
- Ensure that the Metropolitan Planning Organization and Planning reports and documents fully embrace the LPA recommendations.
- Refine the locations for TSP and identify potential queue jump locations through conversations with LFUCG Division of Traffic Engineering. Secure approval from KYTC Central Office Traffic and implement TSP locations in the near future.
- Secure financing for the study and implementation of TSP at select locations.

- Spur transit-oriented development along the corridor by creating special Transit Overlay Zoning Districts:
  - Partner with LFUCG Planning on future development approvals to make them as transit friendly as possible,
  - Encourage higher density development in the corridor,
  - Minimize setbacks, thereby bringing the development closer to the road and closer to transit,
  - Promote mixed-use and mixed-price points, especially more multi-family residential, which will presumably increase ridership,
  - Support alternative parking solutions such as structured parking decks or shared parking (i.e., a church and offices share parking because they operate during different hours), and
  - Enhance the experience for pedestrians and bicyclists, since these are the people who are getting on and off transit.
- Partner with KYTC to monitor the implementation of the US 27/Nicholasville Road Access Management Plan, especially from Man O' War Boulevard to the Nicholasville Bypass. This includes monitoring any other access or permitting projects in the area as well.

<u>2015</u>

- Implement and extend density bonuses and special tax breaks to developers of transit-oriented development (TOD) projects in the corridor and at other locations as a means to encourage the type of development necessary to support BRT. These incentives should be worked on and codified in collaboration with LFUCG Planning staff.
- Proceed with needed further study and environmental documentation for the LPA; this may include documenting a Categorical Exclusion for the running lanes since they exist, and performing an Environmental Analysis on other project components. Final determination of which level of environmental documentation is needed should be determined in consultation with the necessary agencies and the KYTC in conjunction with FTA.
- Develop plans and specifications for the inline station locations and queue jump locations. Determine right-of-way, and utility implications for inline stations.
- Determine location of the terminal park-and-ride lot in Nicholasville, acquire the land and right-of-way, and provide plans and specifications.
- Determine improvements needed at the existing transit center, including improved signage, additional off-street bus bays and the need for and utility of an additional signal at Beck Alley.

2016 / 2017

- Perform any remaining aspects of the project that correspond to preliminary engineering, including the design of the terminal park-and-ride lot, the stations, and any needed improvements to the downtown transit center as well as the roadways near the stations.
- Refine the operating plans of the BRT service, including the needed refinements to the existing Route 5 to develop refined operations and maintenance costs.
- Acquire needed right-of-way and perform utility relocation(s)/work as needed.
- Begin construction.

2017 / 2018

- Complete construction.
- Begin marketing and promotion of new service.
- Project implementation – start up.

13.2 PHASING

If the location of the park-and-ride lot in Nicholasville near the proposed bypass turns out to be too expensive or unavailable, a second alternative is to locate the terminal park-and-ride lot at the Sam's Club/Kohl's center and run the service from this location. Although a shorter route and service, this might be more efficient if the Jessamine County location is unattainable.

13.3 FUNDING

Currently, the project does NOT meet the definitions of a BRT project that would be funded by the FTA under MAP-21. Other transit agencies that have had success in implementing Mixed Traffic BRT concepts have pursued Congestion Mitigation and Air Quality (CMAQ) for capital funding. CMAQ funding in Kentucky is highly competitive and is typically used for projects with lesser costs. If Lextran and/or LAMPO were to secure CMAQ funding, they might not be able to secure all the funds needed for implementation, and the project would be built in phases. Also, the CMAQ funding would be applicable only to the portion of the project in Fayette County if there was an air quality benefit. Jessamine County is not eligible to receive CMAQ funding.

During the next round of approval and/or extension of MAP-21, it is hoped that the definition of BRT will be more inclusive. If this happens, this project could qualify for funding by the FTA. Ongoing O&M costs may be accounted for by the reduction in costs for the existing fixed-route bus (through reducing the number of stops, increasing headways, and reducing the service span) and/or through savings from route streamlining and "right sizing" recommendations as a result of the upcoming Lextran Comprehensive Operational Analysis (COA). If the new Nicholasville Express Route proves to be successful and the City of Nicholasville and

Jessamine County are willing to be funding partners, the mixed-traffic BAT lane BRT concept could replace the new express service and those two jurisdictions could become funding partners with Lextran for ongoing operations and maintenance costs.

