

*Final Report*

# Fort Knox Regional Highway Capacity Study

*Submitted to*

Lincoln Trail Area Development  
District (LTADD)  
& Radcliff-Elizabethtown Metropolitan  
Planning Organization (MPO)

*Submitted by*

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August 2009



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## I. Introduction

The Radcliff-Elizabethtown Metropolitan Planning Organization (MPO) and the Lincoln Trail Area Development District (LTADD) conducted the Fort Knox Regional Highway Capacity Study in order to focus on the growth at Fort Knox and the resultant impacts on corridor capacity surrounding the installation. Primarily, the study was to identify potential improvements to aid in traffic flow and provide better connections to major roadways on a regional level.

### Purpose and Need

The Lincoln Trail region has experienced higher-than-average growth in recent years. This increase has had an effect on the current roadway system. The 2005 Base Realignment and Closure (BRAC) Report included a number of considerable changes to take place on the Fort Knox military post that will further affect the surrounding region. According to BRAC research findings, the population and employment in the Fort Knox area are expected to significantly increase by the BRAC completion date of 2011.

### Study Area

The study area consists of a nine-county region surrounding Fort Knox including the counties of Breckinridge, Bullitt, Grayson, Hardin, Larue, Marion, Meade, Nelson, and Washington. Primary emphasis of the analysis was to be focused on the three “impact” counties: Hardin, Meade, and Bullitt. The Fort Knox Military Reservation is located in portions of the “impact” counties. **Figure I-1** shows the regional study area. **Figure I-2** details Fort Knox, its three access points (all east of US 31W), and the surrounding area.

Several roadways serve as critical routes throughout the study area. These north-south routes include Interstate 65 (I-65), US 31W, and US 31E. Key east-west routes include the Bluegrass Parkway (BG), Western Kentucky Parkway (WK), US 60 and US 62. These roadways provide regional access, either directly or indirectly, to Fort Knox. The three access points are located along the US 31W corridor, just to the north of Radcliff. They are referred to as the Brandenburg Station Road Gate, the Chaffee Gate at Bullion Boulevard, and the Wilson Road Gate.

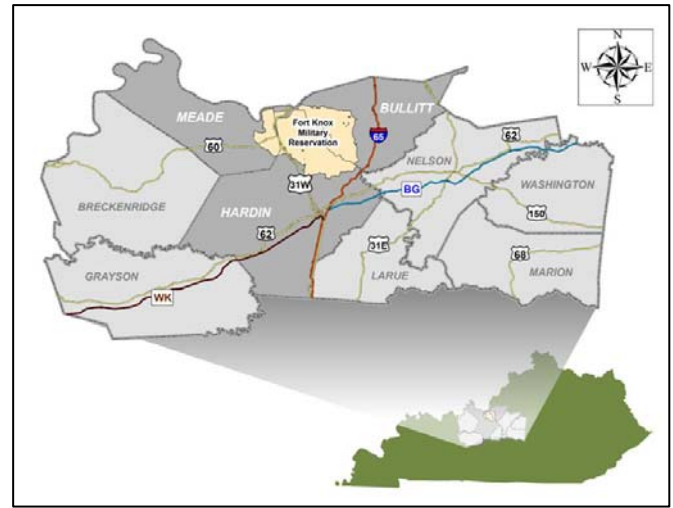


Figure I-1. Regional Study Area

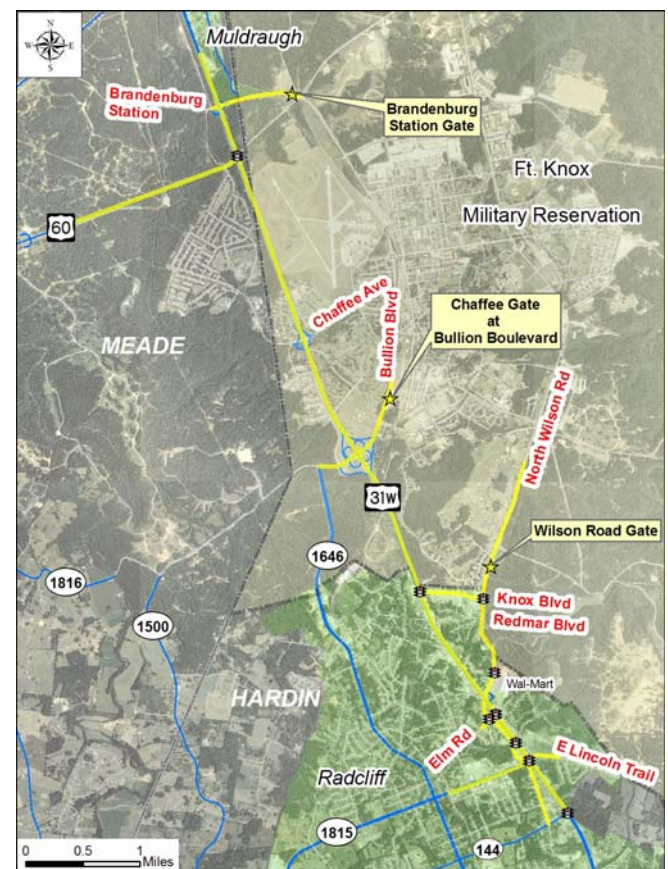


Figure I-2. Fort Knox Area

## Previous BRAC Studies

A series of studies has been undertaken in anticipation of the BRAC impacts to the region. **Table I-1** lists the studies and the agencies responsible.

**Table I-1. Previous BRAC Studies**

BRAC-related Study	Date Completed	Funding Agency
Fort Knox Highway Access Study	Jul-07	LTADD
Analysis of Fort Knox Region Housing Market	Nov-07	LTADD
Fort Knox Study and Improvement Plan	Mar-08	Fort Knox
Fort Knox Joint Land Use Study (JLUS)	Jul-08	LTADD, Fort Knox

The LTADD led the Fort Knox Highway Access Study, an initial effort to develop strategies for improving access into Fort Knox and to mitigate the impacts of increased traffic associated with BRAC-induced changes, particularly along US 31W. The study produced a prioritized list of projects and list of strategies to reduce congestion, improve safety and improve access into Fort Knox. However, these recommendations would not suffice in reducing congestion on a long-term, regional basis. The study concluded that a Regional Analysis would be necessary to focus on additional measures to reduce travel demand along US 31W and provide increased capacity for the regional highway network.

Fort Knox conducted the Fort Knox Study and Improvement Plan, a traffic study to assess the transportation needs of its installation as a part of the BRAC transformation. Recommendations from this study included adding additional vehicle capacity at the gates and various road improvements on the post. The study also affirmed the off-post recommendations listed in the Fort Knox Highway Access Study.

A housing market analysis was completed for the Fort Knox region to assess the kinds of new housing, if any, would be necessary to accommodate the expected growth associated with BRAC. The study determined that the current inventory of single-family homes would be sufficient to handle the increase in demand. Conversely, the increase in the rental market would require an additional 800-1,000 rental units in the area.

The Joint Land Use Study (JLUS) is a collaborative effort between the LTADD and Fort Knox to create a Master Plan for all Counties adjacent to the installation. The plan discusses a series of land use changes in the communities that surround Fort Knox that can take advantage of their proximity and, at the same time, minimize the negative effect of that closeness.

## II. Existing Conditions

An accurate depiction of the region's current traffic conditions and land uses are necessary to show its adequacy and deficiencies. This section examines both of these in order to realize the improvements that will minimize BRAC's disturbance to the region's transportation network. Such data as roadway network attributes and traffic volumes, crash data, comprehensive plan and other land use data, and population and employment statistics were gathered.

### Current Regional Traffic

#### Traffic Attributes

Traffic attributes were collected for the major roadways throughout the study area. Major roadways were defined for this study as any roadway with a two-digit state route designation or above. A summary of the region's roadway functional classification and ADT data are provided in **Figure II-1** and **Figure II-2**, respectively. This information was obtained from the Kentucky Transportation Cabinet. Interstate 65 (I-65) carries the most traffic of all routes in the region; the highest segment reaches an average 83,200 vehicles a day. The second highest traveled roadway in the region is US 31W, carrying an average of 38,800 vehicles a day in parts of Hardin County.

Level of service (LOS) provides an indication of the quality of traffic conditions in the form of a letter grade. LOS ranges from A to F, with A representing free-flow, uncongested conditions and F representing severe congestion and over-capacity conditions. LOS D is considered acceptable in an urban setting. A summary of the existing LOS is provided at the segment level for the study area roadways provided in Figure II-3. As the figure illustrates, the majority of the major roadways in the region currently operate at an acceptable LOS. Nonetheless, there are a few exceptions. The US 31W corridor has the least capacity available throughout the region, with a reported LOS F. Sections of I-65, KY 44 in Bullitt County, US 68 in Marion County and KY 245 in Nelson County are approaching their maximum capacities, with LOS D. level of service in the context that it was For purposes of this study, LOS reflects peak hour conditions; improved conditions exist during off-peak periods.

#### Crash Analysis

Crash data were obtained for all state-maintained roadways for the three "impact" Counties. These data were collected from the Kentucky Transportation Cabinet's Division of Highway Safety between the dates of July 1, 2002 and June 30, 2007. A total of 14,073 crashes were reported, with 4,500 crashes (32 percent) of those occurring along US 31W.

One tool to analyze crash data involves computing critical crash rate factors (CCRF). The CCRF is a comparison of the calculated crash rate to a critical crash rate, where the critical crash rate is a statistically-determined value for similar-type facilities across Kentucky. These rates allow for a comparison of crash experiences along roadways or at intersections for different facility types and entering traffic volumes. A CCRF value greater than 1.0 is considered to be very problematic; that is, compared to similar roadways or intersections, their crash experience in relation to their traffic volumes is uncharacteristically high.

Several high crash segments for the three "impact" counties were identified. They are shown in **Figure II-4**.

Significantly high crash experiences (CRF value greater than 2.00) are located along the following roadway sections within the Fort Knox region:

- Hardin County
  - I-65
  - US 31W between the Larue County line and Hill Street
  - KY 144 between the Meade County line and US 31W
- Meade County
  - US 60 between the Breckinridge County line and US 31W
  - US 31W
- Bullitt County
  - KY 44

#### Gate Volumes

Previously reported Fort Knox gate volumes were used for this study's analysis. Estimated volumes are listed in **Table II-1**.





Figure II-1. Roadway Functional Classification within the Fort Knox Region

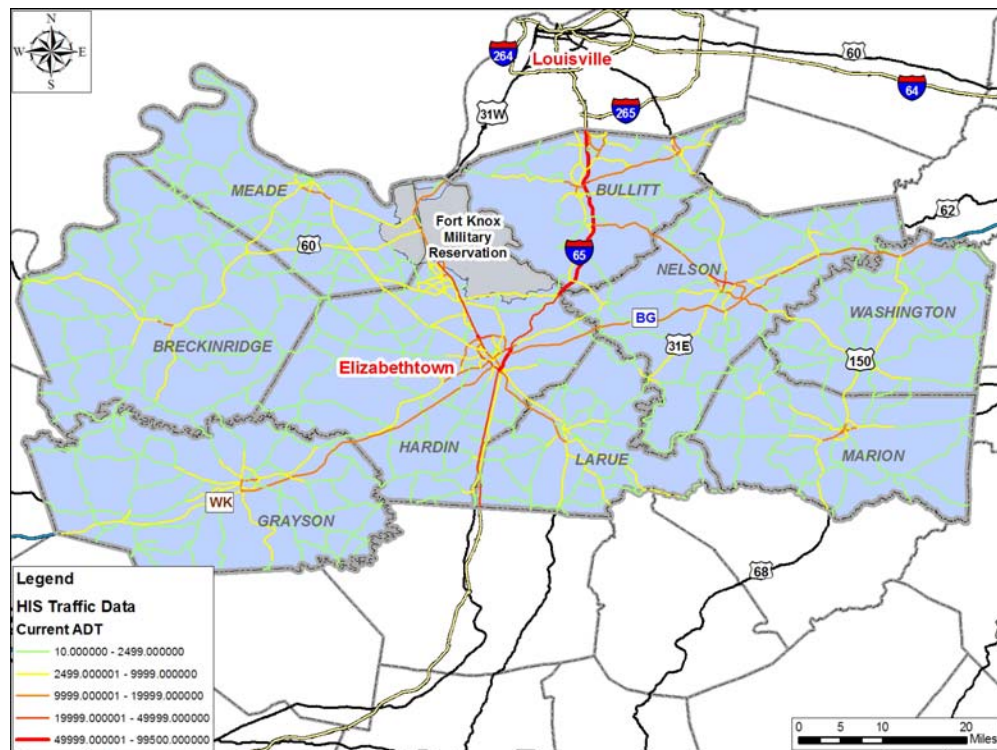


Figure II-2. Average Daily Traffic (ADT) Volumes within the Fort Knox Region

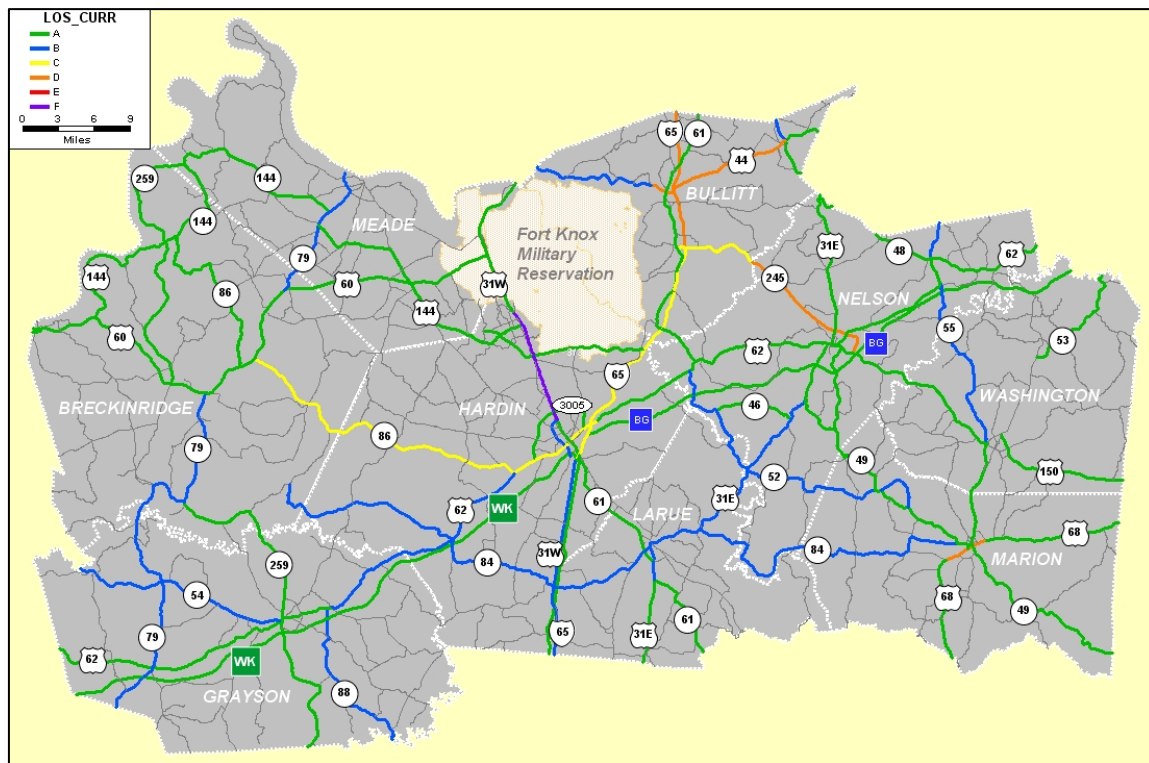


Figure II-3. Roadway Levels of Service (LOS) within the Fort Knox Region

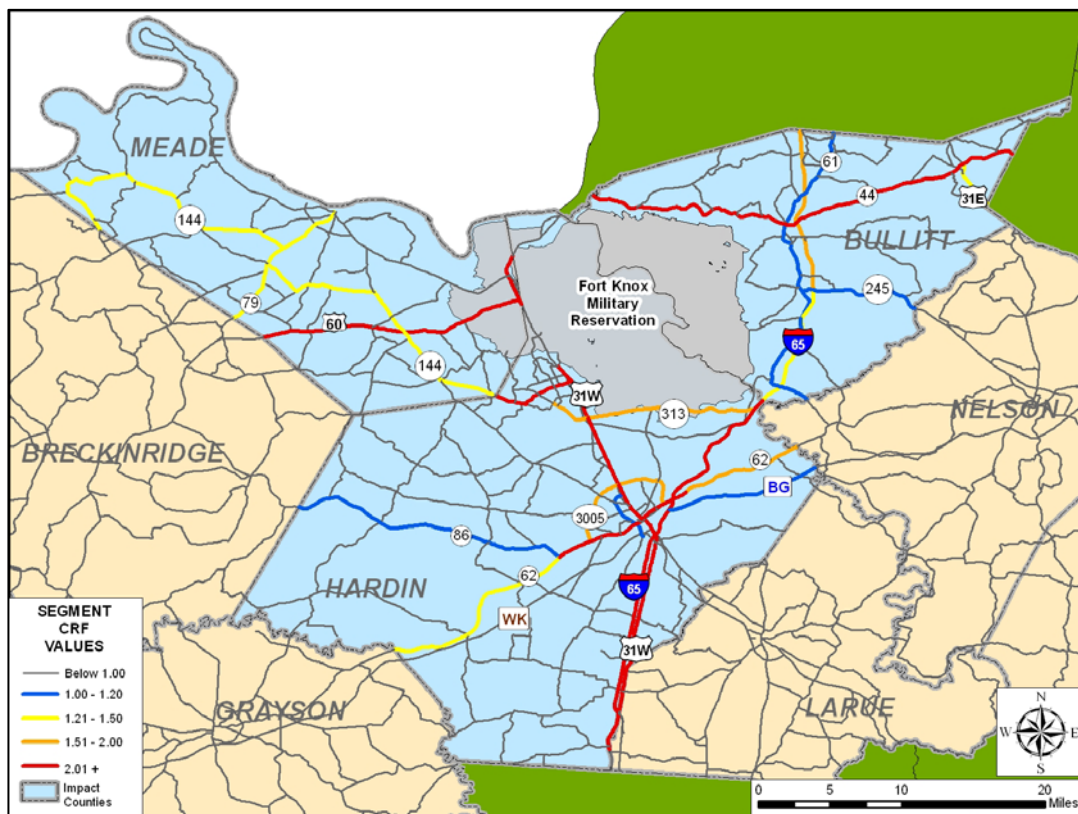


Figure II-4. Crash Analysis within the BRAC Impact Counties



**Table II-1. 2006 Daily Gate Traffic Volumes**

Gate	2006 Volumes
Brandenburg Station	13,000
Bullion Boulevard	9,500
Wilson Road	15,000

It is important to note that traffic volumes at the Fort Knox gates are generally not consistent on a daily basis. The most probable reason for this variance is the frequent occurrence of special events on post. More recent traffic counts were collected in 2008; however, these data were not available at the time of analysis. The recent volumes are reported in **Table II-2**.

**Table II-2. 2008 Daily Gate Traffic Volumes**

Gate	2008 Volumes
Brandenburg Station	6,500
Bullion Boulevard	17,000
Wilson Road	15,000

## Transit Operations

The following transit services are currently in operation within the study area.

**Fort Knox Transit Service:** Fort Knox began a transit service in 2008 for its employees living off-post. Currently, a total of thirteen buses are being used for the service, including six for fixed routes and seven for park-and-ride locations. Approximately 200 Fort Knox commuters are utilizing the service.

**Transit Authority of Central Kentucky (TACK):** TACK operates as the rural transit system providing door-to-door service for the general public with demand-responsive service and pre-established routes to Hardin, Breckinridge, Grayson, Larue, Marion, Meade, and Nelson counties, with the exception of Elizabethtown and Radcliff. TACK also serves as the Human Service Transportation Delivery (HSTD) broker for the service area, including Elizabethtown and Radcliff.

**Transit Authority of River City (TARC):** TARC has one existing route located in Bullitt County, Route #66. The route provides express service from Mount Washington and Shepherdsville non-stop via I-65 to downtown Louisville. Service operates morning and afternoon peak hours only. There is no service on weekends or holidays.

An existing Park & TARC lot is located along TARC Route #66 at the Shepherdsville Park on the corner of Vine Street.

**LogistiCare:** LogistiCare provides health-related transportation services to Medicaid recipients for Bullitt County on a demand-responsive basis.

**Bluegrass Ultra-Transit Service (BUS):** BUS, a rural public transit service, operates in Washington County. The services provided include public demand-responsive service and an inter-city route between Danville and Lexington. HSTD Region 8 brokerage provides Medicaid, Vocational Rehabilitation and Department for the Blind as part of the BUS program.

## Existing Population Trends and Land Use

### Regional Population Trends

Existing population density within the region by TAZ is shown in **Figure II-5**. Areas with highest densities are located along the US 31W corridor in Hardin and Meade counties and in the northern Bullitt County area. **Figure II-6** displays the current employment density for the area. Similar to the existing population density, areas of high employment generators within the region are primarily focused within the city boundaries of Elizabethtown, Bardstown, and Mount Washington.

A snapshot of the region's population growth provides a starting point in which to predict where future growth may occur. **Figure II-7** depicts the region's recent population growth. The majority of the region, particularly in the rural areas, has witnessed either stagnant or negative growth. However, a few "pockets" have noticed significant population increases, such as the Bardstown and Mt. Washington areas.

### Fort Knox Growth Projections

Approximately 2,200 Fort Knox commuters reside within the study area. Of those, 56 percent live within 10 miles of post. **Figure II-8** further defines where these commuters reside.