Appendix A

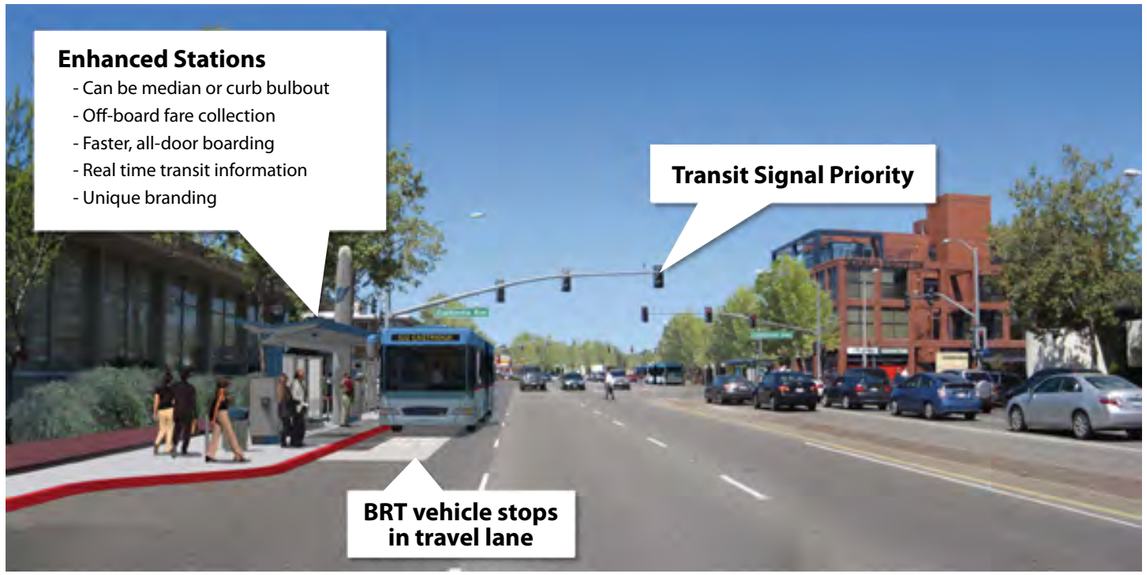
LPA Concept Brochure

Appendix B

LPA Alignment Sheets

LPA SUMMARY BROCHURE

Traffic Interface



Business Access Transit Lane

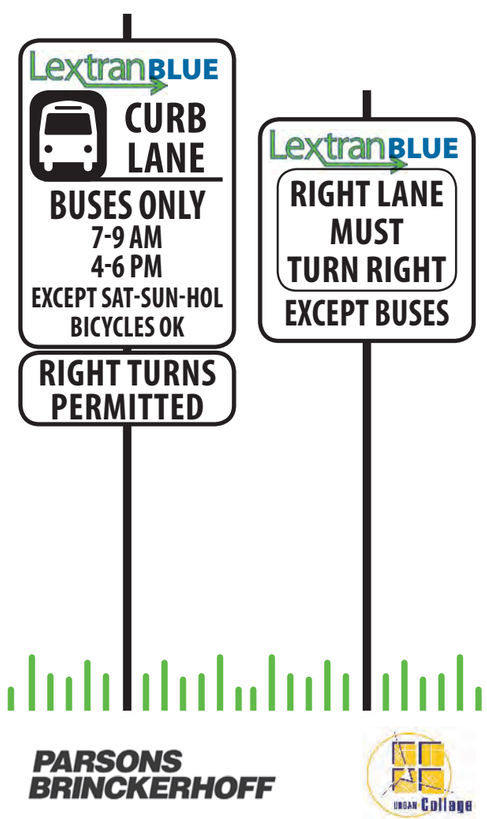
The service would be a mixed traffic option in which the buses would either travel in an exclusive BRT lane or in an existing travel lane. Where exclusive lanes are infeasible, the existing curbside lane can be redesignated as a Business Access-Transit Lane, or "BAT Lane." This would take advantage of the curb lane that most through traffic typically avoids because of frequent right turn entrance activity. BRT buses are not necessarily required to operate only in BAT Lanes if it is advantageous for the bus to travel between stations in an adjacent lane that may be moving faster. BAT Lanes are designated primarily through signage that restricts their use for buses and vehicles making right turns (see examples to the right).

Transit Signal Priority

Through the use of GPS technology, Transit Signal Priority (TSP) provides a time savings advantage to BRT buses with minimal impact on overall traffic flows. TSP allows buses to receive additional and / or early green phase indications at the traffic signal when schedule adherence problems are detected. TSP involves equipping BRT vehicles with special emitters that send speed, heading, and position information. If the vehicle is approaching while the signal is green, the controller provides for additional green time to get the vehicle through the intersection.

Queue Jump Lanes

Queue jump lanes take TSP a step further by providing a short stretch of exclusive lane as a BRT bus approaches an intersection. Queue jump lanes can be located at key intersections, allowing the BRT bus to receive a green signal while other vehicles remain at a stop at the same intersection, thus giving the bus priority in the queue.