One Knox population projections show that Hardin County itself will directly increase by approximately 10,300 residents and 4,300 new households over the first six years as a direct result of the BRAC realignment. Of these

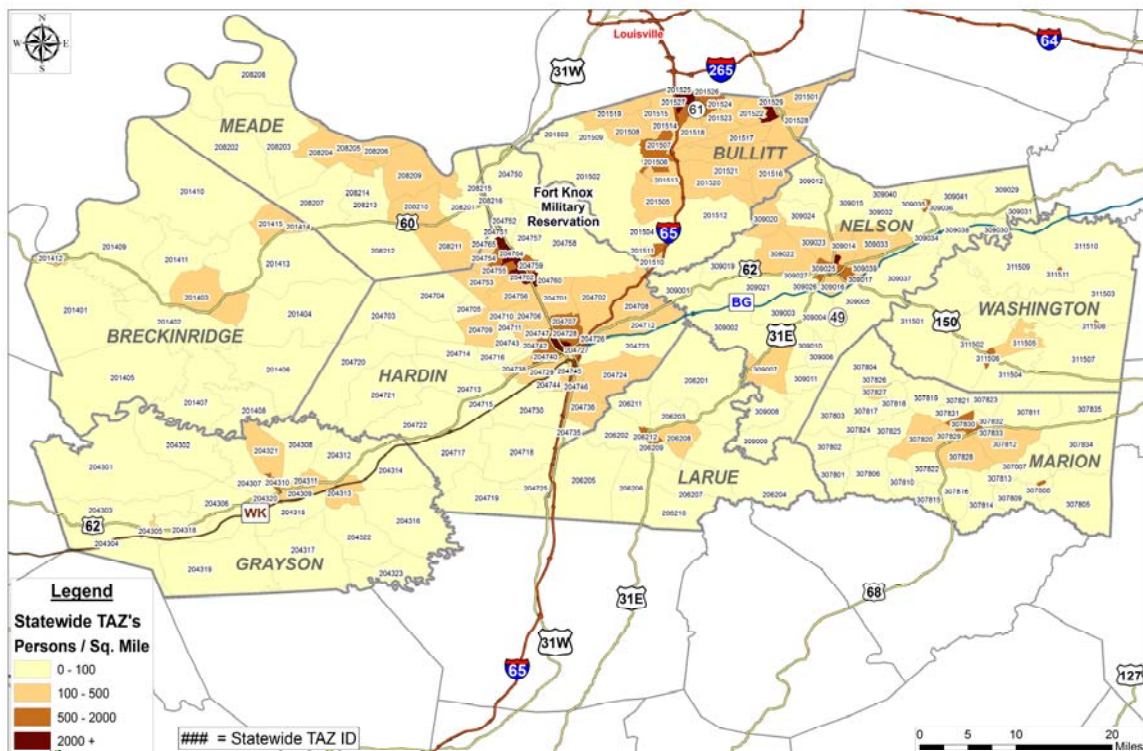


Figure II-5. Population Density within the Fort Knox Region

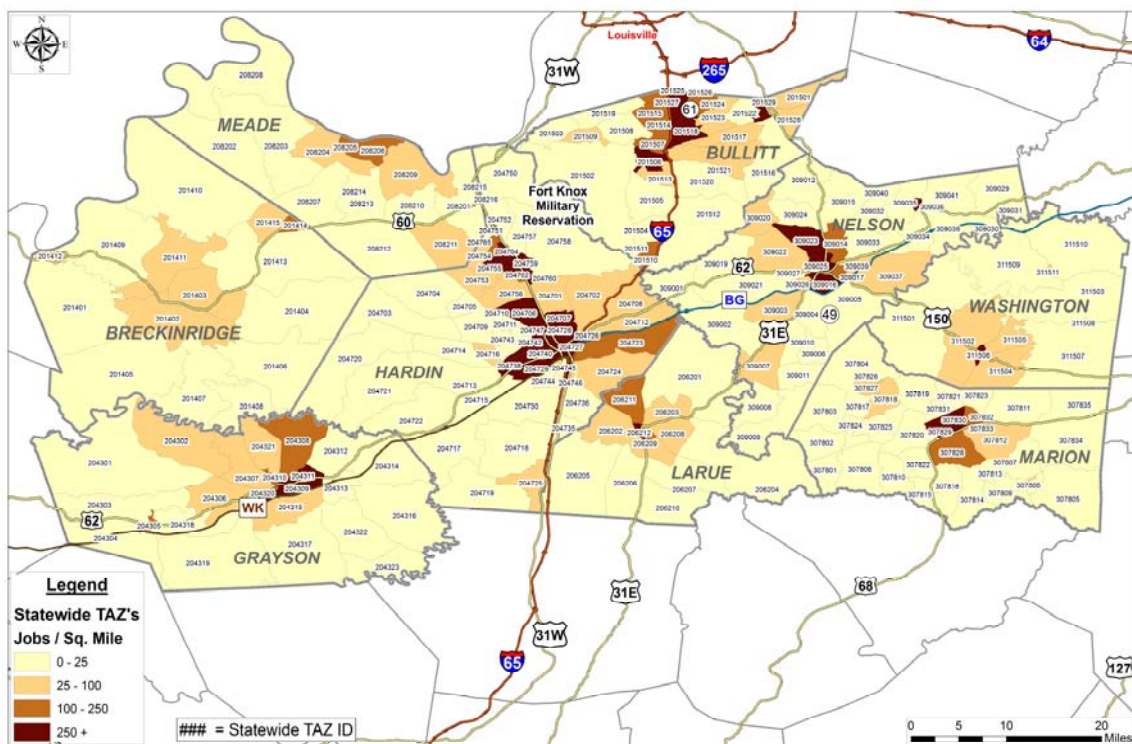


Figure II-6. Employment Density within the Fort Knox Region



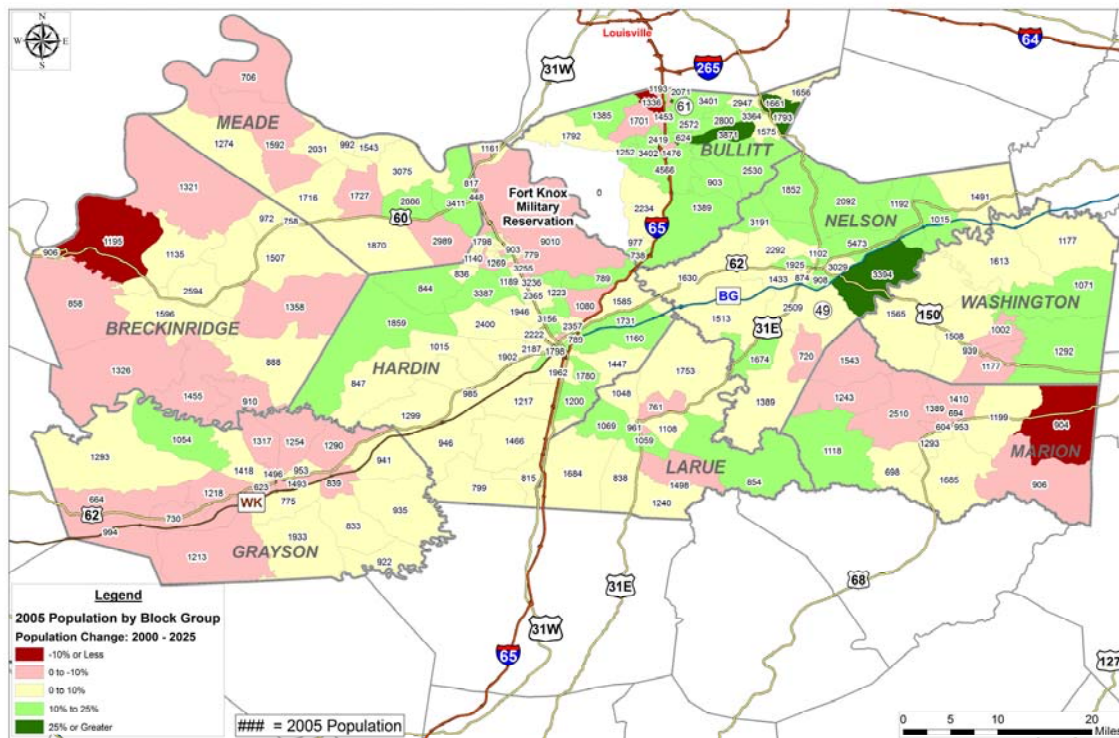


Figure II-7. Historic Population Growth within the Fort Knox Region

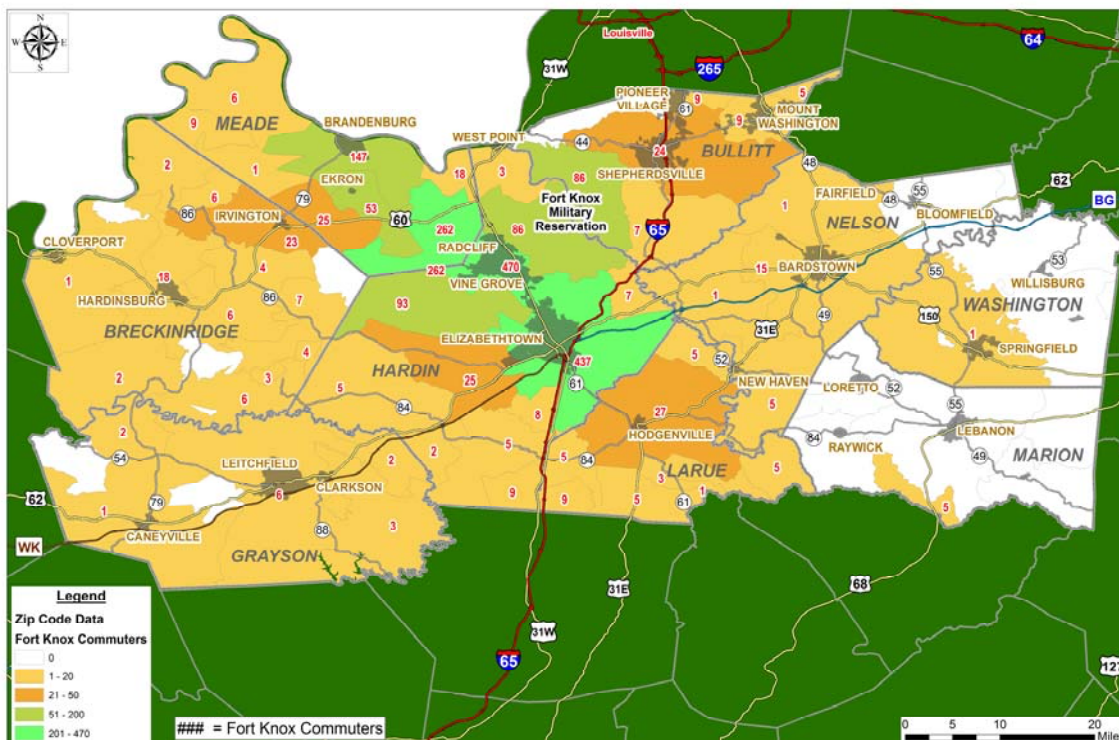


Figure II-8. Fort Knox Commuters within the Study Area



increases, Radcliff is expected to grow by approximately 2,300 people and 1,000 households.

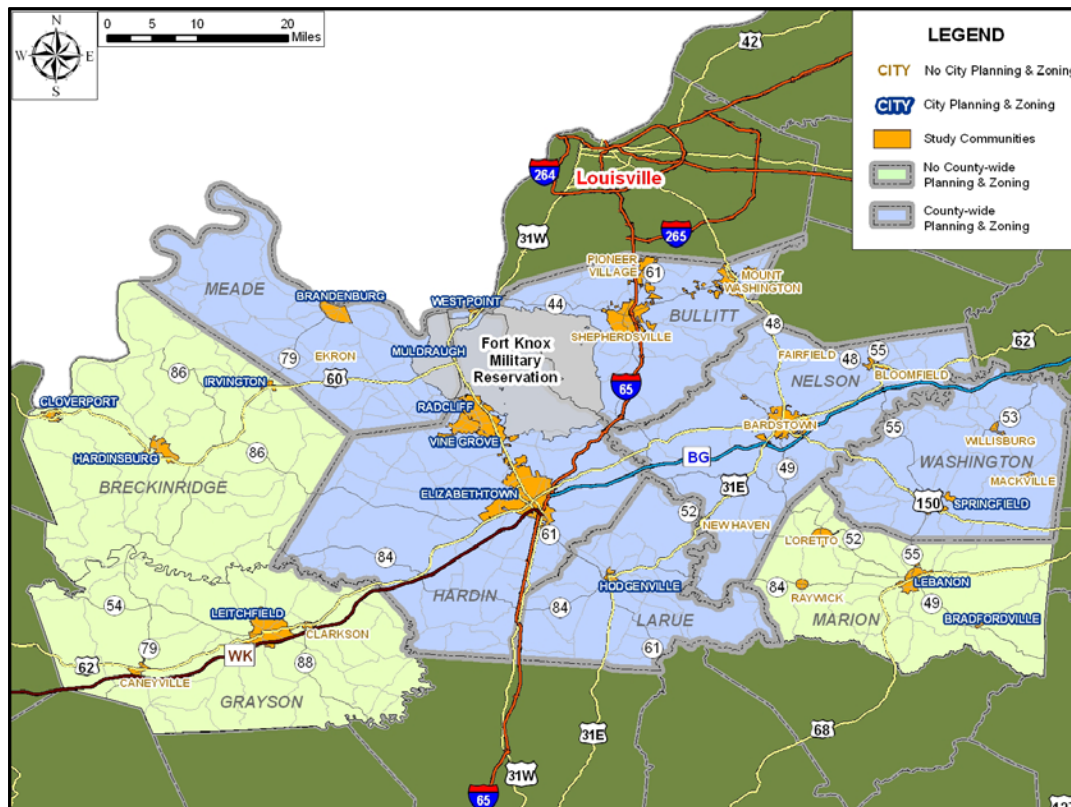
Comparing population trends, Elizabethtown is expected to grow by a similar amount. The remainder of the new population and housing increase, nearly 54%, will be accommodated in rural Hardin County. It is projected that no more than 40% of the projected housing and population growth will occur in the urban areas outside of Hardin County.

development is located between Radcliff and Elizabethtown west of US 31W.

## Regional Planning and Zoning

Several of the communities in the region have planning and zoning commissions established. Along with these, comprehensive plans serve as their guides to plan and regulate future development. These plans are reviewed and updated frequently.

**Figure II-9** shows the communities within the Fort Knox Region that have planning and zoning commissions established. **Figure II-10** illustrates the approved and/or planned residential development occurring near the Fort Knox installation. The majority of the planned



**Figure II-9. Planning and Zoning within the Fort Knox Region**

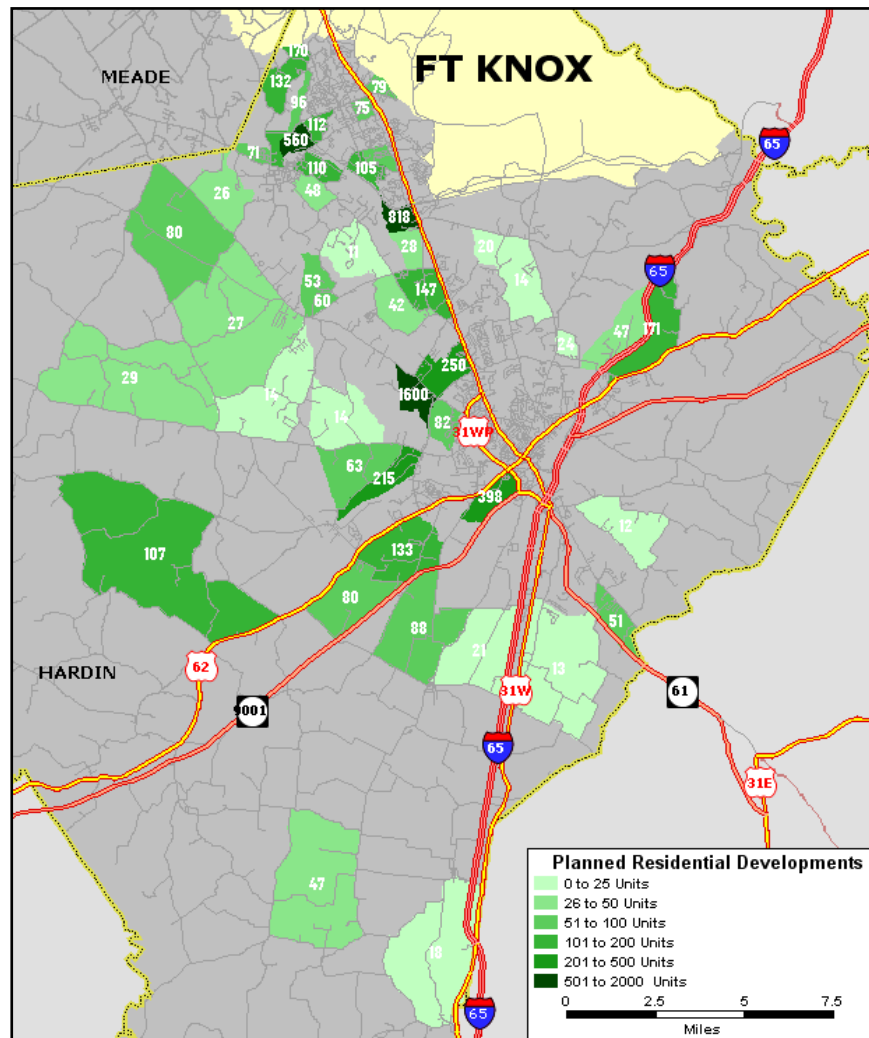


Figure II-10. Residential Development Planned Near Fort Knox

### III. Future Conditions

A thorough understanding of the proposed changes to occur at Fort Knox as a result of the Base Realignment and Closure (BRAC) is critical to estimating the future transportation needs of the region. This section discusses the most recent available data related to the implementation of the 2005 BRAC report and the potential impacts to the regional transportation system.

#### General Information

BRAC is a means by which the U.S. Department of Defense (DoD) evaluates and makes recommendations concerning its base assets in order to maximize efficiency and decrease costs associated with operations and maintenance. The process allows the DoD the opportunity to recommend closure or “realignment” of its military installations by consolidating facilities between the various services in a manner that is open and transparent to the public. The key criterion used in the evaluation of a facility is its “military value”, or the facility’s significance in assisting the military branches in preparing for and winning wars.

The most recent BRAC recommendations were announced in May 2005 and made law that fall. The following recommendations from the 2005 BRAC are expected to have an impact on traffic conditions in the area:

- Relocate the US Army Accessions Command and US Army Cadet Command to Fort Knox, KY.
- Realign Army Human Resources Command leased facilities in Alexandria, VA, Indianapolis, IN, and St. Louis, MO. Relocate and consolidate all functions at Fort Knox, KY.
- Close Louisville United States Army Reserve Center and relocate the 100th DIV(IT) headquarters to Fort Knox, KY.
- Realign Crystal Square 2, a leased installation in Arlington, VA, by relocating the Army HR XXI office to Fort Knox, KY.
- Realign the Park Center IV Building, a leased installation in Falls Church, VA, by relocating

the Army Center for Substance Abuse to Fort Knox, KY.

#### Time Frame

The time frame for implementation of the BRAC recommendations is estimated to be between 2006 and 2011, but many of the changes may occur later. The breakdown of the changes and estimated timeframe of arrival (as of October 2008) is summarized below, with incoming personnel summarized in **Table III-1** and outgoing personnel in **Table III-2**.

**Table III-1. BRAC Timeline for Inbound Personnel**

Inbound Organization	Estimated Arrival Timeframe	Personnel (approx.)
F Company 3rd SARG	Arrived 2007	36
11th Theater Aviation Command HQ	Arrived 2007	166
Ohio Valley Vet Command	Arrived 2006	57
AAA St. Louis	Arrived 2006	3
19th Engineer Battalion	Arrived 2006	670
3rd Expeditionary Sustainment Command	Arrived 2007	260
70th Division	Arrived 2008	60
1/10th Air Support (Air Force)	2008	25
100th Division	2010-2011	60
502nd Bridge Company	Arrived 2008	210
Human Resource Command	2010-2011	3,100
3rd Brigade, 1st Infantry Division	Late 2009	3,400
U.S. Army Accessions Command & U.S. Army Cadet Command	2009-2010	380
	<b>TOTAL</b>	<b>8,427</b>

Source: [www.OneKnox.com](http://www.OneKnox.com)

**Table III-2. BRAC Timeline for Outbound Personnel**

Outbound Organization	Estimated Departure Timeframe	Personnel (approx.)
Unit of Action Maneuver Battle Lab	Departed 2007	190
Blood Bank	Departure in progress	27
Regional Correction Facility	2009-2010	100
Army Research Institute	2010-2011	11
Armor Center and School	2010-2011	3,750
	<b>TOTAL</b>	<b>4,078</b>

Source: [www.OneKnox.com](http://www.OneKnox.com)

#### Quantified Changes

Extensive efforts were made to obtain accurate data to reflect the proposed BRAC changes. This was essential because population and employment figures were used to forecast future traffic conditions on which needed transportation improvements could be based. Initially these changes were anticipated to take place by 2009, but

full implementation is now scheduled for completion by 2011 or later. The following sections discuss the regional socioeconomic statistics developed under this study and used for the traffic forecasting analysis discussed later.

### Changes in Population and Employment

The BRAC changes will result in an overall increase in employment at Fort Knox, in terms of both military and civilian jobs. However, on a regional level the influx of families will result in a secondary increase in not only population, but also jobs. Information regarding these changes has been compiled from a number of sources, including One Knox, (the agency created to support local and regional growth resulting from BRAC), a 2007 study analyzing the Fort Knox regional housing market, and discussions with the staffs at the Lincoln Trail Area Development District and Fort Knox. **Table III-3** summarizes the estimated increases once the BRAC changes are fully implemented.

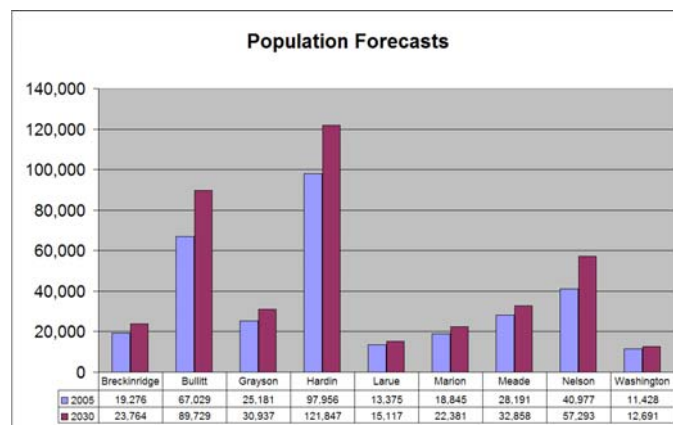
**Table III-3. Anticipated Regional Increases in Population and Employment**

<b>Households</b>	<b>5,700</b>
<b>Population</b>	<b>13,700</b>
<b>Employment</b>	<b>9,850</b>

### Growth Allocation

In order to determine the transportation impacts likely to occur within the study area, the population and employment increases were spatially allocated to each county. Future population and household increases were distributed using data provided by the Kentucky State Data Center and One Knox. **Table III-4** summarizes the estimated 2005 and 2030 (without BRAC) population projections according to the Kentucky State Data Center.

**Table III-4. Estimated 2005 and 2030 Population Projections (without BRAC) by County**



The allocation of increases in BRAC-related population was highly skewed to Hardin County. The 2007 Analysis of Fort Knox Region Housing Market study predicts nearly 80 percent of all housing and population growth to be located there. Additionally, ONE KNOX population projections show that Hardin County itself will directly increase by 10,266 people and 4,260 new households over the first six years of operation after BRAC is implemented. Of these increases, Radcliff is expected to grow by 2,361 people and 980 households. Utilizing historical population shares, Elizabethtown is expected to grow by a similar amount. The remainder of the new population and housing increase – nearly 54 percent - will be accommodated in rural Hardin County. Thus, on a regional level, the additional number of households and people are extremely small within some of the study area counties.

Increases in employment related to BRAC were distributed using information included in the Radcliff-Elizabethtown Travel Demand Model and the Kentucky Statewide Travel Demand model, discussed later in this chapter. The models consist of geographic areas referred to as Traffic Analysis Zones (TAZ). According to the U.S. Census Bureau, TAZ's are special areas delineated by state and/or local transportation officials for tabulating traffic-related data. A TAZ usually consists of one or more census blocks, block groups, or census tracts. Within the Kentucky Statewide model, each TAZ contains its own unique set of socioeconomic data that was allocated during the development and calibration of the model.



The future BRAC-related jobs were distributed according to current percentage of employment allocated within each TAZ relative to each overall county's employment. For example, if employment in a TAZ represents ten percent of the entire county share, then ten percent of the county's projected BRAC employment increase would go to that TAZ. Overall, the county share is determined by its historical percentage. As an example, Breckenridge County accounts for three percent of the entire region's employment; therefore, the county would be assigned three percent of the off-base BRAC related jobs.