PARSONS BRINCKERHOFF

URBAN COLLAGE

LextranBLUE

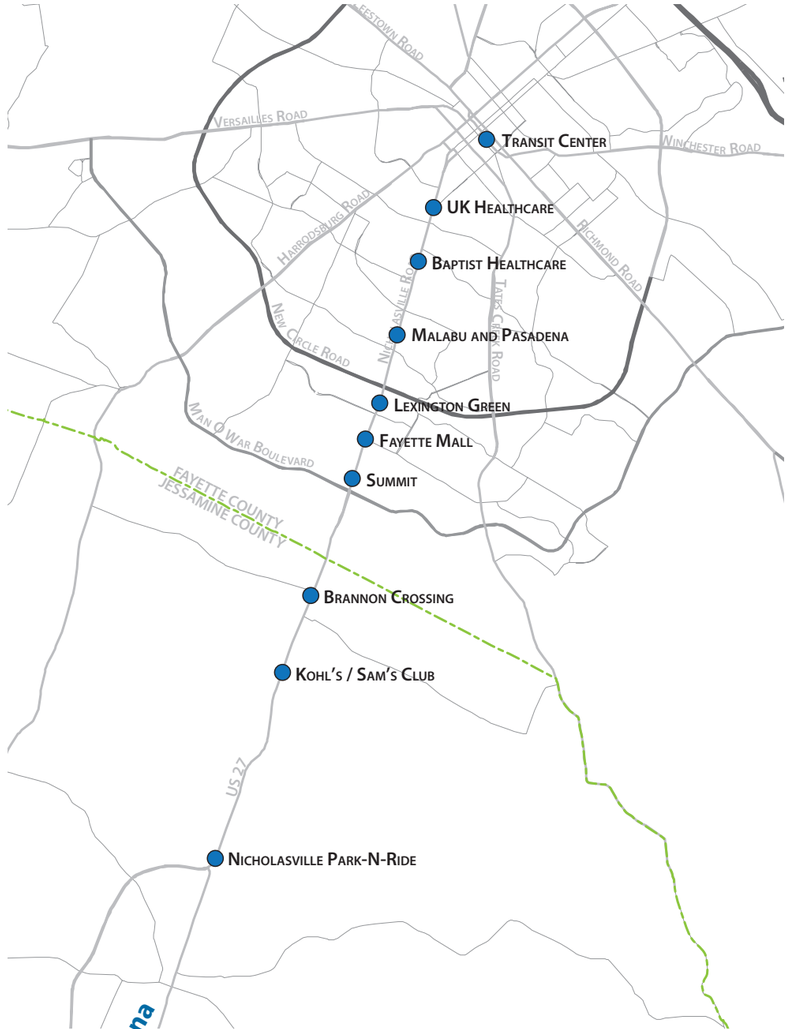
Rapid Transit Service

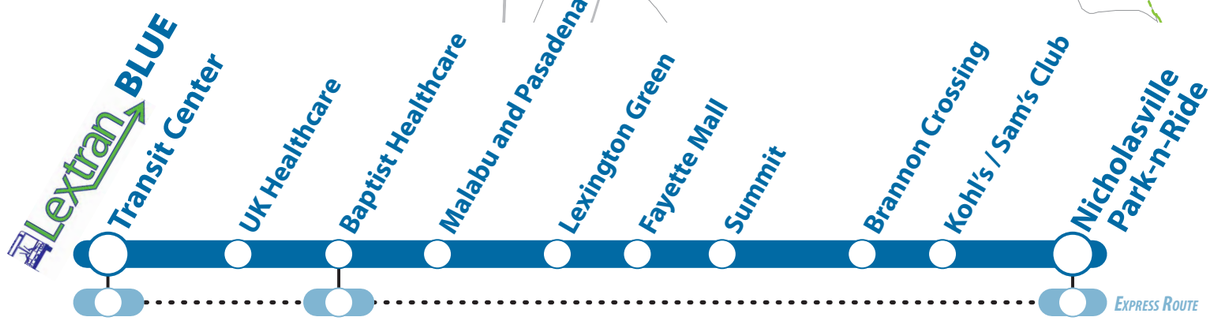
JANUARY 2014

The idea for the US 27 LextranBLUE service envisions a limited amount of inbound and outbound stops with Bus Rapid Transit (BRT) service running from a terminal park-and-ride location in Nicholasville to the downtown Transit Center. The service would consist of nine new stations and the existing transit center.

The BRT line would operate with approximately one mile station spacing from 6 AM to 6 PM on a 20 minute headway weekdays. Ridership estimates using the STOPS model predict 1,700 riders on an average weekday. When college students and special event trips are accounted for, the number is estimated to increases to 2,100 / weekday. Travel time savings for the service are 9.6 minutes for the inbound trip and 6.2 minutes for the outbound trip. The regular route #5 would still be operated, but its stops would be consolidated to ¼-mile spacing with no BRT station overlaps. It would operate every 30 to 40 minutes, offset with the BRT service.

The LextranBLUE service would have some opportunity to be a catalyst for economic development near planned stations. It would connect key destinations including both Downtown Lexington and Nicholasville, the University of Kentucky campus and its related facilities, two major hospitals, numerous key commercial and retail centers, and several major employers.





Typical Stations

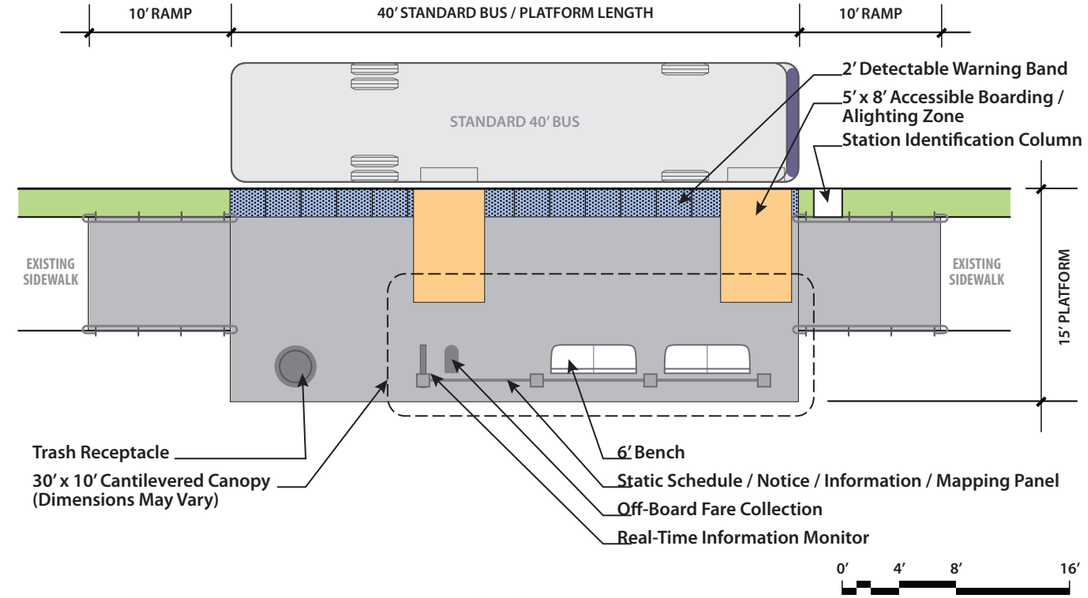
A BRT station typically includes the following:

- Covered waiting area
- Accessible at-grade boarding platform
- Interactive map / information kiosk
- Off-board fare collection
- Real-time information
- Seating
- Waste / recycling can
- Lighting and security

Typical Station Appearance

Accessible At-Grade Boarding

Shelter Options



Branding & Amenities

Bus Branding

Map / Information Kiosk

Real-Time Information

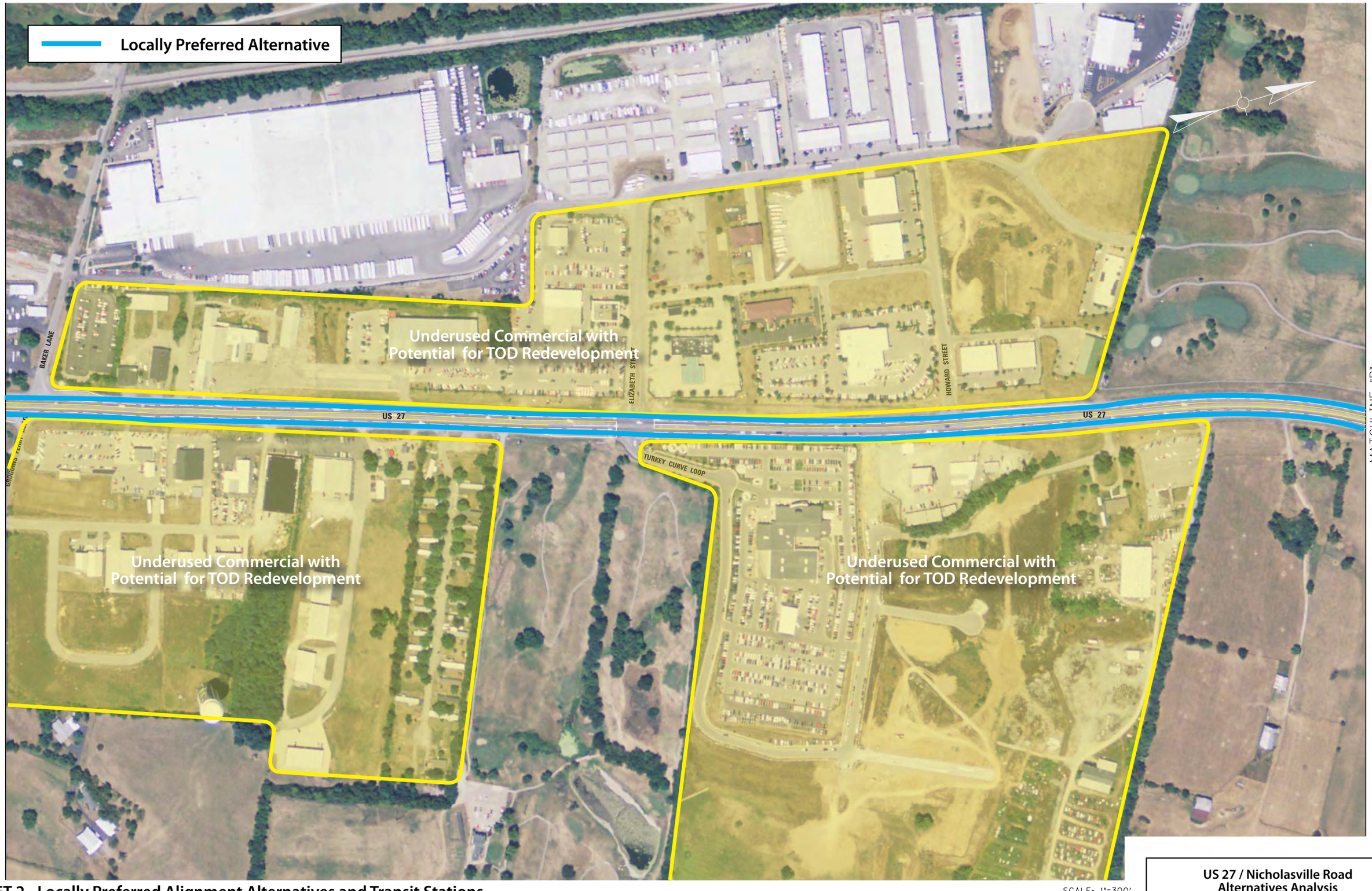
Off-Board Fare Collection

LPA ALIGNMENT SHEETS

SHEET 1 - Locally Preferred Alignment Alternatives and Transit Stations

SCALE: 1"=300'