### **Land Use and Growth Scenarios**

As the BRAC influx will change what goes on inside the post, the new population and employment patterns will certainly change what goes on in the region surrounding it. The primary focus of the land use portion of this study is to apply potential growth scenarios to address the following issues:

- How should the region accommodate inevitable growth?
- How best can the region grow and retain its unique character at the same time?
- What are the costs and benefits to the region of continued conventional growth patterns compared to smart growth?
- What transportation impacts and recommendations result from continued conventional growth patterns and smart growth?

The region has a history of two predominate patterns of growth. One is the linear, strip style seen on US 31W between Elizabethtown and Radcliff. While this is the most noteworthy example, nearly every community in the region has its own version of this pattern. The other predominate pattern is scattered, low density residential development across the rural areas of the region.

The consequences of these patterns are just now becoming better understood. These patterns are wasteful of time and energy resources, as people spend more time in their cars, either stuck in traffic, or commuting long distances. The rural areas and productive farmlands of the region are being transformed into suburban settlements.

Another prime consequence of this current pattern is economic in that taxpayers subsidize this type of development. Studies show that residential development requires at least \$1.24 in expenditures for public services for every dollar it generates in tax revenues, on average. By contrast, farmland or open space generates only 38 cents in costs for each dollar in taxes paid.

This pattern also is degrading the historical and cultural heritage of the region. As development becomes concentrated along the strips or dispersed throughout the countryside, the region's downtown's become less viable and the agricultural and rural heritage disappears.

The result may be an overall loss of the special "sense of place" that regional residents cherish. Studies show that regions that have traded their sense of place for a homogenized landscape find it difficult to retain their young people. In fact, those places that are prime locations of the 21st century knowledge economy are those that have retained a unique sense of place. By forsaking the ability to keep and attract knowledge workers and companies, the region could severely limit its ability to offer an attractive economic climate in the future. This would have the effect of speeding up the exodus of educated and talented young people, making the regional median age ever older than its current 36.4 years.

The counter argument to these statements is that current patterns of development only reflect what people want out of their communities; that in this region, for example, it is highly desirable for people to "live in the country." This lifestyle is considered very appealing, especially by those who are associated with the BRAC developments at Fort Knox. Other appealing aspects of this lifestyle are that it appears to offer what is cheapest, most personally convenient, and the most "ideal."

Yet as we are seeing today, costs are going up, special qualities are disappearing, and negative impacts are increasing. Further, local governments in this region are facing a declining ability to mitigate these negative consequences, which will ensure that everyone feels the impacts. Communities and regions that understand this limitation, are the ones best positioned to make positive, alternative future plans.

The region has choices to make about how best to accommodate the changes that will occur because of BRAC. Relying on the current set of choices will likely bring about a number of the previously discussed consequences. While many regional citizens and governments desire a predictable future, which this choice appears to ensure, evidence is mounting as to the unintended consequences of this choice, most of which are negative.

For purposes of this study, four growth scenarios have been developed. The first focuses on future land use patterns largely unchanged, if at all, from the patterns that exists today. The second two scenarios focus on the implementation of “smart growth” principles that seek to minimize the adverse affects of more-traditional land use patterns and “urban sprawl” by focusing growth within existing urban centers and advocating long-term sustainability. The fourth scenario is a compromise between the current trends and smart growth. The specific consequences of the various future land use scenarios follow.

### Scenario 1: “Conventional Trend”

Scenario 1, depicted in **Figure III-1**, envisions the region’s future, post-BRAC, to be basically the same as the region’s future without BRAC at all. Only the ultimate population and intensity of development will be different. The patterns described in the previous section are projected to continue; the course is the same. Low density urban development will be coupled with low density, far flung rural development.

In order to create Scenario 1 and its effects, the following research was conducted:

- Population trends from the U.S. Census Bureau
- Population estimates from the Kentucky State Data Center
- Population projections from the Kentucky State Data Center
- Household estimates from the Kentucky State Data Center
- Household projections from the Kentucky State Data Center

- Review of comprehensive plans and zoning ordinances, where available, to determine likely future growth patterns
- Review of natural features and systems
- Historical commuting patterns
- Sewage disposal methods
- Planned road improvements
- Employment density
- Residence of current Fort Knox employees
- Historical satellite photographs
- Economic development assets such as infrastructure and industrial parks

The impact of the BRAC population increase in this scenario is felt most strongly in the rural areas of Hardin, Meade, Bullitt and Breckinridge Counties. However, rural areas throughout the region can expect to see increases in housing and population. Even though some counties have a larger minimum lot size, the predominate housing density in the rural areas across the region will be approximately one dwelling unit per acre.

No more than 40 percent of the projected housing and population growth will occur in the urban areas outside of Hardin County in the region. Urban growth in Scenario 1 follows current patterns as described in the initial section. Single use, low density, auto-dependent development patterns predominate.

### Likely Consequences

The likely consequences of this pattern of growth are as follows:

**Higher infrastructure costs:** The conventional trend will cost consumers, developers, and taxpayers as much as 40 percent more than a smart growth future. Low density, widespread development requires more infrastructure and a higher maintenance cost per customer. Water and sewer lines, streets, and stormwater systems are all physically much longer in this pattern, increasing the expense to construct and maintain these facilities. This cost is passed from developer to consumer and from government to taxpayer. The end result of this trend in areas with similar patterns of growth has been higher taxes or reduced services.



**Higher transportation costs:** High gasoline prices, which peaked in 2008 and have been decreasing recently, are most likely to increase again in the future. The result will be an effective lowering of pay for workers in those regions, like this one, where long commutes are the norm. Residents can expect to see transportation costs move much higher the farther they live from work and necessities.

**Higher environmental remediation costs:** Low density, widespread development damages more miles of streams and wetlands than other types of patterns of development. As environmental protection continues to gain prominence, these damaged areas will be required to be restored. The cost of this will be passed on to taxpayers.

This pattern of development results in an increasing amount of private sewage systems and septic tanks, both of which are notoriously prone to failure. Again, the long-term cost of remedying the situation will ultimately be passed along to taxpayers.

Air quality is another vital environmental issue. Currently, portions of the region are classified as non-attainment areas, meaning they fail to meet minimum Federal standards. Continued current patterns of development are likely to exacerbate these problems.

**Higher costs for food:** Cheap gas has made citizens of the U.S. reliant on food transported long distances. Now that the true cost of that transportation has hit home, many regions are returning to a local, high quality food base. However, the continued pattern of development in this region will most likely remove the most productive lands from agricultural use. This places the region at the mercy of continued importation of increasingly expensive, lower quality food.

**Quality of Life Impacts:** Continued patterns of current development will have the end result of creating a region that will not reflect the resident's values. As generic development overwhelms historical and traditional cultural patterns, residents will experience a "loss of place." This "loss of place" will be felt in the ugliness of developed urban places, disappearing open spaces, homogenization of rural landscapes, and the ultimate inconsequence of historic centers. The region that everyone loves now is fast disappearing and is being replaced with the perfectly generic American model of "Nowhere."

The car-dependent culture that has developed in this region can also be expected to cause significant long-term health impacts. Low density, far flung developments lead to sedentary lifestyles, resulting in obesity and the health-related problems that accompany it. As an indication of the future, Kentucky ranks in the top five nationally of highest percentage of obese adults and children.

Many people in the region associate a high quality of life with outdoor activities such as hunting and fishing. As low density, far flung development continues, both the water quality needed to support fish and other aquatic animals and land-based habitats can be expected to diminish.

**Long term regional economic impacts:** This region is in an economic competition with 400 others in the U.S. as well as thousands of others across the world. The prime engine in the region is, of course, the Army facility at Fort Knox. Yet, the region has a history of uncoordinated and seemingly uncaring land use decisions related to the continuance of that facility. As urban development closes in upon the Fort, at what point will it undermine its ability to continue in its current form and size? At what point do the uncoordinated regional land use decisions combine to figuratively kill the goose that laid the golden egg?

Any region with an undiversified economic base is subject to harsh realities in today's global economic competition. Other regions are making plans to go green and to protect the environment, to develop an urban scene to attract the largest demographic in American history (the Millennials), and to create alternative transportation systems among other innovative actions. In other words, many progressive regions are making progressive plans to enter the Knowledge Economy.

Under the current pattern of development in the region however, none of these are likely to happen. Instead, this region will be locked into a pattern all too reminiscent of the old "Rust Belt" economies; the region is at risk of becoming just another set of factory towns. In this case, the factory is Fort Knox, and if it closes, the region will find that it has sacrificed the unique aspects that it could have exploited to move forward in the new economy. The region can simply look to the other Military bases that have closed in recent years to see the predicted effects first hand.



On another level, the current pattern of growth can be expected to limit the growth of tourism. Loss of historic buildings, scenery, landscapes, and their replacement with generic forms, will not be conducive to the development of a significant tourist industry. The World Travel and Tourism Council predict that spending on travel and tourism will grow by over \$200 billion in the U.S. alone between 2009 and 2018.

## Scenario 2: “Smart Growth”

Scenario 2, depicted in **Figure III-2**, offers a resource-based approach to managing future population and housing increases. Prime agricultural and sensitive natural areas would be protected by increased minimum zoning standards. These standards would be enacted regionally, meaning that every county which contains these types of areas would have the same zoning requirements. This not only better protects the farming and sensitive areas of the region, but it works to eliminate some, but not all, of the unintended consequences of uncoordinated planning from county to county.

Scenario 2 differs from Scenario 1 in that it deviates from the One Knox population projections. Due to a large portion of Hardin County’s land area being composed of prime agriculture and environmentally sensitive lands, and with these lands being zoned for larger lot sizes in this scenario, a large portion of the expected population increase currently projected for these areas would be accommodated elsewhere.

The key land use recommendations are as follows:

- Urban densities increased to a minimum overall average of two to four units per acre
- Mixed uses allowed vertically as well as horizontally
- Rural land use as follows:
  - Agricultural Preserve: one dwelling unit per ten acres
  - Resource Protection: one dwelling unit per ten acres
  - General Rural: one dwelling unit per one acre with the following exceptions:
    - 1 dwelling unit per 5 acres in Nelson County
    - 1 dwelling unit per 3 acres in Hardin County

- 1 dwelling unit per 2.5 acres in Marion County

Scenario 2 does not address the overall problem of unintended consequences of uncoordinated planning within each county. While there is a coordinated scheme for some protection of prime agricultural and environmentally sensitive lands, it does not address the remaining inconsistent land use policies.

It is assumed here that some of the rural growth that would have occurred in the areas now deemed important for agricultural preservation and environmental protection will simply occur in other areas of the counties, where minimum lot sizes have not changed from their absolute minimums.

The end result of course will be an increase in density, as this transferred growth is combined with that growth which would have occurred anyway. This increase in density will also result in a potentially dramatic loss of character in these areas.

Due to the restrictions placed on rural development in certain areas and the off-setting increase in denser rural development in other areas, perhaps making those areas more unaffordable or undesirable, a certain percentage of the future population will be assumed to locate in the urban areas of the region. As much as 20 percent of the population increase that may have occurred in the rural areas now can be expected to be accommodated in urban areas. These areas could now account for as much as 60 percent of all population and housing growth.

In order to accommodate this increase in urban density, several critical planning actions need to occur to ensure a high quality of life. First, mixed-use developments must be incorporated. Conventional zoning most often prohibits mixing uses in the same building. This prevents offices or apartments being located above retail stores, for example. The result is that land and infrastructure in the community is used inefficiently.

Mixed-use zoning allows development to maximize efficiency not only of land but of infrastructure. Further, it helps to create interesting and potentially handsome places. More detail about mixed use development will be found in Scenario 3.

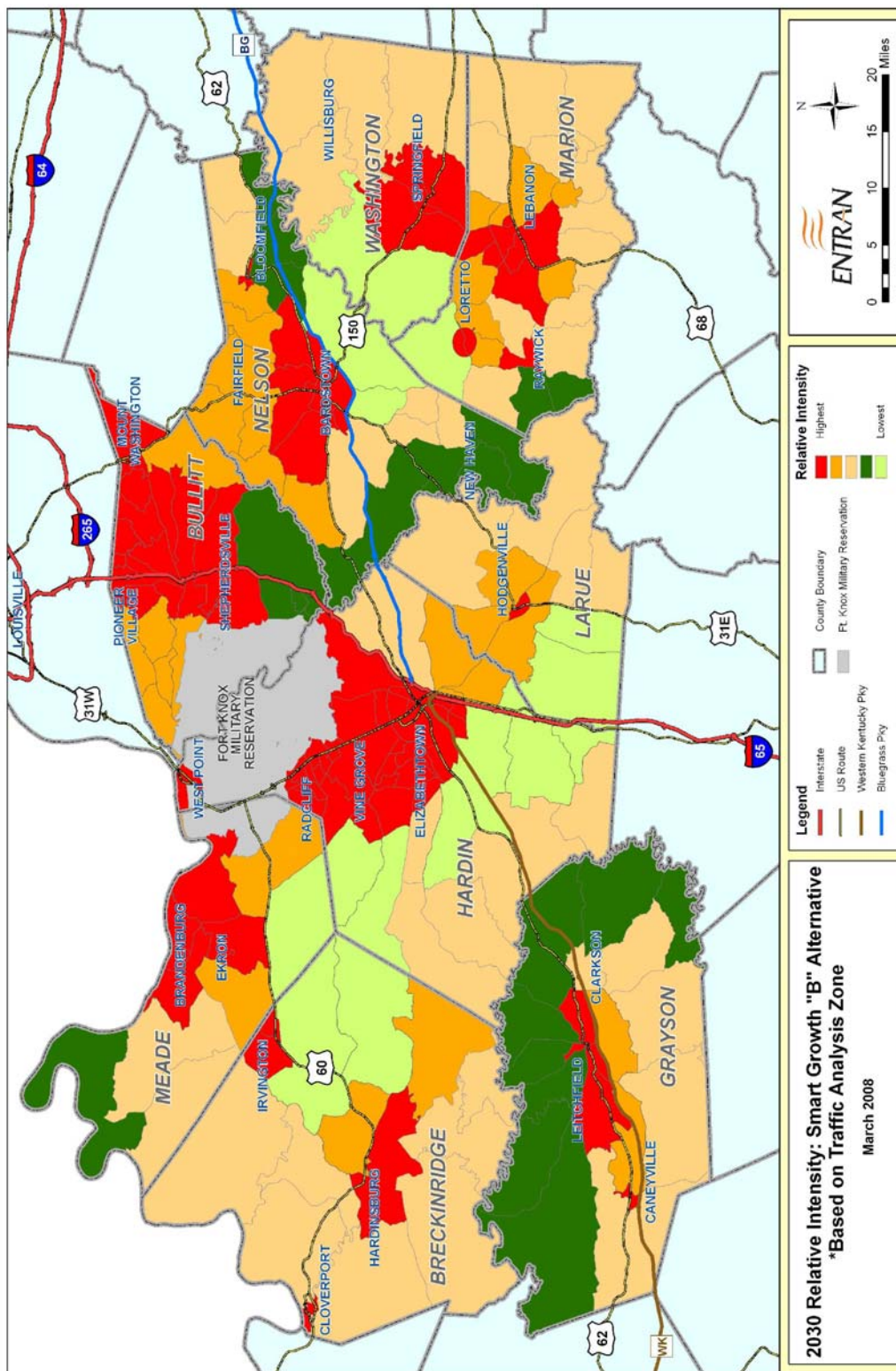


Figure III-2: 2030 Development Trends based on Scenario 2 (Smart Growth)

Other planning initiatives are vital for accommodating increases in urban density. A renewed focus on the economic, physical, and social health of downtowns, development of parks and greenways, new and improved sidewalks, environmentally smart planning and focusing on neighborhood schools will all help to make for vibrant communities. More detail will be found in Scenario 3.

### **Likely Consequences**

If these recommendations are followed, then the following impacts and benefits of Scenario 2 may be seen. The comparisons below are made to those impacts found in “Scenario 1: Conventional Development.”

**Somewhat reduced infrastructure costs:** Infrastructure costs in Scenario 2 will cost consumers, developers, and taxpayers as much as 25 percent more than a smart growth future. While urban densities are increased, and rural densities are decreased, this type of development will still require more infrastructure and a higher maintenance cost per customer than a complete smart growth alternative. Water and sewer lines, streets, and stormwater systems are all still physically longer in this pattern. Longer equals more expense. This cost is passed from developer to consumer and from government to tax payer. While more cost efficient, the end result of this trend in areas with similar patterns of growth has been higher taxes or less services.

**Moderated transportation costs for most:** Under Scenario 2, transportation costs will be moderated by the fact that more people will be living within closer proximity to work and daily necessities. Schools however do not benefit as much, as it is as expensive to use a school bus to pick up one child as ten in a far flung development.

**Moderated environmental remediation costs:** The development patterns in Scenario 2 are purposefully designed to minimize disruption of the natural ecosystem. Yet low density, far flung development will still occur, bringing with it negative effects.

Development in Scenario 2 does little to decrease the overall amount of septic tanks and private sewage systems in the region. In fact, an unintended consequence of the recommendations of this scenario may be an intensification of these imperfect methods in smaller areas that are less physically suited to handle waste. As with the

Scenario 1, the long-term cost of remedying the situation will ultimately be passed along to taxpayers.

**Potential to become less dependent on imported food:** By protecting the prime agricultural areas of the region, locally grown food can become a more important part of the regional diet. This will have the long-term effect of ensuring access to quality food without being at the mercy of spiraling transportation costs.

**Quality of Life Impacts:** Scenario 2 places a premium on protecting farming and environmental resources, and building a cohesive urban fabric in turn creating a stronger sense of place. This has the potential to safeguard the values that most regional residents value: rural heritage, natural environment, and close-knit communities.

Scenario 2 has the potential to reduce dependence on the private automobile. By walking and biking more, regional citizens will become healthier and safer. Air quality will improve. And by protecting farms and environmentally sensitive lands, animal habitats are likely to thrive.

**Long term regional economic impacts:** Scenario 2 does not directly address the land use interface between the military uses at Fort Knox and the private enterprise that will occur around it. In fact, without such actions, the tension between the military and the communities may increase in this Scenario as urban densities are projected to increase in Elizabethtown, Radcliff, Brandenburg and Shepherdsville. This leads to the same question posed with the first two scenarios: as urban development closes in upon the Fort, at what point will it undermine its ability to continue in its current form and size?

Scenario 2 does help to position the region more strongly in the 21st century economic development competition. By preserving farmland and environmentally sensitive lands, the economic value of local produce and tourism can be increased. By increasing urban density, the economic efficiency of land is maximized, increasing returns for developers and increasing local property tax bases while reducing individual tax burdens. Further, strong efforts at creating quality urban places will make the region attractive to the Millennial Generation who will lead economic development in the first part of the 21st century.

### **Scenario 3: “Smartest Growth”**

Scenario 3, depicted in **Figure III-4**, offers the complete counterpoint to the region’s conventional trend pattern of development. The large majority of the region’s future population and household growth, including that associated with BRAC, will be concentrated in the region’s existing urban centers. The region’s prime agricultural land, environmentally sensitive areas, and rural landscapes will be protected with large lot minimum zoning.

The goal is simple: to maintain the region’s quality of life while increasing its economic competitiveness and attractiveness. On the surface at least, Scenario 3 may sound unappealing to many people. Some may fear unfairness to rural landowners hoping to profit from the sale of property for rural housing development. Still others see traffic jams, loss of privacy, and a loss of a relaxed pace of life. And indeed, unless the entire region adopts a new mindset about how best to accommodate future growth, these images and fears may become a reality. Yet it does not have to be that way. With smart planning tools, innovative development practices, and fair policies for all landowners and citizens, this scenario offers the best chance for the region to protect the characteristics and values that it most cherishes.

The most important ingredient to the success of such a scenario will be regional cooperation. Unless every community in the region accepts the benefits that will accrue to individual communities and the region as a whole with the adoption of unified planning, Scenario 3 is not achievable.

### **Scenario 4: “Likely Pattern”**

Scenario 4, depicted in **Figure III-4**, envisions the region’s future, post-BRAC, to be only slightly different from the region’s future without BRAC at all. The ultimate patterns and effects will be the same; the only difference is that Scenario 4 envisions Hardin County enacting a larger minimum lot size than currently exists: moving from a density of one unit per acre across the county to a density of one unit per three acres in the prime agricultural areas.

The projected effect that this zoning change would have on post BRAC impacts would be to moderately reduce the amount of rural housing in the center of Hardin County. The result would be the forcing of the housing and population that would have gone there in the conventional

pattern to be relocated to those areas in Hardin County that would retain the one acre density as well as to neighboring counties that still retain one acre densities.

This is one of the unintended consequences frequently seen in areas without coordinated planning: a restriction in one area will simply encourage growth in another area.

As in Scenario 1, the impact of the BRAC population increase outside of Hardin County is felt most strongly in the rural areas of Meade, Bullitt and Breckinridge Counties. However, rural areas throughout the region can expect to see increases in housing and population. Even though some counties have a larger minimum lot size, the predominate housing density in the rural areas will be approximately one dwelling unit per acre.

No more than 40 percent of the projected housing and population growth will occur in the urban areas outside of Hardin County in the region. Again, this would be accommodated in the current development patterns.

#### **Likely Consequences**

The expected consequences would be essentially the same as with the Scenario 1: “Conventional Trend.”



Figure III-3: 2030 Development Trends based on Scenario 3 (Smartest Growth)

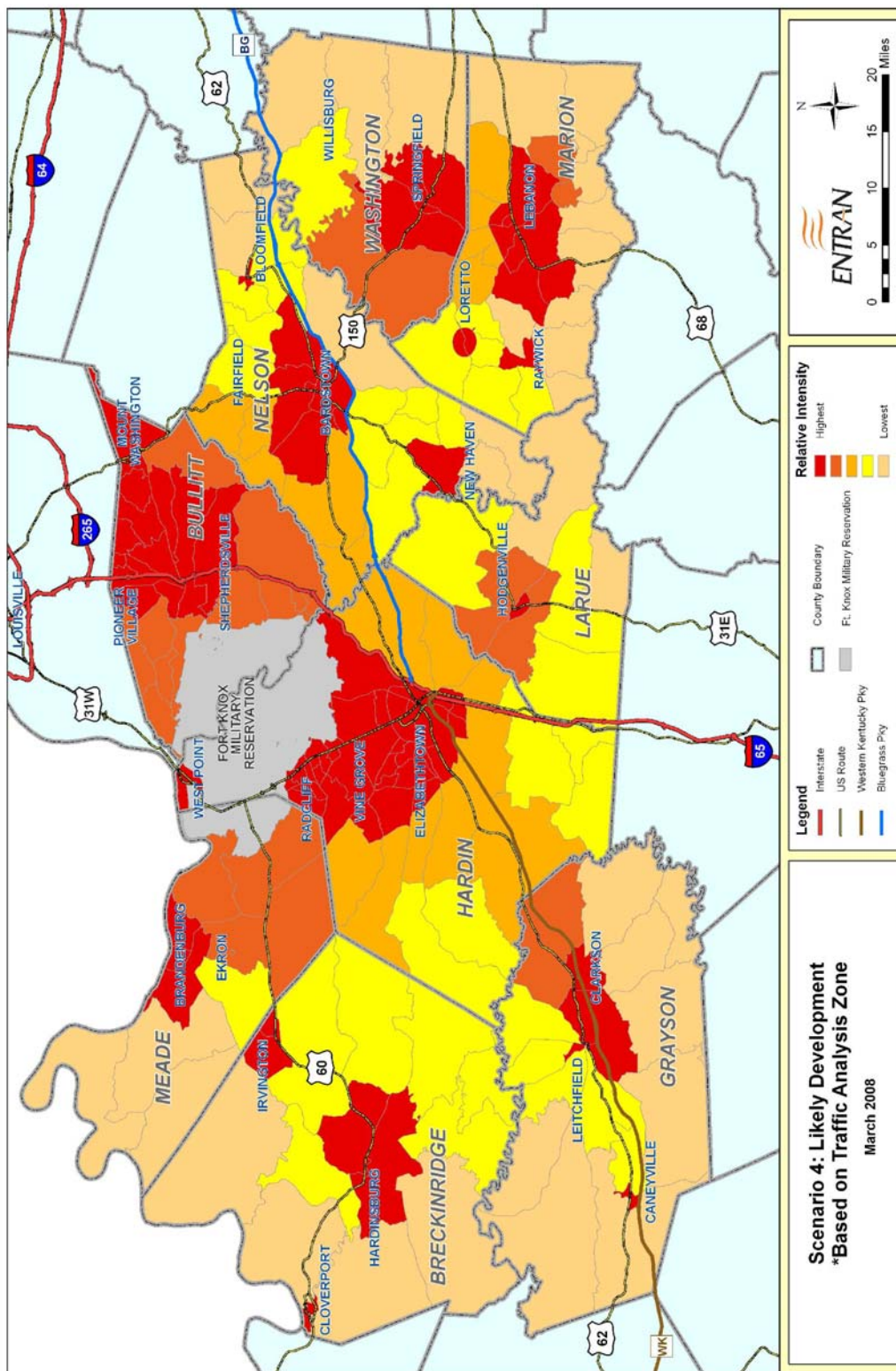


Figure III-4: 2030 Development Trends based on Scenario 4 (Likely Growth)



## Planned Projects

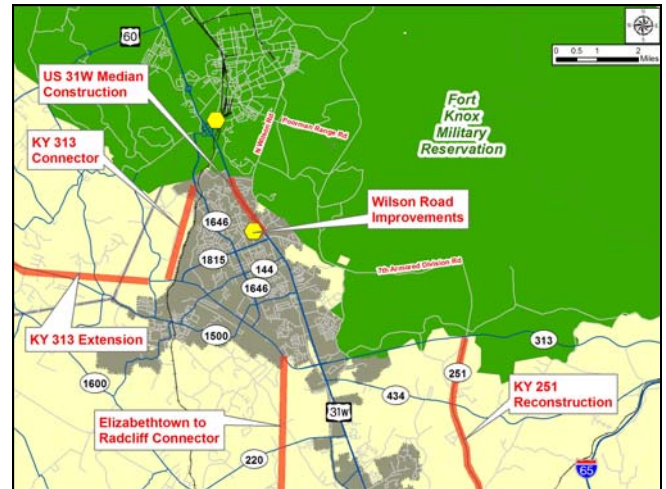
### BRAC Task Force Priority Projects

Early in 2008, Kentucky Governor Steve Beshear created the BRAC Task Force to assist in the implementation of the 2005 BRAC recommendations at Fort Knox. The task force includes representatives from various Kentucky Cabinets (such as Economic Development, Transportation and Education), the Kentucky Adjutant General and the Kentucky Commission on Military Affairs, the executive director of the Lincoln Trail Area Development District, representation from Louisville and the Fort Campbell area, and the executive director of ONEKNOX.

Transportation is one of the many areas that falls under the purview of the BRAC Task Force. The Task Force ranked seven potential transportation improvements that were conceived through the development of the MPO Transportation Improvement Plan (TIP) or during the course of other studies that will affect traffic in the vicinity of Fort Knox. These projects, including cost estimates, are summarized in **Table III-5** and are shown graphically in **Figure III-5**.

**Table III-5. BRAC Priority Projects by Ranking**

BRAC Ranking	Project Description	Total Project Cost
1	KY 313 Extension: Vine Grove to US 60 in Meade County	\$46,580,000
1a	KY 313 Extension: US 60 to Brandenburg	\$44,320,000
2	NEW - Connector Road - Veterans Parkway (KY 1646) to KY 313	\$15,800,000
3	NEW - Elizabethtown to Radcliff Connector (E2RC) Section 1: From E'Town Bypass to Timber Lane including interchange with the Elizabethtown Bypass	\$99,860,000
4	US 31W - Eliminate/Combine Median Openings from Pear Orchard Rd in Elizabethtown to East Spring St in Radcliff	\$1,700,000
5	Fort Knox Highway Access Study Key Capital Improvements - 1) Improve Exit Ramp Merge from Northbound US 31W to Inbound Bullion Boulevard; 2) North Wilson Road Improvements	\$3,530,000
6	KY 251 - Reconstruction from KY 3005 (Ring Road) to KY 434	\$21,500,000
6a	KY 251 - Reconstruction from KY 434 to KY 313	\$10,500,000
7	US 31W - Construct a non-traversable median from Spring St. to Knox Blvd in Radcliff	\$383,000
<b>TOTAL</b>		<b>\$244,173,000</b>



**Figure III-5. BRAC Priority Projects**

The highest priority project (actually, two projects as it is divided into sections) was the KY 313 extension. This proposed corridor, at a total cost of approximately \$91 million, would connect the end of existing KY 313 near Vine Grove to Brandenburg. This new corridor would provide a more efficient travel route for residents of Meade County and Brandenburg to Fort Knox, as well as to I-65.

The proposed KY 313 Connector was the second highest priority project. The \$15.8 million roadway would connect KY 313 near or east of its intersection with KY 1500 to Veterans Memorial Boulevard (KY 1646), providing an alternative route between Vine Grove and western Radcliff to utilize the Chaffee Gate at Bullion Boulevard without requiring travel on the congested US 31W corridor or the densely developed southern section of KY 1646.

The BRAC Task Force ranked the Elizabethtown to Radcliff Connector (E2RC) as its third priority improvement. This corridor would provide a western parallel route to US 31W, providing much needed congestion relief between Elizabethtown and Radcliff. US 31W is essentially the sole route connecting Elizabethtown to Fort Knox as the other possible options, such as KY 251 or I-65, are significantly longer. At a cost of just under \$100 million, this corridor would connect the US 31W Bypass in Elizabethtown to KY 313 just west of US 31W.

The fourth priority project was conceived during the US 31W Access Management Study. It includes eliminating

and/or combining median openings along US 31W between Pear Orchard Road in Elizabethtown to East Spring Street in Radcliff. This 7.5 mile long section contains approximately 100 median openings, most of which do not have turn lanes to accommodate decelerating vehicles. Turn lanes are to be constructed at the median openings which will remain open and that do not currently have turn lanes provided. This project, at a cost of approximately \$1.7 million, would improve traffic flow and increase safety along the corridor.

The fifth priority project resulted from the Fort Knox Highway Access Study. At a cost of just over \$3.5 million, it includes improving the exit ramp merge from northbound US 31W to Bullion Boulevard and constructing a three-lane section on North Wilson Road between KY 1815 (West Lincoln Trail) and the US 31W overpass. KYTC recently widened North Wilson Road to three lanes between the US 31W overpass and Knox Boulevard, but no improvements were made to the also-congested southern section.

The sixth priority project consists of widening two segments of KY 251, with the first segment between KY 3005 (Ring Road) to KY 434 (Battle Training Road) and the second segment between KY 434 and KY 313 (Joe Prather Highway). KY 251 currently provides an alternative connection between Elizabethtown and Fort Knox, and this corridor may see increased usage in the future as there has been some consideration of providing a new access gate to Fort Knox along KY 313. However, KY 251 is narrow with some segments having less than 10-foot wide lanes and minimal shoulder. The combined cost to widen both sections is approximately \$32 million.

The final BRAC Task Force priority project was a result of the US 31W Access Management Study and calls for the construction of a non-traversable median along US 31W between Spring Street and Knox Boulevard in Radcliff. This section of roadway, which currently contains dual continuous center left-turn lanes, is characterized by dense retail development and closely spaced driveways. By constructing a non-traversable median, potential traffic conflicts will be reduced as left turns will only be allowed at select locations. Additionally, removing the traffic signal at US 31W and Spring Street was discussed during the Fort Knox Highway Access Study in an effort to increase the spacing between traffic signals and improve traffic flow.

One additional project was discussed after the BRAC Task Force completed its prioritization process. With the proposed E2RC Connector tying into KY 313 just west of US 31W, and the KY 313 Connector proposed for construction to the west, KYTC has indicated an interest in improving the existing two-lane section of KY 313 between these proposed facilities.

## KYTC Six-Year Plan Projects

The KYTC 2005-2010 Six Year Highway Plan includes a number of regional projects that will increase traffic capacity. These projects are summarized, by county, in **Table III-5**. Projects that will not significantly add capacity, such as minor widening projects, bridge replacements, or intersection improvements, are not included in this summary.

**Table III-6: KYTC Six Year Highway Plan Projects**

County	Project	Project Location/Limits
Breckinridge	No projects	
Bullitt	KY 44 reconstruction	I-65 to Mount Washington
Grayson	Northwest Bypass of Leitchfield	Western Kentucky Parkway to KY 259
Hardin	KY 313 Extension	Radcliff to Meade County Line
	E-2-RC Connector	Radcliff to Elizabethtown
	Improve the I-65 interchange at KY 222	
	New interchange on I-65	South of Elizabethtown (east of Glendale)
Meade	KY 313 Extension	Hardin County Line to Brandenburg
Larue	Widen I-65 to six lanes	Larue County
Marion	Lebanon Bypass	US 68 to KY 55
Nelson	US 31E reconstruction	Nelson County Line to Bardstown
	KY 245 widening	KY 332 to Proposed Flaget Hospital
Washington	Springfield Northwest Bypass	KY 555 to US 150

Breckinridge County is the only location where no capacity-expanding projects are programmed under the Six Year Plan. While the projects included in the plan were not developed solely to counteract the affects of BRAC, as new households locate within the region, each county can expect to see some increase in travel demand.



### Regional Traffic Forecasts

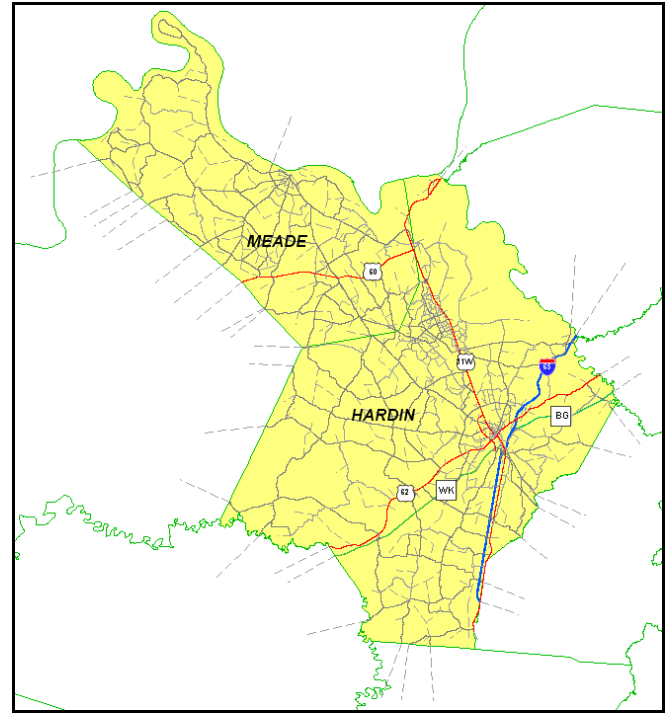
Because of the size of the study area, two separate travel demand models were used to estimate growth forecasts and regional distribution patterns for this study. The first of these tools was the Radcliff-Elizabethtown MPO Travel Demand Model (TDM). The TDM was developed in 2003 as part of the Radcliff-Elizabethtown Urbanized Transportation Plan. The second tool used in developing traffic forecasts was the Kentucky Statewide Travel Demand Model. This model replicates existing conditions and forecasts traffic for every major roadway throughout the state, including areas where no other models exist.

For both models, base networks were revised to better reflect the current roadway network. Future year networks were also updated to reflect expected improvements. Household and employment data were also updated, to reflect current base conditions specifically at Fort Knox, as well as alternative future conditions for both Fort Knox and the surrounding region, according to various scenarios. Model results, in the form of networks with new traffic assignments, were developed for analysis.

### Radcliff-Elizabethtown MPO Model

The Radcliff-Elizabethtown MPO Model, which encompasses the entire roadway network for Meade and Hardin counties as shown in **Figure III-6**, is a conventional three-step daily travel demand model that is run in the TransCAD software package using a custom user interface. The model includes 338 Traffic Analysis Zones (TAZs) and 38 external stations. The model is calibrated to the 2003 base year. As the focus of the model activity for this project was Fort Knox, specific attention was paid to zonal data and network coding directly affecting the model's assignment in this area.

During the course of the Fort Knox Highway Access Study, it was found that the Radcliff-Elizabethtown MPO TDM had some issues with replicating known traffic volumes, which in turn would likely lead to less than desirable accuracy in future forecasts. Unfortunately, the scope of this study allowed for only limited calibration efforts to be undertaken to correct the issues with the existing model. (The model is currently undergoing more significant revisions under separate contract with KYTC.)



**Figure III-6. Radcliff-Elizabethtown MPO Travel Demand Model (TDM) Network**

Beginning with the network, the first issue of concern was the location of base entrance gates and their associated network intersections with US 31W. The network included four entrance gates to Fort Knox. The Brandenburg gate, the northernmost gate, was realigned and placed in its new location farther within the base. The model network around this gate, specifically as it related to the adjacent town of Muldraugh, was realigned to reflect actual roadway connections. The grade-separated interchange at Brandenburg Road and US 31W was also fully coded. The Chaffee Avenue interchange with US 31W south of the Brandenburg gate was also fully coded, maintaining its “exit only” status. The Bullion Boulevard interchange did not need recoding, although the network was adjusted to reflect the location of the new gate. The Wilson Road interchange was recoded to depict the partial grade separation of KY 447.

The interior network of Fort Knox was also recoded to provide greater depiction of interior traffic movement. The large area of the interior TAZs resulted in a minimal network, with centroid connectors introducing all of the base traffic on the network at just a few locations. Traffic flow within the base was not well depicted, and traffic

through the gates was supplemented to match gate counts via the use of special generators. While the boundaries of the TAZ file were not adjusted, a more robust interior network was added. Additional centroid connectors were added to replicate locations where traffic enters and exits the network, and the special generators moved to the actual location of traffic generators within the base. Further, on the west side of US 31W, the network was adjusted to more accurately reflect access to US 31W.

The other major area in which the base network was adjusted was the elimination of propagated counts, where a valid traffic count was copied from one roadway segment to adjacent segments where it was no longer valid. Removing propagated counts results in more accurate calibration statistics. Count data on all network links not associated with an actual count station as depicted in KYTC map and GIS data were removed.

In order to better assess model performance around the base, a new area class was created to assess the assignment of traffic near the base. Further, a consolidated designation of facility types was created to allow for a simpler, more comprehensive understanding of assignments by roadway types.

Base year TAZ zonal data within Fort Knox were updated to reflect the current location of residential households and employment centers within the base. The results of these changes to the base model are presented in **Table III-7**.

**Table III-7: Volume to Count Ratio and Percent Root-Mean Square Error (%RMSE) by Facility Type**

Facility Type	Assigned Volume	Observed Count	Volume / Count	%RMSE	Links
Limited Access Expressway	92,666	95,800	0.97	5.8	6
Major Arterial/Highway	596,219	571,800	1.04	26.6	29
Minor Arterial/Highway	77,495	104,310	0.74	33.5	9
Collector	284,327	311,772	0.91	65.6	80
All	1,050,707	1,083,682	0.97	39.3	124

Table III-7 expresses the Volume-to-Count (V/C) ratios for roadway links where traffic counts are available and Percent Root Mean Square Error (%RMSE), a statistic that describes how well the model assignment as a whole

matches observed count volumes. The links included are for those within a general area of the base, which covers northern Hardin County from the north side of Elizabethtown, and eastern Meade County to KY 144. The closer the V/C ratio is to 1.00, and the lower the %RMSE, the better the model's ability to replicate observed data. Among major facility types (Expressway and Major Arterial), the V/C ratios and %RMSE are acceptable, while the V/C ratio for minor arterials is lower than desirable, and the %RMSE for collectors is higher than desirable. Overall, the model's 0.97 V/C ratio for the Fort Knox area is reasonable, and the %RMSE of 39.3 is within an acceptable threshold, although a %RMSE below 35 is preferred.

### Kentucky Statewide Model

The Kentucky Statewide Model is also a conventional three-step daily travel demand model that is run in the TransCAD software package using a custom user interface. The model contains all major state, federal, and county facilities in Kentucky and the adjacent areas of surrounding states, and has a sparse network that extends to cover the entire United States. The model also has a truck component. The model is calibrated to a 2003 base year and has future year zonal data to run a 2030 forecast.

The Kentucky Statewide Model was run to establish comparable baseline model assignments, especially at the boundaries of the eight counties that comprise the Lincoln Trail Area Development District. While the model does a relatively good job of replicating travel demand along the major highways, such as interstates and U.S. routes, it is typically not as accurate along more minor roadways and rural routes. However, as there are no available travel demand models for most of the study area counties, the Kentucky Statewide Model is the only tool available capable of developing forecasts for the entire study area.

Given the coarse nature of the model, only minor adjustments were made to the model's coding of Fort Knox centroid connectors to ensure that the base entrances to US 31W were accurately placed. Zonal data for the vicinity of Fort Knox were updated to be compatible with the zonal data and traffic generation in the Radcliff-Elizabethtown MPO Model.

## Model Scenarios

For both the Radcliff-Elizabethtown MPO Model and the Kentucky Statewide Model, model runs were made for the base 2003 year, a 2030 base year representing the No Action scenario, and the four alternate growth scenarios. In order to better reflect anticipated conditions for the future, each of the models were updated to include anticipated roadway improvements currently programmed.

In the case of the Radcliff-Elizabethtown MPO Model, four major network changes were coded outside Fort Knox. The first new link is the Elizabethtown to Radcliff Connector, a four-lane arterial highway parallel to US 31W between KY 313 and the US 31W Bypass. The second link is the extension of KY 313 from its current terminus north of Vine Grove to just east of Brandenburg, parallel to KY 144. The third new link is a connector between KY 313 and KY 1500 along the western boundary of Radcliff. The fourth new link is the extension of KY 3003 (Ring Road) on the western side of Elizabethtown, between US 62 and the Western Kentucky Parkway.

**Table III-8** presents a summary of the mileage by county for each Level of Service (LOS) developed from the Radcliff-Elizabethtown MPO Model for each of the scenarios. As discussed in Chapter II, LOS provides an indication of the quality of traffic conditions in the form of a letter grade. LOS ranges from A to F, with LOS A representing free-flow, uncongested conditions and LOS F representing severe congestion and over-capacity conditions. LOS D is considered acceptable in an urban setting and LOS C in a rural setting.

Overall, the vast majority of the street system within both Hardin and Meade County is anticipated to operate at LOS C or better, suggesting that congestion is not expected to be a significant issue for most areas. However, most of US 31W and much of KY 313 and the proposed KY 313 extension are expected to operate at LOS E or LOS F in the future, suggesting that demand for travel along those roadways is likely to exceed capacity for much of the day. There is minimal variation between the growth scenarios, suggesting that smart growth will have a minimal effect on the travel conditions in the future. Maps depicting the anticipated 2030 traffic volumes and LOS are provided in **Appendix A**.

**Table III-8: Level of Service by Mileage Summary from the Radcliff-Elizabethtown MPO Model**

Level of Service (LOS)	Growth Alternative	County	
		Hardin	Meade
LOS C or Better	No-Build	500.7	270.8
	Scenario 1: Conventional	496.0	266.1
	Scenario 2: "Smart"	497.9	266.5
	Scenario 3: "Smartest"	497.6	265.8
	Scenario 4: Likely	494.8	266.1
LOS D	No-Build	40.7	32.0
	Scenario 1: Conventional	45.2	34.0
	Scenario 2: "Smart"	38.5	33.7
	Scenario 3: "Smartest"	39.8	33.4
	Scenario 4: Likely	41.8	33.8
LOS E	No-Build	16.6	13.0
	Scenario 1: Conventional	13.7	15.5
	Scenario 2: "Smart"	20.0	14.2
	Scenario 3: "Smartest"	16.6	18.5
	Scenario 4: Likely	19.4	15.7
LOS F	No-Build	32.6	19.6
	Scenario 1: Conventional	35.6	19.8
	Scenario 2: "Smart"	34.2	20.9
	Scenario 3: "Smartest"	36.6	17.7
	Scenario 4: Likely	34.6	19.8

In the Kentucky Statewide Model, future year network coding changes included the extensions of KY 313 and KY 3003 (Ring Road), the addition of the Elizabethtown to Radcliff Connector, and the widening of US 31E / US 150 to four lanes from Bardstown to Mount Washington.

**Table III-9** presents a summary of the mileage by county for each LOS developed from the Kentucky Statewide Model for each of the scenarios. The statewide model suggests that the vast majority of travel within counties other than Hardin, Meade, and Bullitt will be along roadways operating at LOS C or better. As in the case of the results from the Radcliff-Elizabethtown MPO Model, there is little variation between the growth scenarios. Maps depicting the anticipated 2030 traffic volumes and LOS are provided in **Appendix B**.

**Table III-9: Level of Service by Mileage Summary from the Kentucky Statewide Model**

Level of Service (LOS)	Growth Alternative	Study Area County								
		Breckinridge	Bullitt	Grayson	Hardin	Larue	Marion	Meade	Nelson	Washington
LOS C or Better	No-Build	334.1	171.6	342.9	446.0	189.7	194.0	223.4	312.6	201.9
	Scenario 1: Conventional	334.1	177.0	342.9	442.5	189.0	193.6	224.7	314.1	201.9
	Scenario 2: "Smart"	334.1	177.0	342.9	444.0	189.0	193.6	225.7	314.1	201.9
	Scenario 3: "Smartest"	334.1	173.6	342.9	442.0	184.4	193.6	224.7	313.4	201.9
	Scenario 4: Likely	334.1	177.0	342.9	442.7	189.0	193.6	224.7	312.7	201.9
LOS D	No-Build	0.0	20.4	0.2	17.4	0.7	2.1	12.6	15.2	1.0
	Scenario 1: Conventional	0.0	17.2	0.2	21.8	1.4	2.5	12.7	13.3	1.0
	Scenario 2: "Smart"	0.0	17.6	0.2	19.6	1.4	2.5	11.7	13.1	1.0
	Scenario 3: "Smartest"	0.0	19.6	0.2	18.1	6.0	2.5	9.5	13.8	1.0
	Scenario 4: Likely	0.0	17.6	0.2	22.5	1.4	2.5	12.7	14.7	1.0
LOS E	No-Build	0.0	10.4	0.3	8.5	0.0	0.3	1.4	3.6	0.0
	Scenario 1: Conventional	0.0	8.7	0.3	6.0	0.0	0.0	0.0	2.6	0.0
	Scenario 2: "Smart"	0.0	8.2	0.3	5.3	0.0	0.0	0.0	2.8	0.0
	Scenario 3: "Smartest"	0.0	7.4	0.3	10.2	0.0	0.3	1.4	2.9	0.0
	Scenario 4: Likely	0.0	8.2	0.3	6.4	0.0	0.0	0.4	2.6	0.0
LOS F	No-Build	0.0	7.9	0.0	10.0	0.0	0.2	1.0	0.4	0.0
	Scenario 1: Conventional	0.0	7.5	0.0	11.6	0.0	0.5	1.0	1.8	0.0
	Scenario 2: "Smart"	0.0	7.5	0.0	13.0	0.0	0.5	1.0	1.8	0.0
	Scenario 3: "Smartest"	0.0	9.7	0.0	11.5	0.0	0.2	2.8	1.7	0.0
	Scenario 4: Likely	0.0	7.5	0.0	10.2	0.0	0.5	0.7	1.8	0.0





## IV. Community Outreach

Public involvement is an integral part of transportation studies. This effort gives stakeholders and the general public a sense of ownership to a study and the solutions that result. It fosters better communication and coordination among all parties involved. Involving the community also expands the universe of alternatives examined and ensures that the most appropriate solution is found.