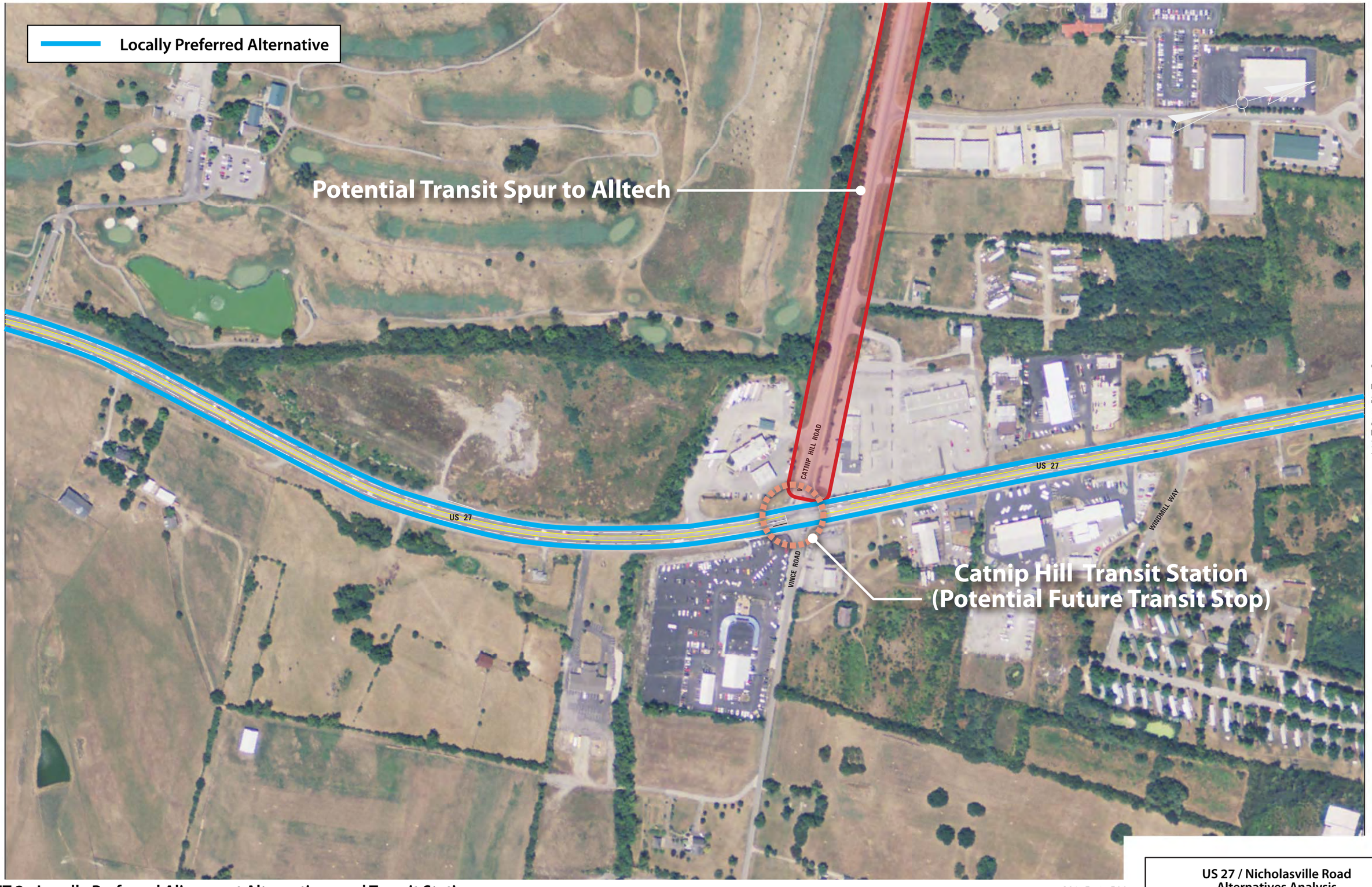
US 27 / Nicholasville Road Alternatives Analysis



SHEET 2 - Locally Preferred Alignment Alternatives and Transit Stations

SCALE: 1"=300'

US 27 / Nicholasville Road Alternatives Analysis



SHEET 3 - Locally Preferred Alignment Alternatives and Transit Stations

SCALE: 1"=300'

US 27 / Nicholasville Road Alternatives Analysis

Locally Preferred Alternative

Sam's and Kohls Shopping Center
Potential for Infill
TOD Redevelopment

Kohl's / Sam's Club Transit Station
(Potential Future Transit Stop
or Park-n-Ride Location)

Underused Commercial/Industrial with
Potential for TOD Redevelopment

MATCHLINE "C"

MATCHLINE "D"