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### *Oversight Committee Meetings*

An Oversight Committee was formed for this study. The Committee was comprised of members of the Radcliff-Elizabethtown Metropolitan Planning Organization's Technical Advisory Committee, with additional representatives from Fort Knox.

Four Oversight Committee meetings were held throughout the study. Additional discussion through email correspondence was also made on a regular basis. Regular meetings with the Committee provided direct communication and coordination with Fort Knox officials. Key information presented during each meeting is summarized below.

#### **December 12, 2007 Oversight Meeting**

- A review of previous BRAC studies and their recommendations was presented. Issues with the implementation of these recommendations were also discussed amongst the Committee.
- Existing transportation issues within the three "impact" counties and in the region were discussed.
- Fort Knox informed the group of an internal transportation study being completed. Results of the study were confirming the conclusions and recommendations from the Fort Knox Highway Access Study.
- Fort Knox also detailed the post's current plan to consider a new southern gate at KY 251/KY 313 as a potential new access point onto the reservation.
- Fort Knox stated the desire to improve the throughput at the three existing gates. They will accomplish this by adding inspection lanes.

Current per lane capacity at Chaffee Avenue and S. Wilson Road gates is about 600 vehicles per hour per lane. Capacity is lower at Brandenburg Station Road gate because all of the contractors must enter here and the vehicles must be inspected.

- Updated BRAC numbers were to be expected from Fort Knox in the near future.
- The Committee was informed that on February 4, 2008, a pilot park-and-ride program would begin for Fort Knox commuters. Initially, 60 riders are expected to utilize the program, with 8 – 10 potential buses being dedicated to this service.
- ENTRAN requested Comprehensive Plan/Land Use data from the region's planning commissions.
- LTADD informed the Committee of the Governor's BRAC Task Force. A list had been developed by the group to include 10 recommended transportation projects totaling \$185 million in Meade and Hardin counties. Some of these projects were already in Six Year Plan. A list of the projects was provided to the consultant.

#### **January 18, 2008 Oversight Meeting**

- Updated BRAC data were presented to the Committee.
- Findings of the region's existing transportation conditions were detailed.
- A stakeholder survey was discussed with the Committee. The consultant stated that the objective of the survey was to obtain input from different areas of the region on BRAC-related issues.
- A presentation on Land Use and its relationship to regional traffic was given. Further, the process to estimate the location of future places of residence and employment for BRAC-related households would live and work was explained. Smart Growth concepts were also presented to the Committee.

#### **March 14, 2008 Oversight Meeting**

- Existing Land Use data was summarized for the Committee.
- The process to determine future Land Use Scenarios within the region was outlined.

## August 13, 2008 Oversight Meeting

- An overview of the MPO's Travel Demand Model, the Kentucky Statewide Model was provided. Travel forecasts for each of the future Land Use Scenarios were presented.
- Future roadway deficiencies were discussed. The concentration of traffic issues would be focused in the three "impact" counties.
- Planned transportation projects related to the BRAC plan were discussed amongst the Committee. Additional preliminary recommendations were introduced.

## Stakeholder Survey

The consultant team developed an outreach plan for stakeholders in the form of a survey to obtain input from each stakeholder about what the changes at Fort Knox will mean to them and to create a wish list of transportation projects and programs they would like to see for the region, specifically with regard to Fort Knox.

A survey was mailed to a total of 59 stakeholders within the region. Nine survey forms were returned. The returned surveys have been summarized in **Table IV-1** below.

## Local Leaders Forum

In addition to the Study Team's regular involvement with the Oversight Committee, local leaders throughout the region were encouraged to discuss study findings during a Local Leaders Forum.

The public forum was held on Thursday, September 11, 2008 at the LTADD Building. Elected officials and business leaders were educated about the implementation of the plan that will result from this study. **Figure IV-1** shows the consultant staff presenting at the forum.



**Figure IV-1. Brian Aldridge (ENTRAN) presenting at the Local Leaders Forum**

**Table IV-1. Stakeholder Survey Results**

Form	Organization	1) Will BRAC impact transportation in your area?	How will you impacted?	2) What actions are you taking, if any?	3) Any New Projects Needed?	If so, What?
1	Radcliff	Y	More traffic, delays.	Applying for TE & SRTS Funding	Y	Improve Wilson Rd. ramp; Improve Elm Rd./Wilson Rd. Intersection
2	Bullitt Co. Econ. Dev.	Y	New residents will increase traffic and schools	--	Y	KY 44 Widening East & West
3	Washington Co. Fiscal Court	N	--	None	N	--
4	Bardstown	Y	More traffic on US 62	None	Y	Improve KY 313 connection w/ BG Pkwy
5	Bardstown	Y	Increase commuter traffic	None	Y	US 62 Widening/Spot Improvements; KY 245 Improvements
6	Hardin Co.	Y	increase traffic by 20-25%	Working to obtain funding for road projects	Y	KY 313 Ext.; E2RC; KY 351 Improvements; 31W Access Study Projects
7	West Point Planning & Zoning	Y	increase traffic, including school traffic	New homes and school addition built	Y	Turn lanes on US 31W; median on US 31W btwn Muldraugh Hill and Salt River Bridge; NB turn lane at stop light
8	Breckinridge Co. Industrial Auth.	Y	US 60 will see increase in truck traffic to Ft Knox	KY 86 Improvements	Y	KY 86; KY 259; US 60; KY 79
9	Meade Co. Fiscal Court	Y	increase traffic	Road improvements near post	Y	KY 313

## V. Recommendations

The final recommendations for the Fort Knox Regional Highway Capacity Study are documented in this chapter. These recommendations are disaggregated by project type, which includes justification for roadway projects that are currently planned, new access portals to the Fort Knox reservation, increased public transportation, and consideration of future growth and land use.

### BRAC Priority Projects

The BRAC Priority Projects, discussed in detail in Chapter III, were evaluated in various combinations and as a total package using the Radcliff-Elizabethtown 2030 Travel Demand Model (TDM). This task was completed in an effort to determine the effects that these recommended projects may have on the future roadway network, in particular, the impacts on US 31W.

The proposed Elizabethtown to Radcliff Connector, referred to as E2RC, is currently a Six-Year Highway Plan project for Hardin County. The BRAC Task Force also ranked this project a high priority. According to the 2030 TDM, this new facility is expected to carry approximately 17,000 daily vehicles. The TDM link representing the E2RC project is highlighted in yellow in **Figure V-1**.

The KY 313 extension project was ranked highest by the BRAC Task Force. Combined with the E2RC project, the 2030 TDM projects that the KY 313 extension will carry approximately 19,000 vehicles per day. **Figure V-2** shows the model results.

Ranked with the second-highest priority by the BRAC Task Force, the KY 313 Connector route was modeled in combination with the E2RC and the KY 313 Extension projects. The results are shown in **Figure V-3**. The 2030 TDM estimates between 7,300 and 10,000 vehicles will travel on this new route daily. It is important to call attention to the lower traffic volumes on US 31W in the vicinity of Fort Knox. The KY 313 Connector performs as a parallel route to access Fort Knox and provides relief to the congested US 31W corridor.

The E2RC corridor connects to KY 313 just west of US 31W, near the location where KY 313 transitions from a four-lane roadway to a two-lane facility as it proceeds west.

The KY 313 extension includes the construction of a four-lane facility west of the existing end of KY 313, at KY 1500. The completion of these two projects will result in a two-lane section of KY 313 over three miles in length between the four-lane sections. This would potentially be problematic with Fort Knox traffic using both the E2RC and the KY 313 Connector to access the Bullion Boulevard gate. The Kentucky Transportation Cabinet wisely requested consideration of widening the remaining section of KY 313 to four lanes once the KY 313 Extension and the E2RC Connector projects are complete.

Another project listed on the BRAC priority list is the reconstruction of KY 251 between Ring Road, just north of Elizabethtown, and KY 313. A scenario was modeled in the 2030 TDM to include the KY 251 reconstruction project and the opening of a potential new southern gate for Fort Knox admittance. More discussion of this alternative is found on page V-4.

Analysis results suggest that the entire list of BRAC Task Force Priority Projects should be implemented; however, these projects cannot all be funded and constructed at the same time. In other words, each of these projects should be considered a high priority for the region, but the importance of each project should be weighed against the others in determining which should be constructed first.

As part of this study, the projects were reprioritized as a Level I, II, III priority. Projects with Level I priority should be implemented before those with lower priority. This prioritization is based solely on the needs of Fort Knox, the City of Radcliff, and surrounding communities and does not necessarily consider other benefits that may be realized once the projects are constructed. The following criteria were used in the evaluation:

- Improved access to Fort Knox
- Traffic congestion relief from US 31W in Radcliff and/or other congested facilities
- Planning-level construction costs

The priority given to each BRAC project is shown in **Table 1**.



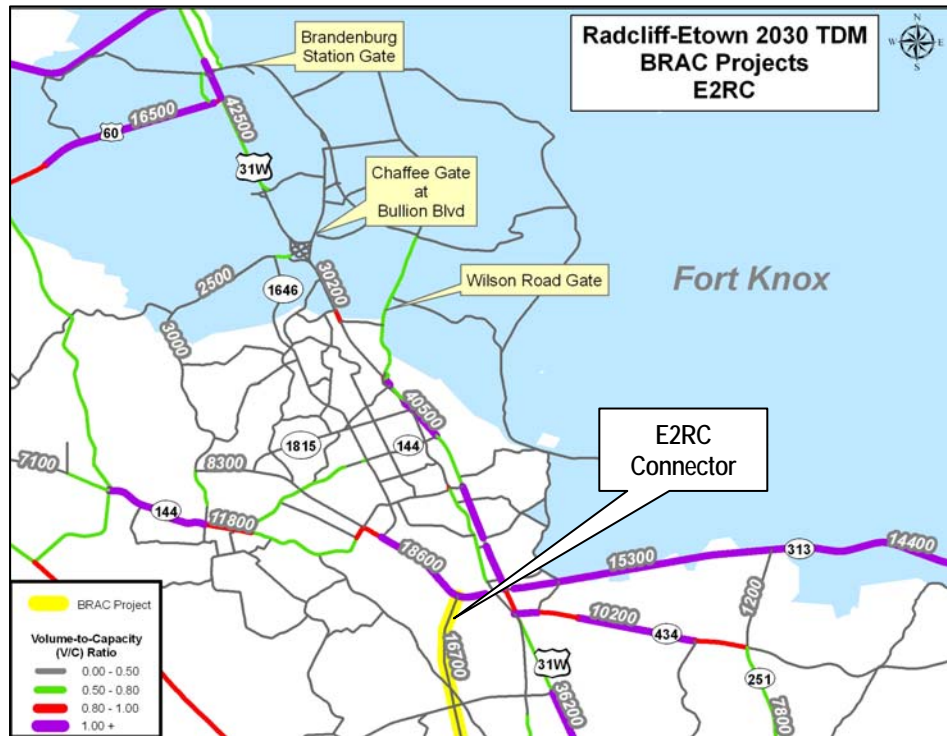


Figure V-1. 2030 TDM Output with E2RC

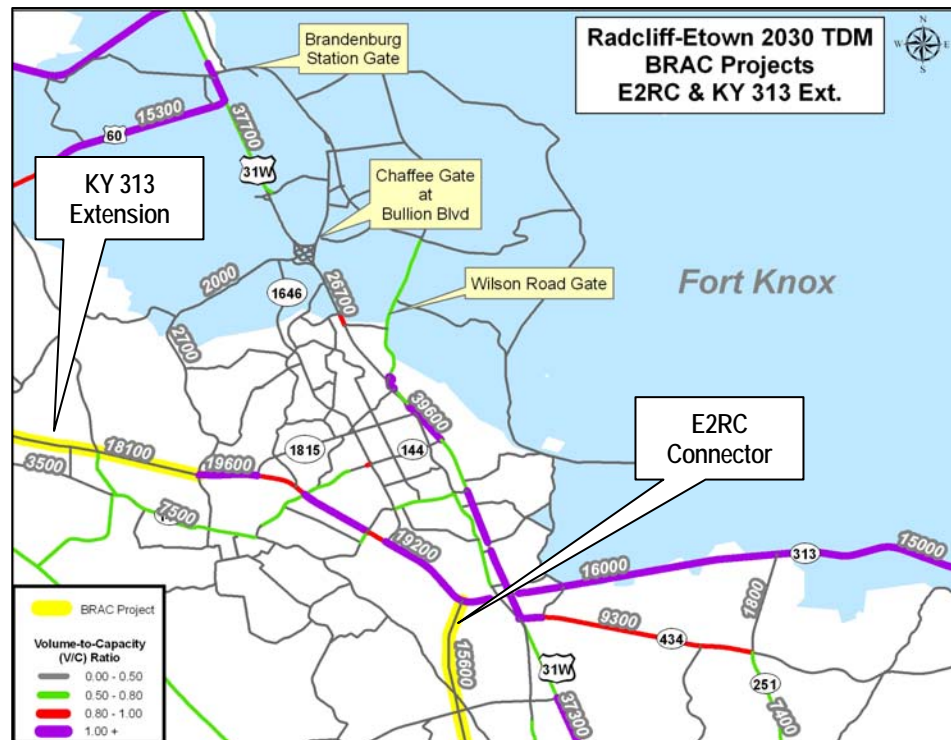


Figure V-2. 2030 TDM Output with KY 313 Extension

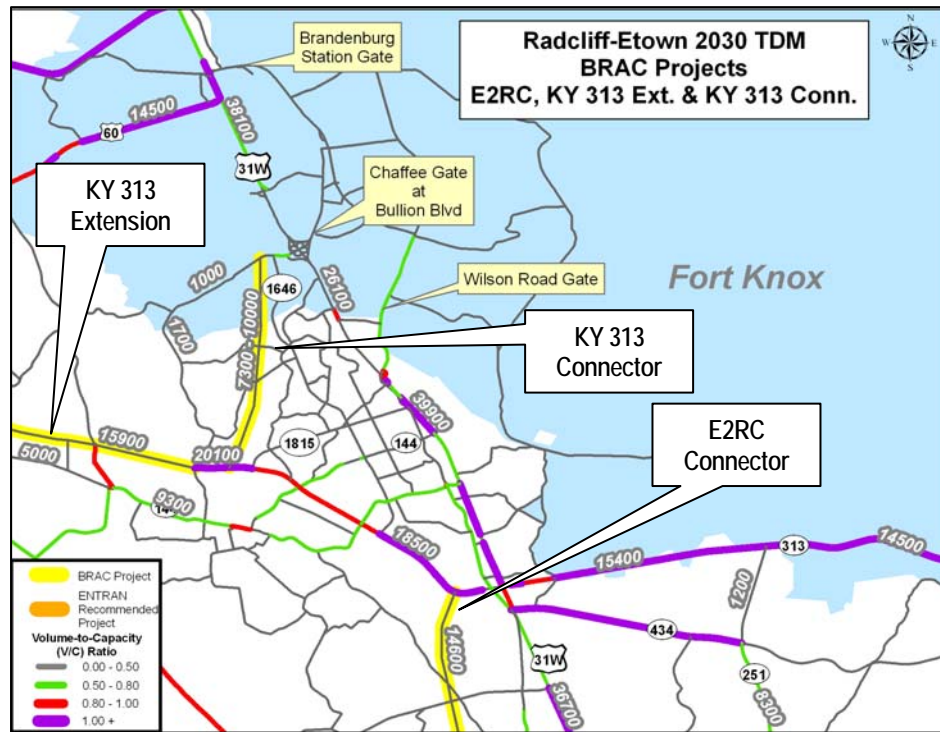


Figure V-3. 2030 TDM Output with KY 313 Connector

Table 1. Priority for BRAC Projects

BRAC Ranking	Project Description	Priority
1	KY 313 Extension: Vine Grove to US 60 in Meade County	II
1a	KY 313 Extension: US 60 to Brandenburg	II
2	NEW - Connector Road - Veterans Parkway (KY 1646) to KY 313	I
3	NEW - Elizabethtown to Radcliff Connector (E2RC) Section 1: From Elizabethtown Bypass to Timber Lane including interchange with the Elizabethtown Bypass	II
4	US 31W - Eliminate/Combine Median Openings from Pear Orchard Rd in Elizabethtown to East Spring St in Radcliff	III
5	Fort Knox Highway Access Study Key Capital Improvements - 1) Improve Exit Ramp Merge from Northbound US 31W to Inbound Bullion Boulevard; 2) North Wilson Road Improvements	I
6	KY 251 - Reconstruction from KY 3005 (Ring Road) to KY 434	II/III
6a	KY 251 - Reconstruction from KY 434 to KY 313	II/III
7	US 31W - Construct a non-traversable median from Spring St. to Knox Blvd in Radcliff	II

The KY 313 Extension project was assigned with a Level II priority. This project provides minimal congestion relief to US 31W as a stand-alone project. The construction costs for the new roadway make this one of the most

expensive BRAC projects. However, it provides improved east-west access to the Fort Knox area, and in particular, access to developing areas to the west. This project is certainly important to the future of the region, and is only a Level II priority in comparison to the proposed Veterans Parkway Connector Road.

The New Connector Road project between Veterans Parkway and KY 313 was given a Level I priority as it will provide an improved route for alternate Fort Knox access for a geographic area that is expected to experience residential growth as a result of the BRAC plan. This new roadway is expected to provide congestion relief to US 31W during peak hours.

Assigned a Level II priority, the Elizabethtown to Radcliff Connector (E2RC) project will provide some traffic relief to US 31W south of Radcliff. However, the high construction costs prohibit this project from being a higher priority.

The US 31W project to combine or close median openings was assigned a Level III priority. While the construction cost is relatively low, the primary purpose of this project is

to improve the safety of the corridor. Quantifying the anticipated improvement for traffic flow for Fort Knox is not possible with currently available analytical tools. If development pressure was to significantly increase along the corridor, this project would receive a higher priority.

Two projects from the July 2007 Fort Knox Highway Access Study were ranked fifth by the BRAC Task Force. These projects were assigned a Level I priority as a result of this study. Reconstructing the exit ramp merge at Bullion Boulevard Gate will greatly improve traffic flow during the heavy morning peak. Peak hour congestion entering and exiting the Wilson Road Gate will be reduced from the improvements recommended on North Wilson Road.

The KY 251 reconstruction projects were evaluated based on the condition that a new southern gate would be constructed along KY 313, providing alternate Fort Knox access that is not dependent upon US 31W. Assuming new southern access is to be provided, this project is a Level II priority. If a southern gate is not built, the KY 251 reconstruction would be considered a Level III priority. Should Fort Knox decide to open a southern gate, this project would be a higher priority.

The US 31W non-traversable median project would improve access in Radcliff / Fort Knox area and the cost to construct the median is relatively low. However, as discussed with the project to close or combine median openings along US 31W, quantifying the anticipated traffic flow improvement is not possible with currently available analytical tools. For these reasons, this project received a Level II priority.

### New South Access Options

Over the course of this study, much attention has been given to the need for additional gate access to Fort Knox. Prior to September 11, 2001, additional access points along KY 313 were open, providing unencumbered access to the post. Subsequent to the events of 9/11, additional security measures were enacted, leaving the current three access gates at Brandenburg Station Road, Bullion Boulevard (also referred to as the Chaffee Gate at Bullion Boulevard), and North Wilson Road as the only means of ingress to post. One additional egress-only access point is currently provided at Chaffee Avenue.

The Human Resources Command, one of the major employment generators linked with BRAC, is expected to amplify the number of vehicles utilizing the Wilson Road Gate. Fort Knox is already preparing for this traffic increase by widening Wilson Road inside post. However, the roadway capacity just outside post will remain limited and cause added congestion on Wilson Road and US 31W in Radcliff. As previous BRAC-related studies have indicated, an additional gate to access the southern part of Fort Knox is needed as the demand is projected to exceed the capacity of the existing three gates.

The March 2008 *Fort Knox Traffic Study and Improvement Plan* proposed a new gate at the KY 313/South Boundary Road intersection. The report stated that the additional access control point would also include eight miles of new roadway construction through rough terrain between KY 313 and Fort Knox, as shown in **Figure V-4**. Similar advantages and drawbacks are associated with this option as the KY 251 gate option. Officials with Fort Knox have commented that a new roadway is undesirable due to the high construction costs associated.



**Figure V-4. New Southern Access Proposed in the March 2008 Fort Knox Traffic Study and Improvement Plan**

Three general locations for an additional access control point to serve the southern portion of Fort Knox were discussed in the current study. Detailed alignments for the routes leading from these proposed gates into Fort Knox



have not been developed; only preliminary route options have been discussed for planning and discussion purposes.

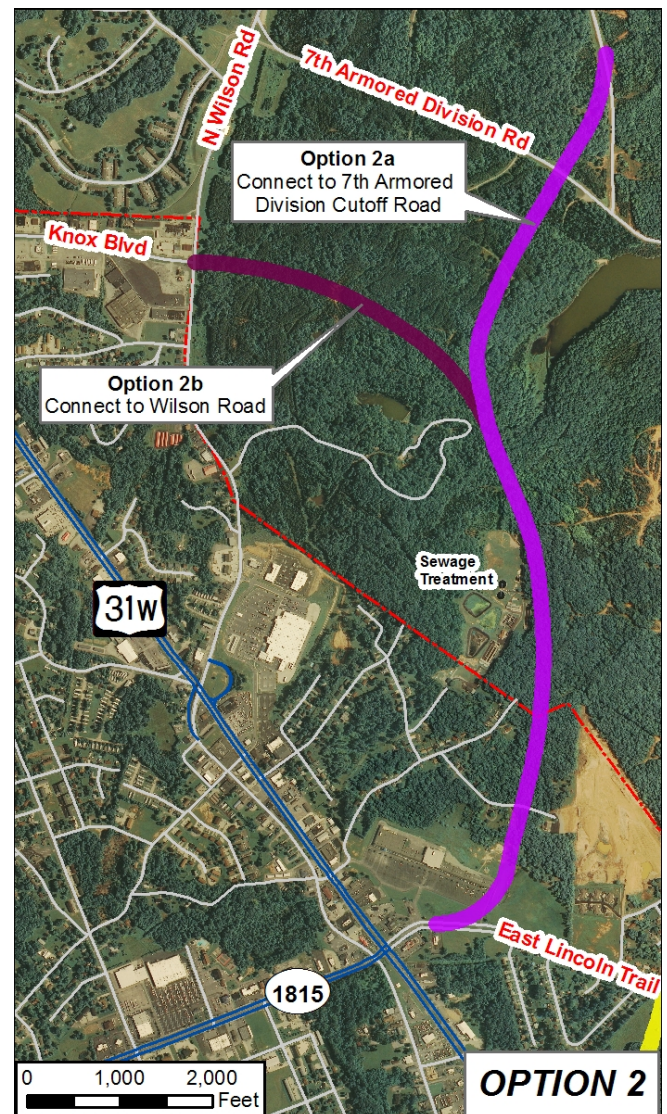
The eastern-most gate option, depicted in **Figure V-5**, is located at the KY 313/KY 251 intersection. This option could utilize the existing 7<sup>th</sup> Armored Division Road corridor (Option 1a) or the 745<sup>th</sup> Tank Battalion Road corridor (Option 1b). Either option would require extensive reconstruction of roadways that are currently in poor condition or are unpaved, requiring substantial upgrades if opened for daily commuters. A clear advantage, however, is that this gate would provide an alternate route into Fort Knox instead of relying on the US 31W corridor. Closer access to I-65 from post would also be a major benefit. Traffic forecasts developed using the Elizabethtown/Radcliff MPO travel demand model suggest 3,500 to 7,500 vehicles per day would likely use a gate at this location, depending on the corridor and scale of roadway improvements.



**Figure V-5. New Southern Access – Option 1**

The second gate location discussed as part of this study includes an extension of East Lincoln Trail Boulevard in Radcliff, as shown in **Figure V-6**. It is envisioned that the roadway would be extended to the northeast from US 31W into Fort Knox, taking a northerly route to connect to either 7<sup>th</sup> Armored Cutoff Road (Option 2a) or a northwesterly route to connect to North Wilson Road near Knox Boulevard (Option 2b). Either option would require the construction of some elevated roadway north of the Radcliff sewage treatment plant. Option 2a would

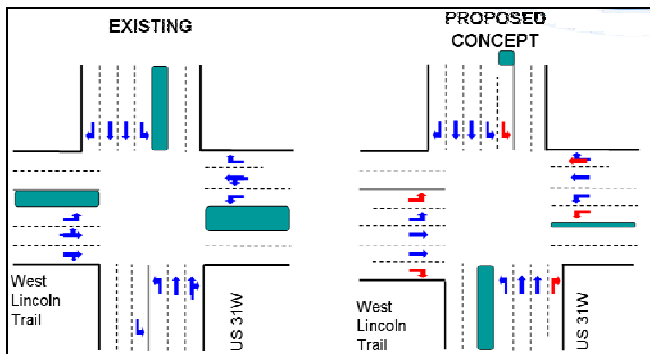
require a new security gate south of 7<sup>th</sup> Armored Division Road and would likely require some upgrades to 7<sup>th</sup> Armored Cutoff Road. Option 2b would require additional capacity at the existing Wilson Road Gate to accommodate increased traffic during the morning peak hours. Traffic forecasts for this alternative were as high as 18,000 vehicles per day, suggesting it would be a more attractive alternative than North Wilson Road.



**Figure V-6. New Southern Access – Option 2**



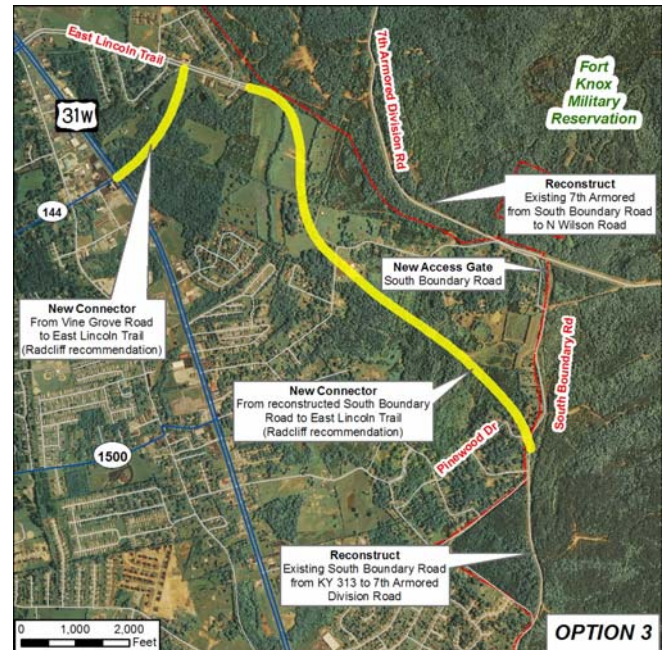
Because of the added demand at the Lincoln Trail/US 31W intersection, the capacity at this location would need to be increased. One low-cost option, shown in **Figure V-7**, could provide dual left turn lanes and exclusive right turn lanes with limited additional right-of-way required. This gate location option would increase demand on the US 31W corridor, especially to the south. Still, this option would likely be the least expensive to construct.



**Figure V-7. Lincoln Trail Boulevard at US 31W Intersection Concept**

The third new southern access option, shown in **Figure V-8**, has some similarities to the alternative proposed in the *Fort Knox Traffic Study and Improvement Plan*. It includes the reconstruction of existing South Boundary Road from KY 313 to 7<sup>th</sup> Armored Division Road and the reconstruction and/or realignment of existing 7<sup>th</sup> Armored Division Road to either North Wilson Road or to an improved 7<sup>th</sup> Armored Cutoff Road. A new gate would be provided on South Boundary Road south of 7<sup>th</sup> Armored Division Road.

The 1983 and 2003 comprehensive plans for the City of Radcliff include two projects in the vicinity of Fort Knox, and Radcliff suggested that both be given consideration with a new South Boundary Road Gate alternative. The first project involves the extension of existing East Lincoln Trail Boulevard to South Boundary Road. According to the 1983 Comprehensive Plan, this extension “will help open up the vacant area south of East Lincoln Trail Boulevard and 7<sup>th</sup> Armored Division Road will provide a means of channeling traffic onto Fort Knox”. The 2003 Comprehensive Plan said the extension would “help move traffic around the southern portion of the city by providing a ‘ring road’ that would include Lincoln Trail Boulevard, South Boundary Road, and Joe Prather Highway”.



**Figure V-8. New Southern Access – Option 3**

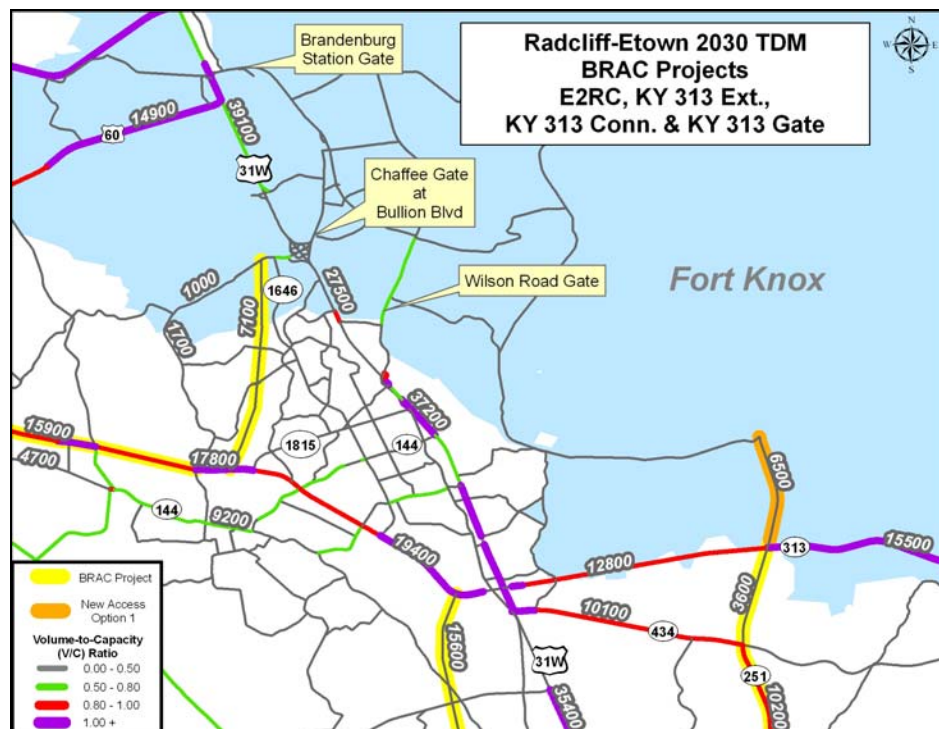
The second project includes the extension of Vine Grove Road/West Vine Street (KY 144) east to the proposed East Lincoln Trail Boulevard extension. The 1983 Comprehensive Plan indicated this extension would “provide access to the vacant tract of land south of East Lincoln Trail, and should collect the traffic of the future local streets built in this area and channel it to East Lincoln Trail, US 31W, or West Vine Street”.

Extending East Lincoln Trail to South Boundary Road would not provide a direct, efficient route onto Fort Knox. However, such an extension would provide a “bypass” around the US 31W/KY 313 intersection. Extending Vine Street would only be a consideration if the East Lincoln Trail extension were to be constructed. With the level of investment planned for improvements to the KY 313 corridor and the other BRAC priority projects, projects such as these involving local streets may be important in the future but should not be considered high priority at the present. Rather, the focus should be on projects that will reduce travel demand along US 31W and provide direct access to Fort Knox. Additionally, if these extensions are pursued in the future, it is recommended that they be constructed as limited access facilities to ensure a safe and efficient connection is provided and that the likely development of currently vacant land does not result in access management issues. Fort Knox has pursued a

buffer area approximately one-mile wide around the installation to prevent non-compatible land uses from locating around training areas, and intensive development along the proposed corridors would likely conflict with such a buffer in the area.

The three potential options for new southern access to Fort Knox were modeled in the 2030 TDM. Each scenario included the construction of all the BRAC Priority Projects. **Figure V-9** presents the resulting output for Option 1. As shown, the model estimates an increase in

traffic on KY 251 in addition to nearby routes, including KY 313 and KY 434. The TDM approximates between 4,000 and 8,000 vehicles will utilize the new southern gate north of KY 313 for access to Fort Knox. Communications with Fort Knox indicate that significant, but currently unknown geometric improvements would be made to the existing roadways, should a new southern gate be constructed. Therefore, a wide range of anticipated traffic volumes utilizing the gate was assigned based on various on-post roadway conditions.



**Figure V-9. 2030 TDM Output for New Southern Access Option 1**

**Figure V-10** shows a new Fort Knox gate located at Lincoln Trail Boulevard, also highlighted in orange, as proposed in Option 2. The 2030 TDM approximates that the Lincoln Trail gate may carry up to 18,000 vehicles per day. Since access to Fort Knox would not be provided via KY 251 in this scenario, the reconstruction of this route was not included.

**Figure V-11** depicts a new access portal into Fort Knox on South Boundary Road, highlighted in orange. The 2030 TDM suggests that 3,000 to 5,000 vehicles per day would likely use a gate at that location.

Information regarding these new access alternatives was provided to Fort Knox personnel for internal discussion. To date, no comments have been received on the proposed alternatives.

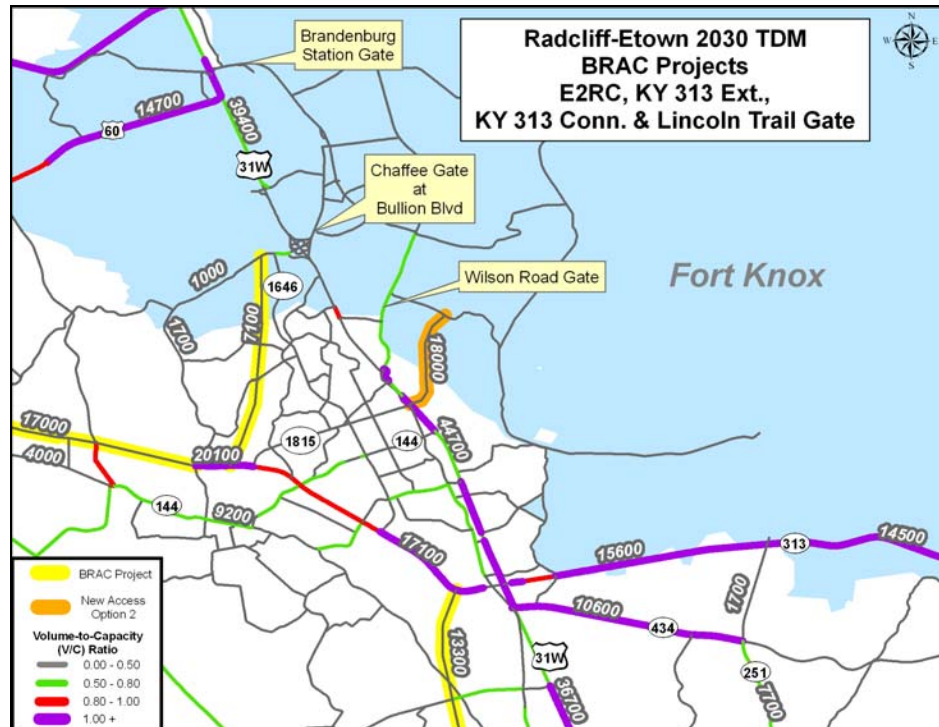


Figure V-10. 2030 TDM Output for New Southern Access Option 2

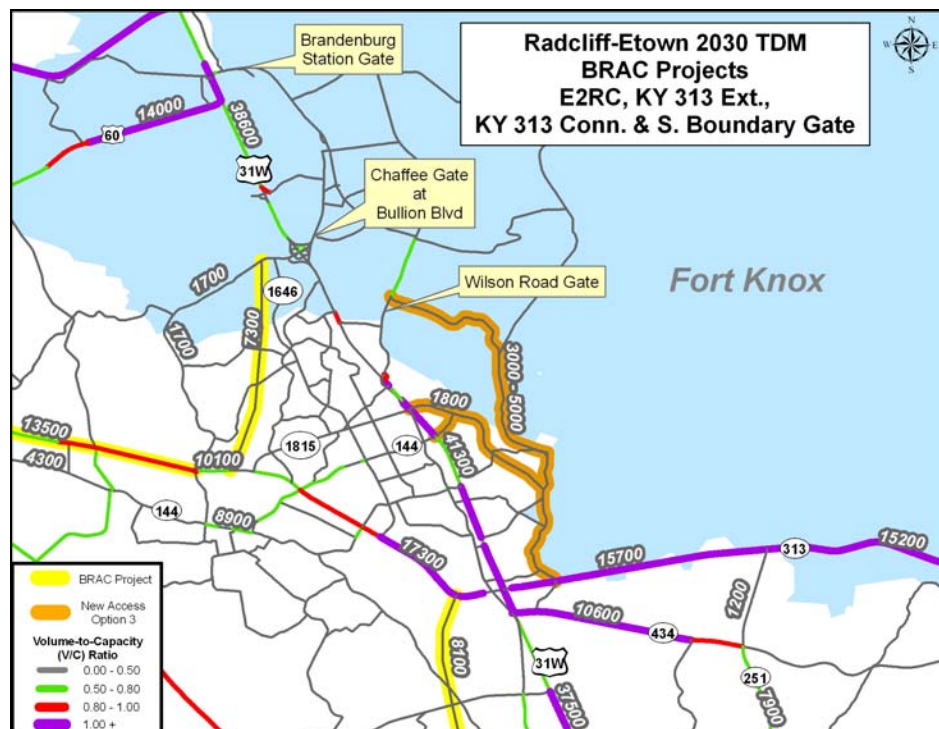


Figure V-11. 2030 TDM Output for New Southern Access Option 3



### Spot Improvements on KY 44

Many Bullitt County residents commute to Fort Knox for work each day. However, as there is no access to post from the east, that commute requires a significant amount of time. For example, a commuter that begins their trip to work from the I-65 interchange on KY 44 in Shepherdsville may have a difficult decision on which is the most appropriate route to take. Using Google Maps<sup>1</sup>, two example routes were evaluated for travel time and distance to the southern gate at North Wilson Road and the northern gate at Brandenburg Station Road. The first route was to the south, using I-65 to KY 313 and US 31W. The second route was to the north and west, using KY 44 west to US 31W.

From Shepherdsville to:

- N Wilson Road Gate via I-65, KY 313, and US 31W: 29.4 miles, 52 minutes
- N Wilson Road Gate via KY 44 and US 31W: 28.2 miles, 52 minutes
- Brandenburg Station Road Gate via I-65, KY 313, and US 31W: 34.5 miles, 63 minutes
- Brandenburg Station Road Gate via KY 44 and US 31W: 23.5 miles, 41 minutes

Thus, it is readily apparent that KY 44 and US 31W to the Brandenburg Station Road Gate would be the fastest and shortest route between Shepherdsville and Fort Knox. In addition, travel to the southern gate at North Wilson Road would be about the same if either route was selected. However, KY 44 west of Shepherdsville is a relatively narrow two-lane roadway with horizontal and vertical curvature issues, such as the area shown in **Figure V-12**.

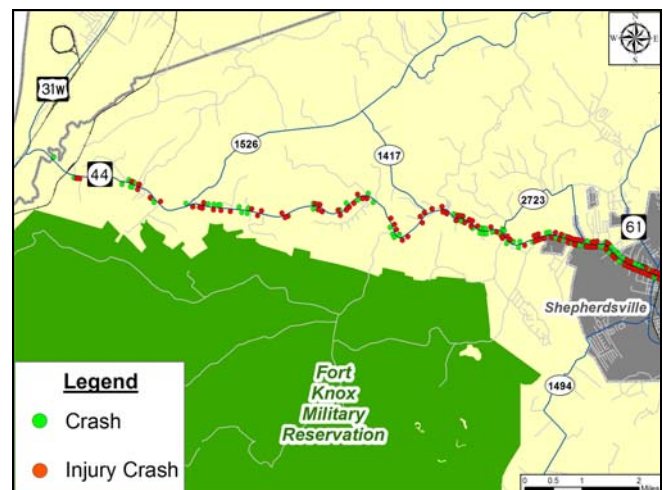
Portions of KY 44 also have a higher than average crash rate. Analysis of the crashes between July 2002 and July 2007 revealed a total of 400 crashes occurred along KY 44 between KY 61 and US 31W west of Shepherdsville. Approximately 142 (36 percent) of these crashes resulted in an injury, which is much higher than expected for a rural collector. **Figure V-13** shows the locations of all reported crashes that occurred along this section of KY 44 during the reporting period.

<sup>1</sup> <http://maps.google.com>



**Figure V-12. KY 44 West of Shepherdsville**

The recommendation is to implement spot improvements along this section of KY 44 to increase safety and travel efficiency. One project on KY 44 is currently listed in the Transportation Improvement Program (TIP) developed by the Kentuckiana Planning and Development Agency (KIPDA), the metropolitan planning organization (MPO) that includes Bullitt County. This project includes correcting a rockfall hazard just east of Hillview Lane, approximately 8.5 miles east of the Bullitt County line.



**Figure V-13. Crashes along KY 44 West of Shepherdsville (July 1, 2002 to June 30, 2007)**



### City of Radcliff Input

During the Leaders Forum held in September 2008, the City of Radcliff suggested two additional projects be considered for future implementation. The first project, shown in **Figure V-14**, involves the construction of a new corridor connecting Logsdon Parkway (KY 1646) to the existing western terminus of Knox Boulevard at US 31W. This project could provide an additional route for access to the North Wilson Road gate that would not require travel on US 31W. In addition, it would likely reduce travel demand along certain city streets (Elm Street, in particular) that currently carry more traffic than they can reasonably accommodate. This project should be given consideration during the preliminary alignment studies for the KY 313 Connector study.

The second proposed project involves the realignment of the northern portion of South Wilson Road, west of Dixie Highway, to connect with the proposed realignment of the southern portion of North Wilson Road, west of Dixie Highway. This alternative was discussed during the Fort Knox Highway Access Study and it was decided that reconnecting north and south Wilson Road could be considered at a later date if the North Wilson Road improvements were implemented. No further recommendations regarding this realignment were made during that study. It is anticipated that North Wilson Road will be over capacity in the future, and widening will not be a feasible alternative. With that in mind, additional access points have been sought that would serve similar destinations, namely the Human Resources Command and Ireland Hospital.

### Public Transportation

In 2005, a public transportation study was completed by the Radcliff-Elizabethtown MPO. The study recommended a fixed-route transit service along US 31W and east-west fixed-routes for Elizabethtown and Radcliff. It was also recommended to provide service to Fort Knox.

As mentioned in the Existing Conditions chapter, park-and-ride transit service for Fort Knox commuters is currently being provided. As part of this study, added park-and-ride lots with additional transit vehicles are recommended, as thus far the service appears to be generating a fair amount of ridership. This will provide additional commuters throughout the region an alternative

to the single-occupancy vehicle as the sole means of travel to and from Fort Knox.



**Figure V-14. Radcliff's Proposed Knox Boulevard Connector**

(Source: City of Radcliff)

The Transit Authority of the River City (TARC) operates the public transit system in Jefferson County, located north of Hardin County and part of the KIPDA MPO. In the regional long range transportation plan known as *Horizon 2030*, enacted in 2005, TARC had included a number of "Advanced Transit Projects" that did not specify a particular mode of transit but defined priority corridors for implementation. One such corridor was the Dixie Highway corridor, also referred to as the "southwest corridor". This corridor would have placed advanced transit vehicles in the Paducah and Louisville rail corridor paralleling US 31W between downtown Louisville and perhaps as far south as Radcliff. Because *Horizon 2030* was to be a fiscally constrained plan and the costs associated with implementing advanced transit within each of the corridors exceeded \$2 billion, the proposed projects were excluded from the long range plan during certification review in 2006.

More recently, there has been renewed interest in advanced transit system investment in the region. The following excerpt is from a recent grant application to KIPDA to conduct a planning study for transit in the southwest corridor:

*TARC would like to explore the public transportation opportunities that would address commuter needs in the southwest corridor of Jefferson County extending north into Hardin County. A number of changes have occurred over the past year which have stemmed a need to examine the commuting and travel needs in the corridor. A major development will occur when Ft. Knox, the military base in Radcliff, Kentucky becomes home to over 3,000 human resource jobs. Most positions will be filled with residents who are new to the area and will be looking for housing in Jefferson and Hardin County, most likely Louisville and Elizabethtown. Also, changes in costs for fuel have increased use and interest in using transit. For these reasons, TARC would like to initiate a planning and feasibility study that examines the possible options for moving increased numbers of people back and forth within the corridor. The focus will be on options that do not increase the use of single occupant vehicles and provide for options that decrease energy use on a per person basis.*

As many of the relocations to the region will be families moving in from the Alexandria, VA and St. Louis, MO areas, the availability of rail service in the southwest corridor, with direct service to Fort Knox, could entice many to locate within Jefferson County. The study is anticipated to begin in the summer of 2009 and should be complete by the summer of 2010. Fort Knox, the cities of Radcliff and Elizabethtown, and the Lincoln Trail ADD should continue to support the efforts of TARC and others in pursuing advanced transit in the US 31W corridor.