US 27

US 27

KLS DRIVE

PARK CENTRAL AVENUE

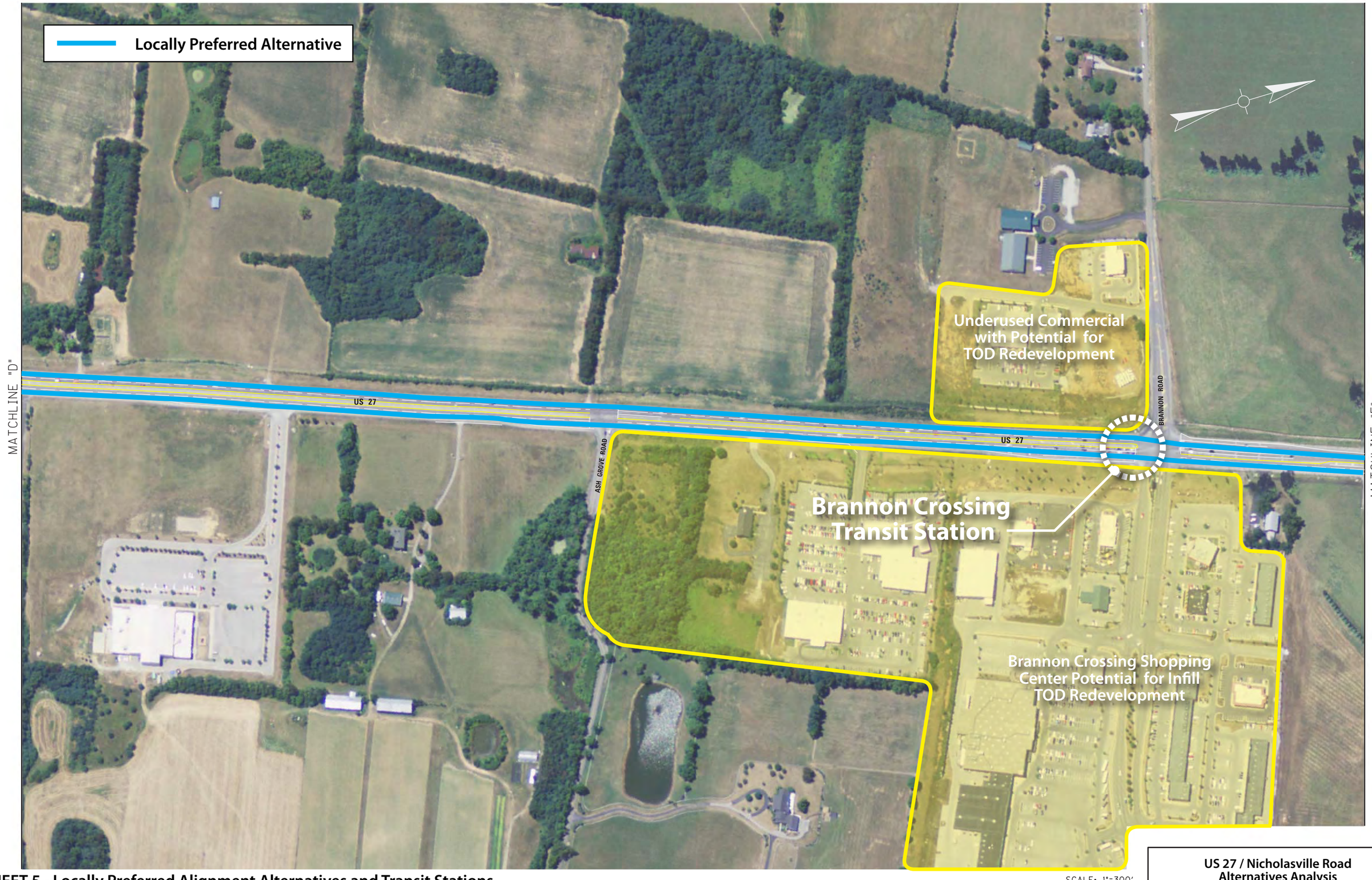
COMMERCE DRIVE

BRAD DRIVE

SHEET 4 - Locally Preferred Alignment Alternatives and Transit Stations

SCALE: 1"=300'

**US 27 / Nicholasville Road
Alternatives Analysis**



SHEET 5 - Locally Preferred Alignment Alternatives and Transit Stations

SCALE: 1"=300'

US 27 / Nicholasville Road Alternatives Analysis

Locally Preferred Alternative

Agricultural Land with Potential for TOD Redevelopment

MATCHLINE "E"

MATCHLINE "F"

US 27

US 27

SOUTHPOINT DRIVE

WAVELAND MUSEUM LANE

SCALE: 1"=300'

SHEET 6 - Locally Preferred Alignment Alternatives and Transit Stations

US 27 / Nicholasville Road Alternatives Analysis

Locally Preferred Alternative

Agricultural Land with Potential for TOD Redevelopment

Fayette Mall and Fayette Place with Potential for Infill TOD Redevelopment

MAN O WAR BOULEVARD

US 27

US 27

TORONTO ROAD

Summit Transit Station

Potential Site for Summit Redevelopment

MATCHLINE "F"

MATCHLINE "G"

SHEET 7 - Locally Preferred Alignment Alternatives and Transit Stations

SCALE: 1"=300'

US 27 / Nicholasville Road Alternatives Analysis

Locally Preferred Alternative

Fayette Mall and Fayette Place with Potential for Infill TOD Redevelopment

Fayette Mall Transit Station

Target and Lexington Green Potential for Infill TOD Redevelopment

MATCHLINE "G"

MATCHLINE "H"

US 27

US 27

ROJAY DRIVE

WILSON DOWNING ROAD

DUNDEE DRIVE

BRIGHTON PARKWAY

FIELDS ROAD

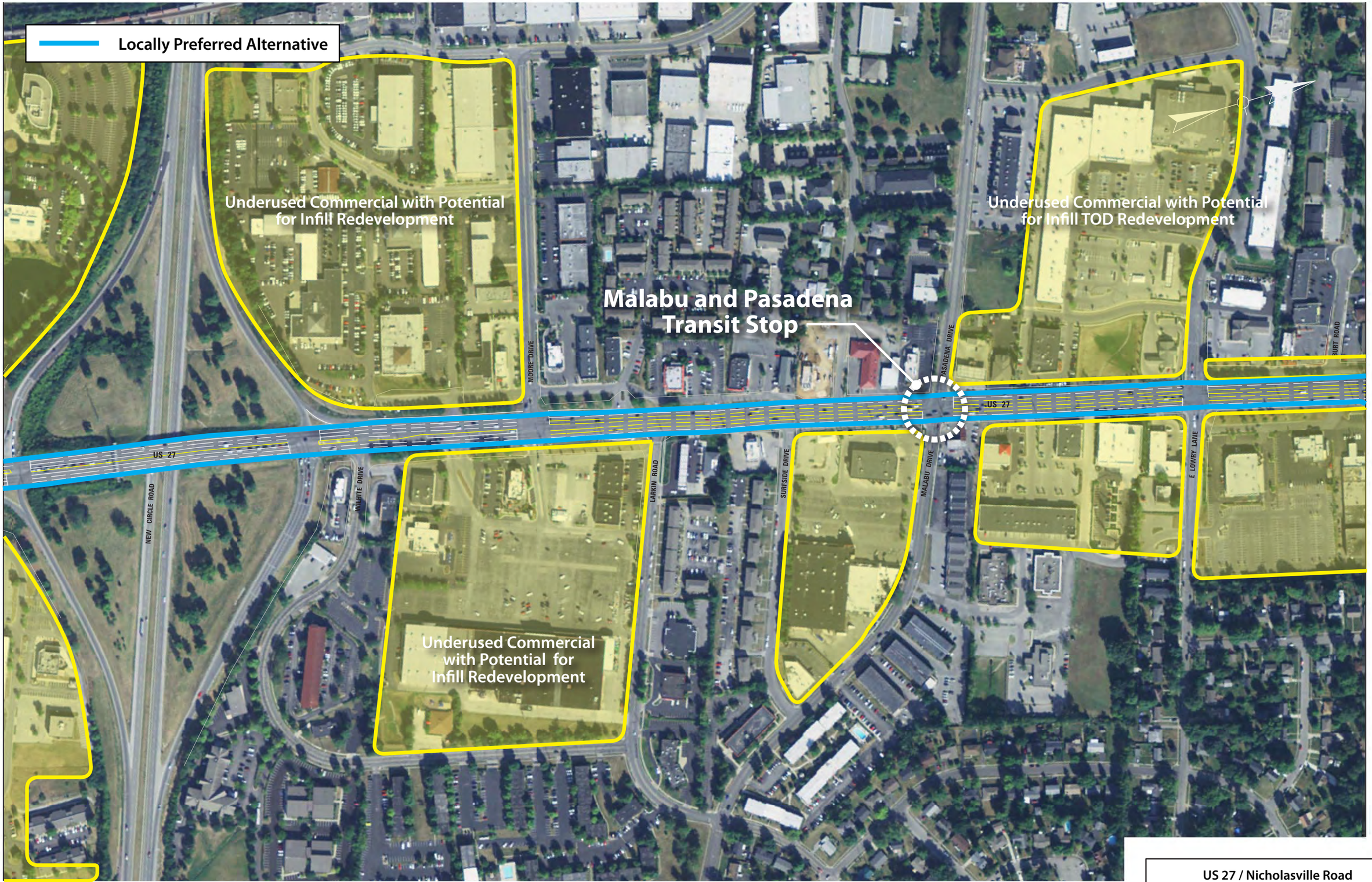
Lexington Green Transit Station

Underused Commercial with Potential for Infill TOD Redevelopment

SHEET 8 - Locally Preferred Alignment Alternatives and Transit Stations

SCALE: 1"=300'

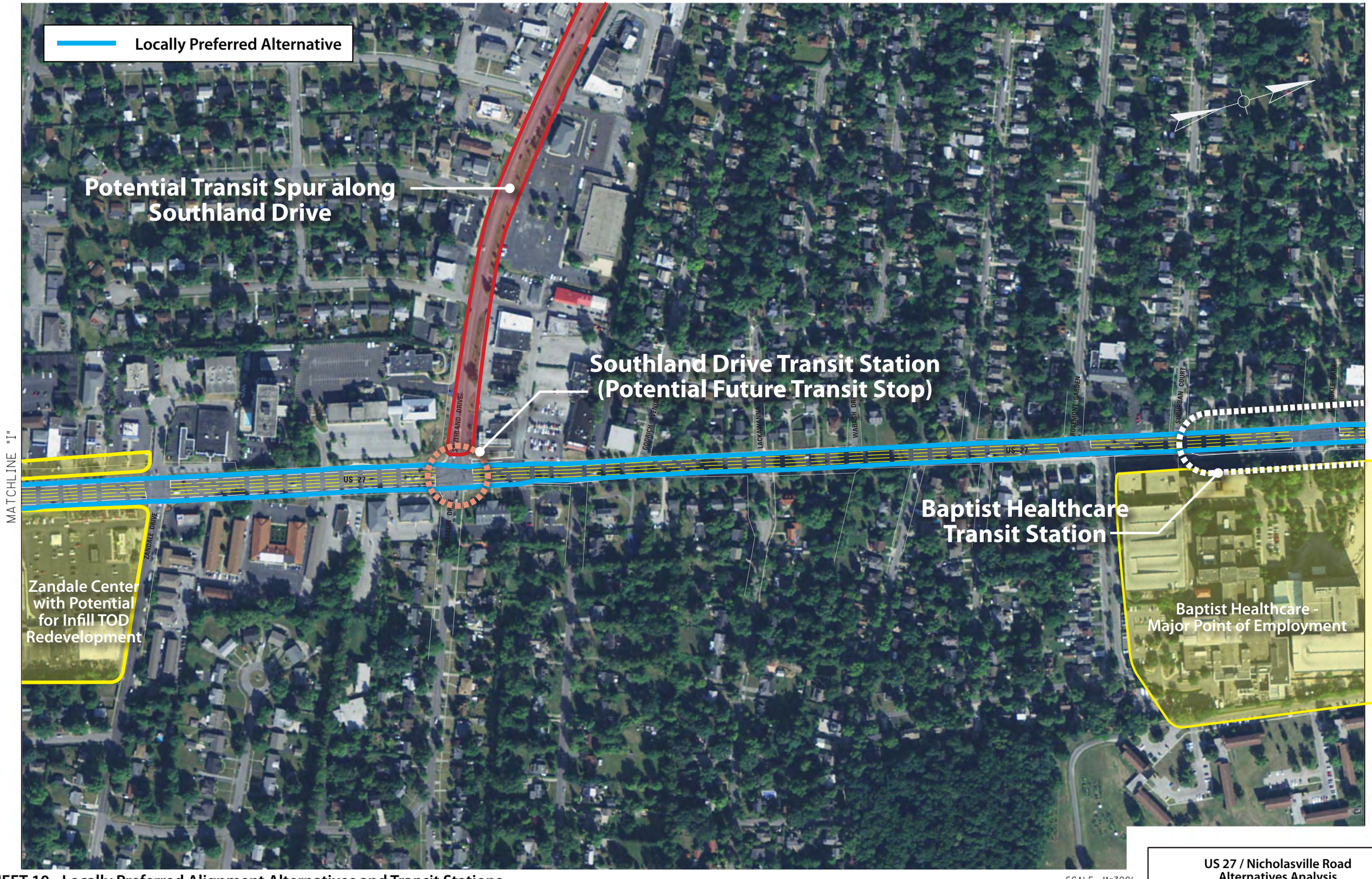
US 27 / Nicholasville Road Alternatives Analysis



SHEET 9 - Locally Preferred Alignment Alternatives and Transit Stations

SCALE: 1"=300'