### **Smart Growth Opportunities**

Much attention in this study has been given to land use within the region, especially as it relates to future growth. To achieve the full measure of benefits from Smart Growth, communities throughout the region are encouraged to implement the following strategies:

1. **Strengthen and encourage growth in existing communities.** Investment in the development and redevelopment in the region's existing communities must be the top priority. Comprehensive plans must reflect this. Land use densities of a minimum of 5 units per acre across the community should be achieved. This will use

land and infrastructure more efficiently, and will also lead to more alternative transportation, more attractiveness and vitality, and a cleaner overall environment.

This approach takes the fullest advantage of existing community assets such as parks, schools, and other institutions. Historic preservation and rehabilitation become necessities in this scenario.

2. **Mix land uses.** In order to best accommodate increased urban densities, land uses must be mixed not just horizontally in close proximity, but vertically in the same buildings as well. Zoning and development ordinances must be modified, or created, to allow this type of development. Design standards often accompany these types of regulations so as best to ensure quality development.
3. **Increase urban densities to allow a range of housing choices.** Not everyone wants the same type of housing. Changing demographics demand a variety of types, from low maintenance condos for empty nesters and single professionals to apartments for younger people, as well as traditional single family detached homes. This variety of housing type and size will ensure a range of affordability.

Much of this variety of housing can be accommodated in traditional neighborhood developments (TND). TNDs mix land uses and housing density effectively by utilizing quality design of buildings, incorporating parks and open spaces, and promoting walking and biking as alternatives to car trips.

A higher density form of development may be appropriate in select areas: Transit Oriented Development (TOD). TODs are dense, mixed-use developments. While this region has no organized transit system as yet, these types of developments can be placed along projected transit corridors to help create the critical mass of ridership needed to support such systems.
4. **Retool, or create, development regulations to foster "walkable," close-knit neighborhoods.**

Conventional development regulations create far-flung, isolated, unwalkable neighborhoods. Smart Growth envisions neighborhoods that offer not just the opportunity to walk -- sidewalks are a necessity -- but something to walk to, for example an ice cream shop or bank, a transit stop or a school. These types of compact, walkable neighborhoods contribute to a resident's sense of community as neighbors get to know each other, not just each other's cars and garage doors.

5. **Preserve open space, farmland, natural beauty, and critical environmental areas.** Smart Growth provides aggressive protection of irreplaceable farmland and environmentally sensitive areas. Land use recommendations include providing a minimum subdivision size of forty acres for designated farmlands and a minimum subdivision size of twenty acres for environmentally sensitive lands. Other rural areas throughout the region would be planned for a minimum subdivision size of five acres.

In urban areas, environmentally sensitive practices such as rain gardens will help to improve the overall quality of the environment.

6. **Provide a variety of transportation choices.** Urban densities and spiraling transportation costs will require planning for public transportation and non-motorized travel. Wide, connected sidewalks, greenways, and bike paths must be created, not only with new development, but retrofitted in existing areas. Public transit in the form of Bus Rapid Transit and local circulators can be adapted to the region as urban densities increase.
7. **Development decisions must be predictable, fair, and cost-effective.** Transforming this region to best face the 21<sup>st</sup> Century is an urgent need. Regional governments must work with developers to create uniform processes to ensure that the transition is as smooth as possible.
8. **Citizen and stakeholder participation in development decisions is absolutely vital.** Plans developed without strong citizen involvement are doomed to fail. Public inclusion is the best way to ensure political support for

making the difficult decisions necessary to transform the region.

9. **Create greenbelts around Fort Knox to ensure long-term viability of the installation.** Smart Growth plans effective greenbelts to buffer Fort Knox from the negative effects of urban development. These greenbelts would be provided adjacent to the Fort Knox's boundaries, but *outside* the actual limits of the installation. As discussed previously, Fort Knox would like to establish a buffer area approximately one-mile wide around its perimeter to prevent non-compatible land uses from locating in the vicinity of training areas.

Greenbelts would also be created at the urban/rural edge to create a clear, permanent boundary. These greenbelt areas could be used for active and passive recreation, environmental protection, or animal habitat development. Local infrastructure policies would prohibit extension of urban infrastructure such as sewers, significant water mains, or city streets from being developed beyond the out limits of the greenbelt.

10. **Create and fund a regional purchase of development rights program to mitigate the financial impacts.** In order to ensure that landowners across the region benefit, as well as share the burdens of this scenario equally, a regional Purchase of Development Rights Program should be created. This program will buy development rights from landowners in the areas targeted for farmland and environmental preservation. Such a program would ensure that individual landowners don't bear the burden for providing a large regional benefit. A variety of funding methods exist for funding such a program.
11. **Renewable energy, climate protection and adaptation strategies are necessary.** Businesses and individuals increasingly judge communities on their actions toward providing energy alternatives. These judgments occur both in the philosophical sense of how one feels about the responsibility to the environment, but also about the impact on the finances of individuals

and the region. Energy and climate protection strategies make good economic sense.

In order to make the region as attractive as possible, strategies should be crafted to reduce and mitigate carbon emissions and to increase renewable power resources.

### **Likely Consequences**

The anticipated benefits of implementing Smart Growth principles on a regional level include the following:

**Lowest infrastructure costs:** By maximizing efficiency of use, infrastructure provision and maintenance in this scenario may be as much as 40 percent cheaper than in conventional patterns. This efficiency can be realized as cost savings for developers, consumers, and local governments. As efficiency increases, long term costs decrease and the savings can be directed at improving and creating quality of life amenities such as parks, greenways, public art, and beautification.

**Transportation freedom/Lowest transportation costs:** By reducing or even eliminating the need for driving a personal vehicle, Smart Growth helps to reduce regional dependence on non-renewable resources such as imported oil. By increasing alternative paths of movement, individuals are free to make the best choices about their personal mobility.

**Protected environment:** Under Smart Growth, thousands of acres are protected from development and thus will retain their critical role in maintaining environmental health. By leaving these areas undisturbed, environmental remediation becomes minimal and is mainly confined to the urban/rural interface with such things as greenbelts and rain gardens. Renewable energy becomes an ever increasing component of this region.

**Food security:** In Smart Growth, the region will be assured of long-term access to quality food at reasonable prices. No longer will the region be dependent on food that is hauled in at ever increasing transportation costs. Further, this is a Homeland Security Issue. To prepare for emergencies, every community should be able to produce or supply at least a third of the food required by its residents. This scenario ensures that this is possible.

**Quality of Life Impacts:** Overall quality of life is highest under Smart Growth. Housing and employment choices are stronger than in any other scenario. Pride of place is increased as community identities are strengthened through the creation of vital centers, open space protection, and improved aesthetics. Personal health will also improve as walking and bicycling increase as well as with the consumption of high quality locally grown food.

Natural spaces and animal habitat retain their current vigor. Outdoor recreation becomes a prominent part of the lifestyle in the region.

**Long term regional economic impacts:** Smart Growth will position the region at the forefront of efforts in the U.S. in developing the new economy. The 21<sup>st</sup> Century world is increasingly “going green,” and this region, because of its development, transportation, energy, and environmental actions, will become one of the most attractive in the world for new businesses and residents.

The vitality and unique sense of place created in Smart Growth will also be attractive to the knowledge workers that will power the 21<sup>st</sup> century economy. By making the leap to this future, the region will blow past hundreds of other regions, gaining for itself the holy grail of 21<sup>st</sup> century economic development – being a “cool” place.

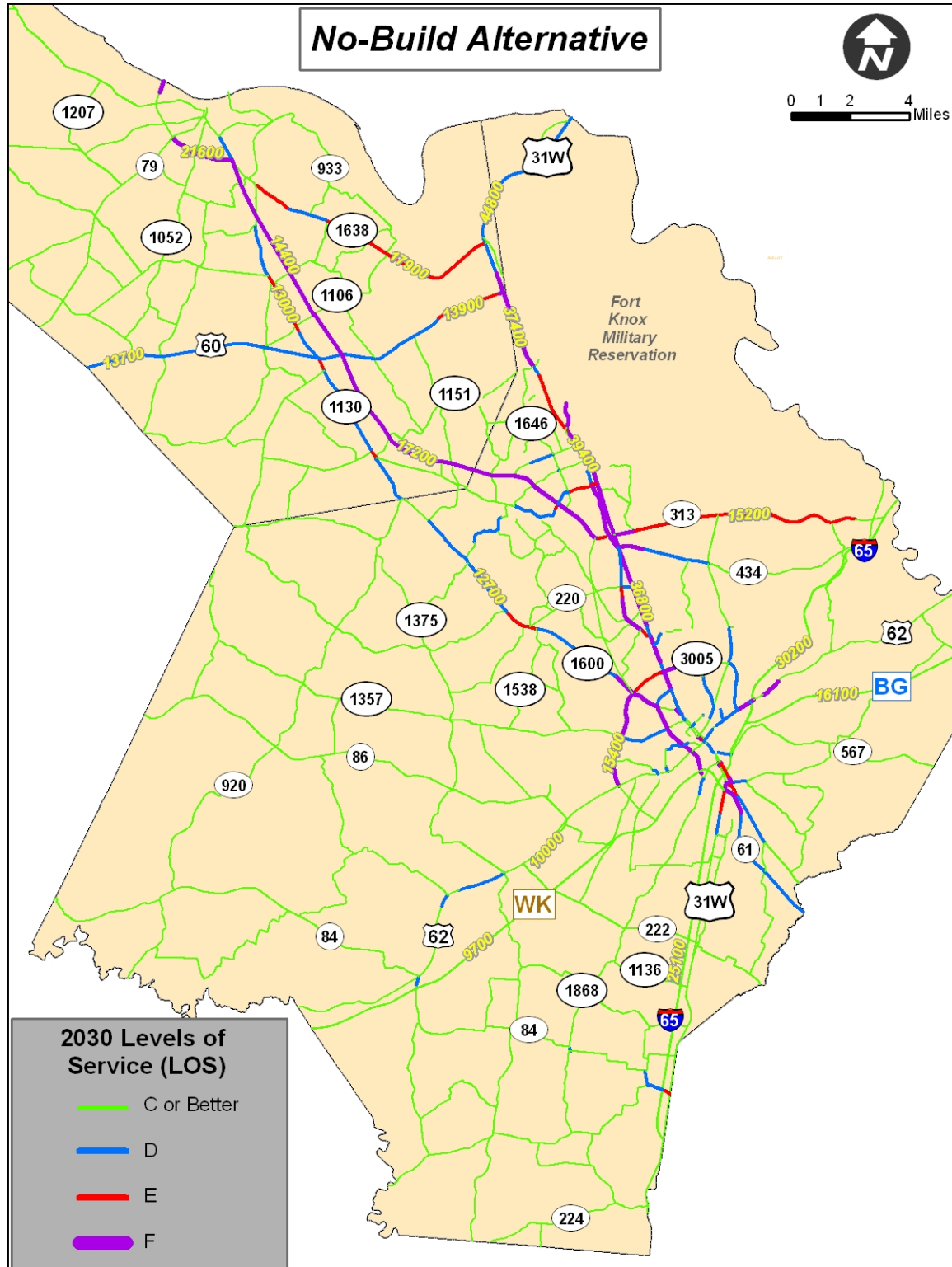
These actions will help to diversify the regional economy. And by providing long-term protection in the form of a greenbelt around Fort Knox, the region will help to ensure the long-term viability of the installation.

Finally, as tourism grows in the 21<sup>st</sup> Century, Smart Growth offers the region the best possible way to distinguish itself from the hordes of others vying for tourists dollars. By protecting the region’s unique heritage, culture, and landscapes, this scenario creates what tourists increasingly seek: real places.

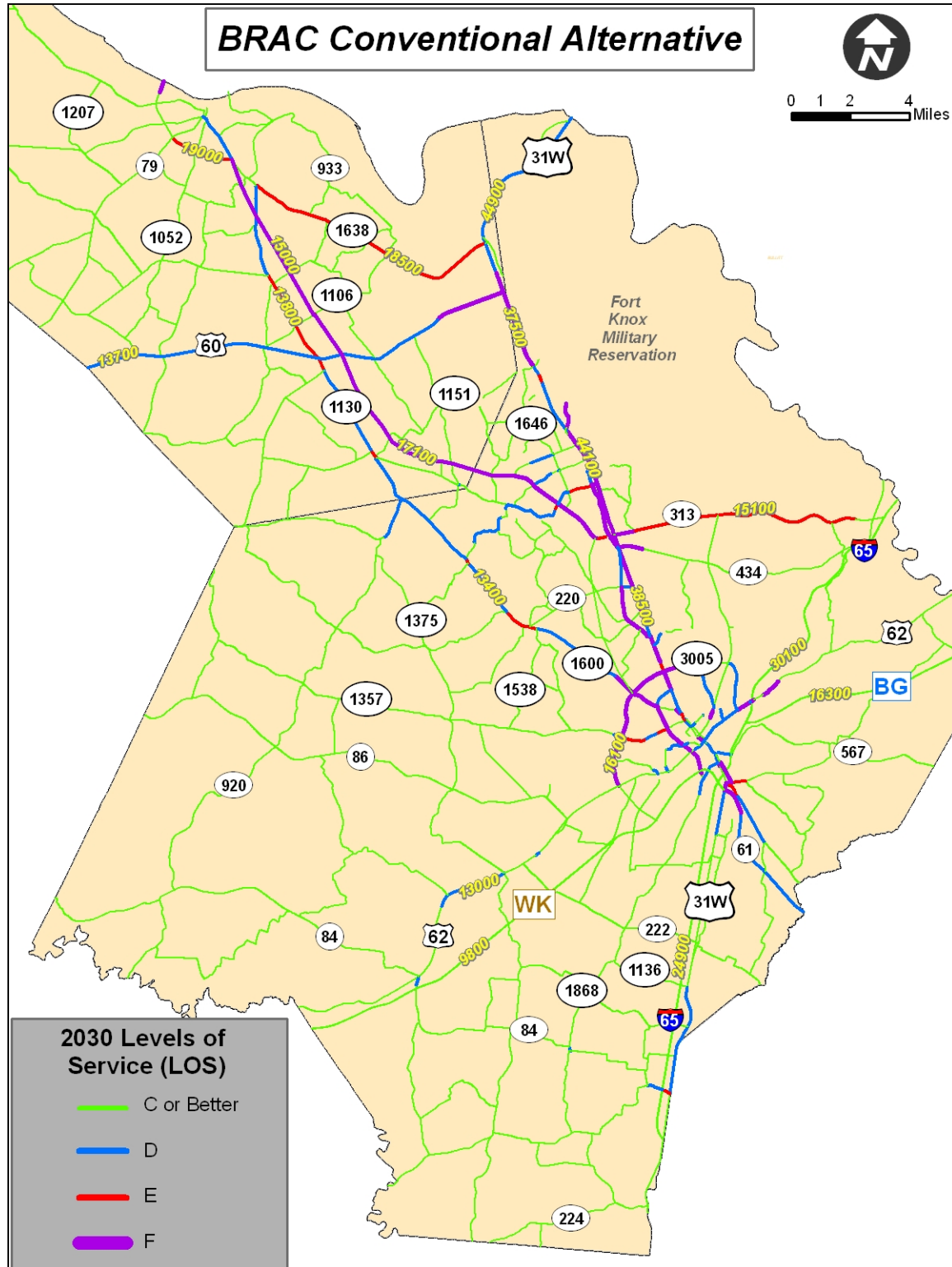


## **APPENDIX A**

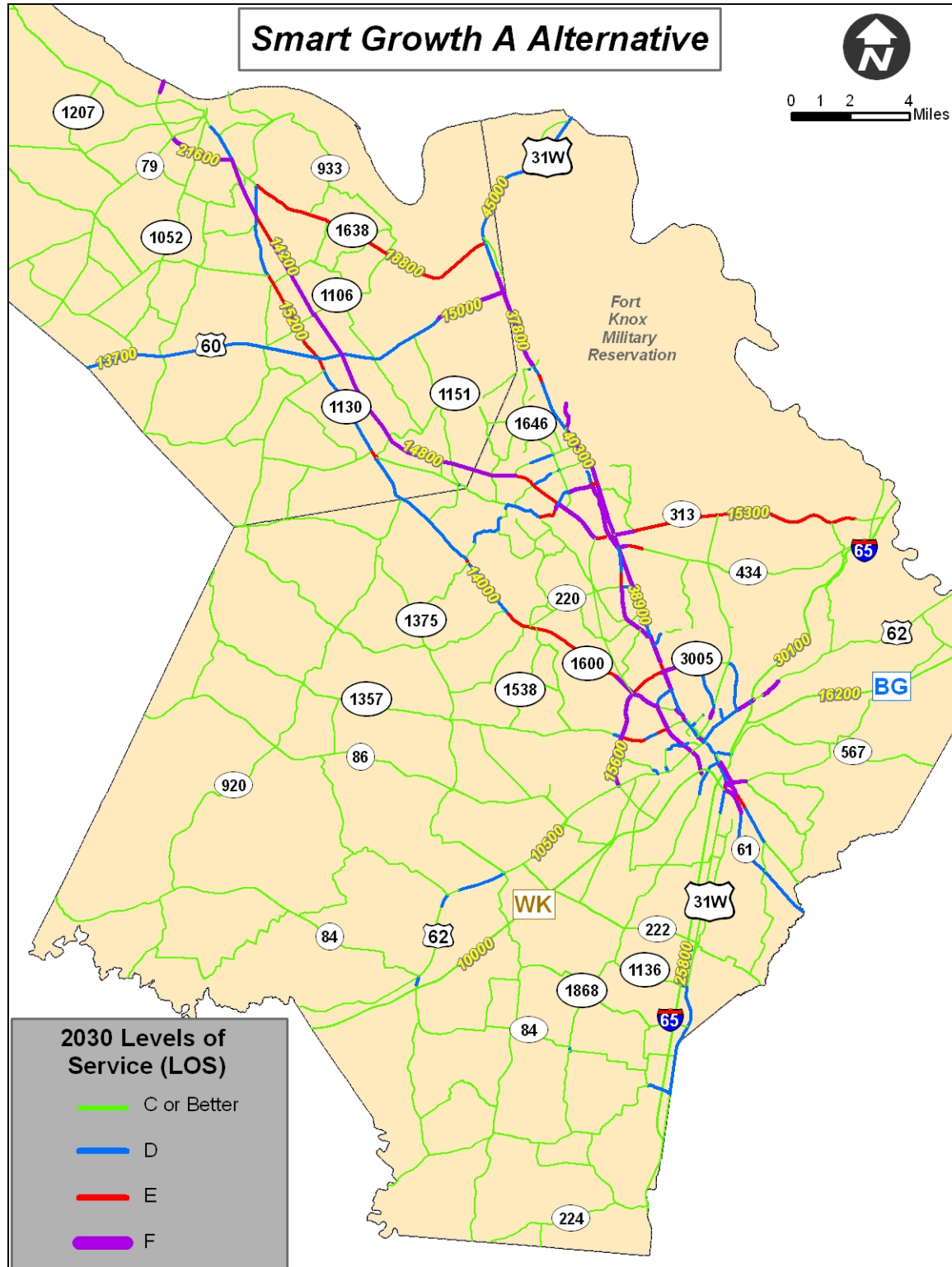
### **Radcliff-Elizabethtown MPO Travel Demand Model Output**