US 27 / Nicholasville Road Alternatives Analysis



SHEET 10 - Locally Preferred Alignment Alternatives and Transit Stations

SCALE: 1"=300'

US 27 / Nicholasville Road Alternatives Analysis

Locally Preferred Alternative

MATCHLINE "J"

MATCHLINE "K"

US 27

WESTWOOD DRIVE

ALUMNI DRIVE

COOPER DRIVE

SUNNYBEE PLACE

UNIVERSITY AVENUE

Baptist Healthcare Transit Station

Baptist Healthcare - Major Point of Employment

UK Healthcare Transit Station

UK Healthcare - Major Point of Employment

SHEET 11 - Locally Preferred Alignment Alternatives and Transit Stations

SCALE: 1"=300'

US 27 / Nicholasville Road Alternatives Analysis

Locally Preferred Alternative

UK Campus
(Potential Future Transit Stop)

UK Healthcare
Transit Station

UK Healthcare -
Major Point of Employment

VIRGINIA AVENUE
MAXWELTON COURT
MONTAVALLO STREET
COLFAX STREET
SCOTT AVENUE
PARK AVENUE
US 27
HARRINGTON AVENUE
AVENUE OF CHAMPIONS
CEDAR STREET
PINE STREET

MATCHLINE "K"

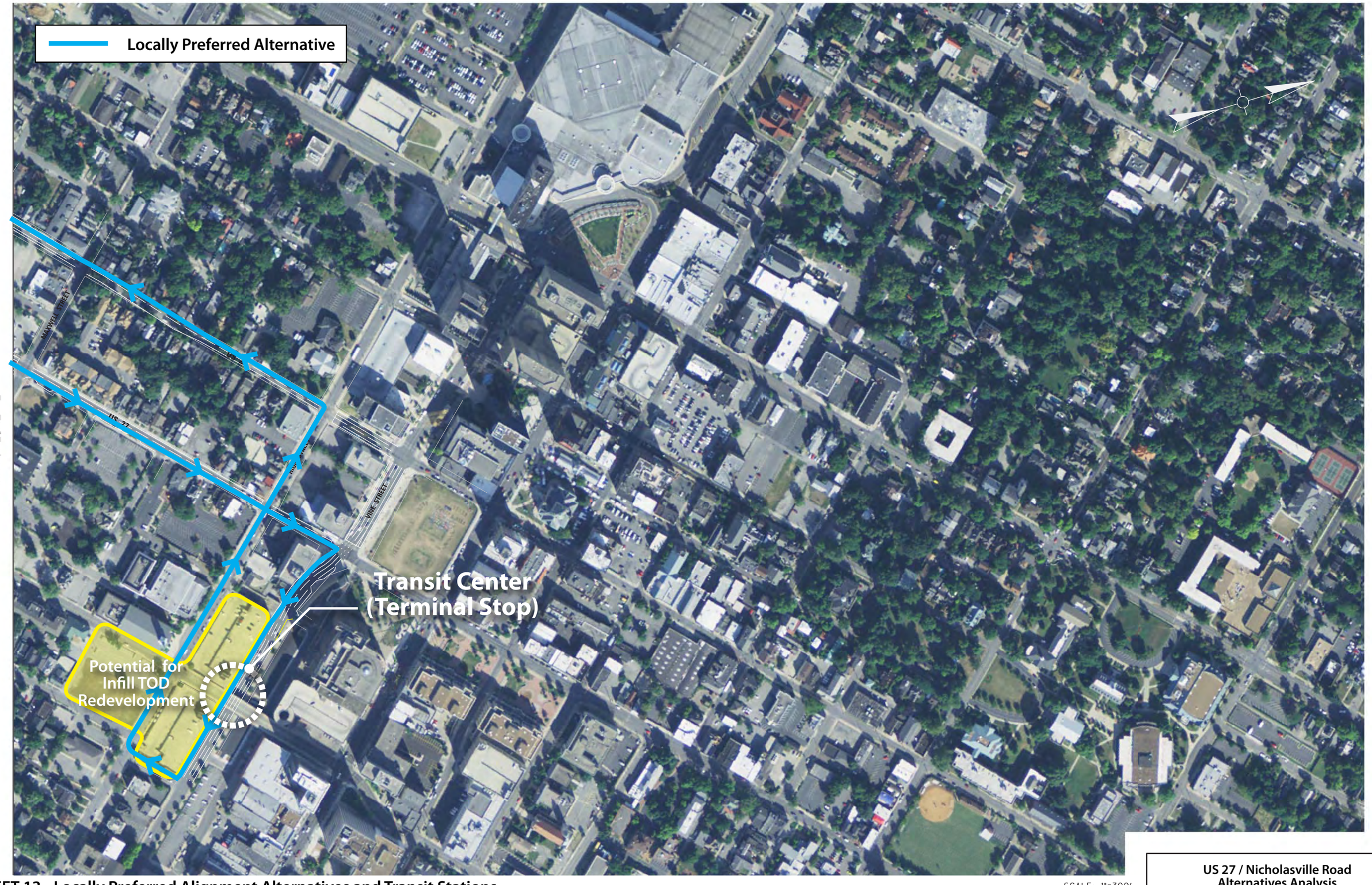
MATCHLINE "L"

MATCHLINE "M" (SHEET 14)

SHEET 12 - Locally Preferred Alignment Alternatives and Transit Stations

SCALE: 1"=300'

**US 27 / Nicholasville Road
Alternatives Analysis**



MATCHLINE "L"

SHEET 13 - Locally Preferred Alignment Alternatives and Transit Stations

SCALE: 1"=300'

US 27 / Nicholasville Road
Alternatives Analysis

Prepared by:

PARSONS BRINCKERHOFF

LORD AECK SARGENT