**Figure A-1: 2030 No-Build Traffic Volumes and Levels of Service (LOS)**

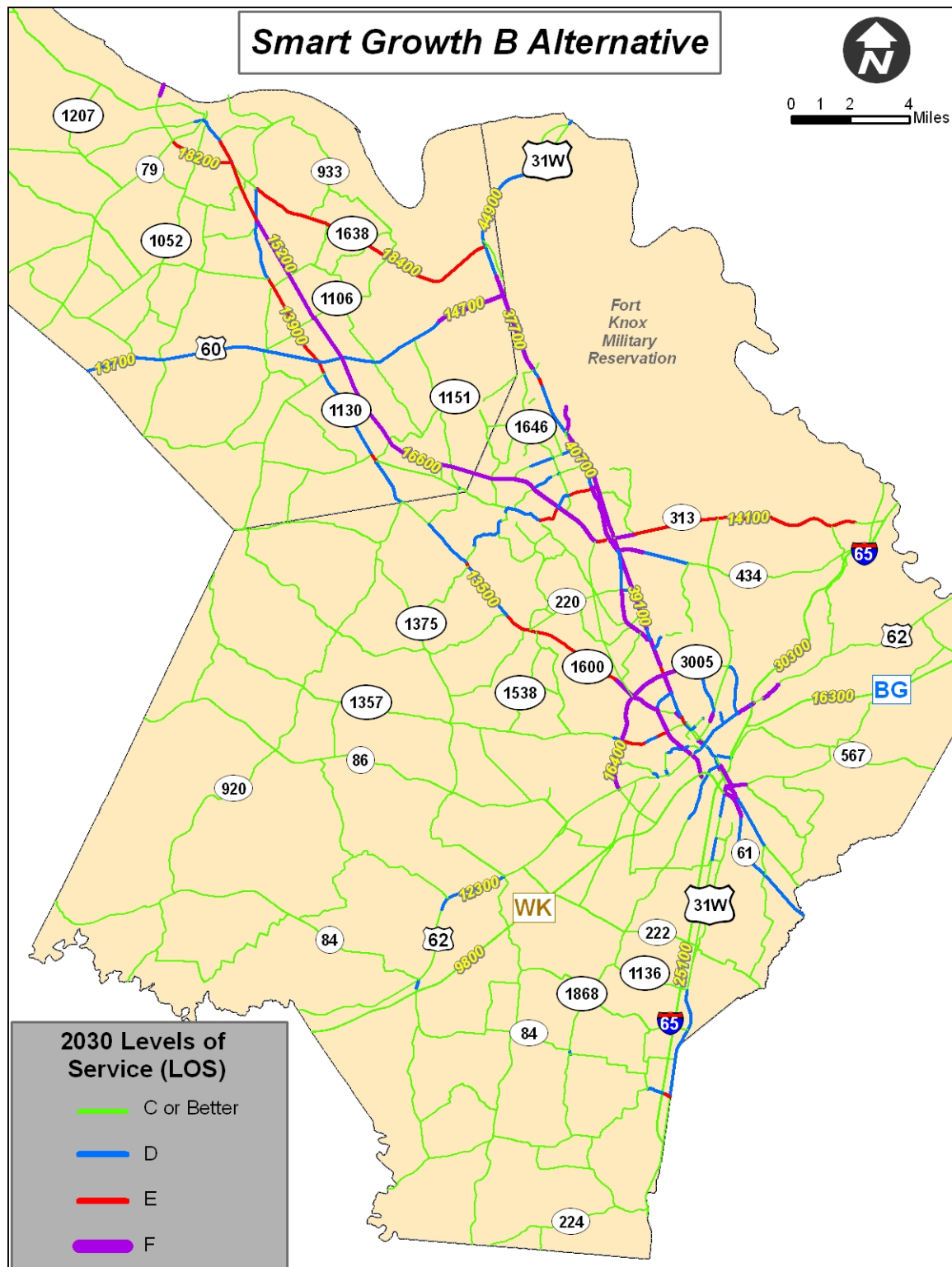


**Figure A-2: 2030 Scenario 1 Traffic Volumes and Levels of Service (LOS)**

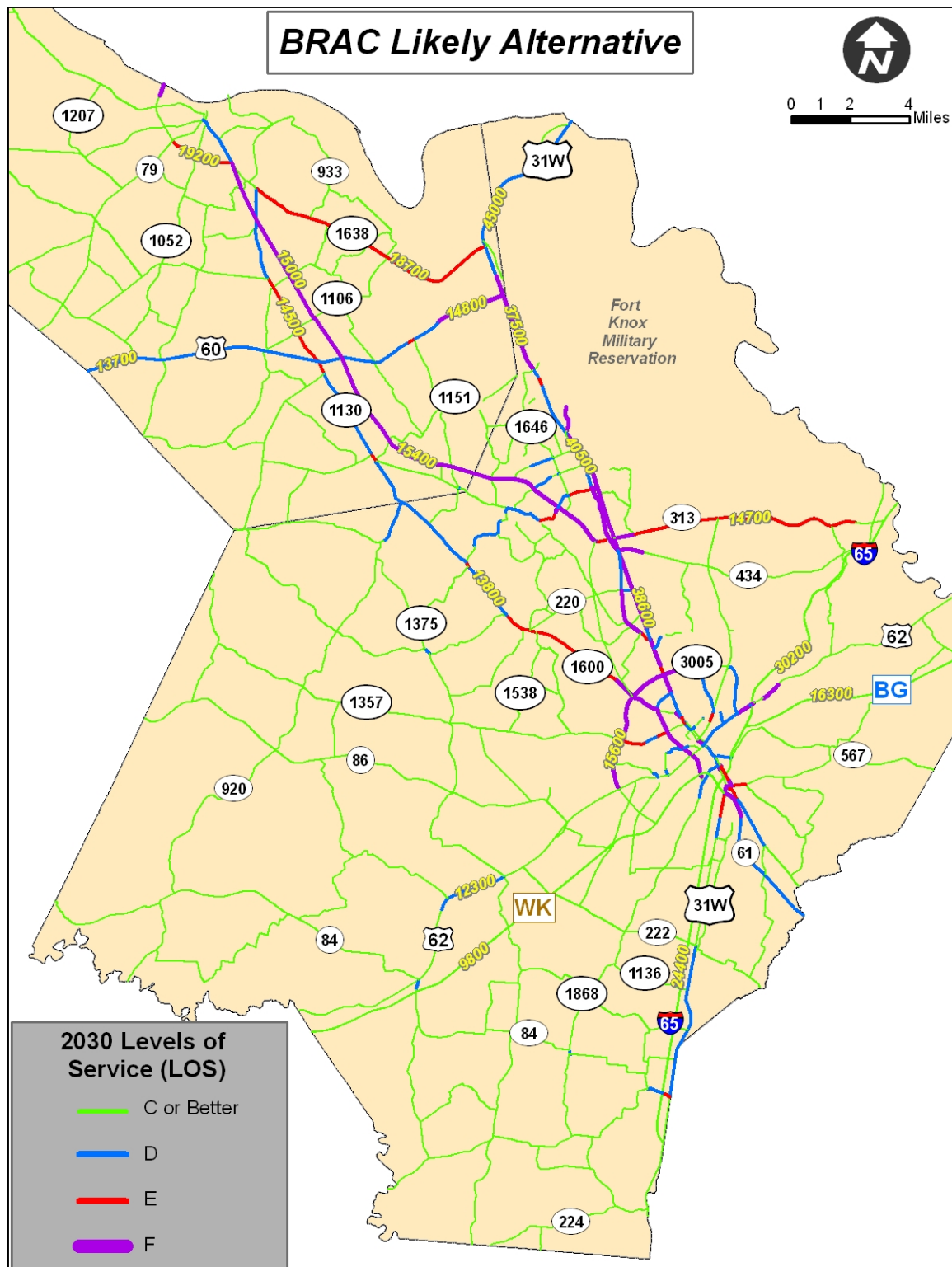


**Figure A-3: 2030 Scenario 2 Traffic Volumes and Levels of Service (LOS)**





**Figure A-4: 2030 Scenario 3 Traffic Volumes and Levels of Service (LOS)**



**Figure A-5: 2030 Scenario 4 Traffic Volumes and Levels of Service (LOS)**

## **APPENDIX B**

### **Kentucky Statewide Travel Demand Model Output**



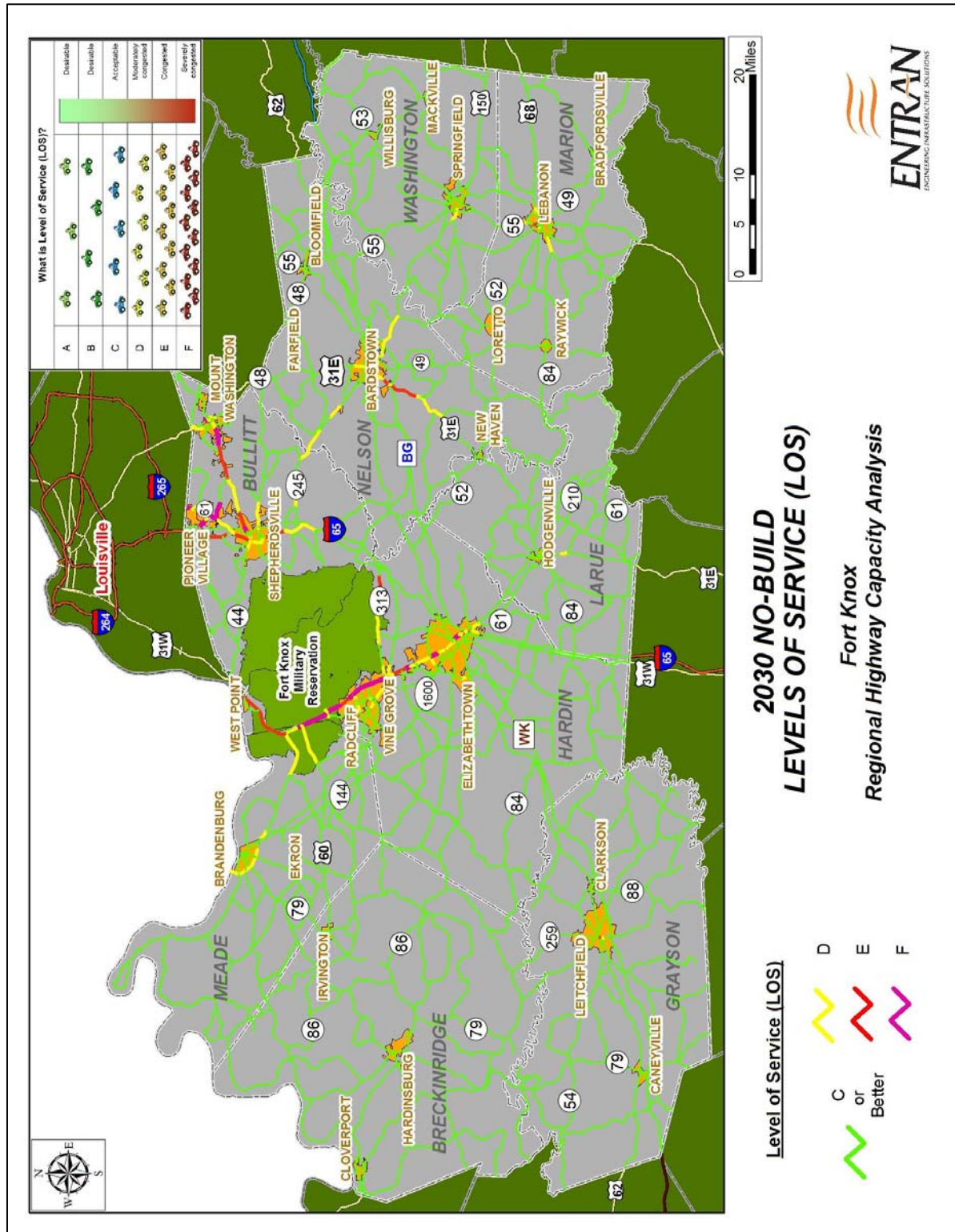


Figure B-1: 2030 No-Build Traffic Volumes and Levels of Service (LOS)

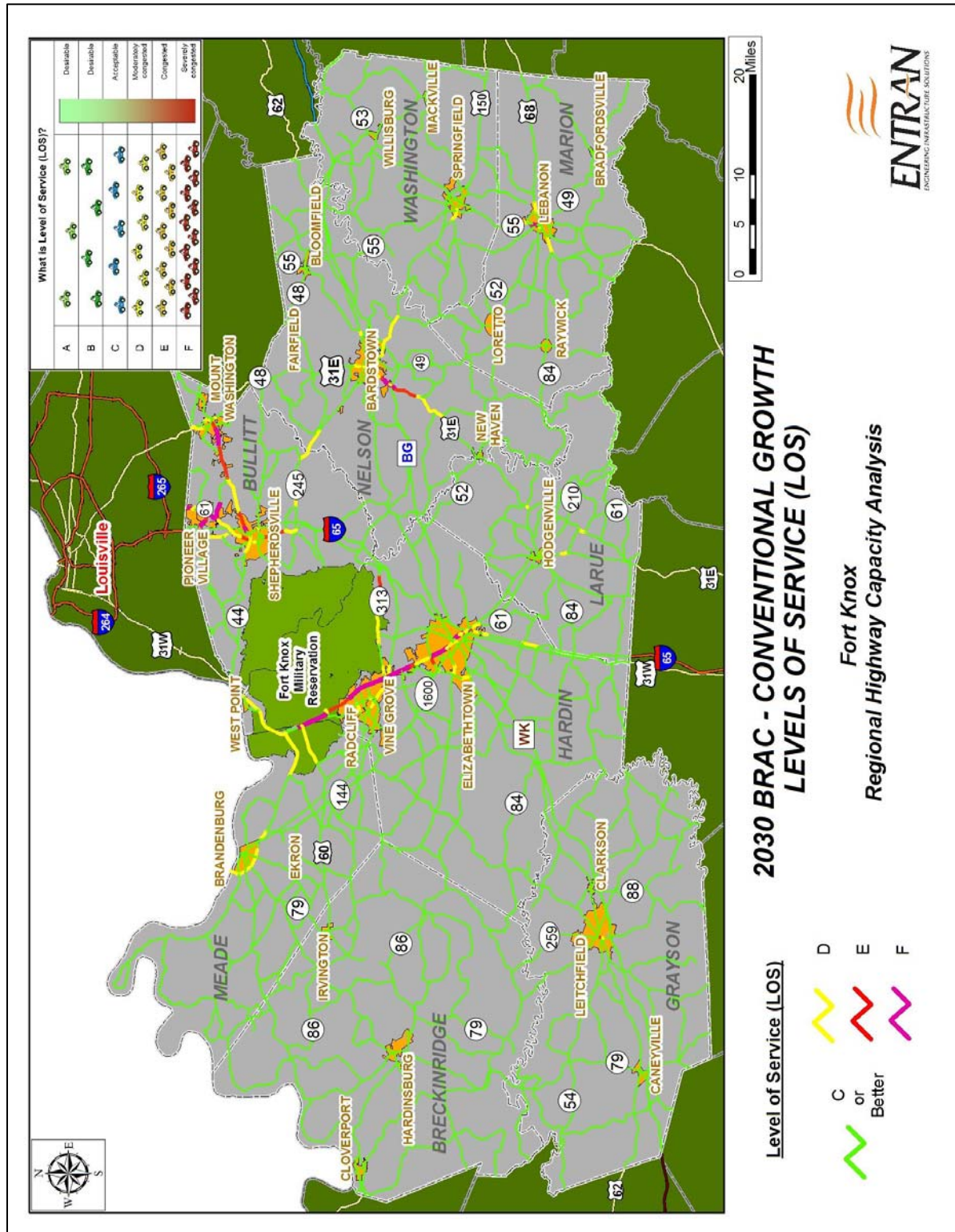


Figure B-2: 2030 Scenario 1 Traffic Volumes and Levels of Service (LOS)



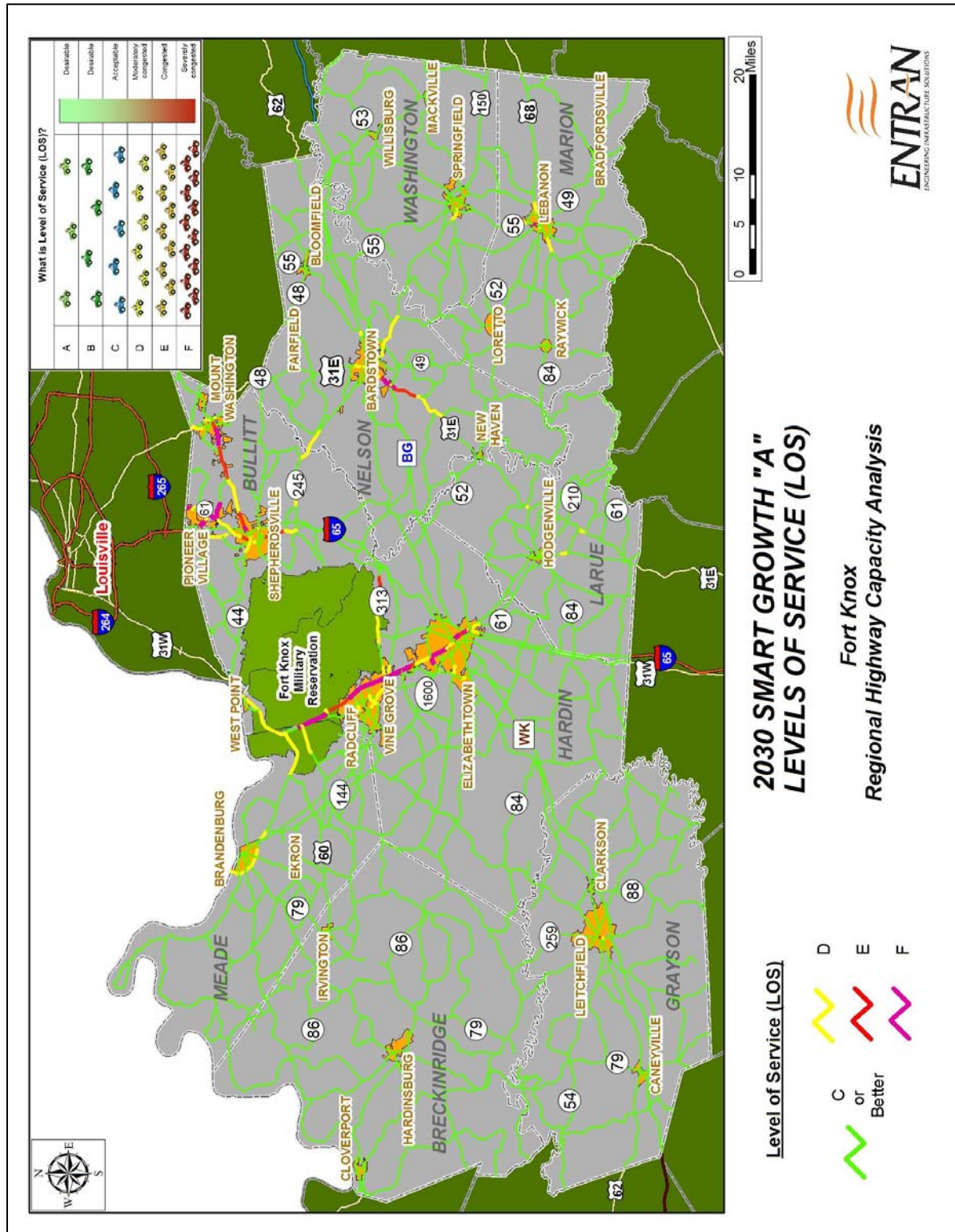


Figure B-3: 2030 Scenario 2 Traffic Volumes and Levels of Service (LOS)



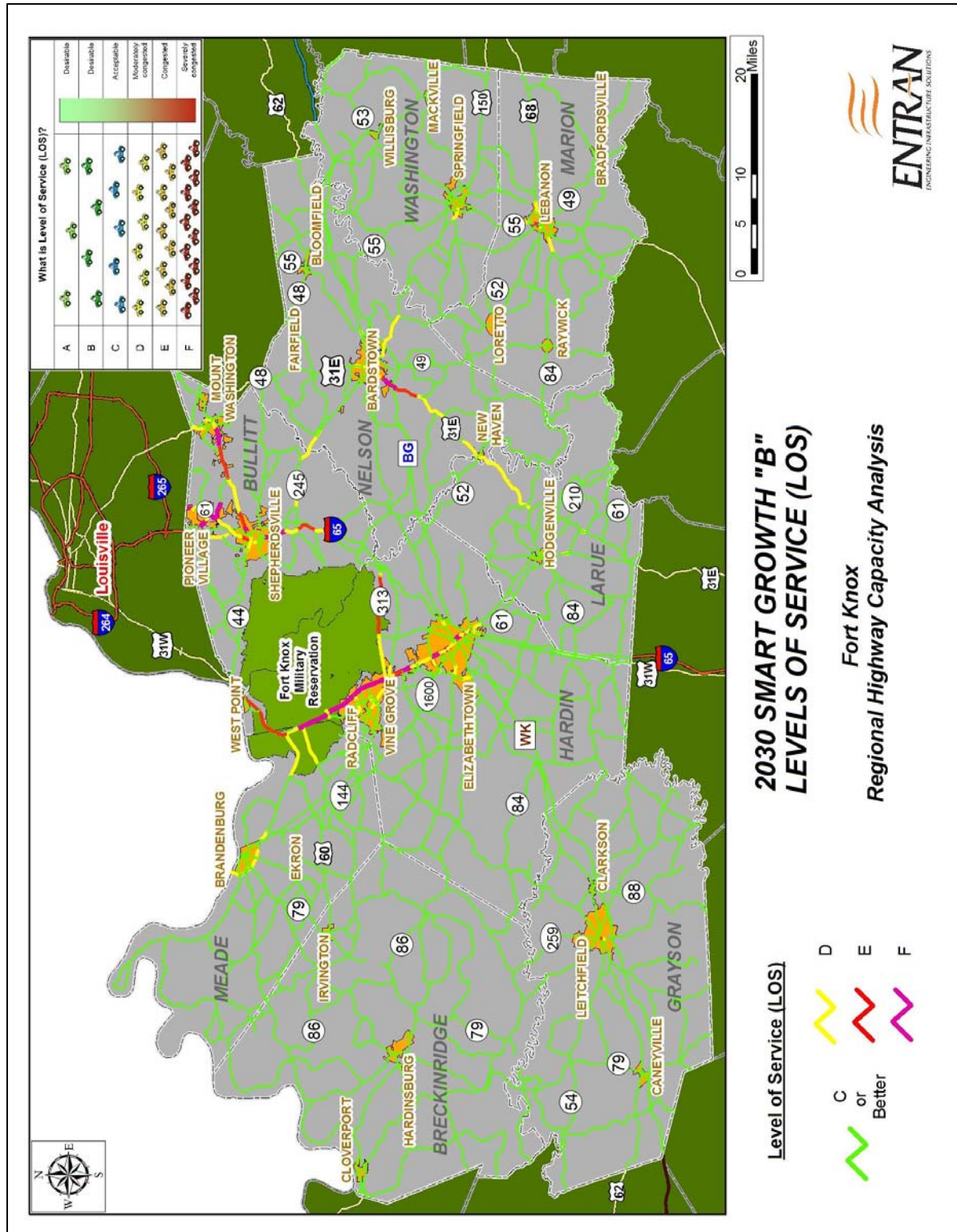


Figure B-4: 2030 Scenario 3 Traffic Volumes and Levels of Service (LOS)

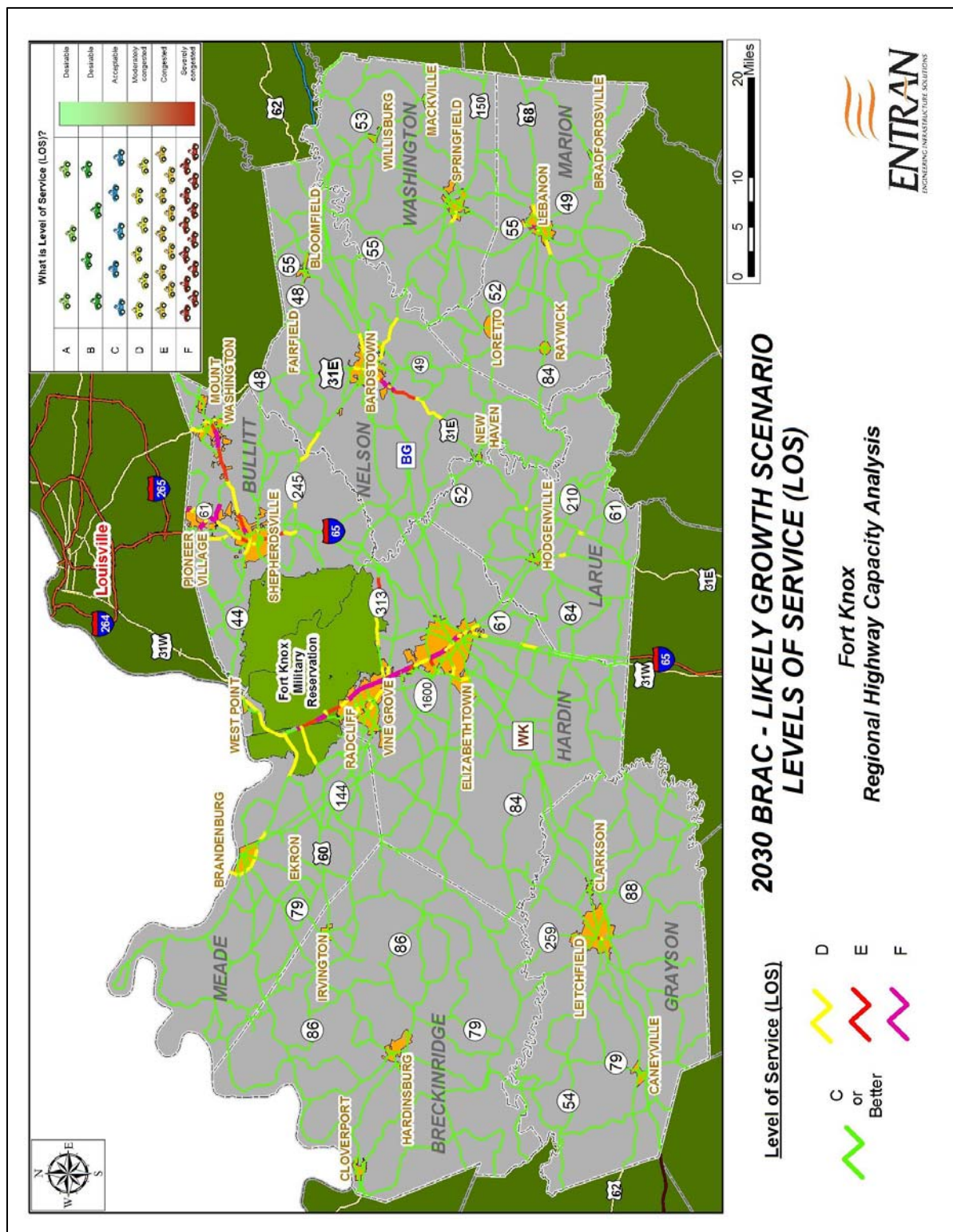


Figure B-5: 2030 Scenario 4 Traffic Volumes and Levels of Service (LOS)